

**BIKRAM YOGA AND MOOD STATES  
IN ADULTS**

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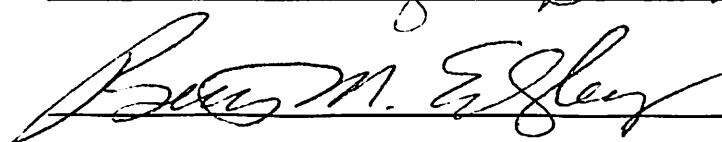
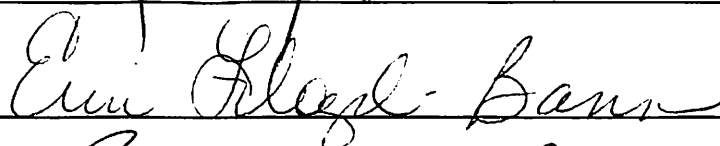
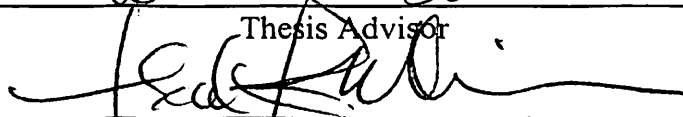
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BIKRAM YOGA AND MOOD STATES  
IN ADULTS

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## PREFACE

This study was conducted to provide more information regarding participation in yoga and its effects on mood states in adults. The Profile of Mood States mood inventory survey was used as the pre- and post-testing instrument. Voluntary yoga participants completed the Profile of Mood States mood inventory survey both prior to and immediately following participation in a standard Bikram yoga class. A voluntary group of sedentary individuals also completed the same mood inventory survey both prior to and immediately following passively reading for ninety minutes (the same amount of time as a standard Bikram yoga class).

I would like to thank Greg McCann and the yoga participants of Tulsa Yoga Quest for allowing me the use of their facility and time. I would also like to thank LAMAMCO Drilling Company for allowing me the use of their office and employees. I sincerely thank my committee—Dr. Betty Edgley (committee chair), Dr. Steve Edwards (thesis advisor), Dr. Frank Kulling, and Dr. Erin Floyd-Bann—for their time, commitment, encouragement, knowledge, and patience during my educational pursuits and completion of this research.

## TABLE OF CONTENTS

| Chapter |  | Page |
|---------|--|------|
| I.      | INTRODUCTION.....                      | 1    |
|         | Statement of the Problem.....          | 3    |
|         | Purpose of the Study.....              | 3    |
|         | Hypotheses.....                        | 4    |
|         | Limitations to the Study.....          | 5    |
|         | Assumptions.....                       | 6    |
|         | Definitions.....                       | 6    |
| II.     | REVIEW OF THE LITERATURE.....          | 9    |
|         | Introduction.....                      | 9    |
|         | Mood and Exercise.....                 | 9    |
|         | Profile of Mood States.....            | 10   |
|         | Mind-Body Relationship.....            | 11   |
|         | Yoga.....                              | 12   |
|         | Bikram Yoga.....                       | 14   |
|         | Summary.....                           | 17   |
| III.    | METHODOLOGY.....                       | 18   |
|         | Introduction.....                      | 18   |
|         | Subjects.....                          | 18   |
|         | Instrumentation.....                   | 19   |
|         | Preliminary Procedures.....            | 19   |
|         | Operational Procedures.....            | 20   |
|         | Statistical Analysis.....              | 21   |
| IV.     | RESULTS AND DISCUSSION.....            | 22   |
|         | Introduction and Descriptive Data..... | 22   |
|         | Hypotheses.....                        | 24   |
|         | Results.....                           | 25   |
|         | Discussion of Results.....             | 32   |

| Chapter   | Page |
|---|------|
| V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS.....     | 36   |
| Introduction.....                                     | 36   |
| Summary.....  | 37   |
| Conclusions.....                                      | 39   |
| Recommendations for Future Studies.....               | 39   |
| REFERENCES.....                                       | 41   |
| APPENDIXES.....                                       | 44   |
| APPENDIX A—Bikram yoga posture sequence diagrams..... | 44   |
| APPENDIX B—Testing Instrument.....                    | 45   |
| APPENDIX C—Demographic Survey.....                    | 46   |
| APPENDIX D—Informed Consent.....                      | 47   |
| APPENDIX E –IRB Form.....                             | 49   |

