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# THE EFFECTS OF GROUP DRUMMING ON SELECTED NEUROENDOCRINE LEVELS AND SELF-REPORTED MOOD, STRESS, SOCIALIZATION, AND TRANSPERSONAL EXPERIENCES

By

Carolyn A. Koebel

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ABSTRACT

THE EFFECTS OF GROUP DRUMMING ON SELECTED NEUROENDOCRINE LEVELS AND SELF-REPORTED MOOD, STRESS, SOCIALIZATION, AND TRANSPERSONAL EXPERIENCES

By

Carolyn A. Koebel

This study compared the experiences of a drumming group to an active listening group across 12 weeks. Thirty-four volunteers, ages 18-70, participated in the 6-week portion of the study, eleven attended the follow-up session at week 12. The Profile of Mood States (POMS), Mental Health Index (MHI) Anxiety, Lubben Social Network Scale, and Wellness and Transcending Index were administered before and after the 6 week intervention. The Phenomenology of Consciousness Inventory (PCI) was taken at sessions 2 and 5. Salivary assays were taken before and after the first and 6$^{th}$ session, and prior to session 12. Saliva was analyzed for changes in cortisol, DHEA-S, estradiol and testosterone within sessions 1 and 6, and across time prior to drumming at sessions 1, 6, and 12. Independent samples *t*-tests revealed no significant differences ($p<.05$) between the drumming and listening group on scores for any of the psychological measures. The PCI yielded significant differences between the drumming and listening groups on 9 subdimensions during session 2, but on only 2 subdimensions during session 5. No significant differences in neuroendocrine measures were found between the two groups at any of the 5 measurement points. Both groups experienced significant decreases in cortisol during session 1, and decreases during session 6. DHEA-S increased in both groups. Repeated Measures ANOVAS revealed no significant differences across time.

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# INTRODUCTION

## *Background*

The use of therapeutic drumming is becoming increasingly prevalent within the field of music therapy. Indeed, within the general populace its popularity continues to soar (Kartha, 1997). There is currently strong demand for outcome-based music therapy research into the effects of hand drumming on health and wellness of both communities and individuals. The popularity has manifested itself through the presence of West African djembes, Cuban congas, Arabic frame drums, and Mid-Eastern doumbeks in nearly every music therapy clinic, as well as in private practice. Although historically the music therapy clinic housed a drum-set for clinical usage, the modality of stick drumming is being slowly rivaled by a hands-on approach that brings the individual into direct contact with the vibration of the instrument. Hand drums provide a portability and accessibility that reflects changing needs in a changing profession. Hand-drums can be found in a myriad of homes and neighborhoods, representing a variety of cultural and professional backgrounds (Friedman, 2000).

Recent interest in drumming for wellness has focused on the community drum circle (Burt & Stevens, 1997; Bittman, et al., 2001): an environment of loud djembes, bells, shakers, tambourines, triangles, and various percussive devices. While many participants enjoy the social spirit of a traditional drum circle, rising numbers are seeking experiences geared equally towards personal growth and exploration. As such, its therapeutic value begins to expand. As interest in yoga, meditation, ritual, and Eastern spiritual practice continues to flourish, (Chopra, 1989) it seems an appropriate time to

investigate the benefits of a ritualized (community) drum circle. The present study will explore the more endogenous health benefits of such a drumming group.

The expansion of consciousness and awareness can be readily accessed through the connection of the voice and body through the medium of drumming (Redmond, 1997). Participants engage in rhythmic material on the drums, initiated and concluded by vocal cues, and resonated in the body. Drumming leads to a synchronized hemispheric brain state, similar to that achieved through repetitive dance or the yogi's alternate nostril breathing (Shannahoff-Khalsa & Bhajan, 1992). When a group of people play a rhythm for an extended period of time, their brain waves become entrained to the rhythm, and they have a shared brain waves state (approaching theta) (Neher, 1962). The intention and shift in consciousness is what ultimately makes the drumming powerful (Redmond, 1997). In this manner, the act of drumming becomes a truly holistic (and therapeutic) experience.

Current practice focuses on the teaching of drum-circle facilitation. Several practitioners have become full-time drum circle facilitators, often offering it to corporate organizations for their livelihood (Mattingly, 1995). One problem is that many facilitators have minimal knowledge about the actual playing of the instruments. What little training is available tends to focus only on superficial technique, with no real sense of transferability to the therapeutic process. Furthermore, the small amount of drum research that does exist has come largely from non-music therapists, unskilled drummers (though perhaps music therapists), or some combination of the two.

The purpose of this research was to gain much needed information about the impact of group drumming on participants' reported mood, anxiety, stress, socialization,

neuroendocrine processes, and transpersonal experiences affecting consciousness and imagery states. Participants were randomly divided into one of two groups: active drumming or receptive listening. Particular comparisons focused on the similarities and/or differences between the two groups. Salivary assays were taken to identify shifts in levels of cortisol, dehydroepiandrosterone-sulfate (DHEA-S), estradiol, and testosterone. Participants consisted of volunteers from the community who completed demographic health questionnaires, and ranged in age from 18 to 70.

The specific objective of this research was to gain baseline data for continued investigation into the therapeutic applicability of group drumming for individual and community wellness. This research may serve as a springboard for future studies that assess drumming interventions with specific clinical populations. This study fills a specific void in the current literature. Nearly all of the available rhythm-based or drumming-based research has focused on populations within Alzheimer's, Parkinson's, cancer, stroke, psychiatric rehabilitation, addictions, speech, and multiple sclerosis; the majority of these areas are dominated by elderly clientele. Moreover, these findings have seldom, if ever, been compared to baseline drumming data.

*Shamanic Literature*

An ancient and multi-cultural tradition has the extraordinary ability to touch something deep and powerful within us all. Shamanic drumming is estimated to be between 20,000 and 30,000 years old and is considered one of the oldest organized systems for healing. Practiced in nearly all parts of the world, this technique is "...strikingly similar the world over, even for peoples whose cultures are quite different

in other respects, and who have been separated by oceans and continents for tens of thousands of years" (Harner, 1990). Shamanic drumming uses one drummer playing a single, repetitive rhythm between three and four beats per second that can last from less than ten minutes to well over an hour. The rhythm played at this speed will induce a trance state in the listener and, when accompanied by specific visualizations, has been observed to facilitate healing of a variety of mental and physical illnesses (Strong, 1997).

A recent dissertation by Harner (1995) examined immune and affective response to shamanic drum journeying. Specifically, Harner found no effect on immune response as indicated by Salivary Immunoglobulin A resulting from the drumming. The dimensions of affect explored included anxiety, well-being, and mood disturbance using the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971). All the well-being factors increased in the drumming/journeying condition when compared to Baseline (before drumming), Resting (participants sat quietly), and Birdsongs (participants listened to a relaxing recording of birds singing). Lower anxiety was found in response to drumming/journeying than to any other condition. All mood disturbance subscales (anger, confusion, depression, fatigue, tension-anxiety) except vigor had lower levels after the drumming/journeying, while vigor was significantly (statistically) higher. Likewise, depression and confusion levels were lower after drumming. An important note is that all participants were experienced shamanic practitioners. As this current research study will address, previous experience impacts the individual's perception of anxiety and stress. Further, increased practice in entering altered states leads to a consistent ability to journey more deeply. It is a skill like any other, such that increased mindful practice leads to greater mastery. When the skill level is higher, the ability to

remain relaxed increases, with less perceived stress and anxiety. Wright (1991) supports this view in the succeeding study.

Wright (1991) observed that live, repetitive drumming combined with verbal suggestions invoking imagery produced "shaman-like states of consciousness" (pg. 5) while sitting quietly in an eyes closed condition. Wright used the Phenomenology of Consciousness Inventory (PCI) to measure participants' subjective experiences in both the drumming and the control condition. She found that the live, repetitive drumming condition showed:

> (a) significant increases in altered experiences (body image, time perception, and meaning), positive affect (joy, love, sexual excitement), negative affect (fear), imagery (amount, vividness), and altered state,
>
> (b) significant decreases in self-awareness, arousal (measures the extent of muscular tension, muscles are "very tense and tight" versus no feeling of "tension or tightness at all"), volitional control (the extent to which one has "complete control over what one is paying attention to" or is "willfully controlling" the experience, versus becoming passive and receptive to the experience), and internal dialogue;
>
> (c) participants with higher levels of experience with shamanic journeying showed more heightened imagery, positive affect, and rationality (thinking is clear and distinct, versus "hard to comprehend") than those with less prior experience.

Another shamanic researcher, Maxfield, (1994) observed brain wave patterns and images in naïve subjects in a controlled listening study with three groups. One group

experienced traditional shamanic drumming in which a high quality recording was used (with beats ranging from 4 to 4 ½ beats per second). A second group received *I Ching* drumming tapes, developed by Maxfield, which takes patterns of the I Ching hexagrams and drums them out. For example, in *I Ching* drumming, a solid line in the hexagrams represents one beat, while a broken line represents two beats. Five drummers are used, often with two playing one series and three playing the other. Maxfield measured theta, alpha, and beta brain waves. The third group listened to free improvisational drumming, but there was no change throughout the session. In the I Ching drumming, there was some increase in theta, but it was considerably less than with the shamanic drumming. The shamanic group had full-scale shamanic experiences, with visions and dreamlike experiences.

*Rhythm Healing*

Rhythmic Entrainment Intervention (REI) is a rhythm-based musical therapy program that uses complex rhythms to stimulate the central nervous system. REI is a unique blend of modern advances in brain research and ancient rhythmic drumming techniques used to treat psychological and physical illness. Using complex hand drumming patterns played at a speed of 8 beats per second, REI delivers a rhythmic auditory stimulus which can positively influence biological function (http://www.reiinstitute.com/IS.html). REI is designed to facilitate both short term and long-term improvement in a variety of symptoms common to neurobiological disorders. REI consists of a 40-minute recording played as background music that contains complex, unusual drumming rhythms chosen to address specific behavioral and cognitive

areas. Researcher Jeff Strong has seen improvements in language and communication skills, social engagement/interaction, self-stimulatory behaviors, sensory defensiveness, comprehension, attention span, eye contact, aggression, and anxiety as a result of structured REI listening sessions.

Rhythmic Entrainment Intervention is influenced by the Minianka style of rhythmic healing in Mali. In this West African view of health, emotional disturbance is expressed in irregularities of muscle tone and blocked, disharmonious neuromuscular and physiological rhythmic processes. An emotionally unbalanced person experiences shallow or irregular breathing, heart symptoms, functional digestive disturbances, and distressed thinking that is reflected in excited brain wave patterns (Diallo & Hall, 1989). Music profoundly affects muscle tone, body rhythms and emotions; respiration, heartbeat, digestive peristalsis, and brain waves tend to synchronize in the presence of music. By playing appropriate rhythms, the Minianka musicians stabilize and synchronize the physiological and motor rhythms of their patients through the audible vibrations of music (p. 82).

*Rhythm for Life*

Throughout human history, the beating of the drum has been used as a healing agent in cultures around the world (Hart & Stevens, 1990). In the United States the popularity of drumming has grown noticeably over the past decade. One of the primary instigators in this movement has been the Rhythm for Life Project (RFL). RFL was an organization dedicated to the study and use of percussive sound, especially active participation in drumming and percussion activities for the benefit of individuals and the

community. RFL sought to promote awareness of the use of rhythm as a tool for the maintenance and restoration of physical, mental, emotional, and spiritual health (Crowe, 1994).

Rhythm for Life formed as a direct result of the testimony presented to the United States Senate Special Committee on Aging during their hearing, "Forever Young: Music and Aging" in August, 1991. Presenters included music therapists, physicians, musicians, and older individuals all attesting to the importance of music in the lives, health, and well-being of older adult citizens (Crowe, 1994). Mickey Hart, author of both *Drumming at the Edge of Magic* and *Planet Drum*, and former drummer with the Grateful Dead, was on hand to testify to the particular importance of rhythm and drumming as an activity for older persons. In particular, he urged the formation of drum circles for the elderly, testifying that

> "...benefits would be wide ranging...immediate reduction in feelings of loneliness and alienation through interaction with each other, ...direct exposure to younger people, and nonverbal communication (as) the means of relating ...Natural byproducts of this are increased self-esteem and the resulting sense of empowerment, creativity, and enhanced ability to focus the mind, not to mention, just plain fun" (U.S. special Committee on Aging, pp. 24-25; Hart, 1991).

The Rhythm for Life project was crucial in starting to research some of these healing mysteries of the drum. In particular, research focused on the rhythm playing characteristics of persons with severe dementia such as Alzheimer's disease. Clair and Bernstein (1990) compared singing, vibrotactile, and nonvibrotactile instrumental playing responses in persons with Alzheimer's disease. They looked specifically at duration of response time. The singing data was not applicable to all participants, as many had lost their verbal ability. All participants could drum, however, and the higher scores (indicating longer playing duration) came from vibrotactile experiences when the drum

was held in the participant's lap, rather than through nonvibrotactile stimuli, during which the therapist held the drum in front of the player. This outcome gains support from Skille (1990), who discusses the concept of VibroAcoustic Therapy (VAT). VAT is a means of using the energy of musical sound waves applied directly to the body to produce relaxing physiological and psychological effects.

In a more comprehensive study, Clair and Bernstein (1993) examined more specific rhythm playing characteristics of the same population in a medical setting. It was concluded that, with the structure provided by the music therapist, Alzheimer's patients can increase the complexity of their rhythmic participation over time, learn and retain rhythmic patterns from session to session, increase their level of participation in rhythmic activities over other activities, and learn and retain new drumming strokes.

