MEASURING THE EFFECTS OF A HIMALAYAN SINGING BOWL ON A MEDITATION PRACTICE: A QUANTITATIVE APPROACH

by

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Abstract

The stress response in certain situations offers many benefits including sharpened focus, increased energy and alertness for academic, business / athletic performance, and critical flight or fight reactions necessary for survival. Life in our society predisposes us to stressful events with most individuals managing stress while maintaining optimum health. However, some circumstances beyond our control can overwhelm innate responses, as cumulative stress takes a toll on emotional and physical wellbeing. Effective providers need access to empirical data describing interventions to improve health and overall functioning. This quantitative study was designed to determine physiological and psychological effects of adding Himalayan singing bowl (HSB) exposure prior to a directed relaxation (DR) session. Research questions and hypotheses aimed to determine relaxation effects (Positive and Negative Affect States – [PANAS]) and physiological responses (blood pressure [BP] and heart rate [HR]) to a HSB exposure prior to a DR. Fifty-one adult female and male participants attended two sessions within a one month period. Study sessions were randomly assigned to have HBS exposure or silence prior to a DR session. There was a positive relationship between HSB exposure and physiological and relaxation responses evidenced by a significantly greater decline in systolic BP and HR with HBS when compared to silence alone. Decreases in diastolic BP were greater in the HSB group with a non-significant trend. Hypertensive individuals (n = 20) had significant changes from baseline in both systolic and diastolic BP when compared to normotensives (n = 31) at first and second measurements. Fifty of 51 participants reported feeling more relaxed at the end of both sessions and indicated positive associations with HSB exposure (deeper meditative state, enhanced spiritual experience, ocean imagery). Building upon prior research in relaxation and sound in Eastern and Western practices, this study offers innovative approaches to

stress management evidenced by decreases in systolic and diastolic BP, HR, and negative affect states when incorporating HSB into a meditation session. Results will have broad implications in the wider psychology and mental health fields offering clinicians practical tools for assisting clients with stress management.

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Table of Contents

List of Tables

List of Figures

CHAPTER 1. INTRODUCTION

Introduction to the Problem

Most of us live in a world filled with daily stressful events and are challenged by a number of demands. Many individuals will cope with these demands in healthy ways by viewing them as challenges to be managed or overcome and they will not manifest in disease. Other individuals will see events as stressors, and if they lack beneficial coping strategies, stressors may evolve into a series of uncomfortable symptoms that can disrupt their ability to lead productive, healthy, and happy lives. These symptoms can manifest as anxiety or depression and have a negative impact on their physical, mental and spiritual quality of life. Many of those individuals will present for therapy seeking relief and assistance for their discomfort. Comprehensive client management requires an approach that encompasses the physical, mental, and spiritual realms of functioning. As mental health care providers, we are challenged to discover and implement strategies that could enhance the relaxation response which has been proven to assist with stress management and alleviate anxiety and depressive symptoms (Benson 1975, Bjerklie et al., 2003). Knowing that part of the human condition involves being subjected to stressful events, we also appreciate that stress can be considered 'the great equalizer' since few are immune and stress does not discriminate based on socio economic, demographic or geographic factors. One approach is to embrace stress as we view it as a natural part of life. This allows us to explore, in a number of ways, our understanding and management of effective, healthy and non-costly interventions. Research has been revealing the efficacy of Eastern approaches as a complement to our Western culture in the fields of stress management therefore, it is imperative we continue to explore additional facets in an effort to enhance our

knowledge base and contribute to the field of complementary and alternative management approaches (CAM's).

As mental health care providers, we are challenged to discover and implement strategies that could enhance the established relaxation response, which has proven to assist with stress management (Benson, 1975), and alleviate anxiety and depressive symptoms (Bjerklie et al., 2003). Dr. Herbert Benson (1975) was one of the first medical doctors to discover the "Relaxation Response" when he objectively measured the relationship between stressful psychological events and the associated physiological changes affecting one's health. Dr. Benson is a pioneer in field of mind/body medicine. Throughout his greater than 35 year career, he defined the relaxation response and continues to research its efficacy in counteracting the harmful effects of stress with effective management. His work offers us a bridge between Eastern and Western medicine and religion, in the field of mind/ body, belief and science.

Over the decades since Benson's work, a number of complementary and alternative methods (CAM's) have emerged to assist in the area of stress management. Beginning with one facet, there is a plethora of medical, mental health and complementary medicine practitioners who have studied the positive physiological effects of music, sound, and vibration spanning the centuries (Adero, 2001; Gass & Brehony, 1999; Gaynor, 1999; Goldman, 2008; and Halpern, 1977). Specifically, Himalayan singing bowls (HSB) have been used for ceremonial and meditation purposes, and are being used by practitioners to enhance relaxation and meditation (Huyser, 1999), using this type of music as therapy (Gainer, 1994; Gardner, 1990). Dr. Gaynor (1999) notes his positive personal experiences of feeling calmer and less stressed after hearing and experiencing the vibrations of a (HSB). Dr. Gaynor, a traditional Western medical

practitioner, noticed positive health benefits after HSB exposure with his patients suffering from a variety of medical illnesses.

Although there is great anecdotal evidence touting the value of exposure to the HSB, the specific physiological effects including systolic and diastolic blood pressure along with heart rate, has not been measured. The intent of this research project is to determine if there are measureable physiological and psychological differences when an individual is exposed to a HSB prior to a directed relaxation (DR) session as opposed to a DR session without HSB exposure.

Background

Over the past thirty years, a number of studies have confirmed the benefits of the "relaxation response," a state of mental calm during which your blood pressure drops, your heart and breathing rate slow, and your muscles become less tense (Benson, 1975; Bjerklie et al., 2003). In his 1970s best seller, *The Relaxation Response*, Benson argued that meditators counteracted the stress-induced fight-or-flight response and achieved a calmer, happier state.

As meditation has become demystified over the decades and mainstreamed as a therapeutic technique, there remains a nugget of Buddhist philosophy: the belief that by sitting in silence for 10 minutes to 40 minutes a day and actively concentrating on a breath, word or image, one can train oneself to be present and induce a more relaxed state of mind and body (Bjerklie et al., 2003). This study attempted to improve upon Benson's (1975) relaxation response by determining if introducing a Himalayan singing bowl (HSB) prior to a meditation session will promote an enhanced relaxation response.

Stress hormones such as cortisol and adrenaline are useful when needed in a true crisis where "fight or flight" is required for survival. However, medical problems develop when one lives their life in this chronic stress state. These psychosocial stressors and stress hormones can lead to hypertension (Weiner, 1977) cardiac disease (Hanser, 1985), gastrointestinal problems (Khorana, 1983), and migraines (Steven & Shanahan, 2002). It is imperative we continue to explore preventative measures to enhance positive physiology thereby limiting the impact these stressors can have on illness causation.

Transcendental Meditation (TM) has been shown to have a positive effect on lowering blood pressure. A study of hypertensive African Americans, who were exposed to TM for 20 minutes twice daily indicated a decrease in blood pressure -3/-5 mm Hg over 12 months (Schneider et al., 2005). In addition, Paul-Labrador et al. (2006) discovered in a randomized trial of TM in comparison to health education in patients with coronary heart disease, TM showed significant benefits on blood pressure (-3/-2mm Hg) and insulin resistance over a 16 week period.

This researcher attempted to demonstrate within the field of CAM's that adding a HSB exposure prior to a meditation session has positive effects on physiology. The results will have broad ramifications in the field of mental health counseling. Practitioners would then have the option of adding a HSB exposure to a relaxation session with the knowledge they will enhance the client's positive physiology in both physical and mental health realms. Study results will advance best practices in the field of meditation and relaxation improving mental and physical wellbeing in the clients we serve.

Statement of the Problem

The body of empirical research proving the mind-body connection, and the negative effects of stress on our health is growing. The effects of anxiety and stress on mental health have been widely recognized as numerous experts estimate that up to 75% of fatigue and medical disorders are directly attributable to stress (Hughes, Pearson, & Reinhart, 1984; Kaptein, Van der Ploeg, Carseen, & Beunderman, 1990).

Since stress hormones play such an important role in determining ones mental and physical well-being, it is important to continue exploring alternative preventative measures before stressors impact the body and evolve into serious medical issues. Since it was unknown if adding a HSB to a directed meditation practice will demonstrate a positive physiological and psychological response, this research project offers an important contribution to the field of stress reduction and management.

Purpose of Study

The purpose of the study was to determine the physiological and psychological effects of adding a HSB exposure prior to a directed relaxation session. Motivation for the project arises from the researcher, a practitioner in private practice, intrigued by the concept of combining Eastern and Western traditions when working with clients exhibiting stress related disorders.

Research Questions

The primary research question (1) and sub questions (2-3) in this study:

1. What are the physiological and relaxation effects when integrating a HSB exposure prior to a directed relaxation (DR) session?

2. Will the HSB produce an enhanced effect on blood pressure and pulse rate when added prior to a DR session versus no HSB exposure prior to a meditation session?

3.Will there be an enhanced relaxation experience measuring positive and negative affect (PANAS rating scale) with HSB exposure prior to a directed relaxation session as opposed to no HSB exposure prior to directed relaxation session?

Directional Hypothesis

Directional Hypothesis: There is a positive relationship between the use of HSB exposure and enhanced relaxation and positive physiological effects when used prior to DR.

Rationale, Relevance, and Significance of the Study

Rationale for Study

This topic is important to study because stress leads to illness. Clinicians implementing stress management will have another management tool, enabling them to offer the highest standard of care in the field of relaxation and stress reduction. With an estimated 75% of fatigue and medical disorders being directly related to stress and anxiety (Hughes et al., 1984; Kaptein et al., 1990), the scientific community is challenged to discover interventions to reduce stress.

Since complementary and alternative methods (CAM's) are new in the field of relaxation response, scientific research studies are needed to examine and test the validity and reliability of claims being made by medical and mental health practitioners that they are indeed effective in promoting a deeper relaxation state. One facet includes how physiology is impacted by sound and vibration. Many practitioners note personal positive experiences with sound, and vibration (Adero, 2001; Gass, 1999; Gaynor, 1999; Goldman, 2008; Hapern, 1977), but little empirical data exist studying direct effects on physiology using a Himalayan singing bowl (HSB). HSB are

of interest, as they have been used for many years in ceremonial and for meditation purposes, to enhance relaxation (Huyser, 1999). There is a paucity of empirical data determining the effect on systolic and diastolic blood pressure, heart rate and subjective relaxation effects using an instrument such as a self-administered PANAS tool. In light of the absence of these published findings determining the effects of adding a HSB exposure to a directed relaxation session, this study was essential.

Relevance of the Study

As therapists and mental health providers, we are charged with the responsibility of offering the highest standard of care to our clients. Each clinical challenge offers the clinician the opportunity to implement best practices. With stress management being a crucial cornerstone for mental and physical wellbeing, the study offered new information on best practices regarding utilization of a HSB exposure along with a relaxation session. Results from this study will make a significant contribution to scientific research by advancing theories and extending knowledge within the relaxation response field.

Significance of the study

Study results will significantly contribute to the body of knowledge within the scientific community in the area of relaxation response and sound, vibration/music therapy. Results have the power to change best practices as clinicians assist themselves and their clients with relaxation modes. They may introduce for the first time, the option of adding a HSB exposure prior to a meditation session when attempting to enhance the relaxation response armed with the knowledge that HSB inclusion enhances positive physiology. Greater stress management improves physical and mental well-being which has the potential to evolve into a higher life

quality. Building on this concept, this project will spur further research in the area of sound and vibration which impact relaxation and stress management.

Since there is a debate among bowl practitioners, as to whether metal offers greater relaxation properties than crystal and vice versa, perhaps differing size bowls and tones could be compared, or the same experiment could be conducted using the same size and tone bowl made of crystal versus the seven metal Himalayan singing bowl. Perhaps future studies could include experiments using specific bowl tones that correspond directly with the chakra center most in need of support to determine client responses. Knowledge gained from this experiment will advance best practices in the field of meditation and relaxation improving mental and physical wellbeing in the clients we serve.

Nature of the Study

The researcher proposed a quantitative correlational design in order to answer the research questions; how does adding a HSB (potential stress reduction tool) prior to a directed relaxation session affect physiological reactions and subjective relaxation state? The experiment was based on defined variables and had a finite time frame to establish cause and effect. The independent variable is the HSB. The dependent variable is the meditation session. This research experiment used a sample size of (51) male and female adult participants from within a 50 mile radius of Boston suburban community in Massachusetts.

Whenever large numbers of participants are needed a convenience sample is justified (Creswell, 2009). The design is created to compare the two conditions with no random assignment as the individual will serve as their own control in an effort to minimize variables. Sampling strategy utilized convenience sampling with flyers posted in local downtown public

places including the library, medical offices, senior center, book stores and market within a 15 mile radius of the research location. Over the past thirty years, systolic blood pressure measurements have been used by Benson (1975) and Bjerklie et al. (2003) as a valid measure to test the relaxation response. The study included quantifiable data from physiological measurements (blood pressure, pulse) and supplemental qualitative data taken from researcher administered relaxation rating scale (PANAS). The reliabilities of the PANAS scales, as measured by Cronbach's alpha, were .89 for PA and .85 for NA. The narrowness of the confidence limits associated with these coefficients indicate that they can be regarded as providing very accurate estimates of the internal consistency of the PANAS in the general adult population. Thus, both PA and NA scale can be viewed as possessing adequate reliability (Crawford & Henry, 2004).

PANAS has been used to effectively measure positive and negative affect states in a number of research studies. Clinical improvements were evaluated using PANAS scores in patients with deep brain stimulation for treatment resistant depression (Mayberg et al., 2005). Positive and negative affect states were measured with PANAS along with associated mindfulness with rock climbers (Steinberg, 2011) and bungee jumpers (Middleton, Harris & Surman, 1996). Lord and Menz (2002) used PANAS to assess mobility, physical functioning and overall cardiovascular fitness after incorporation of a 6 minute walk program for older adults. Health-risk behavior in adolescents was found to be correlated with increasing emotional response to music when PANAS was used in Roberts, Dimsdale, East and Friedman's (1998) study. As in this study, when there is a desire to accurately measure positive and negative affect states, the PANAS has been proven to be a valid and reliable tool.

Definition of Terms

Does adding a Himalayan Singing Bowl (HSB) (potential stress reduction tool), prior to a directed relaxation (DR) session affect the physiological (blood pressure and pulse) and emotional state (PANAS) of adults?

Himalayan Singing Bowls (HSB) - The bowl used in this study is from Tibet. Tibetan bowls have been traditionally used for ceremonial and meditation purposes, and are handcrafted using alloys of several metals to produce different tones, depending on the alloy composition, their shape, size and weight (Inacio, 2004). To control for as many variables as possible, it was important to determine the tone of this particular study bowl. When rubbed and struck using the impacting stick called a puja, the 6 inch circular seven metal HSB to be used in the study was determined by musician John Bermani using a Petersen Strobe Tuner to be vibrating around a B^b pitch.

Directed Relaxation (DR)- This consisted of a prerecorded 20 minute audio relaxation session (see appendix for script) recorded on the researchers IPAD. All participants listened to the same 20 minute audio recording at the end of both sessions.

HSB Session –The bowl was played immediately before the DR session by the investigator for a total of 12 minutes alternating striking the bowl until the sound trails off (approximately 30 seconds) for the first minute and then rubbing with the puja for the second minute. This mode and length of time offers the best exposure to bowl sound (Mitch Nur, PhD, personal communication, July 15, 2011).

Silence session- the participant was asked to get comfortable and the researcher left the room for 12 minutes.

Puja- The exciting stick covered in soft leather, and used to produce sound from the bowl by impacting or rubbing, the rim and side of the bowl.

Blood pressure and heart rate measurements- An automatic blood pressure cuff device (Intelli sense manufactured by Omron, Model # HEM-747IC) was used to obtain and record preset interval data (blood pressure and heart rate) using numerical scores. Pre- session blood pressure including diastolic and systolic and heart rate was taken and then repeated after the 12 minutes of either silence or HSB intervention. Repeat measurements were taken a third time after the 20 minute DR.