## LIST OF TABLES

| Table |   | Page |
|-------|---|------|
| I.    | Bikram Yoga Posture Sequence                                      | 16   |
| II.   | Total subjects and group descriptive statistics.....              | 23   |
| III.  | Subject demographics.....   | 24   |
| IV.   | Mean pre-test and post-test mood state scores for tension.....    | 25   |
| V.    | ANOVA for tension.....  | 26   |
| VI.   | Mean pre-test and post-test mood state scores for depression..... | 26   |
| VII.  | ANOVA for depression.....   | 27   |
| VIII. | Mean pre-test and post-test mood state scores for anger.....      | 27   |
| IX.   | ANOVA for anger.....  | 28   |
| X.    | Mean pre-test and post-test mood state scores for vigor.....      | 28   |
| XI.   | ANOVA for vigor.....  | 29   |
| XII.  | Mean pre-test and post-test mood state scores for fatigue.....    | 29   |
| XIII. | ANOVA for fatigue.....  | 30   |
| XIV.  | Mean pre-test and post test mood state scores for confusion.....  | 30   |
| XV.   | ANOVA for confusion.....  | 31   |
| XVI.  | Mean pre-test and post-test mood state scores for TMD.....        | 31   |
| XVII. | ANOVA for TMD.....  | 32   |

## **CHAPTER 1**

### **INTRODUCTION**

As the self-help movement strengthens and spreads across the nation, many individuals are looking for new ways to reduce stress and optimize their quality of life. As a result, the mind-body exercise of yoga has gained increasing popularity in the United States over the past decade (Herrick, Ainsworth 2000). Yoga has received national attention on talk shows, celebrity endorsements, and feature articles in magazines, as well as a plethora of yoga books in stores (Harrelson, Swann 2003). Mind-body exercise methods, including yoga, are spreading rapidly throughout the health and fitness fields, and have become widely popular in fitness facilities for performance enhancement and general wellness (Ives, Sosnoff 2000). Today, an estimated 11 million Americans practice yoga on a regular basis (Herrick, Ainsworth 2000).

Yoga, which can be traced back approximately 4,000 years (Harrelson, Swann 2003), has many interpretations and often is defined as to join or yoke mind, body, and spirit (Herrick, Ainsworth 2000). There are many different styles of yoga, with most being based on the eight-fold path described in the Yoga Sutra, a text written about 2,000 years ago (Herrick, Ainsworth 2000). The eight-fold path consists of postures, breathing practices, progressive steps in concentration and meditation, and ethical behaviors (Herrick, Ainsworth 2000). The most common forms of yoga are Iyengar, Sivananda, Ashtanga, and Kundalini, which all have common focuses on breathing, meditation, and movement (Harrelson, Swann 2003). In the West, posture (asana) and controlled breathing (pranayama) are the primary concentrations of yoga practice, and while practicing postures, one pays attention to lengthening the spine, linking movement with

breath, and placing awareness on what is experienced in the body in each moment (Herrick, Ainsworth 2000). This type of practice is referred to as Hatha yoga, which is the most common type of yoga practiced in the West (Harrelson, Swann 2003). Within Hatha yoga fall several different styles of yoga, one of which is known as Bikram yoga. According to YogaExpo™, Bikram Choudhury, the founder of Bikram yoga, worked for five years with Western doctors to develop his own system of 26 classic postures. They are practiced in the exact same order in a room heated to 95-105 degrees Fahrenheit. Bikram yoga was the style of yoga used in this particular research.