One of Rhythm for Life's most long-lasting missions was the creation of the community-based drum circle. A community drum circle is a celebration of life through the spirit of rhythm, drumming, movement, and song. It centers around the use of the drum as a tool for unity and harmony. The quality of the music being created in the drum circle is reflected in the quality of the relationship among the people in that circle (Hull, 1998). Participation in such events promotes relaxation, communication, and sense of belonging to the community (Crowe, 1994). Sears (1965) stated that music provides opportunities for socially acceptable reward, enhancement of pride in self, successful experiences, feeling needed by others, and enhancement of esteem by others. Bernstein continues to carry on the (now-defunct) RFL tradition with his own wellness initiative, Healthy Sounds. His work, and that of many others, takes therapeutic drumming out of the nursing home, into the corporate office, and beyond (Mattingly, 1995).

Crowe, Reuer, and Bernstein (1999) have further identified the benefits of group percussion activities based on the following principles:

1. Response to rhythm is basic to human functioning, making these percussion activities and techniques highly motivating to people of all ages and backgrounds.

2. Pure percussion activities are interesting and enjoyable to all people regardless of ethnic and cultural background, musical preferences, or age range, making these activities useful in creating groups that are fun and positive for a wide variety of people.

3. Participation in active group percussion experiences has physical benefits including sustained physical activity, relaxation, and use of fine motor skills.

4. A strong sense of group identity and a feeling of belonging is created because participants are actively making music together and because the sustained repetition of the steady beat brings people together physically, emotionally, and mentally (rhythmic entrainment).

5. Percussion activities can be done with little or no previous musical background or training, making these experiences accessible to all people.

*Statement of the Problem*

The time has come to objectively assess the health and medical implications behind this alluring form of therapy. Although there is current research on the relationship of music and/or music therapy to neuroendocrine function, mood, and stress, the treatments have consisted almost exclusively of recorded music. One notable exception was the Music Making and Wellness Project that demonstrated that group keyboard lessons yield a dramatic alteration (92% increase) in human growth hormone (hGH), while also showing significant decreases in anxiety, depression and loneliness (Tims, et al., 2001; available on-line: http://www.fletchermusic.com/wellness.htm) While psychoneuroimmunological research has tapped into DHEA-S, testosterone, and estradiol, little music therapy research has endeavored to do so. Further, the shamanic literature that exists seldom involved the participants themselves in the actual process of

drumming, even when the shamanic drumming was live (Wright, 1991; Harner, 1995). This study brings the participants actively into the therapeutic process. Both the music therapy and drumming communities can benefit from this contribution to the research body.

Recent research interests have focused on the important role of active music making in achieving healthful outcomes. Yet, no one has explored the potential benefits of actively listening to live music making. The current treatment philosophy is to recommend active music making over passive listening to recorded music. The missing piece is the one that this study explores: Can listening to active music-making approximate the benefits of actually playing the music oneself?

Scientific outcomes are not all that can be gleaned from a study of this nature. There are a host of qualitative elements that merit investigation. Specifically, mood, anxiety, social, and transpersonal indexes will be assessed throughout the study period, as well as at the six-week-follow-up. Salivary neuroendocrine assays will be measured at session one (base-line/pre-test), session 6 (post-test), and session 12 (follow-up). Additionally, participants will be asked to provide descriptive accounts of their experiences. Keen attention will be paid to the differences between groups of active drummers and active listeners. Furthermore, the impact of previous participation in a drum circle, gender, participant's age, ethnic identity, and previous musical experiences will be correlated for possible impact upon outcome measures.

*Purpose and Hypotheses*

With the intent of increasing an awareness of the health benefits of drumming, the purpose of this research is to gain information on physiological, psychological, and transpersonal responses to live drumming. The specific problems of this study are as follows:

1. To determine whether participants in both group drumming and drum listening will show a decrease in reported mood disturbance, as reported on the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971) in the subdimensions of tension, depression, anger, vigor, fatigue, confusion, and overall mood disturbance, as measured by a pretest and 6-week posttest.
2. To determine whether participants in group drumming and drum listening will report a decrease in psychological stress and an increase in socialization, as measured by the MHI Anxiety Index (Veit & Ware, 1983) and Lubben Social Network Scale (Lubben, 1988), when measured at pretest and 6-week posttest.
3. To determine whether participants in the drum listening group report a different subjective experience than participants in the active drumming group, as measured by the Phenomenological Consciousness Inventory (PCI) (Pekala, 1982), administered on the second and fifth session, immediately following drumming, and the Wellness and Transcending Index (Travis, 1988), measured by pretest and 6-week posttest.
4. To determine whether participants in both group drumming and drum listening will experience a change in neuroendocrine levels of cortisol, DHEA-S, estradiol, and testosterone after drumming as measured by a saliva

test, when compared at pretest, 6-week posttest, and 12 week follow-up.

*General Definitions and Operational Terms:*

Cone drumming. A style of hand-drumming using drums with a conical body tube, like ashikos and djembes, in which the drum sits vertically in front of the player, and the arms move in an up/down motion hinging from the elbows.

Journeying. The experience of entering a state of consciousness differing from waking consciousness, in which the individual may experience daydreams, dream-like experiences, heightened sensations and awareness, or imagery/visions.

Transpersonal/Transcendent Experiences. Those experiences that go beyond the scope of most generally accepted ''scientific'' principles and express the values and beliefs of the individual (Travis, 1988). One may experience the phenomenon of moving from one state of consciousness to another.

*Operational Definitions.*

Neuroendocrines. Hormones produced in cells located in the endocrine glands. These chemical messengers excite or inhibit various tissues regarding mineral metabolism, growth, development, aging, reproduction, sexual functioning, and numerous other functions.

Cortisol. The primary glucocorticoid produced by the adrenal glands, and regulated by adrenocorticotrophic hormone (ACTH) from the anterior pituitary. Cortisol is produced in response to stress perception and may serve to depress immune system response.

Dehydroepiandrosterone (DHEA). Steroid hormone produced by the adrenals.

Its functions are debated, but it appears to help regulate immune system activity.

Estradiol. One of three main estrogens. Estrone (E1) is the estrogen of menopause. Estriol (E3) is the estrogen of pregnancy. Estradiol (E2) is known as the estrogen of the reproductive cycle, and the one thoroughly studied to help with problems of menopause. Estradiol forms from testosterone in the ovaries or adrenals and is then converted in the liver. Estradiol is thought to play a dominant role in mood disturbances as levels decrease over time. Perhaps more importantly, it is an effective anti-aging hormone, especially in terms of calcium/bone loss, and is frequently prescribed for hormone replacement therapy.

Testosterone. The hormone produced in males in the testes under the direction of gonadotrophins from the anterior pituitary. Testosterone enhances libido in both sexes. While its primary function is male sex organ development, it is often seen as a measure of aggression. Further, increased testosterone appears to mediate stress and elevate mood.

# CHAPTER 2

# REVIEW OF THE LITERATURE

This chapter includes a discussion and review of the literature pertinent to the topical areas relevant to this study. The discussion begins with an overview of related research in the arenas of psychoneuroimmunology/endocrinology, music and immune response, mood, stress/anxiety, brain activity, and phenomenological experiences. It moves finally into the more recent areas of rhythm research, finally touching upon the limited research on drumming that currently exists in the literature.

## *Psychoneuroimmunology*

There is increasing evidence that the central nervous system (CNS) can influence the immune response, the body's defense against infectious and malignant diseases (Glaser & Kiecolt-Glaser, 1994). As the brain, particularly the hypothalamus, receives feedback from the entire body by way of the nervous system, it responds by commanding other portions of the brain to begin the process of chemical and hormonal secretion. Thus the Cartesian model of separation of mind and body is now being replaced with a holistic model that recognizes a constant reciprocal action and communication between the mind and body (Scartelli, 1992).

Recent research has reflected the many dimensions of well-being in single studies. McCraty, Barrios-Choplin, Rozman, Atkinson, and Watkins (1998) explored the impact of emotional self-management programs on stress, emotions, heart rate variability, salivary DHEA, and salivary cortisol. The techniques were designed to eliminate

negative thought loops and promote sustained positive emotional states. Individuals in the experimental group were assessed before and 4 weeks after receiving self-management training. The experimental group experienced a 23 percent reduction in cortisol and a 100 percent increase in DHEA/DHEAS. DHEA was positively related to the affective state 'warmheartedness,' whereas cortisol was significantly and positively related to 'stress effects.' This study illustrates the direct relationship between mind and body health.

The present research study attempted to connect the activities of group drumming and active listening with four particular endocrine gland secretions: cortisol, dehydroepiandrosterone sulfate (DHEA-S), testosterone and estradiol. Music therapy research has most frequently measured cortisol changes (high levels indicate increased stress), and occasionally DHEA-S (increased levels seem to promote immune functioning). Other studies have explored beta-endorphin activity, human growth hormone, Epstein-Barr, melatonin, secretory immunoglobulin A (s IgA), plasma interleukin-2, plasma interferon-gamma, natural killer cell activity (NKCA) and lymphokine-activated killer (LAK) cell activity. Thus, the present study attempted to replicate previous findings, although in a new domain (drumming/active listening), while also investigating two relatively new areas.

*Immune, Mood, and Stress Response*

As the definition of music therapy continues to expand almost daily, so does its application. Recent trends in the practice of music therapy have begun to examine effects of music on neurological discharge. An investigation on plasma beta-endorphin levels as

an indicator of stress, (McKinney, Tims, Kumar, & Kumar, 1997) found that those who participated in a single group music imaging session demonstrated decreased plasma beta-endorphine levels, whereas beta-endorphin levels were unchanged in those who listened to the music without imagery suggestions. Harte, Eifert, & Smith (1995) examined the relationship between three hormones of the hypothalamic-pituitary-adrenocortical (HPA) axis, beta-endorphin, cortisol, and corticotropin-releasing hormone, to elevated mood. When comparing highly-trained runners and meditators, they found significant elevations of beta-endorphin after running, but attenuation after meditation. Both meditators and runners experienced significant elevations of corticotropin-releasing hormone, but no significant between-group effects were found. Cortisol levels increased from pre-to posttest in runners, while decreasing in meditators.

Short-term decreases in cortisol following music listening have been observed in healthy individuals (Bartlett, Kaufman, & Smeltekop, 1993; VanderArk & Ely, 1992). Vandermark and Ely (1993) found that cortisol levels and galvanic skin response were significantly higher for music majors than biology majors after music listening. Field, et. al., (1998) investigated the effects of rock music on mood state and right frontal EEG activation. No group differences or changes were noted for observed or reported mood state. However, cortisol levels decreased and relative right frontal activation was attenuated during and after the music procedure.

Recorded music has been shown to decrease cortisol levels in patients exposed to pre-surgical stress, when compared to controls (Miluk-Kolasa, Obminski, Stupnicki, & Golec, 1994). Music therapy research on stress reduction has typically been more prominent than neuroendocrine research. Winter, Paskin, & Baker (1994) found that

music listening reduces stress and anxiety in the surgical holding area, when compared to non-listening controls. This is supported by Marshall & Tomcala's (1981) findings that music listening indeed decreases stress, and that there is no significant difference for the genres of rock, jazz, minimalism, classical, or silence (biofeedback tone). Past research with individuals experiencing pain or acute stress has indicated positive psychological impact of music, without observing a corresponding change in physiology (Hanser, Martin, & Bradstreet, 1982; Jellison, 1975; and O'Connell, 1984).

Fukui (1998) investigated the effect of music listening on testosterone levels in males. His original study led to findings that music suppressed testosterone levels. In an attempt to sort out sex differences in music listening, he recently repeated the study with males and females (Fukui, 2001). Seventy college students (35 male and 35 female), ranging in age from 19-25 years, participated in the study. Forty were music majors and 30 were nonmusic majors. Subjects had six musical choices. They were given 30 minutes to listen to (1) their favorite music, (2) Gregorian chant, (3) Mozart, (4) jazz, (5) popular music, or (6) no music at all. Participants submitted saliva samples before and after listening.

Testosterone decreased (nonsignificantly) under music conditions compared with silence and significant sex differences emerged. Testosterone decreased in males under all conditions, whereas testosterone increased in females under all conditions. There were no significant differences due to college subject major or menstrual cycle stage, or between music liked and disliked. Music may indeed affect testosterone levels in both sexes. Fukui (2001) hypothesized that increased levels of testosterone in females suppresses sexual behavior, while decreased levels in males has a similar effect.

Rider, et. al., (1990) investigated the effects of physiologically-oriented mental imagery on immune functioning. College students composed three treatment groups. Group 1 participated in educational training on the production of secretory immunoglobulin A (s IgA). They were then tested on salivary IgA, skin temperature, and the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971) before and after listening to a 17-minute tape of imagery instructions with specially composed "entrainment" music. Here, entrainment refers to the process whereby body rhythms lock into the vibrational frequency of the stimuli (the music); the listener becomes one with the stimuli this way, which can alter mood and energy level.

Group 2 participants (placebo controls) listened to the same music but received no educational instruction. Group 3 served as controls, receiving no musical intervention. Results indicated a significant increase in sIgA for Groups 1 and 2. Group 1 (imagery) was significantly higher than Group 2. The POMS scores favored Group 1, including decreases in "tension," "confusion," "fatigue," and "anger." Positive changes in mood seem to have occurred simultaneously with increases in sIgA antibody production.

McKinney, Antoni, Kumar, Tims, and McCabe (1997) further investigated the effects of Guided Imagery (a form of music psychotherapy) and Music on mood and cortisol in healthy adults. Participants completed the POMS (McNair, Lorr, & Droppleman, 1971) and donated blood before and after the intervention, and again at a six-week follow-up. Guided Imagery in Music (GIM) participants reported significant decreases between pre- and post-session depression, fatigue, and total mood disturbance and had significant decreases in cortisol level by follow-up. This decrease was significantly associated with decreased mood disturbance. Further, such changes in

hormonal regulation may have health implications for chronically stressed people.