Relaxation effect-

A. The participant was asked if there are any new stressful events in their lives when they returned for the second session within two weeks of the first session.

B. Participants completed the Positive and Negative Affect Scale (PANAS) pre and post session.

C. Participants were asked if they felt more relaxed at the end of session compared to beginning.

Assumptions and Limitations

The researcher assumed there would be a significant decrease in blood pressure and heart rate along with an increased participant evaluated relaxation state after the session that included the HSB exposure prior to the directed relaxation compared to the silence session. The parasympathetic nervous system will react favorably to the sound and vibration of the HSB and this will be reflected by the participant having more positive versus negative affect as measured by the PANAS rating scale. In addition blood pressure will show a significant decrease indicating a deeper state of relaxation within the physical body. There may also be a slight decrease in pulse rate. The participant will act as their own control thereby eliminating variables

that could hinder result reliability. Serial blood pressure and pulse monitoring with an automatic blood pressure cuff will offer consistent measurements without disruption to the relaxation state. The participant will be retested with the PANAS scale at the beginning and end of session thereby assuring rater validity and reliability.

Complementary and alternative medicine techniques to lower blood pressure have been evaluated although limitations and biases are present in many studies. In a systematic review of the health outcomes of Tai Chi, there appears to be some physiological and psychological benefits (Wang, Collet, & Lau, 2004). However, specific studies of effects of tai chi on blood pressure have shown no benefit. In a study that directly compared tai chi to resistance training among healthy elderly participants over a 12 month period, there was no significant effect of tai chi on blood pressure (Thomas et al., 2005).

Stress reduction through transcendental meditation (TM) has been shown to have varied effects on blood pressure. Results of a meta-analysis of randomized trials of TM revealed no convincing evidence for an effect of TM on blood pressure, with significant concerns about study methodologies and potential author bias.

The dual role of researcher and facilitator produces a limitation. The natural subjectivity of reporting could by reflective in the findings. The group is a mixture of gender and ages from one affluent Boston suburban community, therefore assumptions drawn may have bias and not be applicable to the general population. In addition, the same size is relatively small (51) and the researcher's choice of bowl size and tone may be pleasing to her but not pleasing to all participants.

CHAPTER 2. LITERATURE REVIEW

Introduction

The focus of this research was to determine if adding the sound and resonance of a Himalayan singing bowl (HSB) will have a measurable effect on the central nervous system prior to a 20 minute directed relaxation (DR) session. Physiological effects were measured by comparing pre and post session blood pressure and heart rate with and without a twelve minute HSB exposure prior to the DR session. Perceived relaxation effects were measured utilizing the Positive and negative affect scale (PANAS) pre and post session. This chapter will discuss the theoretical framework for the study and present a thorough literature review of previous research related to this topic.

Theoretical Framework

Relaxation and the Mind-Body Connection

The components of the theoretical framework for the study include the relaxation response, and research findings associated with improved health via stress management using meditation, and exposure to sound and vibration. The instruments used measured systolic and diastolic blood pressure, and heart rate along with positive and negative affect traits as reported by participants. The dependent measures of interest were the changes in the parasympathetic nervous system, responsible for decreasing blood pressure, and heart rate when inducing the "relaxation response." In addition, there was an analysis of the positive and negative effects using the PANAS scale to determine the physiologic effects as rated by the participant. The framework chosen is based on Herbert Benson's (1975) "Relaxation Response" model.

In 1975, Dr. Herbert Benson, a professor of medicine at Harvard Medical School published his ground breaking book "The relaxation response." In his book, Benson was able to demonstrate the direct relationship between stressful psychological events and the associated physiological changes affecting one's health. Based on research from a decade earlier, he studied 36 transcendental meditators (TM) and found when they meditated, they used 17% less oxygen, lowered their heart rates by three beats a minute and increased their theta brain waves (Bjerklie et al., 2003). He therefore concluded the meditators counteracted the stress-induced fight-or-flight response and achieved a calmer, happier state. His findings were a significant contribution to the field of relaxation and the mind-body connection.

Musical Effects on the Brain and Body

The road was paved by Pythagoras (580-500 B.C.E.) for the theory that music impacts the brain and body by inducing altered states. Pythagoras was the first Greek philosopher and mathematician to study the healing effects of music in his community when people listened to the hammering sounds produced by blacksmiths. This compilation of sounds inspired him to develop harmony theories and musical scales as he conducted research on his lyre. He experimented by stretching strings of equal tension to discover the underlying mathematics of the musical scale. A string that is twice the length of a string that produced a C, will also produce a C, but one that was an octave lower, in a ratio 2:1. Other notes can be obtained by taking simple fractions of the string as 3/2:1 = 3:2 produces an F; 4/3:1 = 4:3 produces a G (Prochazka, 2004). Pythagoras believed that music and mathematics were linked and that everything in the universe was a series of harmonies. He played his lyre to infuse his own soul with divine qualities and played for others believing that music possessed spiritual and healing properties

because when he played, he noted a greater feeling of relaxation and well-being for those suffering from physical and mental ailments (Gaynor, 1999).

In conclusion, by measuring the physical and emotional effects of incorporating both meditation and sound, this study testes, refined and advanced these two theories. As part of the analysis and interpretation of the collected data through blood pressure, pulse and PANAS scores, the researcher examined and explained the findings in light of assumptions and theoretical expectations by extending the body of knowledge in the area of relaxation response theory as associated with sound and vibration.

Review of Critical Literature

Scientific Discoveries About the Brain's Positive Response To Meditation

Although not exhaustive, there are a number of meditation techniques available including transcendental meditation (TM), guided imagery, directed relaxation, mindfulness meditation, and singing bowl. It would be a mistake to assume each technique produces the same results; therefore, it is necessary to examine each procedure and resulting response separately. From a scientific perspective, the approach to take would be to have the understanding that different techniques might be expected to produce different results with regard to differing variables (blood pressure, heart rate, stress levels, brain immunity, EEG, etc.) and as such they need to be evaluated individually.

Orme-Johnson and Walton (1998), revealed in their meta-analyses that, compared to other forms of meditation, relaxation, and health promotion, the transcendental meditation program was more effective in reducing anxiety than other meditation and relaxation techniques; more effective in increasing self-actualization than other meditation and relaxation techniques; and

more effective in reducing drug abuse, alcohol abuse, and cigarette use than other standard treatments. The changes were attributable to the state of relaxation and coherence that the transcendental meditation program produced.

Direct physiological effects on brain wave reactions have been measured after implementing another form of meditation; the Relaxation Response (RR). In an effort to pinpoint specifically how relaxation affects the human brain, Gregg, Jacobs, and Benson (1996) studied how the central nervous system reacts when exposed to effects of the (RR). In their controlled study using novice subjects, topographic EEG mapping was established as their dependent measure. Twenty subjects listened to a RR and control audiotape presented in a counterbalanced order while EEG patterns were recorded from 14 scalp locations. The RR condition produced greater ($p<.0164$) reductions in frontal EEG beta activity relative to the control condition. No significant differences were observed for any other frequency band or scalp region. Their findings suggested that elicitation of the RR produced significant reductions in cortical activation in anterior brain regions in novice subjects.

In addition to meditation effecting EEG brain wave patterns, meditation, specifically TM, also has an effect on cerebral blood flow. Newburg, Pourdehnad, and O'Aquili (2003) studied cerebral blood flow during a verbal meditation offered to a group of Franciscan nuns. The meditation was 50 minutes long and the subjects used an internal repetition of a particular phrase consistent with teachings of transcendental meditation (TM). Findings revealed a 7.1 % increased blood flow in the prefrontal cortex. This has particular relevance as this specific area of the brain is responsible for cognitive processing. Thus one may conclude that TM improves brain

functioning including containing and storing knowledge, thinking, and memory functions (Newburg et al., 2003).

Contrasting the TM approach which was proven to have positive effects on electrical brain activity and improved blood flow, mindfulness meditation was put to the test to measure brain immune function. Davidson et al., (2003) performed a randomized controlled study using 25 healthy employees in their work environment. Their well-known widely used 8-week clinical training program in mindfulness meditation was tested. Electrical brain activity was measured before, immediately after employees were taught mindfulness meditation, and then 4 months following the 8-week training program. A wait-list control group (n = 16) was tested at the same points in time as the meditators. At the end of the 8-week period, subjects in both groups were then vaccinated with the influenza vaccine. Results revealed the meditator group had significant increases in left-sided anterior activation, (a pattern previously associated with positive affect), than the non-meditators. In addition, researchers found significant increases in antibody titers to influenza vaccine among subjects in the meditation group compared with those in the wait-list control group. The magnitude of increase in left-sided activation predicted the magnitude of antibody titer rise to the vaccine. Their findings demonstrated that a short program in mindfulness meditation produced demonstrable, positive effects on brain and immune function, which is essential for mind-body health.

Stress reduction through transcendental meditation (TM) has also been shown to have varied effects on blood pressure. In a study of hypertensive African Americans, TM for 20 minutes twice daily resulted in a decrease in blood pressure -3/-5 mm Hg over 12 months (Schneider et al., 2005). Their long-term follow up study of participants in trials using TM

versus other behavioral stress reducing interventions, found the TM group had a 23% reduction in all-cause mortality and a 30% reduction in cardiovascular mortality. Therefore, stress reducing interventions such as TM may have beneficial effects among individuals with hypertension (Schneider et al., 2005).

In support of Schneider et al.'s (2005) work, Paul-Labrador et al. (2006), demonstrated the relationship between TM and its beneficial effects on blood pressure. Their work included a randomized trial of TM in comparison to health education in patients with coronary heart disease. Results revealed significant benefits on blood pressure (-3/-2mm Hg) and insulin resistance over a 16 week period (Paul-Labrador et al., 2006).

More recently, nine randomized controlled trials met eligibility criteria for a meta-analysis of TM effects on blood pressure (Anderson, Liu & Kryscio, 2007). The random-effects meta-analysis model for systolic and diastolic blood pressure, respectively, indicated that transcendental meditation, compared to control, was associated with the following changes: -4.7 mm Hg (95% confidence interval (CI), -7.4 to -1.9 mm Hg) and -3.2 mm Hg (95% CI, -5.4 to -1.3 mm Hg). Subgroup analyses of hypertensive groups and high-quality studies showed similar reductions. Authors concluded that the regular practice of transcendental meditation may have the potential to reduce systolic and diastolic blood pressure by ~4.7 and 3.2 mm Hg, respectively which represent clinically meaningful changes.

An alternative complementary medicine technique such as tai chi has been hypothesized to lower blood pressure. Efforts to measure Tai Chi's effect on blood pressure have been evaluated although limitations and biases are present in many studies. In a systematic review of the health outcomes of Tai Chi, there appears to be some physiological and psychological

benefits (Wang et al., 2004), however, in a study that directly compared tai chi to resistance training among healthy elderly participants over a 12 month period, there was significant effects of tai chi on blood pressure (Thomas et al., 2005).

The Relaxation Response (RR) is characterized by decreased oxygen consumption, increased exhaled nitric oxide, and reduced psychological distress (Benson, 1975). Three decades of research later, Dusek et al. (2008) advanced the RR by hypothesizing that RR elicitation results in characteristic gene expression changes that can be used to measure physiological responses elicited by the RR in an unbiased fashion. Researchers assessed whole blood transcriptional profiles in 19 healthy, long-term practitioners of daily RR practice (group M), 19 healthy controls (group N1), and 20 N1 individuals who completed 8 weeks of RR training (group N2). 2209 genes were differentially expressed in group M relative to group N1 ($p<0.05$) and 1561 genes in group N2 compared to group N1 ($p<0.05$). Importantly, 433 ($p<10-10$) of 2209 and 1561 differentially expressed genes were shared among long-term (M) and short-term practitioners (N2). Analyses revealed significant alterations in cellular metabolism, oxidative phosphorylation, generation of reactive oxygen species and response to oxidative stress in long-term and short-term practitioners of daily RR practice that may counteract cellular damage related to chronic psychological stress. This study provides the first compelling evidence that the RR elicits specific gene expression changes in short-term and long-term practitioners which may relate to long term physiological effects (Dusek et al., 2008).

Like Dusek et al. (2008), additional researchers in the past decade have studied DNA microarray technology for it allows for the expression level measurement of many thousands of genes. This information offers us more concrete and objective information toward contributions

in the mind body field. These new experimental options have revolutionized research in the area of molecular biology and can also serve as a template for individualized medical approaches (Eisen, Spellman, Brown, & Botstein, 1998).

Researchers have documented the use of DNA microarrays for assessing therapeutic responses to psychological relaxation and meditative practices on the molecular-genomic level (Dusek et al., 2008; Rossi, 2002, 2004, 2005, 2007). This growing body of research substantiates psychotherapy, pastoral counseling, psychiatry, and therapeutic hypnosis as offering a positive "top down" response from mind to gene (Rossi, 1986, 1993, 2007; Rossi & Rossi, 2008). Rossi's (2008) most recent experimental design research using three subjects focused on the possible role of therapeutic hypnosis using their "Creative Psychosocial Genomic Healing Experience." Using DNA microarray analysis, results on the subjects indicated a response to the therapeutic protocol within one hour after the treatment through the expression of 15 early response genes which were up-regulated between 1.2 and 1.8 folds with no single gene being down-regulated. A further cascade of 77 genes occurred 24 hours later. Researchers concluded additional studies require cross validation with more subjects to document the validity and reliability of using DNA microarrays to assess their therapeutic protocol (Rossi, 2008).

Additional Pathways to Positive Brain/body Physiology

In an effort to expand upon prior research and build evidence for best practices, exploring additional avenues for enhanced mental and physical response to meditation is imperative. For example, what kind of effects might sound have on health? Or do the vibrations of singing, sound exposure, prayer, or chanting effect physiology and the relaxation response?

Vilayat (1982) extolled the virtues of chanting within the Sufi ritual. Chanting vowels to hear various harmonics and the mixture of tones is part of Sufi tradition which creates healing power from the sound coming from the chanting harmonics. Taking chanting to another level, Emoto (2004) researched how sounds and vibrations affect the shape of water droplets. He claims that since humans are 70% water, we will be highly affected as our cell shape responds to tone, vibration and composition of sound near the water droplet (representing our cells). In his experiments, when the round water droplet was exposed to heavy metal music, using a black background microscope, those round edges became erratic. In contrast, when the round drop was exposed to classical music, the round edges became more symmetrical- even snowflake shaped. Critics of Emoto's (2004) work assert he had insufficient experimental controls, and neglected to share sufficient details of his research approach within the scientific community. In addition, according to Tiller (2005), he designed his experiments in ways that left them open to human error which could influence his findings. However, if Emoto's (2004) research is valid, his ideas and photos in his book *Hidden Messages in Water* would support the evidence that sound and vibrations have a profound impact on a cellular level.

In contrast to how outside music has a direct effect on cells, one might ask how personal singing may affect individual responses on an internal cellular level. Adero's (2001) research was consistent with his theory that singing is good for your lungs. His study examined the specific effects singing had on the lung capacity of patients at the University Hospitals of Cleveland-Ireland Cancer Center. Results indicated patients who sang exhibited improvements in respiratory conditions including pneumonia and bronchial ailments which required sufficient

lung oxygenation. Thus, singing was determined to be a natural and effective method for increasing oxygen flow through lung capacity expansion (Adero, 2001).

If singing increases oxygen through lung capacity expansion could the vibrations that singing produce also have an effect on physiology? Gass and Brehony (1999) were able to support this theory. Vibration is the physical motion which accompanies singing, chanting, speech and vocal prayer. Their research, based on clinical practice, points to the power of vibration, which appears to charge brain cells, lower blood pressure and balance heart rhythm. These positive effects induced relaxation and resulted in mood elevation (Gass & Brehony, 1999). Similarly, Halpern (1977) researched the effects his music on healing. He discovered the connections between sound and healing by demonstrating positive brainwave patterns using biofeedback and aura photography.