Multiple studies have been conducted to determine the physiological and psychological benefits of participation in various forms of exercise (Arent, Landers, Etnier 2000). According to the American College of Sports Medicine (ACSM), regular physical activity or exercise results in improvement in cardiovascular and respiratory function, reduction in coronary artery disease risk factors, decreased mortality and morbidity, decreased anxiety and depression, enhanced feelings of well-being, enhanced performance of work, recreational, and sport activities. As can be seen by the growing attendance rates of various yoga classes, as well as published studies, yoga offers many physiological benefits for participants (Herrick, Ainsworth 2000). When practiced regularly, yoga has been shown to increase strength, stamina, flexibility, balance, and relaxation, as well as increase energy and vitality (Herrick, Ainsworth 2000). Many studies have examined the mood benefits associated with exercise (Arent, Landers, Etnier 2000) and several have focused on the mood benefits associated with hatha yoga (Birkel 1998), however, more research needs to be performed to examine the relationship between Bikram yoga and mood.



### **Statement of the Problem**

The problem in this study was to investigate any differences among the mood states of Bikram yoga participants prior to participating in a Bikram yoga class and immediately following participation in a Bikram yoga class. The second problem in this study was to investigate any differences between the mood states of Bikram yoga participants versus a sample population of sedentary individuals both prior to the Bikram participant sample participating in a Bikram yoga class and immediately following the Bikram participant sample participating in a Bikram yoga class while the sedentary sample remained sedentary.

### **Purpose of the Study**

There is a lack of scientific data regarding Bikram yoga and the psychological and mood state benefits gained from participation. The purpose of this study was to determine differences in mood states before participation and immediately following participation in a standard Bikram yoga class, among regular Bikram yoga participants (those participating in Bikram yoga classes at least one time per week for the past three consecutive months). Also, the purpose of this study was to examine differences in mood states before participation and immediately following participation (or the equivalent duration of) in a standard Bikram yoga class, between regular Bikram yoga participants versus a sedentary population. The results of this study may be useful in both the theory and practice of exercise prescription. Determining how the practice of yoga, specifically Bikram yoga, affects mood states will contribute to the body of knowledge in this area. Results may be helpful in and of themselves, or for what they offer in terms of future

research. This information has the potential to translate into concrete ideas and strategies for exercise leaders and professionals.

### **Hypotheses**

The following null hypotheses were examined:

**Ho1**

There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the pre-test in the experimental group.

**Ho2**

There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the post-test in the experimental group.

**Ho3**

There will be no significant differences in total mood disturbance scores at the pre-test in the experimental group.

**Ho4**

There will be no significant differences in total mood disturbance scores at the post-test in the experimental group.

**Ho5**

There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the pre-test between the experimental and control group.

**Ho6**

There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the post-test between the experimental and control group.

**Ho7**

There will be no significant differences in total mood disturbance scores at the pre-test between the experimental and control group.

**Ho8**

There will be no significant differences in total mood disturbance scores at the post-test between the experimental and control group.

### **Delimitations to the Study**

This study had the following delimitations:

1. Male and female subjects were at least 18 years of age.
2. The control group consisted of 18 participants (10 male and 8 female) and the experimental group consisted of 16 participants (5 male and 11 female).
3. Each participant was a current resident of the northern region of Oklahoma.
4. Data was collected from participants one time only.
5. Subjects in the experimental group participated in a Bikram yoga class led by one instructor, Greg McCann.
6. Subjects in the experimental group had to have participated in Bikram yoga regularly (at least one time per week for the past consecutive three months).
7. The Profile of Mood States mood inventory survey was the only instrument used to measure mood states.

## **Limitations to the Study**

The research may have been limited by the following:

1. The subjects were asked to self-report their levels of mood.
2. No attempt was made to measure the effort expended by each participant during the yoga sessions.
3. No attempt was made to control what the sedentary group read during the intervention, aside from the material being non work-related.