In a more recent shift towards music making and wellness, group keyboard lessons were shown to significantly increase the level of human growth hormone (hGH) in older adults (Tims, et al., 2001). Human growth hormone is implicated in such aging phenomena as osteoporosis, energy level, wrinkling, muscle mass, aches and pains, and sexual function. Participants took group keyboard lessons over a period of two 10-week semesters. Health measures were administered before the lessons and after each semester. On the Mental Health Inventory (MHI) Anxiety scores, anxiety decreased in the keyboard group but not in the control. Likewise, depression/dejection scores on the Profile of Mood States (POMS) decreased in the keyboard group but not in the control group. On the UCLA Loneliness Scale, a measure of internal perception of social support, scores remained unchanged for the control group but decreased across the span of the lessons. At the same time, Lubben Social Support scores did not change, implicating the keyboard lessons as the dynamic force of change.

*Drumming and Brain Activity*

Creutzfeldt & Ojemann (1989) examined the neuronal processes of the lateral temporal lobe of the human brain in response to three types of music listening. The groups consisted of (a) simple familiar or unknown classical tunes, (b) orchestrated folk music, (c) drumming without a tune. Brain activity was recorded during each activity, with the aid of microelectrodes. All three types of (recorded) music led to changes of neuronal discharge. Both (a) and (b) showed a suppression of discharge rate; (c) was the only musical excerpt that showed a substantial increase in neuronal discharge levels.

These results tended to be bilateral, with no significant right-left hemisphere differences. This suggests that drumming activates neuronal responses independent of hemispheric preference. This is in congruence with the information on drumming and synchronized hemispheric brain states discussed previously.

*Phenomenological Experiences*

Maurer, Kumar, Woodside, and Pekala (1997) looked at phenomenological experience in response to monotonous drumming and hypnotizability. Primary measurement tools were the Harvard Group Scale of Hypnotic Susceptibility (Shor & Orne, 1962), the Phenomenology of Consciousness Inventory (PCI) (Pekala, 1982), hypnoidal scores in response to drumming, and written narratives about the drumming experience. Hypnoidal scores were used to assess subjective level of trance achieved in response to drumming. The question asked was if the subjective level of trance varied as a function of stimulus order (hypnosis-drumming or drumming-hypnosis) and hypnotizability. Results showed that participants who received drumming before hypnosis scored significantly higher than those who received drumming after hypnosis. Thus drumming may be a viable tool for inducing altered experiences, at least for highly susceptible individuals.

*Rhythmic Auditory Stimulation (RAS)*

Rhythmic Auditory Stimulation (RAS) enhances motor rehabilitation through audio spinal facilitation and physiological entrainment. Through the perception of rhythmic auditory stimuli, be it recorded music or a metronomic pulse (Thaut, Rathbun,

& Miller, 1998), neurons in the spinal cord become excited, priming muscles for more efficient movement. Through investigation of electromylograph (EMG) symmetry and variability in clinical and healthy populations, RAS programs are designed to rehabilitate those individuals who suffer from movement and gait disorders. These may be induced by such impairments as Parkinson's disease (Thaut, McIntosh, Rice, Miller, Rathbun, & Brault, 1996; Miller, Thaut, McIntosh, & Rice, 1996; McIntosh, Brown, Rice, & Thaut, 1997), hemiparetic stroke (Thaut, McIntosh, Prassas, & Rice, 1993; Thaut, McIntosh, & Rice, 1997), traumatic brain injury (Hurt, Rice, McIntosh, & Thaut, 1998),

*Drumming and Wellness Research*

Although there has been an exponential growth in community drumming activities across the country, there has not been a corresponding increase in related research. Stevens and Burt (1997) have contributed theoretical principles for the use of drumming across the mental health care continuum. They have identified eight therapeutic elements inherent in drumming: 1) Drumming is accessible, 2) Drumming is aesthetic, 3) Drumming is expressive, 4) Drumming is physical, 5) Drumming is powerful, 6) Drumming is communicative, 7) Drumming is metasocial (creating social unity), 8) Drumming is cognitive. Drumming can be a useful strategy in a climate of treating many different individual issues.

Bittman, et al. (January 2001) have begun to explore the effects of group drumming on positive biological changes. His study is the first known clinical intervention using group drumming music therapy as a modulator of biological variables in normal subjects. They examined neuroimmune levels in response to four types/levels

of drumming: basic drumming, impact drumming (incorporating elements of Tai Chi), shamanic drumming, and composite drumming. Basic drumming consisted of half drumming and half discussion. Impact drumming consisted of 80 percent drumming and 20 percent discussion. Shamanic drumming consisted of drumming under the direction of a Mayan shaman, with an emphasis on cultural and spiritual aspects. Composite drumming included an initial ice-breaker activity, passing "shaker eggs" designed to elicit levity and good feeling, followed by drumming to the rhythm of each subject's name; participant's then drummed together varying volume and rhythm and concluded with a drumming activity using guided imagery stories. The first three methods involved the participants in drumming under the leadership of a local "expert." In composite drumming, a variety of drums and percussion instruments were used in a more structured environment under the facilitation of a professional music therapist.

The total population of test subjects included 111 normal age and sex matched volunteers, 55 males and 56 females, with a mean age of 30.4 years. A preliminary study used six supervised groups of 9 to 11 people each: a resting control group (participants read magazines, newspapers, or books), a listening control group (participants listened to drumming music recorded from an experimental session), and one group for each of the four types of group drumming. The preliminary results were used to determine a single model for the final experiment. The selected model was composite drumming. The final experiment used 60 subjects. The 10-member composite drumming group from the preliminary study with 50 additional subjects was randomly assigned to one of six 10-member drumming or control groups. The control group members would be listening to drumming music rather than playing, to further isolate active drumming as the essential

agent.

Before and after the sessions, researchers sampled blood from the subjects, and later subjected these samples for analysis to determine levels of plasma cortisol, plasma dehydroepiandrosterone (DHEA), plasma interleukin-2, plasma interferon-gamma, natural killer cell activity (NKCA) and lymphokine-activated killer (LAK) cell activity. The first three drumming methods did not produce the desired shifts in neuroimmune function, at times even moving activity in the wrong direction. Bittman, et al., attributed this to the increased stress associated with the performance element inherent in the three styles of drumming. When participants were led in rhythm activities under the guidance of a music therapist (composite drumming), natural killer cell activity showed a 75% increase. Similar increases were seen in interleukin-2-related LAK activity and interferon-gamma-related LAK levels. In the other three groups, NKCA either remained unchanged, or decreased. No significant effects were seen on DHEA levels, but the DHEA-cortisol ratios showed significant increases in the composite drumming group. Cortisol levels decreased in every situation, except shamanic drumming. No significant major changes were evidenced on the Beck Anxiety Inventory or the Beck Depression Inventory II.

The integrated/composite drumming group engaged in relaxation exercises, light-hearted rhythm games, and guided imagery activities. Bittman, et. al., assert that group drumming enhances the activity of cellular immune components that are responsible for seeking out and destroying viruses and cancer cells in normal subjects. Group drumming music therapy, carried out according to this protocol and using a specific approach for facilitating sessions that emphasize camaraderie, group acceptance, light-hearted

participation, and nonjudgmental performance, appears to attenuate and/or reverse specific neuroendocrine and neuroimmune patterns of modulation associated with the classic stress response (Bittman, et. al., 2001).

The strength of this study comes from the highly controlled participant study pool. Individuals were excluded from participation if they reported medical illnesses/histories, used prescription medications, smoked cigars, cigarettes, chewed tobacco, used illicit drugs, or consumed over 2 alcoholic drinks per day. Additionally, subjects were eliminated if they had previously participated in drumming, or listened to drumming music on a regular basis. The mean age of participants was 30.4.

While this study was able to stringently control for extraneous variables, the result was an exceptionally clean, highly unrealistic sample pool. As such, it is difficult to extrapolate the findings to the general population. Nonetheless, its value as a baseline measurement tool is remarkable.

The growing body of drumming and rhythm related research all yields the same basic conclusion: Drumming is a viable therapeutic medium for the modulation of human health and wellness. The present study adds to the small contingent of scientific investigations into the relationship between drumming and physiology. This study draws on a broad cross-section of participants in order to explore the benefits of drumming for average individuals. Are there any similarities of human experience, facilitated by drumming, that defy age, gender, ethnicity, and musical background? If a sample is too clean, you can never examine the ability of the particular treatment to impart a singular, independent effect.

# CHAPTER 3

# METHODOLOGY

*Participants*

The participants in the drumming study were volunteers from the communities of Lansing and East Lansing and from Michigan State University (both undergraduate and graduate students). Thirty-four participants volunteered to participate in the six-week drumming study. Nineteen of the volunteers were females, while fifteen were male. Ages ranged from 18-70. Participants were randomly divided into two experimental groups. Group one served as an active drumming group. Group two served as a non-drumming, active listening group. Active listening group members were offered complimentary group drumming sessions after the study's completion as an incentive for participation. Participants were recruited in several ways. The primary method was through flyers (please see Appendix A) posted conspicuously around town, campus, and in music stores. As originally conceived, people with previous drumming experience were to be excluded from the study. As the deadline began to approach and numbers were low, it was decided that they would be allowed to participate, but their drumming experience would be a covariate when analyzing the data and interpreting results. Newspaper articles also appeared in the Lansing State Journal and the State News (Michigan State University's student newspaper) inviting interested readers to contact the researcher for more information. A local network of drum teachers also helped disseminate the information to drum students.

*Procedure*

Participants (n=34) met once a week for six weeks, from 7 to 8 p.m on Monday nights. Drumming comprised 30 minutes out of the 60, to allow time for late arrivals, saliva collection, paperwork, and physiologic response. Research on imaging, meditation, and relaxation techniques informs that optimal physiological response occurs within the first 10 to 15 minutes and after 25 minutes a diminishing return transpires (Benson, 1984 & Cade & Coxhead, 1979). Additionally, Manuck, Cohen, Rabin, Muldoon, & Bachen (1991) suggest that cortisol becomes elevated approximately 30 minutes after stress onset. Actual drumming went from 7:10 to 7:40. The study was conducted in an all-purpose room in one of the residence hall/cafeteria complexes on the Michigan State campus. The study was thoroughly explained to all participants, with an opportunity for questions and concerns to be addressed immediately. Informed consent forms and one stick of sugarless gum were distributed to all participants at that point. Individual saliva samples were taken as a baseline prior to notification of group assignment. Since it was a gum-based collection procedure, participants were merely offered sugarless gum as an agent to enhance saliva production, and then expectorated into a paper cup. The researcher and two assistants collected the samples individually while wearing sterile lab gloves.

At this point, participants were asked to select a confidential personal code number to represent themselves throughout the study. They were encouraged to select a number that they were already familiar with, such as a birthday, so that they would remember it in future weeks. As participants finished this procedure, they were handed a demographic and life-style questionnaire. They then proceeded to complete the Profile of Mood States

(POMS), MHI Anxiety Profile, Wellness and Transcending Index, and Lubben Social Network Scale, using this same code number on each form. These measures were administered twice during the study: prior to the first drumming experience in session one, and immediately before the sixth session. While participants were completing the cognitive tests, the researcher and assistants would pipette the saliva into the numerically coded test tubes for refrigeration and storage.

After the testing was completed, participants were told which of the groups they had been randomly assigned to, either the active drumming group or the active listening group. The drummers formed a circle, sitting in chairs, in which the music therapist was both the facilitator and participant. All participants were playing cone-style drums (djembes or ashikos). These are the most popular drums in today's Western society and require no formal musical training in order to create rewarding sounds. If participants had their own drums, they were encouraged to bring them. Members of the active listening group were invited to sit or lie down inside the circle, according to their preference. All participants were encouraged to close their eyes and to let the drumming guide their thoughts. No formal shamanic inductions were given, and no imagery scenarios were set-up.

On the second week of the study, participants in the drumming and listening groups were asked to complete portions of the Phenomenology of Consciousness Inventory (PCI) after approximately 30 minutes of drumming. They were also encouraged to provide written comments about their experiences. The PCI specifically examines altered states of consciousness and journeying experiences that the individual may have had. The participants were asked to complete the PCI and phenomenological

self-report again after the conclusion of the fifth session, for a total of two comparisons, 3 weeks apart. The salivary assays, POMS, MHI Anxiety Profile, Wellness and Transcending Index, and Lubben Social Network Scale, were taken again prior to drumming at the sixth session. In addition, the salivary assays were taken from all available participants six weeks following the final meeting (twelve week follow-up), at the regularly scheduled time.

*Materials*

The drums used in this study were of the cone drum style (ashikos, djembes, or tubanos). Drums were of both a synthetic and authentic (animal/natural skin) variety. Instruments were provided by the music therapy researcher, the Music Therapy Clinic at Michigan State University, and two local community drum circle facilitators. Those participants who had their own drums were encouraged to bring them to use.

*Design*

The study began in March, 2001. Participants were involved in drumming/listening sessions for six weeks, with a six-week follow-up, for a total time commitment of seven sessions over a span of twelve weeks. Groups met once a week, from 7:00 to 8:00 p.m. on Monday nights. All participants completed a demographic/life-style questionnaire prior to the first drumming experience (please see Appendix B for a copy of this form). Basic information on age, gender, ethnic identity, musical experience and preference, and health behaviors was collected. If the questionnaire revealed an existing medical condition, the person's history could be correlated with the

neuroendocrine outcome measures during analysis. Participants were asked to comment on their musical background, if applicable, and their drumming experience, if any. Participants were also asked to approximate their daily/weekly nicotine, caffeine, and aspirin intake. Confidentiality was assured, and participants were asked to describe their recreational drug use habits. This included approximate daily/weekly alcohol consumption, as well as frequency and use of marijuana and its derivatives.