Based on the previous research discussed, it is clear that when it comes to the healing effects of sound, there is no "one size fits all" approach to its healing effects and musical preference (Goldman, 2008). Seashore (1937) would agree as he studied how specific musical compilations affect the psyche of different people. He demonstrated that 40% of his subjects enjoyed a specific piece of music that he chose, while the other 40% disliked it. The remaining 20% remained neutral, neither liking, nor disliking it. Goldman (2008) in his book "The Seven Secrets of Sound Healing," explores the concept of vibrational science. His secrets include: everything is vibration, intent is powerful, we are unique vibratory beings, silence is golden, our voice is the most healing instrument, there are many notes in the scale, and sound can change the world.

Dynamics of the Himalayan Singing Bowl

Inacio (2004) offers information about how to play the bowl with the greatest efficacy and in a standardized way, which had implications for this study. Tibetan bowls have been traditionally used for ceremonial and meditation purposes. They are handcrafted using alloys of several metals and they produce different tones, depending on the alloy composition, their shape, size and weight (Inacio, 2004). The sound is produced by impacting or rubbing, the side of the bowl with the exciting stick (called puja) frequently made of wood and covered with a soft skin (Jansen, 1993). Singing bowls, also designated by Himalayans or Nepalese (Gaynor, 1995, 2002) are traditionally made in Tibet, Nepal, Bhutan, Mongolia, India, China and Japan. The alloys used include several metals – mainly copper and tin, but also may include gold, silver, iron, and lead, each believed to possess particular spiritual powers.

Inacio (2004) provides evidence regarding the bowl type, its physical shape, how it is struck, and where it is stuck matters in relation to waveguide synthesis. Inacio (2004) uses the waveguide synthesis technique for performing numerical simulations after bowls are played. These researchers used an experimental modal identification of three different Tibetan bowls, and then developed a modeling approach for these systems. Extensive nonlinear numerical simulations were performed, for both impacted and rubbed bowls and the results are in good agreement with preliminary experiments (Inacio, 2004). The numerical simulations shed light on the sound-producing mechanisms of Tibetan singing bowls. Both impact and friction excitations were addressed, including perfectly-symmetrical and less-than-perfect bowls (a very common occurrence).

The Dynamics of the puja (striking instrument) were also explored (Inacio, 2004), for the excitation of HSB can include impact (striking like a bell), rubbing around the rim of the bowl with the puja or a combination of both. Results indicated that the rubbing gives less discord, and the imperfect bowls (handmade bowls such as the one chosen for this experiment) are more common and have more of a beat when rubbed versus the perfect ones.

Results further revealed when the bowl is rubbed by the puja, a steady motion is never reached, for the bowl is disrupted whenever the vibration amplitude reaches a certain level. This motion results in severe "chaotic impacting", which breaks the mechanism of energy transfer, leading to a sudden decrease of the motion amplitude. Implications for this study are incorporated into the plan of how the bowl will be played during session, and assuring the bowl will not be overplayed. When the bowl is overplayed, the "singing" is converted to "ringing" and results in the displeasing chaotic chattering sound. This sonorous saturation effect, which can be musically interesting, is more like a discord and is contrary to the relaxation response this researcher attempting to achieve.

Inacio (2004) also compared a naked wood puja, and one wrapped in soft cotton covered by leather. With the naked puja, the initial transient became longer, before instability of the second mode (3.0) settled. The bowl responses were less regular, however six beats per revolution were clearly perceived. The results stress the importance of the contact/friction parameters, therefore if one wishes a bowl to "sing" in different modes this is easier to obtain in larger bowls. For the listener, sounds will always be perceived with beating phenomena. However, for a perfectly symmetrical bowl, no beating at all is generated at the moving excitation point. For these reasons, a 6 inch diameter handmade/imperfect seven metal

Himalayan singing bowl was chosen for this research study, which will offer more beats when rubbed. A puja wrapped in soft cotton covered by leather will be used to offer the "purest" bowl singing, with less incidence of the chattering sound.

Rationale for Directed Relaxation and Singing Bowl Pairing

Taking into consideration all the research conducted by the scientific community linking meditation to healing, and the Eastern world research demonstrating sound and vibration and its relationship to healing, this researcher combined the two and studied the effects of adding the sound and vibration of a HSB to a directed relaxation practice. The decision to create a directed relaxation for this study, as opposed to using a TM approach was based on a few reasons for this researcher. Although there is credible research proving the benefits of a specific transcendental meditation approach, the disadvantages of choosing TM include practicality and cost for most providers. Learning the TM technique involves weeks of sessions and cost $1500.00 (TM.org/tuition). This researcher wanted to offer a simple, cost effective mode for inducing relaxation. See Appendix A for partial 20 minute directed relaxation script I developed which is pending copyright and will be available to providers and laypersons requiring no advanced preparation, special skills or fees. Himalayan singing bowls vary in price from $25.00 to hundreds depending on size and tone. The bowl used for this research project cost $150.00. Offering providers and laypersons a new, cost effective option contributing to best practices for relaxation enhancement was a priority.

Overview of Related Research

Bridging the gap between Seashore (1937) and Goldman's (2008) work, Smith and Joyce (2004) investigated the relaxation states of students who listened to Mozart versus New Age

Music. Researchers conducted a study with 63 students. Fourteen listened to a 28-minute tape recording of Mozart's Eine Kleine Nachtmusik, 14 listened to a 28-minute tape of Steven Halpern's New Age Serenity Suite, and the remaining 35 chose magazines versus music. The time exposure was three consecutive days for 28 minutes a session. Smith's (2001) 15 relaxation state (R-State) categories were used as a measuring tool and included: Sleepiness, Disengagement, Rested/Refreshed, Energized, Physical Relaxation, At ease/Peace, Joy, Mental Quiet, Childlike Innocence, Thankfulness and Love, Mystery, Awe and Wonder, Prayerfulness, and Timeless/Boundless/Infinite, and Awareness. Although no differences were noted after the first session, results indicated at the second session, participants who listened to Mozart reported higher levels of At Ease/Peace and lower levels of Negative Emotion. With session 3, the Mozart listeners reported substantially higher levels of Mental Quiet, Awe and Wonder, and Mystery. Mozart listeners reported higher levels, and New Age listeners slightly elevated levels, of At Ease/Peace and Rested/Refreshed. Both groups reported higher levels of Thankfulness and Love compared to magazine reading group.

The efficacy of music on anxiety states was proven with Smith's (2008) study investigating the effects of a music relaxation session with a group of adults working in at a stressful consumer complaint call center in Queensdale. The employees were on the receiving end of angry customers who were subjected to verbal aggression from dissatisfied workers in a highly stressful environment. The stressor-strain framework, along with Selye (1982) adaptation response was used to study 80 customer service specialists (female = 40, male = 40). The state portion of the State Trait Anxiety Inventory was used as a pre and post measurement. Results indicated the music relaxation intervention significantly reduced anxiety levels in participants

compared to the group that was offered a discussion intervention. The effects revealed the music relaxation group indicated a positive increase in feelings of relaxation and pleasantness, as well as decreased tension, after the music relaxation intervention.

HSB Efficacy in Practice

Although there are a few field experts using HSB in practice (Gaynor 1999, Nur 2011), a thorough search of literature represents a paucity of empirical data exploring the effects of the HSB on physiology. Dr. Mitchell Gaynor (1999), a traditional Western trained M.D. discussed his first experience with a Tibetan singing bowl in his book *The Healing Power of Sound:*

> I began searching for healing modalities that could tangibly and reliably help my patients to achieve these transformations. A turning point in my research occurred when I met Odsal who took me to a store where I picked out a Tibetan singing bowl. The exposure to the sound was so thrilling, I began playing it every morning as part of my meditation practice. In a short time, I was less vulnerable to stress than I had been in the past. I could more easily avoid conflicts, as well as minor irritations that once would have made me lose my temper. (p. 11)

Limitations

It is important to understand that tones appealing to some may not be appealing to others depending on size, type, shape, sound and tone which may impact the participant responses in this study using a handmade medium sized (6 inch) seven metal Himalayan singing bowl. When struck, the bowl offers a deep resonance along with superb vibrational quality and sustainability ringing at a Bb tone. The bowl was chosen by the researcher for its relaxing effect. Amplitude and decibel when struck is also considered. When measuring loudness or amplitude-the intensity of sound and the amount of energy- decibel (db) is used and named after Alexander Graham Bell (Martin, 1924). The bowl was played and struck at 70 db, which is measured as normal conversation on the equivalent decibel scale between department store (60 db) and a vacuum

cleaner (75 db). Although pleasing to the researcher, there is a potential limitation that this choice of decibel sound may not be received in the same way by all participants.

Considering that no "one size fits all" another potential limitation could be the size (6 inch diameter) and specific Bb tone chosen for this study, although pleasing to the researcher may not be pleasing to all study participants. Along the same lines as size and tone, how the bowl will be played may also present a limitation. The bowl will be played immediately before the DR session by the investigator for a total of 12 minutes alternating striking the bowl until the sound trails off (approximately 30 seconds) for the first minute and then rubbing with the puja for the second minute. Allowing the sound to trail off creates an important space believed by Goldman (2008) to be necessary for healing. "It's the space where the transformational work of frequency shifting happens and change occurs—a powerful and sacred place that should be acknowledged and honored" (Goldman, 2008 p. 74). Deepak Chopra (1990) makes reference to the "fourth" state of consciousness, which exists beyond waking, sleeping or dreaming. In his book *Quantum Healing*, this state is described as, "absolute inner silence, a feeling of vast expansion, and a profound knowingness" (p.176). Based on Goldman and Copra's work, this researcher built in that space between intervals, when playing the HSB thus incorporating this silence. This configuration may not have been received in the same way by all participants.

The decision of how long and how the bowl was played was made after personal consultation, demonstration and instruction on the HSB with Dr. Mitch Nur (2001). Mitch is considered a master of the Himalayan singing bowls having lived and studied in the Himalayas. His 30 years' experience teaching and using HSB are incorporated into his healing practices. Although twelve minutes was a recommended time frame for the purpose of this project, this

could have been a limitation and a longer time frame may have been needed by some participants to induce the relaxation effects desired.

The Chakras: Energy Centers and Bowl Tones

An intrinsic part of Hindu, Sufi and other Eastern philosophies embraced the concept of seven major energy centers located within the spinal column which influence the health of the whole body (Shapiro, 2006). These energy centers are called chakras and although each rises from a specific location, they work together vibrationally with energy flowing between each one. Shapiro (2006) discusses the connection between each chakra, its relationship to the physical body and how they influence our mental, physical and spiritual wellbeing in her book, ***Your Body*** *Speaks Your Mind.*

The first chakra also known as the "root" located in the perineum has to do with survival, trust, security and self-protection. Shapiro (2006) claims that weaknesses in this chakra create digestive and bowel problems and are linked to our stress response involving the kidneys and adrenal glands. The second chakra, at the base of the spine called the sacral, is linked to desire, sexuality and reproduction. An undeveloped sacral chakra is responsible for exhaustion, low appetite, low sexual desire, lower back pain and menstrual and elimination issues. The third chakra called the solar plexus located behind the naval holds our personal power. When underdeveloped, there are fears, trust and responsibility issues. The fourth or heart chakra is located in the center of the chest and allows one to love and be loved. Problems here can manifest in breathing issues, such as asthma, and heart, circulatory and breast illnesses. The fifth, throat chakra located in the neck holds communication and nourishment faculties. Weaknesses can be manifest in food and alcohol addictions. The sixth, or third eye located in the forehead

above the eyebrow center, holds perception, intuition and insight. A closed third eye chakra is seen in a lack of awareness and gives rise to brain disorders including headaches, and eyesight and hearing deficits. The final chakra is the crown, located at the top of the head and is seen as the "ultimate human experience" (Shapiro, 2006) is responsible for spiritual growth and cosmic consciousness. Weaknesses in the seventh chakra are connected to a loss of purpose, meaning and direction and can result in depressive illnesses.

The Chakras and Associated Note Scale

Kelly (2003) outlines the associations between the Chakras and corresponding musical note scale:

Chakras	Note	Vowel Sound
Root	C	UH
Sacral	D	OOO
Solar Plexus	E	OH
Heart	F	AH
Throat	F	EYE
Third Eye	A	AYE
Crown	B	EEE

In order to control for as many variables as possible, it was important to determine the pitch of this particular study bowl and match to the corresponding chakra. When struck, the bowl was evaluated by musician John Berman, using a Peterson strobe tuner; he determined the bowl vibrated around a "Bb" pitch. Since the B note corresponds to the seventh or crown chakra individuals with issues in the area of spiritual growth, meaning, purpose and direction, or those

suffering from depressive illnesses may resonate more or less with this bowl. Since this will not be specifically assessed, this is included as a limitation.

Evaluation of Viable Research Designs

The study determined the physiological and relaxation effects of HSB exposure prior to a directed relaxation session using a quantitative correlational design. This design strategy was chosen to best answer the research questions proposed. Does adding a HSB (potential stress reduction tool) prior to a meditation session have an effect on one's physiology? This experiment gathered pre and post session quantifiable data from 50 participants using physiological measurements (blood pressure and heart rate at three intervals per session) and supplemental qualitative data taken from researcher administered Positive and Negative Rating Scale (PANAS twice per session) on two separate visits within 2 weeks apart, offering 102/fifty minute sessions yielding 306 mean blood pressure and pulse readings and 204 PANAS scores.

In light of this topic, similar studies were successful in measuring physiological relaxation effects using the quantitative design was used by Orme-Johnson and Walton (1998), Davidson et al. (2003), Schneider et al. (2005), Bjerklie et al. (2003), and Benson (1975). The major strength of this approach includes a large enough sample size enabling results to draw conclusions based on questions proposed. The quantitative design is in alignment with the purpose of the proposed study, the research question, and the other research designs considered. A mixed method or qualitative approach would not be possible or practical based on questions proposed.

Chapter 2 Summary

Based on a number of studies previously cited, it is clear that incorporating various

relaxation techniques such as TM, singing, meditation, and sound exposure has proven physical and emotional health benefits. In the absence of empirical data demonstrating the efficacy of HSB exposure on a DR practice, this project attempted to show a correlation between enhanced physiology and HSB exposure prior to a DR practice. Results will add to the current body of knowledge regarding the impact of sound and vibration on physiology. A review of literature indicates that previous research has not yet examined whether or not there is a relationship between lower blood pressure heart rate and positive effects after exposure to a HSB session prior to a directed relaxation session compared to a silence session. This research will add a new dimension to the body of literature exploring complementary methods to enhance the relaxation response.

CHAPTER 3. METHODOLOGY

Introduction

Building on prior research, health care providers are challenged to discover and implement innovative methods and strategies that could enhance the relaxation response aiding in stress management and alleviate anxiety and depressive symptoms promoting improved mental and physical wellness. Dr. Herbert Benson (1975) was one of the first medical doctors to discover the "Relaxation Response" when he was able to objectively measure the relationship between stressful psychological events and the associated physiological changes affecting one's health.

Over the decades since Benson's work, complementary and alternative methods (CAM's) have emerged to help manage stress. Individuals practicing Eastern complementary and alternative medicine techniques (CAM's) make claims that exposure to the sound and vibration of the (HSB) induce deeper relaxation effects on the mind and body due to its unique resonance (Adero, 2001; Goldman, 2008). Specifically, Himalayan singing bowls (HSB) have been used for ceremonial and meditation purposes, and are being used by practitioners to enhance relaxation and meditation (Huyser, 1999). The specific physiological effects from the HSB have not been measured. The intent of this research project was to measure the differences between a HSB exposure prior to a directed relaxation (DR) session and one without HSB exposure, or silence session.

Researchers Philosophy

Results from this study will make a significant contribution to the scientific body of knowledge in the relaxation response field. Based on outcomes from this study, clinicians will

have the option of including a HSB session prior to a meditation session when attempting to enhance the relaxation response. HSB inclusion enhances positive physiology aiding in stress management. This effect, based on prior studies (Benson, 1975; Bjerklie et al., 2003) will improve both physical and mental wellbeing leading to a greater quality of life. Building on this concept, this project will open doors to additional studies in the area of sound and vibration impact on relaxation and stress management.