## **Assumptions**

The following assumptions were made:

1. The subjects honestly reported the requested demographic information.
2. The subjects truthfully responded to the Profile of Mood States mood inventory survey.

## **Definitions**

Anger- defined by the terms furious and ready to fight (Berger, Pargman, Weinberg 2002).

Bikram Yoga – a 90-minute, 26-posture yoga series, performed in a 95-105 degrees Fahrenheit room, that is designed to scientifically warm and stretch muscles, ligaments, and tendons in the order in which they should be stretched (YogaExpo™).

Confusion- represents a mood of bewilderment and muddleheadedness and represents a dimension of organized-disorganized (Berger, Pargmann, Weinberg 2002).

**Depression**- reflects feelings of personal inadequacy and personal worthlessness, and a sense of emotional isolation from others (Berger, Pargman, Weinberg 2002).

**Fatigue**- represents feelings of inertia, low energy or tiredness, and weariness (Berger, Pargman, Weinberg 2002).

**Mood**- a host of transient, fluctuating affective states, both positive ones and negative ones (Berger, Pargman, Weinberg 2002).

**Mood State**- state measures that reflect how an individual feels at a particular moment in time (Berger, Pargman, Weinberg 2002).

**Mood State Scores**- scores obtained from the Profile of Mood States mood inventory survey that encompass the six subscales of mood; tension, depression, anger, vigor, fatigue, and confusion (Berger, Pargman, Weinberg 2002).

**Profile of Mood States**- a 65 item mood-assessment rating scale which instructs subjects to indicate on a 5-point Likert scale the extent to which they feel each item, a 0 indicating “not at all” and a 5 indicating “extremely”. It includes six factors, including: Tension, Depression, Anger, Fatigue, Vigor, and Confusion (Tobar, Stegner, Kane 1999).

Sedentary lifestyle- Persons not participating in a regular exercise program or meeting the minimal physical activity recommendations from the U.S. Surgeon General's report (American College of Sports Medicine, 6<sup>th</sup> Edition).

Tension- refers to musculoskeletal tension as defined by the terms tense, on edge, and restless (Berger, Pargman, Weinberg 2002).

Total Mood Disturbance (TMD)- reflects a person's overall state of well-being, and it is formed by adding the five "negative" subscales of Tension, Depression, Anger, Vigor, Fatigue, and Confusion and subtracting the "positive" score on Vigor (Berger, Pargman, Weinberg 2002).

Vigor- suggests moods of ebullience and high energy (Berger, Pargman, Weinberg 2002).

Yoga- to join or yoke mind, body, and spirit through postures, breathing practices, progressive steps in concentration and meditation, and ethical behaviors (Herrick, Ainsworth 2000).

## **CHAPTER II**

### **REVIEW OF LITERATURE**

#### **Introduction**

The benefits stemming from exercise are multi-faceted and widespread. The term exercise can encompass a wide variety of modalities and the benefits of exercise can be seen both physiologically and psychologically. Over the years, researchers have specifically linked exercise with desirable mood changes (Berger, Pargman, Weinberg 2002). Recently, more research has found that the exercise modality of yoga can provide a variety of desirable mood changes including increased energy, vitality, and balanced emotions (Herrick, Ainsworth 2000). The emerging literature on the efficacious benefits of yoga supports that this ancient health practice has a wide range of benefits in promoting wellness (Herrick, Ainsworth 2000).

#### **Mood and Exercise**

The term mood is used to describe a host of transient, fluctuating affective states, both positive ones and negative ones, that are usually in our conscious awareness (Berger, Pargman, Weinberg 2002). Affect is a term denoting broad psychological states of positive and negative feelings that change from moment to moment (Berger, Pargman, Weinberg 2002). Moods are composed of subjective feelings, and they have cognitive, behavioral, neurochemical, and psychophysiological manifestations (Berger, Pargman, Weinberg 2002). Shifts in mood states occur routinely and easily, but despite the variability in mood states, mood has very pronounced effects on our thoughts and judgments, behavior, feelings, and thus our overall quality of life (Berger, Pargman, Weinberg 2002). Mood is an integral component of daily life; it influences our feelings