*Pilot Procedure*

The final experimental protocol was arrived at after several months of hosting community drum circles in Kalamazoo, Michigan. This researcher's style is one of light-handed facilitation, such that the rhythm emerges naturally from the opening call and response chant that is used. Participant's were not given rhythms to play, but were allowed to bring forward their own organic response. Those with less comfort at doing so were encouraged to reinforce the facilitator's rhythm, or one that they heard in the circle. The voice was used to indicate both the beginning of drumming and the ending cue. The researcher's role was primarily to play simple, grounding rhythms with a clear definition of pulse for the group to center around. The researcher sat among the participants in the circle, rather than being in the center. While most facilitators locate him/herself in the center, this was not necessary in this study, since participants were not being directed in their playing. Moreover, listeners were occupying that space, and it would have been distracting to them.

*Consent and approval*

The Michigan State University Committee on Research Involving Human Subjects (UCRIHS) reviewed all materials relevant to this study and was satisfied that the procedures would not violate the rights of the participants. Per their recommendation, participants created confidential code numbers on all interactions, so that no materials could be traced back to the individual's name. Informed consent was obtained from all participants. (Please see Appendix C for a copy of this form.)

*Measurement Tools*

For the purpose of measuring mood change, the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1971) was administered as a pretest and posttest over a six-week period. This instrument helps to distinguish mood states from enduring personality traits by measuring mood reaction over a specific period of time, such as the previous week; in the present study, it measured a period of six weeks. The POMS is a 65-item scale with subtests for tension/anxiety, depression/dejection, anger/hostility, vigor/activity, fatigue/inertia, and confusion/bewilderment. The approximate testing time was 5 minutes.

In terms of reliability, McNair, Lorr and Droppleman (1971) stated that all the indices of the extent to which the individual items within the six mood scales measure the same factor are near .90 or above. The test-retest validity is reported for each of the six POMS factor scores, with a six-week retest period. The scores follow: Tension/Anxiety .70/.51, Depression/Dejection .74/.47, Anger/Hostility .71/.53, Vigor .65/.43, Fatigue .66/.45, and Confusion/Bewilderment .68/.52.

With regards to validity, McNair, Lorr, and Droppleman (1971) reported that the six factor analytic replications in the development of the POMS may be taken as evidence of the factorial validity of the six mood factors. The results were remarkably congruent for the different patient and normal samples, for the different rating time periods, and for the four-point and five-point scales. An examination of the individual items defining each mood scale supports the face or content validity of the factor scores. In addition, four areas of research have provided evidence for the predictive and construct validity of the POMS. These four areas are: (1) brief psychotherapy studies; (2) controlled outpatient drug trials; (3) studies of response to emotion-inducing conditions; (4) studies of concurrent validity coefficients and other POMS correlates.

The Lubben Social Network Scale (Lubben, 1988) was the primary measure for self-reported communication and social interaction/network. It, too, was given prior to the first drumming experience and immediately before the sixth session. It provides a picture of an individual's current life context, including relationships and social contact with friends and relatives. This scale works well with healthy adults, psychiatric patients, depressive patients, medical patients, and problem drinkers. It contains eight items, for an approximate testing time of less than 5 minutes.

The MHI Anxiety Index (Veit & Ware, 1983) was used as the primary measure for self-reported stress and anxiety. It was taken with the other psychological tests, prior to the first drumming experience and immediately before the sixth session. It profiles information on the individual's tendency to be anxious, worried, or nervous in their overall demeanor. It contains 10 multiple choice items, for an approximate testing time of 3 minutes.

In terms of reliability and validity, the test is designed to measure psychological distress and well-being in general populations. The full test consists of 38 items representing 5 factors. The factors associated with psychological distress are anxiety, depression, emotional ties, general positive affect and loss of behavioral/emotional control. The self-administered tool is appropriate for respondents aged 13 to 70. Internal consistency ranges from .83 to .91 across subscales. Stability ranges from .56 to .64 (Goldman & Mitchell, 1990).

The Phenomenology of Consciousness Inventory (Pekala, 1982) was administered at the end of the second and fifth sessions. Its primary purpose was to measure participants' subjective experiences in the presence of drumming. It consists of 53 self-report questions (with opposite dipoles on a Likert-type scale) assessing 12 major dimensions and 14 minor or sub-dimensions, which include: positive affect (joy, sexual excitement, love), negative affect (anger, sadness, fear), altered experience (altered body image, altered time sense, altered perception, altered/unusual meaning), imagery (amount of imagery, vividness of imagery), attention (direction of attention, absorption), self-awareness; altered state of awareness, internal dialogue, rationality, volitional control, memory, and arousal (relaxation). Participants were given space for an optional narrative account of their experience, as well.

Pekala (1991) computed coefficient alphas for 11 dimensions and subdimensions of the PCI during eyes open sitting quietly. Scores ranged from a high of .92 for sexual excitement to a low of .69 for time sense and averaged .82 for all major dimensions and .82 for all dimensions and subdimensions combined. Differences in phenomenological experience between males and females were assessed for all subdimensions of

consciousness. Females reported significantly more imagery, more vivid imagery and more inward attention than males ($p<.05$). In terms of re-test reliability, coefficient alphas were computed for conditions of eyes closed sitting quietly and hypnotic induction. Pearson *r*'s for the five pair of reliability items for the PCI during eyes closed (.53) and hypnotic induction (.53) were considerably lower than those obtained during the earlier eyes open condition. Coefficient alphas were computed for the various subdimensions. Alphas for the eyes closed condition ranged from .85 for internal dialogue and positive affect to .65 for volitional control and self-awareness and averaged .76. Alphas for the hypnotic induction condition ranged from .87 for state of awareness to .74 for negative affect and arousal and averaged .80. Alphas for all subdimensions during eyes closed averaged .73 and .67 during hypnotic induction.

Multivariate analysis of variance (MANOVA) found no significant main effect for groups when comparing either the major of the minor PCI dimensions across the same stimulus conditions. Results of the repeated-measures MANOVA revealed a significant main effect for conditions (eyes-closed versus hypnosis) for the 12 major PCI dimensions and the minor dimensions (Pekala, 1991). The Jennrich test comparison between conditions yielded a chi-square value of 196.2, $p<.001$, suggesting a significant pattern structure difference between the two conditions. In regard to gender differences, only 1 of the 26 (sub)dimensions comparisons was significant when individual ANOVAS were completed: during eyes closed, women scored higher on love, and during hypnosis, women scored higher on absorption.

The Wellness and Transcending Index (Travis, 1988) was administered as a pretest, prior to session one, and a posttest, prior to session six. It is a 26-item index

asking a range of questions beyond the scope of most generally accepted "scientific" principles, exploring people's individual belief systems and structures. Participants rated the items on a Likert-scale from 0 to 4, in which 0 represented "No, Never, or Hardly Ever"; and 4 represented "Yes, Always, or Usually." This served as a useful, informative tool for assessing people's base-line views on altered states of consciousness and provided a potential correlational tool for use with the PCI. The approximate testing time was 5 minutes.

The Wellness Index is not a formal assessment tool, per se, but more of an informational questionnaire. As such, there is no specific information available on reliability and validity. If the participants answer honestly and thoughtfully, it is a reliable measure of their opinions.

Neuroendocrine measures were assessed by salivary samples taken before and after the first session, before and after the sixth session, and again as a follow-up at week 12. The sample profiled cortisol, DHEA-S, estradiol, and testosterone levels. The desired change would be to see a decrease in cortisol (indicating a decrease in reported stress levels) from pretest to posttest/follow-up (VanderArk & Ely, 1992; Bartlett, Kaufman, & Smeltekop, 1993; Bittman, et. al., 2001), DHEA-S would increase, and the DHEA-cortisol ratio would increase (Bittman, et. al, 2001), and testosterone and estradiol would modulate to more health-serving levels (Fukui, 2001; Carlson, Sherwin, & Chertkow, 2000). High or low levels of testosterone would reflect gender differences, libido, and activity level. Increased levels of estradiol (E2) would suggest elevated mood states in women and enhanced anti-aging benefits, particularly reduced boneloss. Saliva tests were chosen over blood draws for three key reasons: They are more economical,

less intrusive to the participants, and have a much faster lab turn-around time for analysis. Most notably, the newer saliva lab kits have a reliability similar to the plasma kits (Khan-Dawood, Choe, & Dawood, 1984).

*Analysis*

Data were analyzed using SPSS 10.00 to run paired and independent samples t-tests. Analysis of variance procedures with repeated measures were also employed in the analysis of the neuroendocrine measures. Means comparisons were made, based on the variables of time (pre-, post-, follow-up) and categorical levels of treatment (gender, previous participation in a drum circle, ethnic identity, prior musical experience, drumming vs. listening group, and age). *Post-hoc* comparisons were run using Fischer's Protected Least Significant Differences (FPLSD) to determine the specific categorical variable responsible for significance.

# CHAPTER IV

# RESULTS

*Sociodemographic variables*

A total of 34 participants completed the 6-week portion of the present study. The mean age for the sample was 33.62, with a standard deviation of 14.78. The ages ranged from 18 to 70. The principal hypothesis of this study explored the question of whether or not the participants in the drumming group would report different experiences than those in the listening group. During analysis, it became evident that the primary differences in outcome measures were not a result of group membership. Therefore, the results were further analyzed in terms of five categorical variables: male versus female, previous participation in a drum circle (yes/no), musician/drummer versus musician/other versus nonmusician, age category (18-23, 24-29, 30-39, 40-49, 50-70), and ethnic identification (Caucasian, Asian, Asian-American, African-American).

It is helpful to look first at the ages of the individuals within each category, to get a sense of the distribution. Table 1 illustrates the number of participants in each categorical group, their mean age, standard deviation, and age range.

*Drumming group.* Eleven members of the drumming group were male, while eight were female. Six of the male participants and five of the females had previously participated in a drum circle. Eight participants selected drums as their primary instrument; seven identified themselves with other instruments, while four identified no instruments. Four non-Caucasians were members of the drumming group.

*Listening group.* Four members of the listening group were male, while eleven

were female. The groups were originally gender-matched, but circumstantial variables intervened. The imbalance in these numbers will be addressed in the discussion section of Chapter 5. Four of the male participants and five of the females had previously participated in a drum circle. Four participants selected drums as their primary instrument, 9 identified themselves with other instruments, while 2 identified no instruments. Three non-Caucasians were members of the listening group.

*Table 1. Age distribution within each category.*

| Categorical Group | N | Mean Age | SD | Range |
|---|---|---|---|---|
| Total Participants | 34 | 33.62 | 14.78 | 18-70 |
| **Drumming Group** | 19 | 36.00 | 14.59 | 18-70 |
| **Listening Group** | 15 | 30.60 | 14.97 | 18-70 |
| Gender/Male | 15 | 31.60 | 11.39 | 18-52 |
| Gender/Female | 19 | 35.21 | 17.14 | 18-70 |
| Drum Circle Experience/Yes | 20 | 32.80 | 14.69 | 18-70 |
| Drum Circle Experience/No | 14 | 34.79 | 15.39 | 18-70 |
| Primary Instrument/Drums | 12 | 31.58 | 11.23 | 18-52 |
| Primary Instrument/Other | 16 | 29.94 | 14.90 | 18-70 |
| Primary Instrument/None | 6 | 47.50 | 14.65 | 25-70 |
| Age Category I | 11 | 20.45 | 1.97 | 18-23 |
| Age Category II | 8 | 26.25 | 1.67 | 24-29 |
| Age Category III | 5 | 34.60 | 4.22 | 30-39 |
| Age Category IV | 4 | 46.50 | 3.11 | 40-49 |
| Age Category V | 6 | 58.17 | 9.26 | 50-70 |
| Ethnicity/Caucasian | 27 | 34.37 | 16.25 | 18-70 |
| Ethnicity/Asian | 4 | 30.75 | 5.12 | 26-38 |
| Ethnicity/Asian-American | 1 | 24.00 | ---- | 24 |
| Ethnicity/African-American | 2 | 34.00 | 11.31 | 26-42 |

*Profile of Mood States (POMS)*

*Pretest.* The POMS was administered to determine whether participants in both group drumming and drum listening would report differing pretest scores. This was assessed using the 6 subdimensions of the POMS including tension, depression, anger, vigor, fatigue, and confusion. In addition, the total mood disturbance score (TMDS) was calculated and compared. An independent samples *t*-test revealed no significant differences between the drumming and listening group on mood measures. The groups were therefore considered equivalent for comparison purposes. The means for the drumming group were nonsignificantly higher on tension, depression, vigor, and TMDS, while slightly lower on anger, fatigue, and confusion scores at pretest.

Independent samples *t*-tests were also run on the categorical variables of prior drum circle experience, previous musical experience, and gender. Scores on fatigue and total mood were significantly different when comparing those who had previously participated in a drum circle to those who had not. Fatigue scores were significantly higher (t=-2.041, p=.050, df=29) for those without previous experience. Total mood disturbance score was also significantly higher (t=-2.072, p=.047, df=29) for those without previous experience.

Oneway ANOVAS revealed a significant difference in fatigue scores (p=.045) in the previous experience category (drummer, other instrument, neither). *Post hoc* analysis using Fischer's Protected Least Significant Difference (FPLSD) revealed the difference to be between drummers and other instrumentalists (p=.014). The other instrumentalists scored significantly higher on fatigue than the drummers. There was no significant impact of gender, age, or ethnicity on POMS pretest scores.

*Posttest.* An independent samples *t*-test revealed no significant differences between the drumming and listening group on these measures. The means for the drumming group were higher on vigor and confusion, while slightly lower on tension, depression, anger, fatigue, and TMDS at posttest; however, these differences were not significant. Independent samples *t*-tests and oneway ANOVAS were also run on each of the other categorical variables. Confusion scores were significantly different (p=.013) among age categories. Post hoc analysis using FPLSD revealed the difference to be between group I (18-23) and group III (30-39) (p=.056, group I higher); group II (ages 24-29) and group III (p=.006, group II higher); group II and group IV (40-49) (p=.016, group II higher); and group II and group V (50-70) (p=.006, group II higher). There was no significant impact of previous drum circle experience, prior musical experience, gender, or ethnicity on POMS posttest scores.