This researcher, a practitioner in private practice, is intrigued by the concept of combining Eastern and Western traditions when working with clients exhibiting a number of stress related disorders and attempted to measure the physiological and psychological effects of adding a HSB prior to a meditation practice. The purpose of this chapter includes identifying the methodology utilized (quantitative method) and specific research design implemented. The purpose of the study was to determine the physiological (blood pressure and heart rate response) and psychological effects (measured by PANAS) when adding a twelve minute HSB exposure prior to a twenty minute meditation practice compared to the same session with silence. Permission to use PANAS was obtained by Dr. David Watson, author of the tool.

A quantitative correlational design was used to answer the research questions proposed as a means to determine best practices in the field of meditation by determining if adding a HSB (potential stress reduction tool) prior to a meditation session has an effect on one's physiological reactions (outcome measures) including blood pressure, heart rate and overall feeling of relaxation.

In my psychotherapeutic work with clients in distress, I use a combination of Eastern and Western techniques to promote wellness, namely; breathe work and directed relaxation (DR) to

promote the relaxation response. There are a number of mental health and alternative medicine practitioners who make claims that hearing the sound and feeling the vibration of someone playing a Himalayan singing bowl (HSB) promotes a greater sense of relaxation and wellbeing in the client being assisted. A review of the literature yields no specific empirical studies proving the cardiovascular and mental health effects of this practice. The purpose of this project was to explore the effects of a (HSB) exposure prior to a 20 minute directed relaxation (DR) session. This experiment gathered quantifiable data from physiological measurements (systolic and diastolic blood pressure and heart rate) along with supplemental qualitative data taken from researcher administered and participant rating PANAS scale assessing positive and negative affect scores pre and post both sessions.

Research Design

The study determined the physiological and positive and negative affect changes comparing a twelve minute HSB exposure to the same time period using silence prior to a twenty minute directed relaxation session. The researcher proposed a quantitative correlational design to answer research questions and hypothesis proposed: there is a positive relationship between to use of HSB and enhanced relaxation and positive physiological effects when used prior to DR. There was a desire to explore if there was a difference in affect states and physiology between the HSB and silence when offered prior to a prerecorded twenty minute directed relaxation session. This experiment gathered pre and post session quantifiable data from physiological measurements (blood pressure and heart rate) and supplemental qualitative data taken from researcher administered Positive and Negative Rating Scale (PANAS).

Research Design Strategy

The study with a sample size of 51 adult males and females determined the physiological and relaxation effects of HSB exposure prior to a directed relaxation session versus silence session. The researcher utilized a quantitative correlational design to answer research questions proposed.

Research Questions and Hypothesis

The primary research question (1) and sub questions (2-3) in this study:

1. What are the physiological and relaxation effects when integrating a HSB exposure prior to a directed relaxation (DR) session?
2. Will the HSB produce an enhanced effect on blood pressure and heart rate when added prior to a DR session versus no HSB exposure prior to a meditation session?
3. Will there be an enhanced relaxation experience measuring positive and negative affect (PANAS rating scale) with HSB exposure prior to a directed relaxation session as opposed to no HSB exposure prior to directed relaxation session?

Directional Hypothesis

Directional Hypothesis: There is a positive relationship between the use of HSB and enhanced relaxation and positive physiological effects when used prior to DR.

Does adding a HSB (potential stress reduction tool) prior to a meditation session have an effect on one's physiology? This experiment gathered pre middle and post session quantifiable data from physiological measurements (blood pressure and heart rate) and supplemental qualitative data taken from researcher administered Positive and Negative Rating Scale (PANAS). This

credible research design offered results useful to both Western and Eastern practice fields. This quantitative method was chosen based on the research questions and field of inquiry being studied. The experiment was based on defined variables and a finite time frame to establish cause and effect. The independent variable is the HSB. The dependant variable is the meditation session.

Sampling Design and Setting

Participants were drawn from a fifty mile radius in an affluent suburb located twenty miles north east of Boston, Massachusetts. The town houses the researcher's private practice and includes a great majority of the clients being treated for anxiety and depression issues. Stress management is the cornerstone of many client interventions. Drawing research results from this demographic will aid the researcher in enhancing best practices for relaxation and stress management in a suburb closely connected to a major United States city.

The town is in Essex County, Massachusetts, United States. It was incorporated in 1646 and as of the 2010 census, the population was 33,201. It is part of the Boston-Cambridge-Quincy, Massachusetts, -New Hampshire metropolitan statistical area. The population is comprised of a mixture of working class, suburban elite and lower income with a majority holding a bachelors/associate or graduate degree. Of the total population there are 1,111 more females to males. The majority of the population is 40-64 years old, 96.13% are White and native born in the state. The majority of homes are owner occupied and residents have a median household income of 60,040 compared to the national average of 44, 512 (Zillow, 2010).

Fifty six male and female adult participants were recruited from a fifty mile radius of the town chosen in Massachusetts, age 18 and over with no age cap. According to Conlin (2008)

and Vollmer (2005), using 42 participants, they were able to demonstrate non-pharmacologic interventions inducing a change in blood pressure with a SD of 9.7 mm Hg for systolic blood pressure and 7.9 mm Hg for diastolic blood pressure. A total of 42 participants in a crossover study had 90 % power to detect a difference at a two-sided 0.05 significance level of 5 mm Hg for systolic blood pressure and 4 mm Hg for diastolic blood pressure.

Although many people benefit from the relaxation response, Lazarus (1990) makes an argument for some who appear to be "allergic" to it and for them, it should be approached with caution. It was prudent for this researcher to make every attempt to properly screen participants during phone interview for past negative relaxation experiences and have a plan in place to manage potential problems should they arise.

Caution would have been used with a participant having a history of anxiety disorder in an effort to avoid relaxation-induced anxiety (Heide & Borkovec, 1984). Another population to be mindful includes individuals with asthma. According to Lehrer et al. (1986), relaxation tends to decrease sympathetic activity or reactivity, and individuals with small-airway obstruction may experience a counter-therapeutic effect if they have airway dilatation in response to the sympathetic autonomic nervous stimulation.

A management strategy suggested by Lazarus (1984) was incorporated into the directed relaxation script which focused on the guided imagery of “clear blue sky.” Positive or pleasant imagery is often helpful (Lazarus, 1984) if the subject exhibits unpleasant side effects of the relaxation. Additional tools could have been utilized if needed such as including a mantra and focusing on mindfulness. The researcher is familiar with both techniques and could be utilized if needed. In addition, all participants had a well-lighted room which according to Lazarus (1984)

assists fears. Furthermore, all subjects were sitting rather than laying down creating a feeling of being in control. The researcher's voice tone remained calm, slow and focused on the prerecorded directed relaxation and throughout both sessions.

The researcher tracked each participant through the session with blood pressure and heart readings. If the participant exhibited any counter relaxation signs as described above, the session would have been stopped immediately. As a clinical nurse specialist trained in CPR and advanced life support techniques care needed would have been offered on site along with a call to our 911 rescue station located two minutes from the research setting. None of the participants had asthma, or experienced an adverse effect from the session.

Informed Consent

All participants provided written informed consent after receiving an explanation of the voluntary nature of their participation and a description of the study. This single researcher conducted all sessions with 56 individuals who were required to return for a second session within two weeks of the first. Informed consent included why they are being asked to be in the study, how many people will be in the study, who is paying for the study, fees required, the length of the study which includes (2) 50 minute sessions in the same office within 2 weeks of each other, and the address of the study office. See appendix for full informed consent form. If the participant decided to be in this study and if they sign the consent form, they were expected to do the following:

- Give personal information about themselves, such as age and gender.
- Answer questions during an interview about how relaxed they feel**.**
- Complete a survey about positive and negative emotional states.

- Allow the researcher to observe them while they relax during a pre-recorded directed meditation session.
- Allow the researcher to look at their data collected during the sessions.

While they are in the study, they were expected to:

- Follow the instructions they were given.
- Tell the researcher if they wanted to stop being in the study at any time.

They were also informed the researcher would not be audio and/or videotaping any sessions. Potential risks and possible discomfort was explained. The signed consent indicated their permission to have an automatic blood pressure (BP) cuff applied to their arm to monitor heart rate and (BP) throughout the 50 minute sessions. It was explained that this is similar to what they may have experienced in their doctor's office and like in the doctor's office; they may feel slight tightness when the cuff is inflating for the series of readings taken during the two sessions. They understood their right to change their mind about being in the study and at any time they could choose to stop without penalty. Participants did not receive anything for being in the study, which was voluntary. The researcher could have removed them from the study at any time if:

- The researcher believes it was best for them to stop being in the study.
- They did not follow directions about the study.
- They no longer meet inclusion criteria required to participate.

Any information they provided in this study that could identify them such as name, age, or other personal information was kept confidential. Data was collected with pen and paper on site at

researchers private practice office which is locked between sessions and after hours. Participants were assigned a number. All materials related to research were transported sealed to a totally secure location for tabulation. All results were tabulated in a password protected computer or kept in a locked file cabinet. Only the researcher and Capella supervisor were able to view the information gathered. All results and materials collected will continue to remain confidential. In any written reports or publications, no one will be able to identify study participants.

In general, the researcher can assure participants confidentiality. There may be times when this is not possible such as if:

- The researcher finds out that a child or vulnerable adult has been abused.
- The researcher finds out that that a person plans to hurt him or herself, such as commit suicide.
- The researcher finds out that a person plans to hurt someone else.

The above is based on laws in this state that require mental health professionals to take action if they think a person might harm themselves or another, or if a child or adult is being abused. In addition, there are guidelines that researchers must follow to make sure all people are treated with respect and kept safe. The participant was encouraged to ask questions they may have about this issue before agreeing to be in the study, since it is important participants do not feel betrayed if the researcher is required to breech confidentiality.

Participants were encouraged to ask questions about the study at any time, and were offered the researchers private cell number if they had any concerns or complaints, or became ill, which was listed on page 1. Informed consent lists the Capella Research Integrity Office (RIO)

number which is established to protect the rights and welfare of human research participants. They could be reached for any of the following reasons:

- They have questions about your rights as a research participant.
- They wish to discuss problems or concerns.
- They have suggestions to improve the participant experience.
- They do not feel comfortable talking with the researcher.

They were instructed the RIO can be contacted at any time without giving their name, and the university may need to reveal information they provide in order to follow up if they report a problem or concern.

Sampling Procedures

The research experiment initially started with a sample size of (56) male and female adult participants from within a 50 mile radius of Boston suburban community in Massachusetts. Whenever large numbers of participants are needed a convenience sample is justified (Creswell, 2009). The design was created to compare the two conditions with no random assignment as the individuals served as their own control in an effort to minimize variables. Sampling strategy utilized convenience sampling with flyers posted in local downtown public places including the library, medical offices, senior center, book stores and market within a 15 mile radius of the research location. There were no conflict of interest issues between the researcher and the locations the flyer were posted.

The flyer advertised two free relaxation sessions taking place over a two week period of time with a trained licensed psychotherapist. Interested participants were instructed to call the number on the flyer connecting them directly to the researcher. They were asked to state their

age to confirm they are over 18 years old. Upon arrival a license was used to confirm age. It was explained they would be attending two, fifty minutes sessions within two weeks of each other to help researchers understand more about the field of stress management and relaxation (see Appendix D). All participants offered written informed consent after receiving an explanation of the voluntary nature of their participation and a description of the study. There was no payment or other forms of compensation offered. Once they agreed, directions to the research location were provided and participants would be scheduled for the sessions. Both sessions took place in the researcher's private office which is also posted on the flyer.

One might argue this strategy may result in a potentially biased sample, based on the fact that they responded and agreed to participate. This is expected with a large recruitment effort. Even if a random method was chosen, the participants decision to participate or not would in and of itself result in some bias.

Instruments and Measures

HBS Intervention – To control for as many variables as possible, it was important to determine the tone of this particular study bowl. When rubbed and struck using the impacting stick called a puja, the 6 inch circular seven metal HSB to be used in the study was determined by musician John Bermani using a Petersen Strobe Tuner to be vibrating around a B^b pitch, see Appendix E. The bowl was played by the investigator for 12 minutes immediately before the DM session (Mitch Nur, Ph.D., personal communication, July 15, 2011).

On the non-bowl group session, the individual was asked to get comfortable and the researcher left the room for 12 minutes.

Measures

1. Blood pressure and heart rate: An automatic blood pressure cuff (device called Intelli sense manufactured by Omron, Model # HEM-747IC) was used to obtain and record preset interval data (blood pressure and heart rate) using numerical scores. Pre- session blood pressure and heart rate were taken and repeated after the 12 minutes of either silence or HSB intervention. Repeat measures were taken a third time after the 20 minute DR.
2. Relaxation effect:

   A. The participant was asked if there are any new stressful events in their lives when they returned for the second session within two weeks of the first session. There were no events reported that would have eliminated the participant from the study.

   B. Participants completed the Positive and Negative Affect Scale (PANAS) pre and post session.

PANAS has been used to effectively measure positive and negative affect states in a number of research studies. Clinical improvements were evaluated using PANAS scores in patients with deep brain stimulation for treatment resistant depression (Mayberg et al., 2005). Positive and negative affect states were measured with PANAS along with associated mindfulness with rock climbers (Steinberg, 2011) and bungee jumpers (Middleton et al., 1996). Lord and Menz (2002) used PANAS to assess mobility, physical functioning and overall cardiovascular fitness after incorporation of a 6 minute walk program for older adults. Health-risk behavior in adolescents was found to be correlated with increasing emotional response to music when PANAS was used in Roberts et al.'s (1998) study. As in the proposed study, when

there is a desire to accurately measure positive and negative affect states, the PANAS has been proven to be a valid and reliable tool.

The reliabilities of the PANAS scales, as measured by Cronbach's alpha, were .89 for PA and .85 for NA. The narrowness of the confidence limits associated with these coefficients indicate that they can be regarded as providing very accurate estimates of the internal consistency of the PANAS in the general adult population. Thus, both PA and NA scale can be viewed as possessing adequate reliability (Crawford & Henry, 2004).

Construct validity, measurement properties and normative data using PANAS was administered to a non-clinical sample (N = 1,003) broadly representative of the general adult population in the United Kingdom (Crawford & Henry, 2004). Competing models of the latent structure of the PANAS were evaluated using confirmatory factor analysis. Correlational analysis and regression were used to determine the influence of demographic variables on the PANAS scores as well as the relationship between the PANAS with measures of depression and anxiety (the HADS and the DASS). Results indicated the best-fitting model of the latent structure of the PANAS consisted of two factors which corresponded to the positive affect and negative affect scales, and permitted correlated error between items drawn from the same mood subcategories (Zevon & Tellegen, 1982). Demographic variables had only very modest influences on PANAS scores and the PANAS exhibited measurement invariance across demographic subgroups. Reliability of the PANAS was high, and the pattern of relationships between the PANAS and the DASS and HADS were consistent with tripartite theory (belief, truth, and justification). Crawford and Henry (2004) concluded the PANAS is a reliable and

valid measure of the constructs it was intended to assess. The utility of this measure is enhanced by the large scale normative data.

Watson and Walker (1996) examined the long-term temporal stability and predictive validity of trait Positive Affect and Negative Affect scales. Participants were initially assessed as undergraduates, rating how they felt generally (general sample) or during the previous year (year sample). Retesting occurred on a general affect measure and on scales assessing current depression and anxiety approximately 6 years for the general sample or 7 (year sample) later. All participants had graduated from college and most were employed full-time. Negative affect scores decreased significantly over the study period and the Negative and Positive Affect scales both displayed a significant and moderate level of stability. In addition, initial scores on both scales correlated significantly with measures of current symptoms that were completed several years later. Researchers concluded that trait affect scales were substantially stable and maintained significant prediction power, even across extended time spans (Watson & Walker, 1996).