*Pretest-Posttest Differences.* Paired samples *t*-tests were used to identify significant changes in reported mood from week 1 to week 6. When comparing the drumming and listening groups, the drummers reported a significant increase in confusion (t=-2.551, p=.021, df=17) from pre to posttest. Total mood disturbance score approached significance (p=.065), with an increase at posttest. No significant differences were reported for the listeners during the study period.

Paired samples *t*-tests revealed significant changes among two categorical variables. Females reported significantly higher depression scores (t=-2.120, p=.051, df=15) at posttest. In the category of previous experience, drummers reported significantly higher fatigue (t=-2.743, p=.021, df=10) and TMDS (t=-2.314, p=.043, df=10) at posttest, when compared to other instruments or no instrument.

The mean for the drumming group was not significantly different from the mean of the listening group. Therefore, a decrease in total mood disturbance score from pretest to posttest was not confirmed, suggesting that mood did not play a relevant role in the findings of this research.

*MHI Anxiety Index and Lubben Social Network Scale*

*Pretest.* Independent samples *t*-tests revealed no significant differences between the drumming and listening group on either the MHI Anxiety Index or Lubben Social Network Scale at pretest. The groups were therefore considered equivalent for comparison purposes. The means for the drumming group were not significantly higher on anxiety and not significantly lower on social networks when compared to the listening group at pretest. Independent samples *t*-tests and oneway ANOVAS revealed no significant differences among other categorical variables at pretest.

*Posttest.* An independent samples *t*-test revealed no significant differences between the drumming and listening group on these same measures at posttest. The means for the drumming group were not significantly higher on anxiety and not significantly lower on social networks when compared to the listening group at posttest. Independent samples *t*-tests revealed no significant differences among relevant categorical variables. Oneway ANOVAS indicated a significant change (F=4.368, p=.008, df=4) between age categories on social score at posttest. Post hoc analysis (FPLSD) revealed the difference to be significantly higher scores for participants in category I when compared to each of the other categories, category II (p=.047), category III (p=.009), category IV (p=.009), and category V (p=.001)

*Phenomenological Consciousness Inventory (PCI).*

The PCI (Pekala, 1982) was administered at the second and fifth session, immediately following drumming, to determine if participants in the active drumming group would report a different subjective experience than participants in the active listening group. The PCI contains a total of 26 subdimensions with five main dimensions: altered experience, positive affect, negative affect, attention, and imagery.

*2nd session (pretest).* An independent samples *t*-test revealed significant differences between the drumming and listening group on eight of the subdimensions. On all dimensions except arousal (including 3 of the 5 main dimensions), the mean score of the listening group was significantly higher than that of the drumming group. When a score is higher on the PCI, (on a Likert scale from 0 to 6), it denotes an increased amount of that dimension. The positive affect dimension consists of three subdimensions: joy, sexual excitement, and love. Joy assesses feelings of ecstacy and extreme happiness, sexual excitement addresses the extent of "intense sexual feelings," and love asks about feelings of love and loving-kindness.

Attention contains the subdimensions of direction of attention and absorption. Direction of attention addresses whether attention is directed toward "internal subjective experience" or "toward the environment around me." Absorption assesses whether the person was absorbed in what they were experiencing versus being "continually distracted by extraneous impressions." Imagery is composed of amount of imagery and vividness of imagery. Imagery amount assesses the overall imagery whereas, vividness assesses the extent to which visual imagery is "vivid and three-dimensional" or "as clear and vivid as objects in the real world." Arousal is really a measure of muscular tension, that is, the

extent to which the muscles of the body are "very tense and tight" versus not feeling "tension or tightness at all" (Pekala, 1991). Please see Table 2 for a summary of these findings.

*Table 2. Mean scores of drumming and listening groups and significance levels on the PCI at pretest.*

| Subdimension | Mean(D) | Mean (L) | df | t | p |
|---|---|---|---|---|---|
| Positive Affect* | 2.1853 | 3.3060 | 29 | -2.688 | .012 |
| Sexual Excitement | 1.1176 | 2.6000 | 24.310 | -2.102 | .046 |
| Love | 2.8824 | 3.7833 | 24.350 | -2.087 | .047 |
| Attention* | 3.1412 | 4.0667 | 29 | -3.111 | .004 |
| Direction of Att. | 2.7647 | 4.1340 | 29 | -3.901 | .001 |
| Imagery* | 2.8235 | 3.9000 | 29 | -2.387 | .024 |
| Imagery Amount | 2.8235 | 4.3000 | 29 | -2.795 | .009 |
| Imagery Vividness | 2.5588 | 3.5000 | 29 | -1.995 | .056 |
| Arousal (decreased relaxation) | 3.0588 | 2.0333 | 29 | 2.592 | .015 |

*Indicates main dimension

Independent samples *t*-tests revealed additional differences on the categorical variables of gender, previous drum circle experience, previous musical experience, and age. On the dimension of memory, females scored significantly higher (p=.042) than males at the pretest. Those individuals with previous drum circle experience scored significantly higher on the dimensions of unusual meanings (the person reports an experience that might be labeled religious, spiritual, or transcendental; p=.045), joy

(p=.021), and rationality (thinking is clear and distinct, easy to comprehend, p=.016). Oneway ANOVAS indicated significant differences based on previous musical experience. *Post hoc* analysis revealed those differences to be on the dimensions of positive affect (other instrumentalists scored significantly higher, p=.017, than those claiming no instrument), imagery (both drummers, p=.030, and other instrumentalists, p=.003, scored significantly higher than those claiming no instrument), imagery amount (both drummers, p=.010, and other instrumentalists, p=.000, scored significantly higher than those claiming no instrument), and internal dialogue (other instrumentalists scored significantly higher than drummers, p=.005, and those claiming no instrument scored significantly higher than drummers, p=.042).

Oneway ANOVAS and *post hoc* analysis revealed significant differences among age groups on the subdimensions of time sense (the flow of time seemed to speed up or slow down drastically), positive affect, sexual excitement, imagery, imagery amount, imagery vividness, and altered state of awareness. Younger participants in category I (18-23) scored significantly higher on time sense than those in category II (ages 24-29), p=.046, and those in category III (ages 30-39), p=.011. Participants in category V (ages 50-70) scored significantly higher, p=.049, than those in category III. On the main dimension of positive affect, participants in category I scored significantly higher than those in category II, p=.003. Participants in category III scored significantly higher than those in category II, p=.010. On the dimension of sexual excitement, participants in category I scored significantly higher than those in category II (p=.004), and those in category V (p=.026). Participants in category III scored significantly higher than those in category II (p=.007), and those in category V (p=.025). On the main dimension of

imagery, participants in category I scored significantly higher (p=.022) than those in category II and category IV (p=.001). Participants in category III scored significantly higher than those in category IV (p=.030). Likewise, participants in category V also scored significantly higher than those in category IV (p=.015). The same findings occurred on imagery amount.

For imagery vividness, participants in category I scored significantly higher than those in category II (p=.043) and category IV (p=.016). Participants in category V also scored significantly higher than those in category II (p=.043) and category IV (p=.016). On the dimension of altered state of awareness, participants in category I again scored significantly higher than those in category II (p=.004) and category IV (p=.002). Participants in category V scored significantly higher than those in category IV (p=.034). No significant differences appeared in the category of ethnic identity.

*Posttest (5th session).* An independent samples t-test revealed significant differences between the drumming and listening group on two of the subdimensions. In both cases, the listening group presented significantly higher scores than the drumming group. Please see Table 3 for this information.

*Table 3. Mean scores of drumming and listening groups and significance levels on the PCI at posttest.*

| Subdimension | Mean (D) | Mean (L) | df | t | p |
|---|---|---|---|---|---|
| Imagery Amount | 2.8529 | 4.2333 | 29 | -2.364 | .025 |
| Direction of Att. | 3.1571 | 4.0227 | 29 | -2.585 | .015 |

Independent samples *t*-tests revealed differences on the categorical variables of gender, previous drum circle experience, and age. On the main dimension of attention, females scored significantly higher than males (p=.006). On the subdimension of direction of attention, females again scored significantly higher (p=.020). In the category of previous drum circle experience, those with prior experience scored significantly higher on absorption than those without (p=.039). The differences that appeared the first time the PCI was given disappeared at posttest in the category of previous musical experience. Oneway ANOVAS yielded significance on one dimension at the second testing, compared to seven at the pretest. *Post hoc* analysis of the dimension of absorption indicated significance between category I (ages 18-23) and category III (ages 30-39), p=.006, and between category V (ages 50-70) and category III, p=.027. There were no significant differences according to ethnic identification.

*Narrative Accounts*

Participants in both the drumming and listening groups were encouraged to write descriptive accounts of their experiences after the drumming had concluded. Some had previous experience with shamanic journeying and made comparative notes. A total of 19 accounts were given, 6 at the pretest stage (session 2), and 13 at the posttest stage (session 5). Narrative accounts suggested similarity in tone and content of altered states for both groups. Some members in the drumming and listening groups described feeling physical sensations, seeing visual imagery, or hearing auditory voices, like a choir. The following accounts were selected to represent the scope of experience of participants.

> "I had a very different experience than ever before. I kept hearing the hum of a low, deep voice separate from the drumming. It was scary at first, but then I

realized that it was okay, and that it was some outside voice joining in" (pretest female drummer, part I).

"I experience altered states of awareness regularly through my spiritual activities. I have had training as a musician, but am an inexperienced drummer—so my attention was on listening to the group and experimenting with drumming (outer awareness). But at the same time, inner images were coming up for me very vividly. I had the sense that it was almost all memories being released, so I've interpreted this to be both strong inner and outer awareness (pretest female drummer).

"Tonight's drumming stirred in my feelings of deep sorrow—not sadness or fear or dejection—but a sense of mourning. I came and went, my awareness surfacing...now and glimpsing the candle, the still and moving forms, the scatter patter rhythms...and diving into the "dark" realm" (pretest male drummer).

"Knowledge of the formal limitations of the group (time, parking meters, final exams, etc.) impinges on my experience" (posttest male drummer).

"At the last session, it was more intense. I kept hearing another voice in the background, like a hum. This time, the hum was high pitched instead of low. I thought I was the only one who heard it, until someone else mentioned it, too" (posttest female drummer, part II).

"Shamanic drumming—more visual. I was lost in drumming, physically and emotionally. A lot of things are happening in my life—these drumming sessions help me to stay in balance" (posttest male drummer).

"Compared to the last time we did this inventory, I felt a great deal of change. I seemed to actually listen more to the beat and rhythm of the group. Strangely enough, when I felt as though I had lost my own personal rhythm, it also felt as if the circle had lost its unified rhythm. There were times when I found my mouth hanging open—as if in sleep—and I discovered that I had lost myself in thoughts of when I was a kid. This happened often. Also, a few times, a sense of paranoia crept in, as if certain people were watching me and listening for my mistakes. But I dismissed them as paranoia. This time and ever since the last inventory, I found that if I didn't face the doors I could concentrate. But that one time I faced the doors, I could not keep my mind from wandering" (posttest male drummer).

"The last session was particularly charged for me and I felt a real sense of control and helplessness at various times throughout. Once, I had a distinct urge to wail out singing (about 1/3 of the way through). Another time, I felt I had a strong sense of yellow color. One other time, I felt a perception of a strong chorus of alto and tenor voices adding affirming chants" (posttest male drummer).
"I experienced more audible imagery than visual. Wow! I had never experienced

such auditory imagery before. It was as if I could hear people singing at various points coming in and out as I let go into the experience" (posttest female drummer).

"Clearly, the drumming experience has powerful moments that draw you into another plane of sensory experience—and this is enjoyable and an adventure to find, discover, and experience; however, my lack of drumming skill often inhibited my exit from self to experience this place. Confidence in most all things in life facilitates a focus on other things than self. From a previous experience, coughing from someone in the group markedly disturbed the wave-like flow and magnetic quality of the drumming" (posttest male drummer).

"I brought much stress with me, and found it hard to let it go. When I did let go, I experienced images and more abstract concepts/ideas, but it was hard to hold on to. Reality kept getting my attention tonight" (posttest female listener).

"I have had many experiences with meditation, visual imagery, and a few with shamanic journeying before this study. During the study, I was able to journey kind of haphazardly during two separate sessions, though each time was a bit difficult. I think this might have been due to not preparing before the drumming started. Usually there is a process of asking for guidance from the spirits before journeying. So during those two instances I was easily distracted from the journey and would have to begin again. During the sessions where I was unable to journey, there were definitive times where I lost my sense of consciousness but was definitely not sleeping. Each of these times, after the session was completed, I found myself to be extremely sensitive and emotional, and not sure as to the source or cause. At times, it was distinct sadness; at other times, the emotions were closer to fear" (posttest male listener).

"It was interesting this time. As I laid there, all the happy moments of the day were constantly relived in my head, over and over again, and every time it just made me happier and happier. So happy that I started singing (kinda)...I mean not real singing, just humming to the drums. It was really interesting. No one else could hear it because the drums were so loud, but I just went on humming. Time stood still and I thought that because all these images and events were racing through my head that I wasn't en'tranced' as I had been before, but then when the final song was sung I heard it, and my body immediately seemed to expand and energy was running out from my entire body--my arms and pores and legs and everywhere. Totally different than what has happened before, but really, really interesting" (posttest female listener).

"My journeys at the beginning were more exploratory, where this time it seems guides are preparing me for events/something. They are closer in feeling and are more intense and with deliberation that I am prepared properly for events to come" (posttest female listener).

*Wellness and Transcending Index (Travis, 1988).*

*Pretest/Post-test.* The Wellness and Transcending Index was used to determine whether participants in the active drumming group would report a different worldview and transpersonal belief system than participants in the active listening group. An independent samples *t*-test revealed no significant differences between the drumming and listening group on these measures at pretest/posttest. The groups were therefore considered equivalent for comparison purposes. Independent samples *t*-tests and oneway ANOVAS revealed no significant differences among categorical groups at pretest/posttest. These findings indicate that participation in the activities of drumming and active listening had a direct impact on individual's PCI scores.

*Pretest-Posttest Differences.* Paired samples *t*-tests were used to determine whether there were significant differences in belief structure within groups from week 1 to week 6. There were no significant differences in scores within drummers or active listeners on these measures, from pretest to posttest. One categorical variable, prior drum circle experience, approached significance on these measures. Those participants without prior experience reported a decrease in score on the wellness index at posttest (p=.055, SD=.1676).

*Neuroendocrine Measures.*

Neuroendocrine levels of salivary cortisol, DHEA-S, estradiol, and testosterone were compared at pretest, 6-week posttest, and 12-week follow-up. In all, a total of five saliva collections were taken. At session 1, two samples were collected, one as a baseline pretest before drumming, and one as a posttest five minutes after drumming was

completed. These samples were analyzed for acute intrasession changes as a result of drumming. At session six, these same procedures were repeated. A final collection was taken at the twelfth week, prior to drumming. The pre-drumming measures from sessions 1, 6, and 12 were then analyzed for long-term change over time, to add dimension to the acute measurement points.

Independent samples *t*-tests revealed no significant differences between drummers and active listeners on any of the neuroendocrine measures at the five collection points. Only twice did it approach a significant difference, in regards to testosterone, at baseline and the second measurement point, when drummers scored higher than listeners (p=.059) each time.

*Categorical variables*: Independent *t*-tests and oneway ANOVAS. The influence of gender on neuroendocrines was most prominent on the testosterone measure. Nonetheless, baseline cortisol readings indicated a significantly higher level for males (p=.053). In regards to testosterone, however, 4 out of 5 measurements indicated higher levels for males. At baseline, significance reached .008; at measurement point 2, p=.003; at measurement point 3, p=.014; and at measurement point 4, p=.029. There was no significant gender difference at measurement point 5 (follow-up).

Previous participation in a drum circle had no significant impact on neuroendocrines, when compared to lack of experience. Oneway ANOVAS revealed virtually no impact of musical experience on neuroendocrines. Only testosterone yielded a significant difference among groups, at baseline pretest. Drummers had significantly higher levels than other instrumentalists (p=.026), and those with no instrumental experience (p=.023). Likewise with age, only one variable was affected, estradiol 3 (6th

session pretest). Participants in category I (ages 18-23) had significantly higher levels of estradiol than those in category II (p=.001), category III (.006), and category IV (.024). Ethnic identity did not play a significant role in neuroendocrine levels.

*Paired Samples T-tests: Drummers versus Listeners.* Paired samples *t*-tests were run to assess acute changes from pretest to posttest on each neuroendocrine for session 1 and session 6. In session 1, both drummers and active listeners experienced significant decreases in cortisol from baseline to posttest, (drummers, t=2.480, df=16, p=.025; listeners, t=3.076, df=14, p=.008). Neither group achieved a significant decrease in these same measures when analyzed at session 6, pretest to posttest. Nonetheless, cortisol levels still decreased nonsignificantly in both groups (please see Table 4 for means of neuroendocrines at each measurement point). This same method of analysis indicated a near significant increase in DHEA-S levels from pretest to posttest in the drumming group during session 1 (p=.055). Listeners also experienced a nonsignificant increase. Likewise, during session 6, both groups experienced nonsignificant increases in DHEA-S levels from pretest to posttest. The listeners also experienced a significant decrease in estradiol levels (p=.043) from pretest to posttest during session 6.

*Paired t-tests: Categorical Variables.* Nearly every categorical variable resulted in the same significant decreases in cortisol that were evidenced between drummers and active listeners. Both males (p=.014) and females (p=.011) experienced significant decreases in cortisol from baseline to posttest during session 1. Both previous experience in drum circles (p=.023) and no experience (p=.006) resulted in significant decreases in cortisol during session 1. Those with previous experience also gained an accompanying increase in DHEA-S during session 1 (p=.013). Interestingly, this group also experienced

significant decreases in cortisol from pretest to posttest during session 6 (p=.013).

The category of primary musical instruments yielded important findings. Those who considered themselves drummers experienced significant decreases in cortisol during session 1 (p=.011), and near significant increases in DHEA-S (.056). Those with a different primary instrument also experienced significant decreases in cortisol during session 1 (p=.019), with DHEA-S increasing nonsignificantly. Those with no primary musical instrument did not experience significant decreases in cortisol or DHEA-S, although they both moved in the desired directions. When the category of no primary instrument was combined with a different primary instrument in analysis, the resultant cortisol outcome was again significant (p=.013).

In the category of ethnicity, both Caucasians (p=.015) and non-Caucasians (p=.001) experienced significant decreases in cortisol from baseline to posttest during session 1. Caucasians also reached nearly significant levels of change in DHEA-S during session 1 (p=.066) and session 6 cortisol (p=.054). Paired samples t-tests did not reveal significant changes in levels of estradiol or testosterone within the categorical variables during session 1 or session 6.

Repeated Measures Analysis of Variance. Repeated measures ANOVAS were used to assess long-term change over time, by examining neuroendocrine measures at week 1 (baseline), week 6 (posttest), and week 12 (follow-up). For each of the neuroendocrine measures, cortisol, DHEA-S, estradiol, and testosterone, no significant difference was found on the mean average of the three measurement points.

*Table 4. Means Summary Table of Neuroendocrines for Drummers and Listeners.*

| Neuroendocrine | Week | Mean (Drummer) | SD | Mean (Listener) | SD |
|---|---|---|---|---|---|
| Cortisol 1 (ug/dl) | 1 pretest | 1.0594 | .7451 | .9527 | .1709 |
| Cortisol 2 | 1 posttest | .7456 | .5389 | .4453 | .4077 |
| Cortisol 3 | 6 pretest | 1.0238 | .8116 | 1.5900 | 1.8306 |
| Cortisol 4 | 6 posttest | .7453 | .4519 | .8586 | .5892 |
| Cortisol 5 | 12 follow-up | .5667 | .2750 | .8633 | .4119 |
| DHEAS 1 (ng/ml) | 1 pretest | 10.4318 | 14.6905 | 11.1653 | 21.6542 |
| DHEAS 2 | 1 posttest | 14.9044 | 21.4537 | 19.5827 | 41.2664 |
| DHEAS 3 | 6 pretest | 6.9807 | 9.1465 | 11.4443 | 10.7056 |
| DHEAS 4 | 6 posttest | 8.4035 | 9.2983 | 11.6614 | 14.4003 |
| DHEAS 5 | 12 follow-up | 5.8444 | 5.5113 | 14.1733 | 22.8399 |
| Estradiol 1 (pg/ml) | 1 pretest | 4.6912 | 2.7297 | 3.8907 | 2.6205 |
| Estradiol 2 | 1 posttest | 4.2783 | 1.8069 | 4.7171 | 4.2802 |
| Estradiol 3 | 6 prettest | 4.2313 | 1.5456 | 5.9300 | 3.3917 |
| Estradiol 4 | 6 posttest | 4.0894 | 2.0012 | 3.8333 | 1.0743 |
| Estradiol 5 | 12 follow-up | 5.0978 | 4.1070 | 8.9800 | 3.9512 |
| Testosterone 1 (ng/ml) | 1 pretest | 12.0125 | 11.9641 | 5.6929 | 3.5913 |
| Testosterone 2 | 1 posttest | 12.2765 | 13.0690 | 5.1500 | 3.7756 |
| Testosterone 3 | 6 pretest | 11.6400 | 8.0504 | 13.3769 | 11.3687 |
| Testosterone 4 | 6 posttest | 8.3438 | 8.0642 | 8.0077 | 8.7121 |
| Testosterone 5 | 12 follow-up | 8.4222 | 7.7822 | 6.7333 | 4.4095 |

# CHAPTER 5

# DISCUSSION

The primary investigative purpose of this research was not to sustain a given hypothesis, but rather, to compare the responses of individuals to active drumming and active, intentional listening. Previous studies have examined the responses of drummers or listeners, but not both units within the same investigative environment. Furthermore, music listening research has explored the effects of listening to recorded music, but has not examined the same questions in regards to listening to live music.

While previous research has focused on acute changes within a session, this study expanded on that concept by measuring changes over time. Two acute measures were compared over a period of six weeks, for both psychological and neuroendocrine measures. Three long-term measures were compared at week 1, week 6, and week 12, for neuroendocrine measures. Differences between the two groups were largely absent when profiling psychological measures via the Profile of Mood States, Lubben Social Network Scale, MHI Anxiety Index, and Wellness and Transcending Index. The most significant area of difference was revealed in the dimensions of the Phenomenology of Consciousness Inventory (PCI). Both drumming and listening groups were able to have transpersonal experiences, but often in different areas. Even the neuroendocrine measures did not show strong partiality in response to the individual's membership in either of the two groups.

Interestingly, the areas where differences were most often revealed were not between the drumming and listening group, but according to the categorical variables at

play: gender, previous participation in a drum circle, primary musical instrument, age, and ethnic identity. The category of ethnic identity was least useful in identifying differences, since the participants in the study were predominately Caucasian. Although these areas were not part of the initial research question, they became a valuable piece in understanding more about the importance of matching groups across categorical dimensions.

Since this was a study using non-paid volunteers from the community, it was very difficult to create gender-matched listening and control groups. Two main problems were encountered during recruitment. The first was the simple fact that people volunteered because they wanted to drum. Many participants responded to the flyers and newspaper articles, but balked at the possibility of being assigned to the listening group. Several people were quick to inform me that they would not come back after the first session if they ended up in the listening group. Others simply decided to not even take the risk after being given that information. Although the listeners were offered the option of drumming at the end of the study period, or even receiving a complimentary private lesson from the researcher, it was often times not enough incentive to merit their involvement in the study.

The second challenge in creating equal-gendered groups was the drop-in factor. Prior to the first session, random group assignments were made of the individuals who had pre-registered by phone or email to participate in the study. At the first session, several of these people failed to show up, while a number of new faces emerged that had not made previous contact. Due to the time constraints and large amount of pretest paperwork and saliva samples that needed to be dealt with, it was impossible to spend

time carefully making new group assignments, and/or reassignments.

The result of the interplay of these factors was an unbalanced group of drummers and listeners. The drumming group consisted of eleven males and eight females, while the listening group consisted of four males and eleven females. The only solution for this situation would have been to reduce the total number of participants in the study from 34 to around 16, if the two groups were to be gender balanced. The fact of the matter was that females were far more cooperative and willing to be in the listening group than the male volunteers. Even so, one female listener failed to return after the first session (because she wanted to drum). The males preferred to decline participation than to take the chance of being assigned to the listening group. During pre-study recruitment, it became apparent that ideal research design principles would have to be compromised if the study were to transpire. Nonetheless, the sociodemographic information presented in chapter 4 reveals a much greater equality between the two groups on the other categorical variables, particularly age and ethnicity, rendering the possibility of gender as a confounding variable less likely.

The same compromise was eventually made in regards to previous drumming experience. It was originally intended to be a study involving participants with no previous drumming experience. This was extremely difficult to achieve and would have again resulted in a subject pool with significantly fewer participants. It was decided that drumming experience would be used as an additional variable during data analysis, rather than as an exclusion criterion.

Overall, the differences between drummers and active listeners were virtually absent, with the exception of the Phenomenology of Consciousness Inventory, where

gender seldom played a significant role in the key differences. Gender was most relevant on the PCI dimensions of imagery, vividness of imagery, and inward attention, where Pekala (1991) reported significantly higher levels (p=.05) of these dimensions for females. On the whole, the more pertinent areas turned out to be previous participation in a drum circle and prior musical experiences. These changes were particularly prominent in acute changes during session 1, but tended to "wear off" over time. During the study, there was not time for lengthy instruction on drumming technique. A brief overview and demonstration was provided, and participants were encouraged to be aware of their bodies and posture while they played, to prevent fatigue. Suggestions were offered for injury prevention and increased enjoyment during drumming. All participants had the option of arriving early before the successive sessions in order to ask questions about basic playing techniques.

*Previous Participation in a Drum Circle*

Twenty participants had previously participated in some type of drum circle, while fourteen indicated they had not. Fatigue scores and total mood disturbance scores were significantly higher at pretest for those without experience, regardless of whether the participants were assigned to the drumming or listening group. The pretest measures that were taken before any drumming occurred suggested that the inexperienced participants had preconceived notions and/or expectations of what a drumming circle would be like. At the time of the posttest, 6 weeks later, these differences had disappeared, suggesting that their predictions were unfulfilled.

Scores on the Phenomenology of Consciousness Inventory (PCI) were significantly higher at session 2 on the dimensions of unusual meanings, joy, and rationality for those with previous experience. At session five, those with previous experience scored significantly higher on absorption, but not in the areas of significance during session 2. The fact that individuals who had previously participated in drum circles scored higher on absorption suggests that they were able to experience a greater alteration and change of consciousness than those who scored lower on absorption. Tellegen (1981) suggests that subjects who are highly tolerant of ambiguity are also better able to relax during meditation. This same tolerance of ambiguity undoubtedly played its role in this research study, particularly for those with no previous drum circle or drumming experience. Since they did not always know what to expect, they were less able to relax and enjoy the more transpersonal aspects of drumming.

*Primary Musical Instrument*

Twelve participants selected drums as their instrument of choice, sixteen identified with other instruments, while six identified with no primary instrument. Fatigue scores were significantly higher for other instrumentalists at pretest, when compared to drummers. This perhaps reflects the opinion that many people have in regard to drumming: it looks tiring. It is equally probable that the stress of something new and unknown may have affected their responses. Six weeks later, these differences had virtually disappeared, suggesting that increased experience alters and informs initial perceptions.