In follow up to the PANAS, a 10 item short from was developed and tested by Thompson (2007) for validity. These validation studies included a large sample size (N = 1,789), and researchers compared the original 20 item PANAS which I am proposing to use for this study, to a newer 10 item short form I-PANAS-SF. Thompson (2007) was able to confirm the cross-sample stability, internal reliability, temporal stability, cross-cultural factorial invariance, and convergent and criterion-related validities with the PANAS 10 item short form. Although all were found to be psychometrically acceptable (Thompson, 2007), this researcher will choose the 20 item original longer version PANAS since there are more studies confirming its validity and

reliability (e.g., Crawford & Henry, 2004; Lord & Menz, 2002; Mayberg et al., 2005; Middleton et al., 1996; Roberts et al., 1998; Steinberg, 2011; Watson &Walker, 1996; Zevon & Tellegen, 1982).

Data Collection

The environment was the same community office setting for all experiments in an effort to control variables that could affect the relaxation response. Since the individual served as their own control, they were required to return for the second session within two weeks. Blood pressure, heart rate and affect response ratings (PANAS) were measured prior to and after directed relaxation (DR) session with and without the HSB exposure. To avoid the introduction of a fixed variable and an ordering effect, a coin toss was used to randomly assign singing bowl or silence intervention on the first session followed by receipt of the alternative at the second session. Before the second session, the client was asked if there were any significant events in their lives between the first and second session. It was the therapist's discretion to use the data from the session if client reported a significant event which could have impacted study results (traumatic event such as sudden death of loved one, motor vehicle accident on the way to session). There were no reports requiring study elimination.

The dependent measures of interest were blood pressure (BP), heart rate (HR) and PANAS. The mean of three readings (BP and HR) were recorded to reduce the variance seen with only a single reading, and were taken at the same time at three different intervals during both sessions (baseline, first (after intervention) and second measurement (final taken at end of session). PANAS scores were taken twice in both sessions at the beginning and the end. Changes in BP, HR and PANAS across sessions were calculated. Sessions with and without the bowl

(experimental versus control), control days (silence) versus bowl days, were then compared using paired T tests and repeated measures ANOVAS.

If randomly assigned to receive HSB session prior to DR, the bowl was played by the investigator for 12 minutes immediately before the DR session (Mitch Nur, Ph.D., personal communication, July 15, 2011). Since sound trail off occurs at 15 seconds, the bowl was struck softly every 15 seconds. The bowl was played by the researcher sitting on the couch next to the participant creating a 12 inch bowl distance from participant's right ear for 56 participants and played into the opposite ear at the same distance for the mastectomy participant. All data was collected within a 30 day period and all sessions took place in the same researchers private practice office with participants sitting upright on the office couch. Blood pressure readings were obtained by using the same cuff for all subjects who remained attached but un-inflated through both sessions. The cuff was applied to the left arm in 55 participants, and to the right in one, due to a history of having a mastectomy on the left side.

On the non-bowl group session, the individual was asked to get comfortable and the researcher left the room for 12 minutes. Blood pressure and pulse readings were obtained before session, after 12 minutes and at the end of session. Participants completed the Positive and Negative Affect Scale (PANAS) pre and post session.

Data Analysis Procedures

The dependent measures of interest were blood pressure, heart rate and PANAS. All blood pressure and heart rate results represent the mean of three sets of readings for each time period. There are 3 mean blood pressure and heart rate readings for control session and bowl session (6 scores). Statistical analyses were completed using SPSS (version XX, 2011, IBM Corporation). Two way analysis of days was used to measure the differences between all

variables on day 1 compared to all variables on day 2 with 51 subjects (n = 102). The data represents a two way repeated measure analysis of variance on two factors using a balanced design. The general linear model analysis mode was used for repeated measures with the same person having multiple measures. ANCOVA allowed the researcher to analyze change from baseline while including age, sex and baseline measurements as covariates. Changes in outcome measures were accounted for while controlling for the influence of the above mentioned parameters assisting in determining if response over time is significant when controlling for age, sex and baseline. The sample size in all analyses was 51. PANAS scores were taken twice in both sessions. Changes in BP, heart rate and PANAS across sessions were calculated. Sessions with and without the bowl (experimental versus control), control days versus bowl days, were then be compared using paired T tests and repeated measures ANOVAS.

Limitations of Research Design

One limitation could have been drop –out rate after the first session. Fifty-six participants attending session one and five were eliminated due to their inability to return for session two. Session one data sets from these 5 subjects was eliminated from study. Other limitations could include the homogeneity of the group as well as the sample size of final 51. Additional studies could include only clients with hypertension and a similar approach could study specific age groups: (20-40, 41-60, 61-80) comparing results. Repeated studies could utilize a crystal singing bowl to determine possible differences in results.

Internal Validity

When conducting credible research, it is imperative to control for extraneous variables so conclusions can be drawn of the observed effects solely attributed to the HSB (treatment variable).

One way to accomplish this was by having the same person serving as their own control and exposed to the same conditions. Paired T testing was done using data from the same individual on two successive measures, comparing paired data sets to determine the mean of the blood pressures and heart rate, taken in three intervals during the fifty minute session. The researcher is confident that conclusions drawn are warranted from the data collected and the methodology used.

External Validity

External validity refers to the extent to which the results of this study will apply to situations beyond the study itself. By identifying and reporting a measureable relaxation response after a HSB, these results may be generalizable to particular meditation practices.

Expected Findings

1. There would be a statistically significant decrease in systolic blood pressure BP across the course of each session.
2. It would be expected that systolic BP would decrease in both HSB session and non HSB sessions, but the change during HSB will be greater versus non HSB.
3. I did not expect pulse or diastolic BP to be affected within the time frame offered for the experiment.
4. In both HSB and non HSB I expected significant increases in positive and significant decreases in negative affect scores. However, the change is expected to be significantly greater during the HSB sessions.
5. All participants would experience a greater feeling of relaxation after both sessions.

Ethical Issues

Ethical considerations are woven into the research plan to ensure respect for the participants and research sites taken into consideration. The Belmont Report, generated from the Department of Health, Education, and Welfare, on July 12, 1974, established the National Research Act (Pub. L. 93-348) and signed it into law. This created the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. A core tenet; informed consent ensures the respect for persons and requires that subjects, to the degree that they are capable, be given the opportunity to choose what shall or shall not happen to them (Belmont Report, 1979).

Another tenet included is presence of beneficence. Respect for persons includes individuals being treated as autonomous agents, and persons with diminished autonomy are entitled to protection. This study will not include participants with diminished autonomy (excluding minors and those with diminished mental health capacity). In addition, participants will be protected from harm. Respecting autonomy will include considering opinions and choices. This research study involving human subjects, took all measures needed to ensure the participants entered into the project voluntarily and with adequate information. Participants in this study were not put at risk and those who were vulnerable and needed protection (minors under age 19) were excluded from participating.

Participants signed informed consent explaining the study and understanding the participation as voluntary. Informed consent included: Identification of the researcher/ sponsoring institution, how participants were selected, and research criteria designed to meet study goals. Additional items included: the purpose of the research, the benefits for participating (a complimentary meditation session, identification of the level and type of participant

involvement, possible risks to the participant (none anticipated), guarantee of confidentiality to the participant, assurance that the participant can withdraw at any time, provisions of names of persons to contact if questions arise, (name and contact number of the researcher were provided).

This single researcher conducted all sessions with 56 individuals who completed first session and 51 who returned for second session within two weeks. Data was collected with pen and paper on site at researchers private practice office which is locked between sessions and after hours. Participants were assigned a number. All materials related to research were transported sealed to a totally secure location for tabulation. All results and materials collected remained confidential. All results were tabulated in a password protected computer or kept in a locked file cabinet. Only the researcher and Capella supervisor were able to view this information. In any written reports or publications, all results and materials collected remained confidential.

Chapter 3 Summary

The researcher predicted there would be a significant change in the parasympathetic nervous system as measured by blood pressure and heart rate along with a heighten relaxation response as indicated by PANAS scores after adding the sound, and resonance of a Himalayan singing bowl (HSB) prior to a 20 minute directed relaxation session. Findings were expected to indicate that it is worthwhile to consider the role of a 12 minute exposure to a HSB prior to a 20 minute directed relaxation session for enhanced physiological and psychological effects. The quantitative method chosen and choice of data collection and data analysis clearly aligns with the research problem and research questions outlined. The primary research question (1) and sub questions (2-3) the proposed study will address are listed:

1. What are the physiological and relaxation effects when integrating a HSB exposure prior to a directed relaxation (DR) session?
2. Will the HSB produce an enhanced effect on blood pressure and heart rate when added prior to a DR session versus no HSB exposure prior to a meditation session?
3. Will there be an enhanced relaxation experience (PANAS rating scale) with HSB exposure prior to a meditation session as opposed to no HSB exposure prior to meditation session?

Results for the first question addressing the physiological effects, was evident in pre and post blood pressure and heart rate readings. These were compared to the second session to determine statistically significant difference between the session with and without the HSB exposure. The researcher expected to see a statistically significant decrease in systolic blood pressure across the course of each session. It may follow that if systolic BP is significantly decreased in both HSB session and non HSB sessions, the change during HSB will be greater versus non HSB. Systolic blood pressure is more susceptible to changes associated with short term external circumstances. Heart rate, similar to diastolic pressure is not usually influenced with a short term relaxation intervention (Paul R. Conlin, MD, personal communication, October 29, 2011).

In the HSB session, the researcher expected significant increases in positive affect scores (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive and active), and decreases is negative affect scores (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery and afraid). Results of this study will add scientific evidence to the claims that exposure to the sound and vibration of the (HSB) induces deeper relaxation effects on the mind and body due to its unique resonance (Adero, 2001; Goldman, 2008).

CHAPTER 4. DATA ANALYSIS AND RESULTS

Introduction

This study was designed to determine the physiological and psychological effects of adding exposure to a Himalayan singing bowl (HSB) prior to a directed relaxation (DR) session. Chapter four offers a non-evaluative reporting of the data collected in the study. Findings will be supported by tables, and graphs to help illustrate study results.

The directional hypothesis that guided the study and the research questions**:** There is a positive relationship between exposure to a HSB and physiological and relaxation responses when used prior to DR**.** The primary research question (1) and sub questions (2-3) in the completed study are:

1. What are the physiological and relaxation effects of integrating exposure to a HSB prior to a DR session?
2. Will the HSB produce an enhanced effect on blood pressure and heart rate when added prior to a DR session when compared to no HSB exposure?
3. Will there be an enhanced relaxation experience as measured by positive and negative affect (PANAS rating scale) with HSB exposure prior to a DR session when compared to no HSB exposure?

Description of the Sample

In this study, a convenience sampling was utilized by recruiting adult participants through flyers posted in public places (e.g. library, medical offices, senior center, book stores and market) within a 15 mile radius of the research location, in Massachusetts. This suburban community is located twenty miles north east of Boston, Massachusetts. Fifty-six male and

female adult participants were recruited and reported to the first session of the study where full informed consent was obtained. All participants who responded enrolled in the study. The design was created to compare the two conditions with no random assignment as the individual was required to return for the second session within a week so they could serve as their own control minimizing study variables. Five of the initial participants were unable to return for the second session within the allotted time frame and the data from those five participants were removed from the data set resulting in a total of 51 participants completing both sessions, for a total 102 sessions. There were 16 males and 35 females ranging in age from 26 to 69 with mean age of 50.52. This sample is representative of the town's majority population being 40-64 years old.

Sample size is based on studies measuring change in systolic and diastolic blood pressure in response to non-pharmacologic interventions (Conlin, 2008 & Vollmer, 2005), where repeated measurements of blood pressure in individuals with normal and high blood pressure generated a SD of 9.7 mm Hg for systolic blood pressure and 7.9 mm Hg for diastolic blood pressure. Thus, 42 participants in a crossover study had 90 % power to detect a difference of 5 mm Hg for systolic blood pressure and 4 mm Hg for diastolic blood pressure at a two-sided 0.05 significance level.

Summary of Results

The findings in this study supported the directional hypothesis that there was a positive effect of HSB exposure prior to directed relaxation (DR) on physiological responses. Blood pressure and heart rate fell significantly over time in both the HBS and silence groups. There was a statistically significant difference in the change in systolic and diastolic blood pressure over time with the HBS group having a greater decline when compared to the silence group. Heart

rate fell in a similar pattern to blood pressures. Participants who were hypertensive at baseline had the same qualitative responses but when compared to the normotensives, the hypertensives had a statistically significant difference in their response to the bowl session.

Positive and negative affect scores on the PANAS responded similarly in both the bowl and the silence sessions. Both scores fell significantly, with no statistically significant difference between the two sessions. Analysis of 10 individual sub-scores for both the positive and negative composites showed that all fell in parallel with the total scores. Results revealed a consistent drop in both positive and negative due to the relaxation response elicited using twenty minute directed relaxation regardless of bowl versus silence preceding the session.

Details of Analysis and Results

The directional hypothesis along with the research questions guided the study. I hypothesized that there is a positive relationship between the use of HSB exposure and enhanced relaxation and positive physiological effects when used prior to directed relaxation (DR)**.** The primary research question (1) and sub questions (2-3) were:

1. What are the physiological and relaxation effects of integrating exposure to a HSB prior to a DR session?

2. Will the HSB produce an enhanced effect on blood pressure and pulse rate when added prior to a DR session when compared to no HSB exposure?

3. Will there be an enhanced relaxation experience as measured by positive and negative affect (PANAS rating scale) with HSB exposure prior to a DR session when compared to no HSB exposure?

SPSS was used to obtain the two way analysis of days measuring differences between all variables on one day compared to all variables on the return day with 51 subjects. Measures are illustrated in the Table below with mean values (± SD) shown. In all analyses N the sample size was 51 and all blood pressure and heart rate results represent the mean of three sets of readings for each time period (baseline, first and second). The twenty minute directed relaxation was a constant and followed both intervention groups just prior to the second readings.

Using descriptive statistics, the mean systolic has a greater decrease in the bowl group comparing baseline HSB (132.2) second measurement HSB (122.5) compared to silence baseline (133.9) to second measurement silence (127.1) with standard deviation showing even disbursement across all sets. The mean diastolic measurement reveals a greater drop in diastolic with bowl group baseline at 81.2 to 79.2 at second measurement compared to the same reading for silence (83.5 and ending at 83.2). Heart rate changes indicate a deeper drop in the bowl group comparing baseline (75.) to second (68.7) versus silence (72.8) to second (69.5). Positive PANAS scores resulted in both groups falling significantly but indicating no difference between the baseline and final positive PANAS baseline and positive PANAS second in bowl (34.0 to 30.5) versus silence (34.0 to 31.2) groups. Negative PANAS scores which indicated both groups falling significantly and a greater decease in the bowl group. Although there was no statistically significant difference between the baseline and final negative PANAS in bowl (13.8 to 10.8) versus silence groups (12.7 to 10.4), the bowl group had a greater decrease in negative scores.

Table 1 illustrates the mean systolic and diastolic blood pressure which fell significantly in both groups over time ($p < 0.001$). While the HBS group had greater declines, there was no significant intervention x time interaction. Heart rate fell significantly in both

groups ($p < 0.05$) and there was a significant intervention x time interaction (p = 0.004), with heart rate significantly lower in the HBS group. Both positive PANAS and negative PANAS scores fell significantly in both groups over time ($p < 0.001$). Although there was a greater decline in the HBS group there was no significant intervention x time interaction.

Table 1

Mean Systolic and Diastolic Blood Pressure

Time Period	Intervention	SBP (mm Hg)	DBP (mm Hg)	HR (per min)	PANAS Positive	PANAS Negative
Baseline	HBS	132.2 (19.1)	81.2 (11.0)	75.0 (11.5)	34.0 (7.8)	13.8 (5.0)
	Silence	133.9 (18.2)	83.5 (11.1)	72.8 (10.6 b)	34.0 (7.1)	12.7 (3.6)
First Measurement	HBS	124.2 (16.2)	78.6 (10.2)	71.4 (10.5)		
	Silence	125.9 (18.1)	80.7 (10.9)	69.5 (9.3)		
Second Measurement	HBS	122.5 (17.4)	79.2 (9.8)	68.7 (9.3)	30.5 (10.2)	10.8 (1.8)
	Silence	127.1 (17.6)	83.2 (11.6)	69.5 (9.0)	31.2 (8.8)	10.4 (1.2)

Note. Values are mean (SD); SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate

Change in Parameters Over Time

The previous analyses looked at each BP and heart rate measurement separately (baseline, first, and second). The ANCOVA allows the researcher to analyze change in BP and HR from baseline including age, sex and baseline measurements as covariates. This enables the researcher to adjust the changes for these parameters. With the prior three sets of measures (pre, post and post2), we now have subtracted post from pre which now represents delta 1, and subtracting post2 from pre, we have delta 2. ANCOVA will assist in determining if response

over time when you control for age, sex and baseline will change over time.

Delta Systolic Blood Pressure by age and gender results indicate a greater difference between the bowl group from time 1 = 8.0 to time 2 = 9.6 compared to silence group time 1 = 7.8 to time 2 = 6.8. Delta Diastolic Blood Pressure results indicate a decrease in bowl group 1 = 2.6 to time 2 = 2.0 compared to silence group time 1 = 2.8 to time 2 = 0.34. Heart rate results indicate statistically significant difference in bowl group from time 1= 3.6 to time 2 = 6.3 compared to silence group time 1= 3.3 to time 2 = 3.2. The changes in systolic blood pressure and heart rate were significantly different with the HBS intervention in comparison to the silence intervention with a significant time x intervention interaction ($p = 0.044$ and $p = 0.003$, respectively). The change in diastolic blood pressure was greater in the HBS group with a non-significant trend ($p = 0.073$).

Figures 1-3 plot the mean change in systolic and diastolic blood pressure and heart rate. In each case, the HBS intervention had a more sustained effect versus silence intervention. Table 2 provides the descriptive statistics for the interventions.

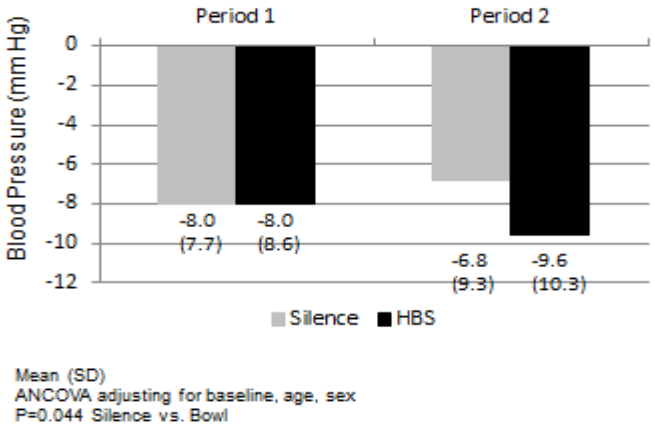

Figure 1. Change in Systolic Blood Pressure.

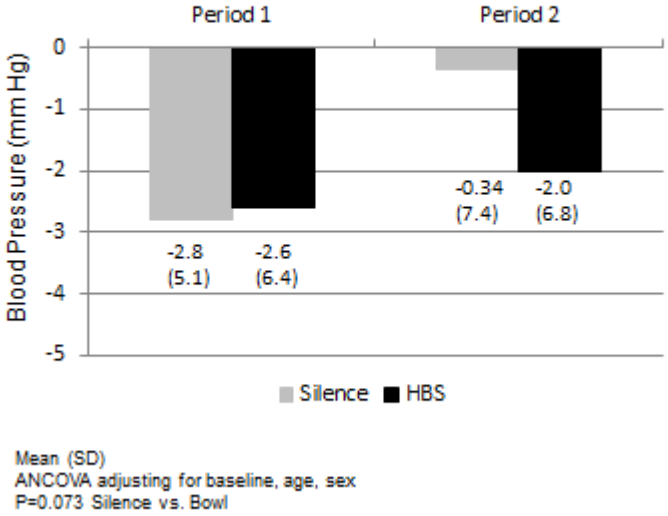

Figure 2. Change in Diastolic Blood Pressure.

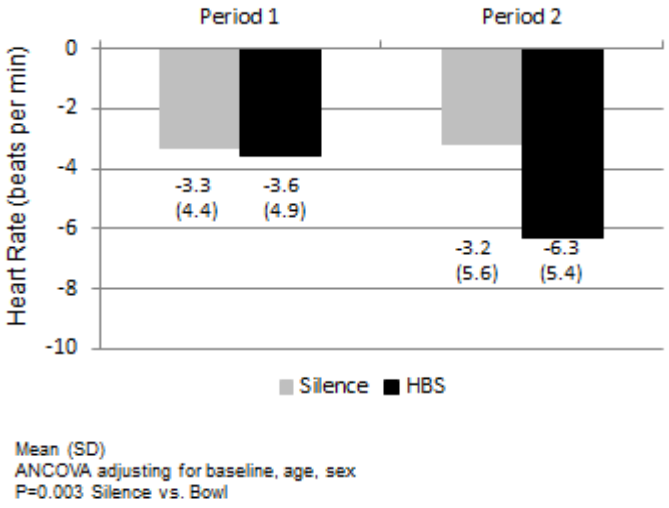

Figure 3. Change in Heart Rate

PANAS Positive

Table 2, using general linear model for positive PANAS scores and Figure 4 below indicate both groups falling significantly with no difference between the baseline and final positive PANAS pre and post in bowl (34.0 to 30.5) versus silence (34.0 to 31.2) groups.

Table 2

Descriptive Statistics for the Positive PANAS Intervention

Pre/Post	Intervention	Mean	Std. Deviation	*N*
pospanaspre	a	34.03	7.13	51
	b	34.02	7.76	51
	Total	34.02	7.41	102
pospanaspost	a	31.17	8.84	51
	b	30.49	10.20	51
	Total	30.83	9.51	102

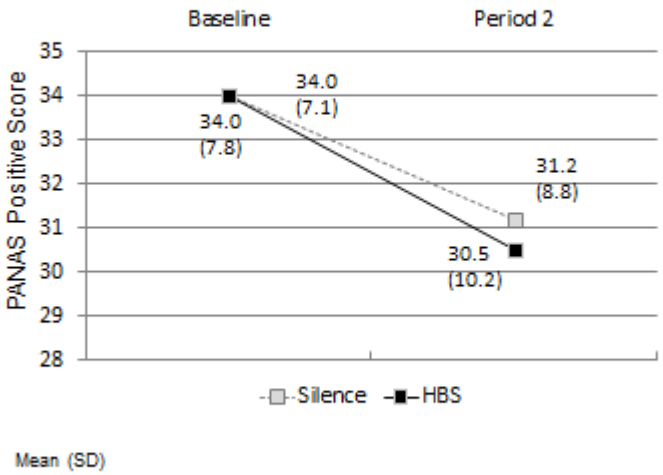

Figure 4. Change in Positive PANAS scores.

PANAS NEGATIVE

Table 3, using general linear model for negative PANAS scores and Figure 5 below indicate both groups falling significantly and a greater decease in the bowl group. Although there was no statistically significant difference between the baseline and final negative PANAS pre and negative PANAS post in bowl (13.8 to 10.8) versus silence groups (12.7 to 10.4), the bowl group had a greater decrease in negative scores.

Table 3

Descriptive Statistics for the Negative PANAS Intervention

Pre/Post	Intervention	Mean	Std. Deviation	*N*
negpanaspre	a	12.69	3.58	51
	b	13.88	4.99	51
	Total	13.28	4.36	102
negpanaspost	a	10.39	1.15	51
	b	10.78	1.85	51
	Total	10.59	1.54	102

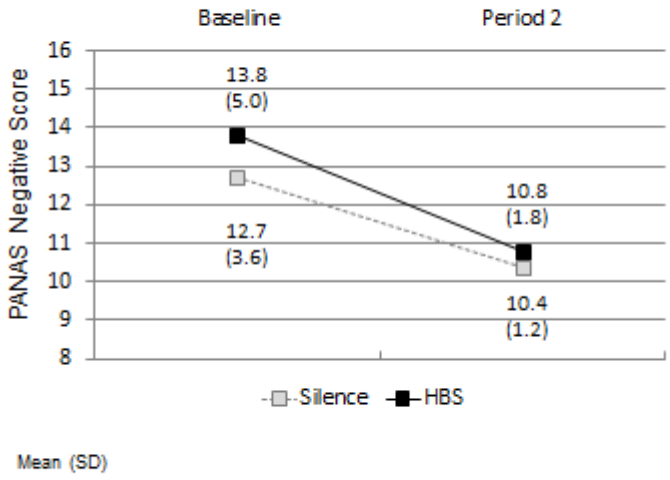

Figure 5. Change in Negative PANAS scores.

Hypertensives

Table 4 illustrates blood pressure values for hypertensives and normotensives on bowl versus silence days.

Table 4

Blood Pressure Values for Hypertensives and Normotensives

Time Period	Intervention	SBP (mm Hg)		DBP (mm Hg)		HR (per min)	
		NT	HT	NT	HT	NT	HT
Baseline	HBS	124.0 (9.8)	149.1 (17.9)	77.3 (8.2)	87.3 (12.5)	74.5 (12.2)	75.8 (10.5)
	Silence	120.8 (8.7)	149.7 (17.6)	79.9 (10.5)	89.2 (9.3)	74.1 (11.4 b)	70.8 (9.1)
First Measurement	HBS	115.5 (7.7)	137.6 (17.0)	75.6 (8.9)	83.4 (10.3)	71.2 (11.7)	71.8 (8.5)
	Silence	116.7 (10.8)	140.3 (17.9)	77.3 (10.1)	86.0 (10.0)	69.5 (9.8)	69.5 (8.4)
Second Measurement	HBS	113.8 (10.2)	136.1 (17.8)	76.3 (8.9)	83.8 (9.6)	68.0 (9.5)	69.8 (9.1)
	Silence	118.5 (11.5)	140.5 (17.2)	79.7 (9.2)	88.7 (13.0)	70.1 (9.8)	68.6 (7.5)

Note. Values are mean (SD); NT = normotensive (n = 31); HT = hypertensive (n = 20); SBP = systolic blood pressure; DBP = diastolic blood pressure; HR = heart rate

Systolic BP Comparison of the Hypertensives on Bowl Versus Silence Days

Individuals were defined as hypertensive if systolic BP was greater than 140 mm Hg at the baseline measurement on one of the intervention days. Across both interventions, hypertensive individuals (n = 20) had significant changes from baseline in systolic BP when compared to normotensives (n = 31) at both the first measurement (hypertensives: -10.5; normotensives: -6.4 mm Hg; p = 0.012) and second measurement (hypertensives: -11.1; normotensives: -6.3 mm Hg; p = 0.017). There was no significant interaction between hypertensive status and response to the specific interventions. Figures 6 and 7 illustrate systolic

BP, in the hypertensives and normotensives in silence (a) and bowl (b) groups. They had the same response between the 2 interventions.

Systolic blood pressure of Hypertensives- H (blue)- Hypertensives N=Normal (green).

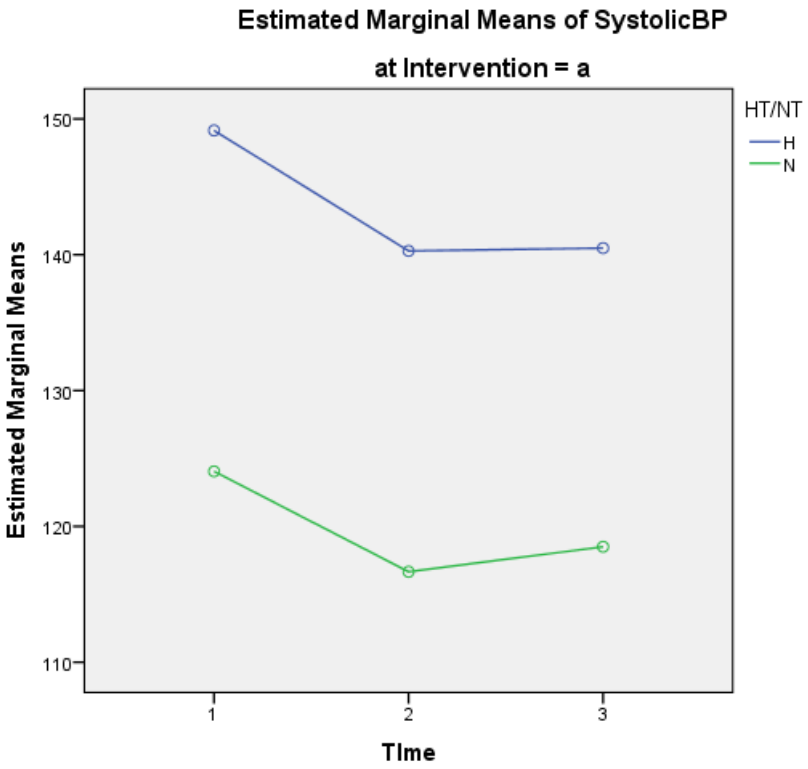

Figure 6. Systolic BP of Hypertensives versus Normotensives with Silence

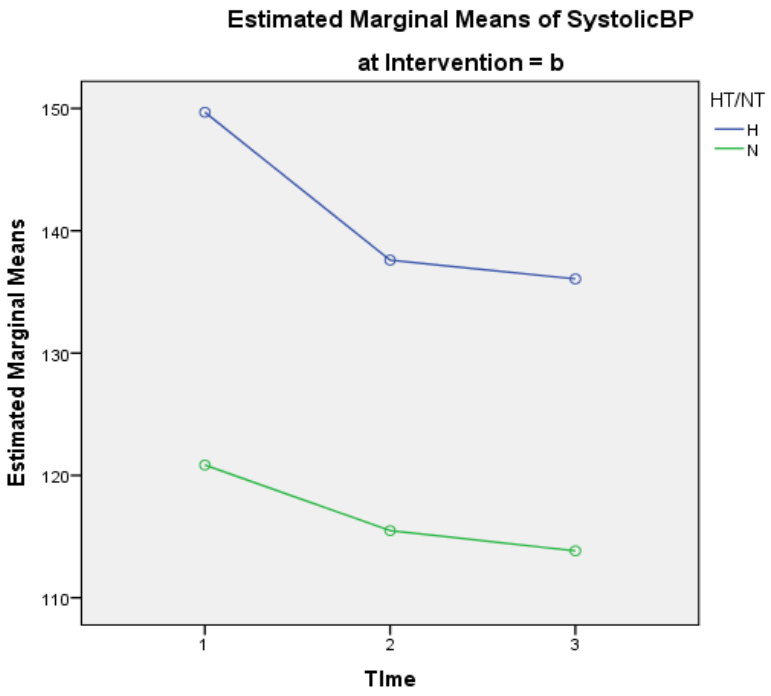

Figure 7. Systolic BP of Hypertensives vs. Normotensives with Bowl

Diastolic BP Comparison of the Hypertensives on Bowl Versus Silence

Diastolic blood pressure was not significantly different between the groups (p = .48) as illustrated by graphs 5 and 6 for silence, versus bowl group. Figures 8 and 9 illustrate diastolic in the hypertensives and normotensives in silence (a) and bowl (b) groups.