Scores on the PCI were markedly different for those with no identified primary instrument. The other 2 groups scored higher on dimensions of positive affect, imagery, and imagery amount. On the dimension of internal dialogue, however, both other instrumentalists and those with no primary instrument scored significantly higher than drummers. These differences occurred during session 2, the first time the PCI was administered, but not during session 5.

These findings on the PCI suggest that each session was a unique experience. The drumming was organic and different each time, giving rise to different imagery environments, some being more conducive to imagery than others. In some sessions, the group stayed very grounded and connected to the central pulse. As time went on, especially during sessions 4, 5, and 6, the drumming group became increasingly exploratory, with many individuals playing complex rhythmic material that did not necessarily reflect a strong relationship to the central pulse. At times, it sounded more like random drumming in which no one was listening to one another. This never lasted more than a few minutes before the group would quiet down and begin listening again, connecting back to the pulse. This is reflective of the typical stages of group process and dynamics in which individuals begin to increase risk-taking behaviors as group cohesion and camaraderie develop over time (Yalom, 1995).

These pulls and shifts in the rhythmic environment directly affect the conscious state of the imager. Flatischler (1992) has suggested an interesting tendency regarding the impact of subdividing pulsations. He purports that rhythms with three subdivisions in each interval make the listener more introverted and bring him or her toward an inner

stillness. In contrast, intervals containing the movement of 2 or 4 subdivisions will direct the listener toward outer movement and greater extroversion.

It can be disruptive to the imagery process when the group loses its connectedness and splinters into different rhythmic branches. Nonetheless, the PCI powerfully indicated that participants in both drumming and active listening groups may experience imagery, and it may or may not be similar in content. This was most strongly illuminated by scores on the first PCI, session 2. In this instance, listeners scored significantly higher than drummers on 8 subdimensions (see Table 2, Chapter 4). In fact, on 17 of the 26 subdimensions, listeners scored non-significantly higher overall. The dimensions on which drummers scored higher tended to have more negative connotations, such as negative affect, anger, sadness, and fear. In other cases, they related to self-awareness, arousal, volitional control (the extent to which one has "complete control over what one is paying attention to" versus "having images and thoughts pop into my mind without my control") and memory (remembering everything that was experienced versus not being able to remember what was experienced). For all subjects the reliability index score was within the recommended guidelines for reliability. Pekala (1991) reports that a score of 3 represents random responding, and recommends the subject's index score should be less than 2.0. Participants in this study had a mean reliability index of .8548 at session 2, and .8452 at session 4.

From these data, some interesting speculations arise. It seems that imagery for the listeners tended to have more positive qualities, across more dimensions. For those in the drumming group, it is plausible that drumming was not always conducive to imaging. This fits with the literature suggesting that musicians often have trouble imaging,

especially on their own instrument, because they are analyzing the music making instead. For less experienced drummers, it was sometimes a stressful and frustrating experience, during which they became quite self-conscious and externally focused on the other drummers in the group. In one instance, an inexperienced drummer reported that another member of the drumming group had made derogatory comments to her about her playing. This individual frequently stopped playing on many occasions throughout the study and reported feeling frustrated and self-conscious of her limited skills.

A number of drummers were externally focused on listening to what others were playing, often reacting to it rhythmically. These individuals were more interested in the community aspect of drumming, rather than the introspective imagery possibilities. Overall, the drumming group was more likely to play with their eyes open, while the listening group tended to have their eyes closed. Nonetheless, the more experienced drummers in the drumming group frequently relaxed into the group rhythm and closed their eyes for the majority of the session. Pekala (1991) reports coefficient alphas for eyes open conditions to average .82 on major dimensions and .82 on subdimensions. Likewise, for eyes closed conditions, coefficient alphas averaged .76 for major dimensions and .73 for subdimensions.

The differences that evidenced themselves from one session to the next on the PCI suggest an important consideration for future researchers. The most significant differences occurred during session 2, the initial introduction of the measuring instrument. In many ways, the PCI was measuring a novel stimulus effect at session 2. For many people, the idea of reporting their imagery was an entirely new experience; indeed, imaging in a controlled environment was equally foreign. As such, people had

strong responses to the event. By session five, things were becoming more familiar and possibly less significant in intensity for some individuals, while for others, they were able to go deeper into the experience and actually experience a deeper altered state with less internal dialogue. That is to say, they got better at imaging over time (with increased experience). This fits with the notion of imaging being a learned skill, much like any other.

Other factors should also be considered when making sense of the data from the PCI. The desired environment for imaging would not be a college multi-purpose room. It would be a much more comfortable and aesthetically pleasing environment, with no distracting outside noises. One of the biggest challenges of the room where the sessions were held was a fluctuating temperature from week to week. Although it was normally tolerable, at times it was a bit too cool for the listeners. The drummers were usually fine, since they were active throughout the session. Likewise, many listeners sat or lay on the floor during the session and may have experienced discomfort. Many adapted by bringing blankets or jackets to lie on. The room was about 200 meters from a moderately busy road, from which loud truck noise emanated occasionally. (The drums were usually loud enough to mask the sound.) Several other sites were explored, but none were willing to accommodate a drumming group for 6 consecutive weeks.

*Neuroendocrine Response*

The majority of the studies cited in the literature review of this document employed one-time interventions to assess acute changes as a result of a musical intervention. In most cases, it was a music listening environment. More recently,

researchers have begun to investigate hormonal changes as a result of live music making and most recently, of live drumming (Bittman, et. al., 2001). This study attempted in part to replicate the short-term changes in neuroendocrine levels that previous researchers have reported, while expanding the investigation to include long-term changes over time.

*Cortisol.* Cortisol responded favorably for participants in the drumming group and the active listening group. For both groups, cortisol decreased significantly, moving in the desired direction from pretest to posttest during session 1 (drummers, $p=.025$; listeners, $p=.008$), with listeners experiencing greater decrease. This speaks to the fact that members of the drumming group were more likely to have a stressful rather than relaxing experience, especially the inexperienced players, when compared to the listening group. When the same pretest to posttest measures were taken during session 6, the decrease in cortisol was no longer significant ($p<.05$), but was present. This is critical information for understanding the effects of music on well-being over time.

Why was the effect lessened by session 6? One possible explanation is the novelty effect. Perhaps the first experience was new and exciting to participants, and they were more fully engaged in the activity. Rossi (1986) reports that novel stimuli heighten the activity sent to higher cortical and limbic-hypothalmic areas of the brain. By session 6, things were becoming familiar and routine, with less margin of pleasure or unpredictability. By session 6, the end of the semester was approaching, perhaps distracting some of the participants from being fully present in the session, thinking more about where they had to be and what they had to do after the group. It is possible that many of them were experiencing heightened stress levels as they prepared for their final examinations and impending graduation. This may have counteracted the effects of

drumming on neuroendocrine activity. Even so, participants' scores on the MHI Anxiety did not rise significantly at the end of the semester.

The effect of cortisol over time, at week 1, week 6, and week 12 also resulted in nonsignificant findings. Baseline cortisol levels at each measurement point showed no consistent response among participants. For some, it had increased, for others it had decreased, with a high degree of variance among subjects. The mean change in cortisol levels was not significant over time when analyzed by drumming group or by listening group. In the majority of cases, the pretest level of cortisol at session 6 closely resembled the baseline levels taken prior to session 1.

Although statistically nonsignificant, cortisol levels actually decreased in the drumming group from session 1 baseline (M=1.0907 ug/dl) to session 6 pretest (M=.8653 ug/dl). Levels decreased again (in the drumming group) from session 6 pretest to 12 week follow-up (M=.6150 ug/dl). Listener's cortisol levels increased from session 1 baseline (M=.6733 ug/dl) to session 6 pretest (M=1.5900 ug/dl), then decreased by session 12 (.8633 ug/dl). An important characteristic of the 11-member follow-up group was that 8 had previously been in the drumming group, while only 3 had been in the listening group. From this information, it appears that group drumming has the possibility of maintaining positive decreases in cortisol levels across time. Data is inconclusive on the potential for similar results among listeners due to the loss of so many subjects for the follow-up, resulting in unequal variances because of the small number of listeners.

This study occurred during winter semester at Michigan State University. Since approximately one-third of the participants were students, it was very difficult for them to come to the follow-up session during the first week of June. Most of them had left the

campus and community for the summer break. Additionally, because of the six-week period of non-contact, it was challenging to motivate participants to return. Phone calls were made and e-mail messages were sent as reminders, but turnout remained low.

*Dehydroepiandrosterone.* DHEA-S levels behaved in a manner quite similar to cortisol, although the readings moved in the opposite direction. Intrasession changes during session 1 resulted in nonsignificant increases during session 1, with drummers experiencing a greater effect than listeners. The same was true for session 6, but the effect was lessened in comparison to session 1.

These results point out two key areas for consideration. The first being diminished effect over time, and the second being specificity of neuroendocrine activation to specific activities. The behavior of DHEA-S levels in this study suggests that repeated applications of the same treatment may lead to a smaller effect (increase) over time. After 6 weeks, the effects of drumming and listening are no longer reaching significant levels of change ($p<.05$). Yet, they are still shifting in the desired direction. Nonetheless, it is difficult to say when that effect would wear off, would it be 12 weeks later, 20 weeks later, or 6 months? It is important to recognize that various neurohormones experience relative rise and fall over time. Some are affected earlier than others (they precurse each other), some have short half-lives requiring the intervention to be continuous, and others, once generated, sustain themselves across periods of time. No studies have yet attempted to investigate this type of long-term change, so the future holds strong investigative possibility. Further, perhaps levels of accepted significance are too conservative in these arenas. It may be enough to know that neuroendocrines are shifting in health-serving directions, even though they may not meet a significance level

of .05. Perhaps "clinical significance" is more important than statistical significance in this case. It may be equally meaningful if their significance levels reach .10 or even .20. This information merits further investigation. Indeed, in this study, it would have led to more impressive findings if these parameters were expanded.

The second question is in regard to neuroendocrine specificity. As the field of music therapy continues to investigate the effects of music making on neuroendocrine activity, it will certainly begin to delineate specific activities for the alteration of particular neuroendocrines. Perhaps organ playing is better suited to the changing neuroendocrine needs of well older adults, while group guitar classes are more appropriate for troubled adolescents. Perhaps stick drumming is best suited to geriatrics with dementia, while hand drumming appeals to young adults. In some cases, certain individuals respond better to highly structured environments, while others need room for improvisation and creativity. Are the interests of the individuals directly correlated to the positive neuroendocrine changes they experience? Are people naturally drawn to a given activity because it makes them "feel good"? In the present study, cortisol was the most responsive neuroendocrine to group drumming. Perhaps other neuroendocrines that were not measured would have also shown more significant findings, such as melatonin, human growth hormone (hGH), natural killer cell activity, beta-endorphin, or others. At the same time, not all neuroendocrines are appropriate for measurement at the particular hour of day when this study took place. There is no simple answer to these questions. Only inquisitive research will provide this information in years to come.

*Testosterone and Estradiol.* Testosterone levels were nonsignificantly higher ($p=.059$) for the drumming group, compared to active listeners, at session 1 baseline and

posttest. This is most likely attributable to the fact that there were more men in the drumming group than in the listening group, since males registered significantly higher levels of testosterone than females at measurement points 1, 2, 3, and 4. Additionally, those who considered themselves drummers had significantly higher levels of testosterone at session 1 baseline than those claiming other primary instruments or no instrumental experience. One plausible explanation may be the fact that there were 10 male "drummers" and only 2 female "drummers" in the study, reflecting the impact of gender on testosterone levels.

Since the number of female drummers was so small, it is impossible to conclude if drummers had higher testosterone levels overall, independent of gender. It is further complicated by the fact that participants were scoring rather high on the PCI dimension of sexual excitement, implicating possible neuroendocrine correlates in the sex hormone levels. This contrasts Fukui's (2001) findings that music listening leads to increased levels of testosterone in female listeners, but decreased levels for males. The listening group in the current study experienced a decrease in testosterone during session 1, and again during session 6. Nonetheless, it is in agreement with the fact that music affects the testosterone level in both sexes. The interaction of testosterone with behavior is bi-directional: testosterone can influence behavior and behavior can alter testosterone levels. The result is a very complex interaction with no firm conclusions to date.

Estradiol levels had a stronger relationship to participants' ages than to any of the experimental conditions. Participants in category I (ages 18-23) had significantly higher levels of estradiol than those in category II, III or IV, and nonsignificantly higher levels than those in category V, at session 6 pretest. Participants in the listening group also

experienced significant decreases in estradiol from pretest to posttest during session 6. During session 1, however, estradiol actually increased from pretest to posttest. For drummers, the exact opposite changes occurred. Their estradiol levels decreased during session 1 and increased during session 6. This becomes even more dimensional when we look at gender effects. Being female resulted in the same estradiol changes as being in the listening group, but at nonsignificant levels. Male estradiol levels actually modulated similarly to the females, suggesting that estradiol levels move comparably in the two sexes. Gender, then, cannot sufficiently explain changes in estradiol.

The experimental event had a significant influence for listeners, but not for the drumming group. The drumming group had three participants (one female) from age category I, and 5 from category V (4 female). The listening group, however, included 8 participants (6 female) from age category I and 1 from category V (female). Given the fact that age was the predominant predictor of estradiol behavior, the data seems self-evident, based on uneven distribution of age category I participants between the drumming group and the listening group. Although one view of the data suggests that listeners experienced significant decreases in estradiol during session 6, it is not reasonable to attribute it solely to active listening. It would be interesting to see if estradiol behaved the same way in the drumming group, if the distribution of ages were more equivalent.