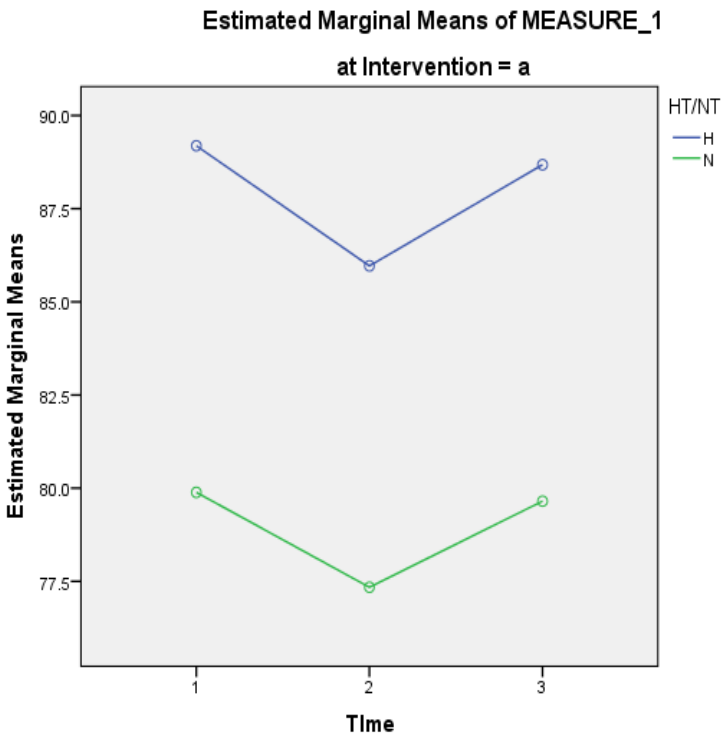

Figure 8. Diastolic BP of Hypertensives vs. Normotensives with Silence

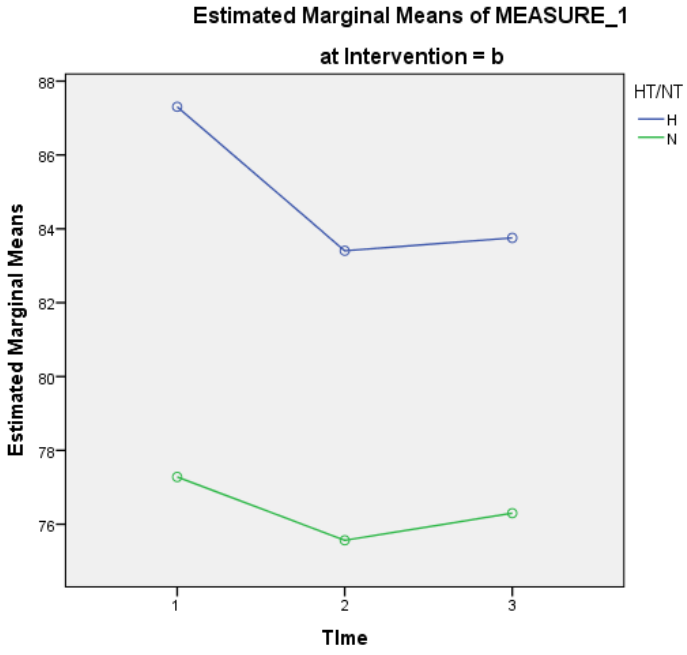

Figure 9. Diastolic BP of Hypertensives vs. Normotensives with Bowl

Heart Rate Comparison of the Hypertensives on Bowl Versus Silence Days

Figures 10 and 11 illustrate there was a trend toward a significant difference in response to the two interventions with hypertensives having a greater response (p = .058) for heart rate on bowl day versus non bowl day. The hypertensives and normotensives are compared with silence (a) and bowl (b) groups. Figures 10 and 11 illustrate heart rate in the hypertensives and normotensives in silence (a) and bowl (b) groups.

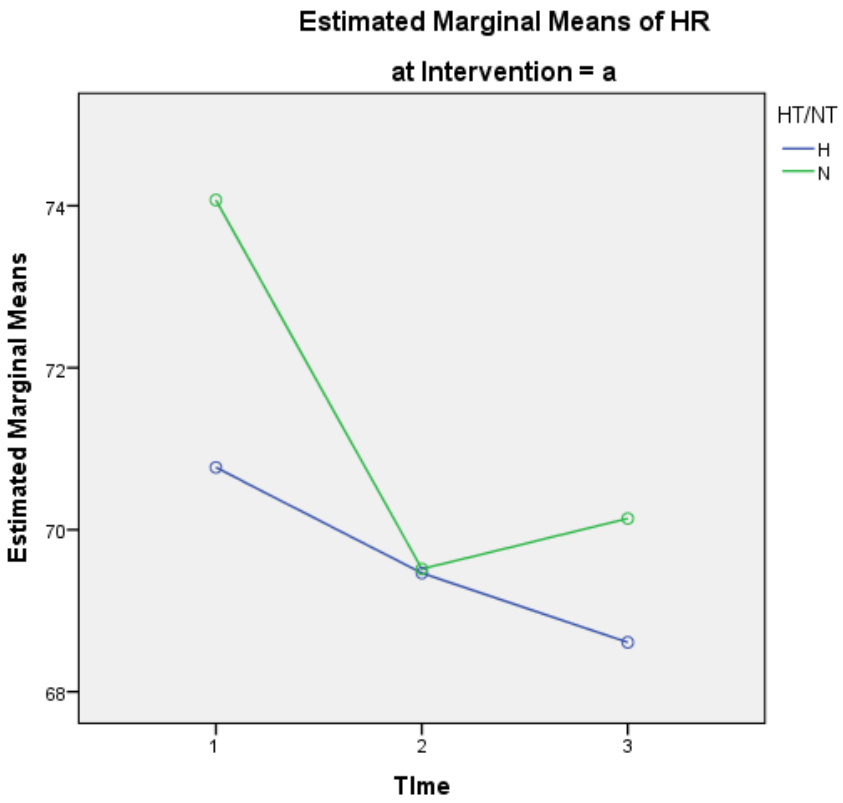

Figure 10. Heart Rate of Hypertensives vs. Normotensives with Silence

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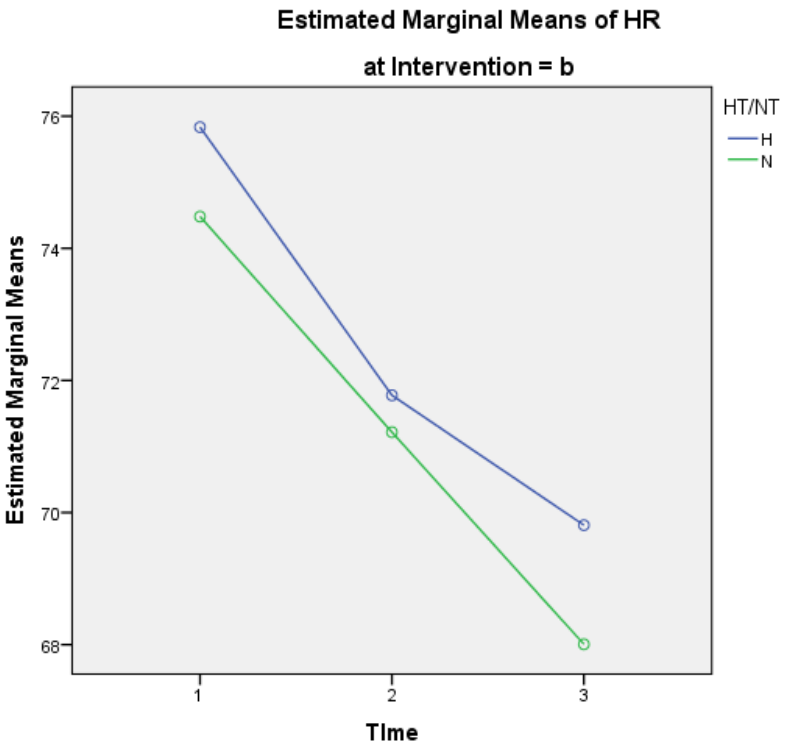

Figure 11. Heart Rate of Hypertensives vs. Normotensives with Bowl

Participant Responses

Fifty out of 51 participants reported feeling more relaxed than when started at the end of both sessions which included the twenty minutes of directed relaxation as a constant. One participant reported feeling the same at the end of both sessions. Forty eight out of 51 preferred the bowl session, 3 preferred the silence session.

The following comments describe the stated experiences from participants after the data was collected on the final session regarding their experiences with the bowl session unless otherwise specified:

Soothing bowl sound: 3 reported the bowl was more soothing than silence.

Bowl & relaxation: 33 reported obtaining a very/deeper relaxed state with the bowl.

Sleep states: No participants reported falling asleep during the silence session. Three participants fell asleep during the directed relaxation segment of the silence session. During bowl, one participant reported feeling sleepy, with eight falling asleep during bowl playing as evidenced by snoring and or presence of rapid eye movement sleep state with reporting of dreams during session. One of the 8 fell asleep within the first 2 minutes of bowl playing as evidenced by snoring.

Involuntary body movements: When one participant fell asleep during bowl exposure, his right index finger moved involuntarily. Another participant noted her arms were frozen in a good way.

Church Associations: Four participants had a positive association with church, sensed God was present, with one using guided imagery to walk through the woods to a chapel where they felt very peaceful and relaxed.

Spriritual: One participant traveled outside their body to another place describing spiritual experience, another described they had the deepest past life experience during bowl session.

Chakras: One participant reported accomplishing some energy work in her crown chakra, while another described a tingling in her crown chakra. A third described seeing the associated crown chakra colors of purple and blue.

Changes in affect/mind states facilitating relaxation: The researcher made the decision to alternate bowl strike to bowl rub with both running out to silence based on review of literature regarding dynamics of bowl playing (Inacio, 2004; Nur, 2011). Most participants responded favorably to this method (n = 49) with two stating the strike segments brought them back up out

of a deeper state where they were called to attention. The bowl rub was described as stimulating and calming at the same time, soothing, with the fading sound trailing to silence was very relaxing.

Participants noted feeling more peaceful with the bowl, and described feeling the bowl through their whole body while enjoying the continuity of sound. Other comments included, “I felt beautiful, the energy came up through my feet causing deeper meditation, the bowl helped with internal focus on my body, I loved it, if I were lying down, I'd be asleep, I felt calmer, more chilled out, extreme serene, I felt like I was floating, giving me something to tune in to helped me feel more focused, enabled me to concentrate, relax, ignore distracting thoughts, be more clear-minded, when it was over, I felt like I was brought to another place and was in a daze in a good way, I felt less stressed, was slower from the inside out and could feel the vibrations of the bowl inside body which was more relaxed than my mind.”

Associations with musicians: One participant was a drummer who attained a deeper relaxed state by tuning into the rhythm of the bowl, another, a pianist who could relate to the harmony of the bowl.

Imagery: Twelve participants reported attaining a deeper meditation state which offered imaginary trips to European mountain tops, Paris, with vivid descriptions of, “the wind blowing through my hair, and wanting to live in that peaceful state.” Other images during bowl play included seeing clouds, feeling the bowl reverberate like the ocean, traveling to the ocean where it is peaceful, and with one participant experiencing the outside office traffic turning into ocean waves crashing on the beach matched to the rhythm of the bowl vibration.

Hypertensives: Three out of 5 participants who had been on antihypertensive medication has a diastolic blood pressure of 90 mm Hg at the end of the second session and was referred to their primary care physician for follow up evaluation along with nine other participants who were not diagnosed but were hypertensive at the completion of session two.

Chapter 4 Summary

In conclusion, results indicated there is a positive relationship between exposure to a Himalayan singing bowl (HSB) and physiological and relaxation responses when used prior to a directed relaxation session. The physiological differences were captured using ANOVA and ANCOVA, revealing changes in systolic blood pressure and heart rate which were significantly different with the HBS intervention in comparison to the silence intervention. Furthermore, there was a significant time x intervention interaction ($p = 0.044$ and $p = 0.003$, respectively). The change in diastolic blood pressure was greater in the HSB group with a non-significant trend ($p = 0.073$). An additional finding included participants who presented with hypertension. When measuring the delta diastolic blood pressure, the hypertensives had the same response between the 2 interventions. When comparing the hypertensives to normotensives, they had a statistically significant difference in their response (hypertensives + n (.01) no interaction between hypertensives and intervention).

The subjective relaxation experience was captured using the self-administered PANAS scale. General linear model revealed positive PANAS scores falling significantly in both bowl and silence groups with no difference between the baseline and final positive PANAS pre and positive PANAS post in bowl (34.02 to 30.49) versus silence (34.04 to 31.17) groups. Negative PANAS scores fell significantly in both groups with greater decease in the bowl group.

Although there was no statistically significant difference between the baseline and final negative PANAS pre and negative PANAS post in bowl (13.88 to 10.78) versus silence groups (12.69 to 10.39), the bowl group had a greater decrease in negative scores (25% drop in scores from 13 to 10). The clinical implications for the study results will be discussed in greater detail in the final chapter of the dissertation.

CHAPTER 5. CONCLUSIONS AND DISCUSSION

Introduction

While the purpose of the previous chapter was to present the facts of the study, this chapter will offer an evaluation of this researcher's work while providing personal insight into and interpretation of the study results. Detailed descriptions will be provided of what the study means to me as a practitioner and more widely, to the fields of psychology and Complementary and Alternative Medicine (CAMs).

This chapter will evaluate if the dissertation addressed the problems that motivated me to create the study and will interpret the study's results in light of existing findings in the field of relaxation and CAMs. It will also offer recommendations for future studies. This will be accomplished by offering a summary of results, discussion of results, discussion of the conclusions in relation to the literature and the field, limitations, recommendations and conclusion.

Summary of the Results

As explained in chapter 2, this study was designed to determine the physiological and psychological effects of adding a Himalayan singing bowl (HSB) exposure prior to a meditation practice. The directional hypothesis implied there would be a positive relationship between the use of HSB exposure and enhanced relaxation and positive physiological effects when used prior to directed relaxation (DR). This guided the study along with the research questions which included: (1) what are the physiological and relaxation effects when integrating a HSB exposure prior to a directed relaxation (DR) session, (2) will the HSB produce an enhanced effect on blood pressure and pulse rate when added prior to a DR session versus no HSB exposure prior to

a meditation session, and (3) will there be an enhanced relaxation experience measuring positive and negative affect (PANAS rating scale) with HSB exposure prior to a DR session as opposed to no HSB exposure prior to a DR session.

Literature Review

Literature review included a comprehensive search and study of sound and meditation as it affects physiology. This started with Pythogoras's early work (580-500 B.C.E.) with his theory about music impacting the brain and body by inducing altered states. Benson's (1975) early work in the area of the relaxation response was followed by his later work with Rossi (2008) in the area of gene expression changes (Dusek et al., 2008). The effects of transcendental meditation (TM) was explored to determine efficacy in the areas of oxygen, heart rate and theta brain wave changes (Berklie et al., 2003), anxiety and addiction trait reduction (Orme-Johnson & Walton, 1998), cerebral blood flow (Newburg et al., 2003), blood pressure (Anderson et al., 2007; Paul-Labrador et al., 2006; Schneider et al., 2005) and EEG mapping (Gregg et al., 1996).

Additional areas of review included the effects of mindfulness meditation as it relates to positive brain immune function (Davidson et al., 2003), and tai chi effects on blood pressure (Thomas et al., 2005). Sound therapy was explored beginning with the effects of chanting (Vilayat, 1982), vibratory effects (Emoto, 2004), singing (Adero, 2001; Gass & Brehony, 1999), music effects on mood and brainwave patterns (Halpern, 1977), and on anxiety states (Smith, 2008).

Taking the combination of sound and vibration to another level by exploring the possible impact on physiologic states, Himalayan singing bowls were examined. Primarily, the design and composition (Gaynor, 1995, 2002; Inacio, 2004; Jansen, 1993) along with utilization for relaxed

state attainment (Chopra, 1990; Goldman, 2008; Nur, 2011; Seashore, 1937) were noted. Finally, the Hindu, Sufi and other Eastern philosophies incorporating the seven major energy centers (chakras) influencing health of the whole body (Shapiro, 2006) and the associations with the corresponding musical note scale (Kelly, 2003) was explained.

Updated Literature Review

A current literature review was completed to determine the presence of new published findings pertinent to this paper, in the areas of altered physiology effects (blood pressure, pulse, heart rate) from relaxation response, TM, CAMs, sound and vibration. Search options included full text, peer reviewed and scholarly articles within the past 12 months. Stetz et al. (2011) published a research study comprised of three Forward Surgical Teams ($N = 60$) in the military. Three 7-minute video clips of a virtual relaxation (VR) tool that included embedded guided narratives and imagery- was offered to half the subject group. Results using The State-Trait Anxiety Inventory indicated the VR tool was successful in reducing overall anxiety levels. Physiological measurements were not included. Rosenthal, Grosswald, Ross, and Rosenthal (2011) published research along a similar line, using transcendental meditation (TM) which was taught to veterans of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF), from 18 to 65 years of age with a history of moderately severe combat- related PTSD. Subjects agreed to practice the TM technique for 20 minutes twice a day for three months. Efficacy of treatment was assessed using the Clinician Administered PTSD Scale (CAPS). Secondary outcome measures included the PTSD Checklist-Military Version (PCL-M), the Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q), Clinical Global Impression-Improvement (CGI-I) scales, the Clinical Global Impression-Severity (CGI-S) and the Beck

Depression Inventory (BDI). The results of this small (n = 5), uncontrolled pilot study found that TM may have helped to alleviate symptoms of PTSD and improve quality of life in the veterans who had combat- related PTSD.

Wright, Gregoski, Tinge, and Trieber (2011) examined the impact of breathing awareness meditation (BAM), life skills (LS) training, and health education (HE) interventions on self-reported hostility and 24-hour ambulatory blood pressure (ABP) in 121 African American (AA). Their sample included ninth graders who demonstrated an increased risk essential hypertension development. Participants were randomly assigned to BAM, LS, or HE and participated in these intervention sessions during health class for 3 months. After the intervention ended, self-reported hostility and ABP were measured, before, after, and 3 months following. Results indicated that between pre- and post-intervention, BAM participants had significant decreases in self-reported hostility along with 24-hour systolic ABP.

Gregoski, Barnes, Tingen, Harshfield, and Treiber (2011) were determined to evaluate the effect of breathing awareness meditation (BAM), Botvin LifeSkills Training (LST), and health education control (HEC) on ambulatory blood pressure (ABP) and sodium excretion in African American adolescents (N = 166). After three day of systolic blood pressure (SBP) readings participants were randomly assigned to either BAM (n = 53), LST (n = 69), or HEC (n = 44). Intervention sessions held at school were provided for 3 months by health education teachers. Overnight urine samples and 24-hour ambulatory SBP, diastolic blood pressure, and heart rate were obtained before and after the interventions. Results indicated significant group differences in overnight SBP and SBP, diastolic blood pressure, and heart rate over the 24-hour period and during school hours with the BAM group exhibiting the greatest decreases. There

was a nonsignificant trend for overnight urinary sodium excretion (p = .07), with the BAM group displaying a reduction of −.92 ± 1.1 mEq/hr compared with increases of .89 ± 1.2 mEq/hr for LST and .58 ± .9 mEq/hr for HEC group. Thus BAM improved hemodynamic function by affecting sodium handling among African American adolescents who are at increased risk for development of cardiovascular disease.

Akiyama and Sutoo (2011) were interested in exploring the effects of music frequency on brain function. Using spontaneously hypertensive laboratory rats (SHR), different frequencies of music on brain function was investigated by measuring blood pressure. Using Mozart's music (K. 205) the study demonstrated that the blood pressure-reducing response was dependent on the frequency, and was markedly greater at 4k–16k Hz compared with lower frequencies. The findings suggest that music containing high-frequency sounds stimulates dopamine synthesis, and this may affect various brain functions.

In the area of mindfulness based stress reduction (MBSR), Matchim, Armer, and Stewart (2011) reported a statistically significant improvement in physiological and psychological outcomes including reduced blood pressure, heart rate, and respiratory rate along with increased mindfulness state at the level of p = 0.05 to p = 0.001. Subjects included early-stage breast cancer survivors and consisted of a quasi-experimental, pre- and posttest control group design. The intervention group received the MBSR intervention and the control group received no MBSR intervention. The effect was not sustained at a 1-month follow-up. In the study conducted by Campbell, Labelle and Bacon (2011), female post cancer treatment patients were recruited from an MBSR program. Participants completed self-report measures on mindfulness and rumination, and measured blood pressure at home before and after the 8-week MBSR program.

This group was compared to those in a waiting period. Results indicated the MBSR group demonstrated higher levels of mindful attentiveness and lower rumination, along with decreases in systolic blood pressure (n = 19) compared to control group (n = 16) by the end of the 8th week.

Methodology

The quantitative research method was used to measure the physiological effects (diastolic, systolic blood pressure and heart rate) and psychological effects (self-administered PANAS) comparing a HSB exposure to silence, prior to a twenty minute directed relaxation session. Results of the correlational design were obtained by statistical analysis using IBM-SPSS version 20 and Sigmastat by Jandel Corporation (1994). ANOVA Two Way repeated measures analysis of variance on two factors balanced design, and using a general linear model analysis for repeated measures, for the same person served as their own control. ANCOVA was implemented to adjust for the introduction of parameters such as baseline readings, age and sex and their effect on physiology over time.

Findings

Fifty-six adult participants ranging in age 26-69, responded to the study, with a total of 51 (16 male and 35 female) completing both sessions within a few weeks period of time (N = 102 sessions). Data from the incomplete sets (5) were not utilized. Findings supported the directional hypothesis: there was a positive relationship between the use of HSB exposure and enhanced relaxation, with positive physiological effects when used prior to directed relaxation (DR) compared to the same session using silence. There was a statistically significant drop in systolic and diastolic blood pressure over time in both interventions with the bowl group having a sustained fall compared to the silence group. Heart rate fell in a similar pattern to blood

pressures. Hypertensive individuals had the same response between the two interventions, but when compared to the normotensives, the hypertensives had a statistically significant difference in their response to the HBS session.

Self-administered PANAS results indicated bowl and silence interventions produced significant decreases in scores, with no statistically significant difference between the two. The relaxation response from the session resulted in a fall of both positive measures (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active), as well as negative measures (distressed, upset, guilty, scared hostile, irritable, ashamed, nervous, jittery, afraid).

Discussion of the Results

The study results supported the original hypothesis and research questions by demonstrating both physiologic and relaxation effects of Himalayan singing bowl (HSB) exposure. When a HSB is added to a meditation session, there is an enhanced physiological effect resulting in a deeper relaxation response. Fifty out of 51 participants reported feeling more relaxed at the end of both sessions, which included the twenty minutes of directed relaxation as a constant.

Results suggest that a HSB exposure has the potential to create a deeper meditative experience and decrease negative affect states. This positive relationship between Himalayan singing bowl (HSB) exposure and physiological and relaxation responses was evident in statistically significant difference in systolic blood pressure ($p = 0.044$) and heart rate ($p = 0.003$) change with the HSB session over silence session. Changes in diastolic blood pressure were also greater in the HSB group with a non-significant trend ($p = 0.073$). There was also an enhanced

response to the HSB by participants who presented with hypertension. When this group was compared to normotensives, there was a statistically significant difference in their response. Thus, HSB exposure could be used as an adjunct to other complementary and alternative medicine techniques to acutely lower blood pressure, particularly in hypertensive individuals. What is not known from the present study is the duration of the effect.

When looking at the subjective relaxation experience, as captured by the self-administered PANAS scale, participants had a significant drop in both positive and negative affect states. Based on prior studies in the area of relaxation response, it is plausible that negative states (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid) would fall during the relaxation response. This indeed happened and scores fell significantly with both interventions but with greater decrease in the HSB group. But the analyses also showed both positive and negative states falling in parallel. The fact that the positive states (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) fell as well may have been due to the enhanced relaxation achieved during the interventions. This likely resulted in the participants being in a very relaxed, meditative or sleep state by the session's end. What this study demonstrates is that when an individual relaxes with the HSB, it results in a fall of positive as well as negative affect measures. Therefore, the PANAS may not have been the ideal instrument to capture overall changes in the subjective experience during this experiment.

In light of the intense, interesting and varied participant responses, it would be interesting to design and implement a qualitative study to explore personal experiences with HSB exposure

in greater detail. Nearly all the participants preferred the HSB session over the silence session. This may be relevant to its utility as a treatment tool with certain clients.

Two participants experienced involuntary movements- one with right index finger and the other describing her arms felt frozen. Ogden (2000) has identified the presence of involuntary micromovements and gestures consistent with sensorimotor processing which can occur spontaneously during the body's processing of prior trauma experiences. In the absence of cognitive processing, this interactive regulation can have a positive effect on emotions. Van der Kolk (1996) describes the origin of these unresolved sensorimotor reactions as part of the conditional emotional and cognitive processing system, which if unresolved, can lead to a disruption in the traumatized person's ability to think clearly or to glean accurate information from emotional states. Levine (2000) offers another way to understand involuntary movements as "organic discharge," for explicit memory is accessed primarily through thought, implicit memory must be reached through the body. This *felt sense*, enables the non-conscious *intentional movement* which facilitates the release of bound energy leading to renegotiation and healing of trauma. It is possible that the HSB exposure has implications for somatic experiencing in this body-oriented psychotherapy approach.

When the HSB is inverted, it resembles a bell without the striker and when struck, it sounds like a bell with superior resonance. Some participants associated the bell sound of the HSB with positive church and chapel associations including feeling God's presence in the session. This association contributed to feeling very peaceful and more relaxed. Two musicians noted a deeper relaxed state by tuning into the rhythm of the bowl, and relating to bowl harmony respectively.

Other spiritual experiences including references to crown chakra were noted by participants. This latter observation was interesting for the B^b tone designation of the HSB was not discussed with any participant and it is associated with the crown chakra on the note scale (Kelly, 2003). The remaining six chakras were not mentioned by any participant.

Discussion of Conclusions

This study took a CAM technique and studied it with a Western approach and was able to determine that introducing a HSB prior to a meditation session did indeed promote an enhanced relaxation response as evidenced by statistically significant decreases in systolic, diastolic blood pressure, heart rate, and negative affect scores. The study builds upon prior research in the fields of meditation and music therapy and bridges the gap between the efficacy of sound in the form of a HSB and its physiologic and enhanced relaxation effects. Results presented support and confirm the positive physiological and relaxation effects when incorporating a HSB into a meditation session. These results have broad implications in the wider field of psychology and mental health for both the traditional Western medical community and the Eastern complementary and alternative medicine community (CAMs).

Experts estimate that up to 75% of fatigue and medical disorders are directly attributable to stress (Hughes et al., 1984; Kaptein et al., 1990). Medical problems develop when one lives in chronic stress states, potentially related to cortisol and adrenaline stress hormone release. These psychosocial stressors and stress hormones can lead to hypertension (Weiner, 1977) cardiac disease (Hanser, 1985), gastrointestinal problems (Khorana, 1983), and migraines (Steven & Shanahan, 2002). The present study builds upon the initial work of Benson's (1975) "relaxation response." A number of studies 30 years hence have demonstrated the physical and mental health

benefits of deeper relaxation, meditation, mindfulness, and music therapy. Having this knowledge offers clinicians another tool that can be used to limit the impact of stressors on illness causation.

Limitations

Several limitations may have affected both the results of the study and its generalizability. The rationale for using the PANAS was to determine the subjective relaxation states comparing HSB to silence sessions. The use of PANAS for relaxation assessment could be viewed as a limitation of the study, as the participants reported the opposite of positive coming out of a deeply relaxed state. The goal was to measure an increased feeling of relaxation and this tool was not designed for that specific purpose. In future studies, I would recommend a tool designed specifically for capturing relaxation levels.

A larger sample size along with lack of cultural variety in the sample may also be a limitation. It is uncertain whether a study repeated with a larger sample would yield similar results. Observations that the hypertensives had a greater response to the HSB, although interesting and noteworthy, were drawn from a subset of the participants and were not a pre specified analysis. Similar studies in a larger sample of hypertensive individuals would add to the body of literature regarding their response to HSB exposure.

Age and cultural backgrounds of participants may be limitations to the study. The majority of the population ranged in age from 26 to 69. The mean age of participants was 50.5. Based on the mean age of the sample, conclusions may not represent how a younger or older participant would respond to a similar study.

The relatively homogeneous race and ethnicity of the study population is reflective of the 96.1% White, native born occupants in the municipality in which the study was conducted. Even though the researcher exercised great care to observe and document with objectivity, the results may be influenced by the researcher's similar cultural background to most participants. According to Kirmayer (2001), the clinician can see the client through his or her own lens which may include training, cultural experiences and current setting, thus creating an intercultural therapeutic exchange. Social and cultural contexts must be considered before one could make associations about how other cultures would respond to the same study.

Another limitation could be the use of this particular handmade Bb seven metal HSB. Since the bowl is handmade from Nepal, it might be considered a challenge to replicate the study without the same bowl. It would be very interesting to do a similar study with other handmade bowls of differing sizes and tones. Another idea would be to replicate this study using a crystal bowl of the same B^b tone to determine similarities and differences in results. Since the two bowls are made entirely of different compositions, it would not be appropriate to make the same assumptions about the results of this study regarding the efficacy of crystal singing bowls.

It is also very possible that the study results were affected by either the Hawthorne effect or regression to the mean. That human self-awareness may influence the results of a clinical investigation is well established. In considering the Hawthorne effect, when human subjects know they are being studied, that knowledge influences their behavior. As such, participants may try to respond as they think researchers expect them to (Comer, 2007). It's possible, that the attention the participant received during 12 min bowl session versus being left alone in the room

during the silence session may itself have increased participant optimism, improve mood and affected their responses.

Recommendations for Further Research or Intervention

While a single quantitative study cannot provide a sound basis for changes in the practice of relaxation response, this study suggests that adding a HSB has a positive effect on physiology and relaxation, and spur further research on the impact of sound and vibration on stress management. There is debate among HSB practitioners, as to whether or not metal construction offers greater relaxation properties than crystal. Perhaps differing size bowls and tones could be compared, or the same experiment could be conducted using the bowls made of crystal versus the metal HSB. Future studies could include experiments using different HSB tones. In addition, creating or finding a tool to assess affective functioning that has construct validity and reliability aimed at specifically assessing level of relaxation would be helpful.

Future studies could be conducted using patients with hypertension. The relaxation approach implemented in this study could have positive ramifications for the hypertensive population. The technique of playing the bowl is simple and this form of therapy is inexpensive, portable and carries no foreseeable risks.

Somatic Experiencing encompasses somatic education and body-oriented psychotherapy and includes the interconnection between the body, brain and mind. Traumatized individuals learn to restore homeostasis after being aroused by a threat. Once implicit traumatic memory is accessed in a resourced way (through the felt sense such as involuntary movements), it is transformed and changes. This change leads to healing. Further studies using the HSB could advance the psychotherapeutic area of somatic experiencing and sensorimotor processing.

Practitioners might consider incorporating a B^b HSB in their practice to enhance a deeper relaxation and meditative state with the clients they serve. Knowledge gained from future studies with Eastern and Western approaches would continue to advance best practices in the field of meditation and relaxation improving mental and physical wellbeing in the clients we serve.

Conclusion

This study showed a positive relationship between the use of HSB exposure and enhanced relaxation and positive physiological effects when used prior to directed relaxation (DR). Results from this study can contribute to the body of knowledge in the area of relaxation response and music therapy. The bowl is easy to play, carries low risk, is inexpensive, portable and can be taught to clients as a technique aiding them in self-care. These findings can also have a significant impact on and change practices for clinicians assisting clients with various relaxation modes. Incorporating this tool prior to a meditation session enhances the relaxation response, an essential component of stress management. Stress management contributes to improved physical and mental well-being leading to a deeper quality of life.

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APPENDIX A. PARTIAL DIRECTED RELAXATION SCRIPT

Jayan's Twenty minute Partial Directed Relaxation (DR) Script

For Capella Dissertation

Author: Jayan Landry MS, APRN-BC

(Partial sample pending copyright)

Get comfortable in your seated position moving your body and using the cushions to provide maximum support. Know that when you take this time over the next 20 minutes to clear your mind, you will be helping your body and mind to become more relaxed. Being in this relaxed state is good for your mind and body. Now if you are comfortable, close your eyes to minimize distractions and place your hands on your lower belly. Picture breathing into your front and back lungs as you inhale through your nose. As you inhale through your back of your throat…..

APPENDIX B: DATA COLLECTION TOOL

Date		
Number		
Name		
Phone #		
Consent signed		
Unusual events? (Return Visit)		
Pre PANAS P-N		
PRE BP/Pulse		
12 min Bowl or Silence B/S		
Second BP/Pulse		
20 min DR		
Post BP/pulse		
Post Panas P-N		
Self report “Do you feel more relaxed than when we started?”		