To explore one more angle, the effect of previous participation in a drum circle was examined. Those with prior experience had estradiol levels in sync with the listening group. Those lacking prior experience had a different phenomenon entirely. At the first session estradiol levels decreased and they did so again at the sixth session, but with a

much smaller difference from pretest to posttest. Estradiol levels for those who considered themselves drummers and those who had another primary instrument mirrored the behaviors of the listeners, increasing during session 1 and decreasing during session 6. Those participants with no primary instrument had the opposite experience, with levels decreasing during session 1 and increasing during session 6.

Analysis over time at week 1, week 6, and week 12 again resulted in nonsignificant findings for DHEA-S and testosterone. In the case of estradiol, paired samples t-tests revealed a significant increase ($p=.036$) between session 6 pretest and 12-week follow-up for the listeners. The number of listeners present at the follow-up session was 3. The total number of participants who were able to return for the follow-up was 12, but one of those participants had not provided a saliva sample at session 6. Therefore, neuroendocrines for 11 participants (just short of 33 percent of the total participants) were analyzed at posttest. Seven of the eleven returnees were female. Only 1 of the participants was from age category I, with 4 from category II, 1 from category III, 2 from category IV, and 3 from category V. It is difficult to draw any meaningful conclusions from this data, since it compares means of 34 individuals to means of only 11. Nonetheless, the increase in listener's estradiol levels from session 6 to follow-up closely resembles the increase that was seen for the listeners during session 1.

Neuroendocrine levels in the body respond to many activities throughout the day. During any given week, it was impossible to control for the activities of the participants in-between drumming sessions. It is quite possible that several of them were drumming between sessions, lessening the effect of neuroendocrine change, since it was something they regularly engaged in. Since approximately half of the participants did enjoy

drumming as a somewhat regular part of their lives, this seems highly probable. Meanwhile, it was equally difficult to control for their physical activity and emotional state throughout the study period. The difficulty in using volunteers for a study of this nature is that it becomes impossible to impose restrictions on their daily living activities, thus making it virtually impossible to isolate the singular effects of group drumming or listening. Further, a few individuals reported regular use of cigarettes, alcohol, marijuana, and some prescription medications on their Health and Health Behaviors Inventories (see Appendix B). These activities may have contributed to the large variance in salivary neuroendocrine assays throughout the study period. This is undoubtedly one of the leading reasons why most studies to-date have assessed one-time acute interventions.

*Conclusions*

No significant differences were revealed on any of the psychological measures from pretest to posttest for either the drumming group or the active listening group, suggesting that the changes that were evidenced in this study were largely the result of drumming and drum listening. Positive decreases in cortisol and increases in DHEA-S were present within both groups. During both sessions 1 and 6, listeners experienced a more highly significant decrease in cortisol than drummers. Also during session 1, listeners achieved a greater increase in DHEA-S than drummers. By session 6, DHEA-S in listeners went virtually unchanged, while drummers' DHEA-S increased—although by a much smaller margin than during session 1. A maintained decrease in cortisol across 12 weeks was implicated for participants in the drumming group, but results were

inconclusive for the listeners due to small sample size at follow-up. Estradiol increased consistently across 12 weeks among listeners. Testosterone decreased consistently across 12 weeks within the drumming group. The current findings of this research include data from potential outliers. It is possible that more significant results would have been obtained if those individuals' scores had been eliminated from the final analysis.

Participants in both groups reported experiences representative of altered states of consciousness on the Phenomenological Consciousness Inventory (PCI). Listeners scored significantly higher than drummers on 8 subdimensions on the first PCI, after session 2. By session 5, the second time the PCI was administered, listeners scored significantly higher than drummers on only 2 subdimensions. In each case, previous experience in a drum circle and prior musical experience had a significant impact on outcome.

The fact that drumming groups and listening groups were not equally matched by gender or age makes it difficult to make conclusive statements about the findings of this study. During analysis it was evident that the categorical variables of age, gender, previous experience in a drum circle and prior musical experience had a significant impact on outcome measures. Nonetheless, one important implication stands out from this research study. The experience of actively listening to live drumming closely approximates the benefits of actually drumming. Previous research has strongly concluded that listening to drumming does not have the same benefit as the live drumming experience. However, this research body has based its findings on listening to recorded drumming. It is an entirely different experience to be present in the energy and resonance of a live drumming circle. For many, it begins to feel as if they are actually

part of the circle and contributing to the rhythm. In this way, they become not just an active listener, but an active participant.

*Suggestions for future research*

Future research should continue to explore all the variables that influence an individual's response to drumming. It is not conclusive to say that group drumming promotes health. Drumming is specific and individualized. Some people may respond better to frame drumming, some to stick drumming, and some to hand drumming. Some prefer homogeneous environments, whereas others like the variety of drums, bells, shakers, tambourines, triangles, and more that a drum circle may offer. Certain individuals enjoy consistency and repetition, while others appreciate variability and texture. Further, some people prefer to be given a part or rhythm to play, while others desire the expressive freedom to play as they wish. Providing the optimal drumming experience for each person involves exploration, acceptance, and consideration of their personal interests. Providing this experience should be the ultimate goal of a therapeutic application of drumming.

Group drumming is a complex intervention encompassing the participant's involvement with physical, psychological, emotional, spiritual, and cognitive dimensions. Future investigations are needed to illuminate precise mechanisms for neuroendocrine alterations. Stronger research methods will move beyond acute research investigations to multiple sessions over time, in both well individuals and those with chronic illness and disease. Future studies should strive for rigorous controls and equality of variance within groups, based on factors related to gender, age, ethnicity, and previous drumming

experiences. Music therapy research must continue to elucidate the specific intervention that brings about the desired health outcome. Group drumming alone, according to this protocol, may not effectively yield the optimal shifts in human psychoneuroendocrinology. A more effective approach may employ elements to insure a more positive and successful experience for all individuals. Drumming is accessible, but it still has the ability to intimidate many individuals. Incorporating ice-breakers, warm-ups, structural elements, and opportunities for nonjudgmental performance may make the difference between a stress-reducing and stress-enhancing experience. Group drumming and active listening to live drumming, in conjunction with music therapy procedures that address the needs of the less experienced participants, offers exciting promise as areas for continued research.

Preliminary findings of this study suggest the possibility that actively listening to live drumming may approximate the benefits of actually drumming. This is an important area for future research. It may not be specific to drumming, but could include active listening to a variety of different instruments when played live. Perhaps individuals enjoy going out to see their favorite bands for precisely this reason. Finally, it gives credence to the fact that many individuals with profound physical, mental, and emotional disabilities still benefit from being in an environment of live music-making.

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# COME AND DRUM!

## Do you enjoy the sound of drumming, always wanted to try it for yourself?

*Get involved in a cutting-edge research study examining the potential health benefits of group drumming and listening. NO PREVIOUS EXPERIENCE REQUIRED! Ages 18 +*

This Wellness study is open to anyone in good medical health. The purpose of the study is to compare the experiences of active drum listening and drum playing, and to establish baseline data for future research purposes. Participants may bring their own drum (djembe/ashiko style), or one will be provided.

The study will run for **6** consecutive weeks, with a follow-up session at week 12. First session is **Monday, March 19**; Sixth session is **Monday, April 23**. The final meeting will be **Monday, June 4**. Groups meet on Monday nights from 7 to 8 p.m. in Multi-Purpose Room A of MSU's Brody Building, off Harrison Road. Please consult your schedule carefully, and contact Carolyn to sign up.

*FOR MORE INFORMATION, CONTACT:*

CAROLYN KOEBEL,
Board-Certified Music Therapist, World Percussionist
e-mail: **koebelca@msu.edu** or phone 487 8508

APPENDIX B

**The Effects of Group Drumming on Neuroendocrine Levels and Self-reported Mood, Stress, Socialization, and Transpersonal Experiences**

Carolyn Koebel, MT-BC, Michigan State University

Demographic Information: This will allow me to factor out variables that may negate or replace the physiological effects of the drumming experience. All personally identifiable information will be held strictly confidential.

PERSONAL CODE NUMBER: _____

1. Your age: _____

2. Your sex: (please circle) Female Male

3. Your primary ethnic group: (please circle)

   African African-American Caucasian Native American Asian
   Hispanic Other (please indicate) _____

Musical Experience: The following questions are meant to provide me with background information on your musical interests.

Have you ever taken private instruction on an instrument/voice, participated in band or orchestra, or played in a (i.e. rock 'n' roll-style) band? (please circle) Yes No

5. Do you currently play an instrument(s)? (please circle) Yes No

6. Please indicate your instrument(s) of choice: (please circle)

   Not Applicable Piano/Keyboard Drum-set Percussion Voice

   Guitar (Acoustic and/or Electric and/or Bass) Brass (indicate) _____

   Woodwind (indicate) _____ String (indicate) _____

   Other (please indicate) _____

7. Have you ever participated in a drum circle before: (please circle) Yes No
   If yes, briefly describe the instrumentation: _____

8. What types of music do you listen to?: (you may circle more than one)

Don't Listen to Music Rap R & B/Soul Blues Classic Rock
Classical Pop Rock Country New Age Funk/Ska Roots/Reggae
Jazz International/Ethnic (explain) _____
Other (please describe) _____

Health and Health Behaviors:

The following information is confidential, and will assist me in determining the possibility of outside influences on changes in body hormones or altered states of consciousness.

9. In general, would you say your health is: (please circle) Poor Fair Good Very Good Excellent

10. How many hours of restful sleep did you have in each of the past 3 nights?
Last Night_____ Night before last_____ 3 nights ago_____

11. Do you have, or has a doctor told you that you have any health problems? _____
If yes, please describe _____

12. List over-the-counter (non-prescription) medications, such as aspirin, laxatives, sleeping pills, and pain medications that you have regularly taken in the past 2 weeks:

_____

13. List all prescription medications you are currently taking:

_____

14. During the past week, how many cups of coffee or caffeinated tea have you consumed per day?_____

15. During the past week, how many cans of soda pop have you consumed per day?
What soda do you usually drink?

_____

16. How many alcoholic beverages have you consumed per week during the last month? (Use the following system: 1 beverage = 1.5 oz. Liquor, 12 oz. Can/Bottle of Beer, 8 oz. Glass of wine) _____

17. In the past 2 weeks, how many cigarettes have you smoked per day? _____

18. Do you, or have you engaged in the use of any of the following? (please circle appropriate responses)
Don't Use Marijuana LSD/Acid Mushrooms PCP Ecstasy ("E") Crack Cocaine Heroine Other_____
Approximate Frequency of Use_____

APPENDIX C

## CONSENT PROCEDURES

Thank you very much for your interest in this research endeavor. It represents a cutting-edge attempt at the empirical exploration of the psychological and physiological responses within human beings when engaged in drumming. It particularly seeks to determine if there is a difference in personal response between drum listening and active drumming, and if so, what that difference is. There has been a long-standing debate over the effectiveness of live versus recorded music in therapeutic contexts, and this study seeks to address the question in relation to drumming.

Specifically, I will measure selected hormones via individual saliva samples to assess possible health benefits inherent in a group drumming experience. I am interested in phenomenological experiences, such as imagery, journeying, or altered states of consciousness induced by the drumming. I am further interested in general levels of reported mood, stress, and socialization factors, and whether or not these factors change over time.

The study runs for 12 weeks, but you will only meet for 7. For the first six weeks, we will meet once weekly, at 7:00 p.m. in the MSU Union, for approximately one hour. Drumming will constitute approximately 30 minutes of each session. On weeks where there is no paperwork, sessions will end around 7:40 p.m. The first session will run slightly longer, at most an hour and a half, to provide time for initial demographics, group assignments, base-line saliva tests, and initial reports on mood, stress, and socialization. This will be followed by the first drumming session, lasting 30 minutes. Upon completion of the first 6 sessions, you will have 5 weeks off, and return on the twelfth week for a short session on follow-up testing, both saliva samples and paperwork. If you are assigned to be a member of the control group, you will attend only sessions 1, 6, and 12. It is very important that you plan to attend all sessions, including the follow-up at week 12. In the event that you are unable to fulfill your obligation, please contact the researcher directly.

Throughout the study, your privacy will be protected to the maximum extent allowable by law. At no time will your name be directly associated with the information you provide. All information will be coded for confidentiality, and stored in a locked cabinet in the researcher's office. You will not be personally identifiable in any subsequent report.

If at any time you have specific questions or concerns about the research study, please contact: Carolyn Koebel,
koebelca@msu.edu
phone 517-487-8508.

If you have questions about your participant rights as human subjects of research, please contact David Wright, UCRIHS Chair, phone 355-2180

No health risks are anticipated. The researcher is a Board-Certified music therapist with training to accommodate personal needs. In the event that the journeying

experiences bring up uncomfortable personal material, the therapist will be available for private debriefing. There is a minimal potential for physical discomfort if the drum is misused. The researcher is a professional percussionist with extensive teaching experience. Any questions on playing technique will be promptly addressed. In the unlikely event that you are injured as a result of your participation in this research project, Michigan State University will provide emergency medical care if necessary. If the injury is not caused by the negligence of MSU you are personally responsible for the expense of this emergency care and any other medical expenses incurred as a result of this injury.

At the conclusion of the 12 weeks, participants from the control group may opt for a complimentary private lesson, group drumming experience, or both. Instruction may include any style of percussion, with an emphasis on hand-drumming traditions from around the world.

While I sincerely hope that you will follow this study through to completion, your participation is voluntary. You may choose to withdraw or refuse participation in certain procedures if you find something particularly objectionable. I would ask that you speak to me personally if you are considering this. Thank you for your interest and commitment to this study.

INFORMED CONSENT

Your signature below indicates that you have had a chance to review this research information and ask any additional questions: You are aware of what is being asked of you, and you voluntarily agree to participate in all aspects of this research study.

Your Signature Today's Date

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