of happiness, appreciation of the moment, the likelihood that we will provide assistance to others, appraisal of stressful situations, and the quality and meaning of our lives in general (Berger, Pargman, Weinberg 2002). Because of the importance of mood, its self-regulation is an essential component of a well-lived life (Berger, Pargman, Weinberg 2002). Consciously altering our moods can assist in establishing healthy habits and lifestyles, boost our immune system, and enhance our general zest for living (Berger, Pargman, Weinberg 2002). Mood alteration can include desirable as well as undesirable changes, but mood enhancement is a primary component of an active lifestyle (Berger, Pargman, Weinberg 2002). Exercise psychologists have consistently found that desirable mood changes do occur after exercising, but may not occur for all types of exercise (Berger, Pargman, Weinberg 2002). One study found that resistance training resulted in significant decreases in depression levels (Lane, et al 2002), while another revealed that there were not significant differences in mood states following resistance training (Rehor, et al 2001). Rehor, et al (2001) also examined the effect of circuit training and racquetball on mood states with results supporting the belief that physical activity is associated with positive changes in mood states. In a study comparing mood for runners on running and non-running days, Szabo, et al (1998) found that runners report better mood on running days than on non-running days. Evidence suggests that physical activity generally yields a positive effect upon psychological well-being, including mood (Turnbull, Wolfson 2002).

### **Profile of Mood States**

Because of the pervasiveness of mood and its implications for the quality of our daily lives, it is important to be able to measure it with valid and reliable measures. The



POMS is a mood inventory that contains six subscales of mood. Specific subscales include Tension, Depression, Anger, Vigor, Fatigue, and Confusion (Berger, Pargman, Weinberg 2002). Tension refers to musculoskeletal tension as defined by the terms tense, on edge, and restless. Depression reflects feelings of personal inadequacy and personal worthlessness, and a sense of emotional isolation from others. Anger is defined by the terms furious and ready to fight. Vigor suggests moods of ebullience and high energy. Fatigue represents feelings of inertia, low energy or tiredness, and weariness. Confusion represents a mood of bewilderment and muddleheadedness and represents a dimension of organized-disorganized. A Total Mood Disturbance score can be obtained by summing each of the six subscale scores together, while weighting vigor negatively. It can help the researcher obtain an overall estimate of total mood. Scores on the six subscales can be connected with one another to form a POMS profile and even though five of the six POMS subscales reflect undesirable mood states, scores on this inventory can reflect desirable changes in mood (Berger, Pargman, Weinberg 2002). The Profile of Mood States (POMS), developed in 1971, was originally intended as a means of measuring the mood states of people undergoing counseling, but currently is also used in the area of sport and exercise to better understand how these factors influence mood. Many studies have utilized some variation of the Profile of Mood States to assess the effects of exercise on mood states. The POMS has proven to be a popular and abundantly useful psychometric instrument in sport-related research (Snow, LeUnes 1994).

### **Mind-Body Relationship**

Mood is closely intertwined with physical health. Moods, especially distress moods, may influence our immune system, health habits, and even the onset and time-

course of specific diseases (Berger, Pargman, Weinberg 2002). Heart disease, stroke, and flare-ups of chronic autoimmune diseases such as rheumatoid arthritis and asthmatic attacks may be associated with the activating mood states of fear and anger through both direct and indirect paths (Berger, Pargman, Weinberg 2002). Long-term phlegmatic moods of hopelessness and fatigue may be associated with the development of cancer and the reoccurrence of myocardial infarction. The direct pathways in which mood states may interact with our immune system support the mind-body relationship. These include our moods affecting both the number and activity of B and T lymphocytes, macrophages, antibodies, leukocytes, reactivity to pathogens, and shift in energy balance (Berger, Pargman, Weinberg 2002). Mind-body exercise methods are spreading rapidly throughout the health, fitness, and rehabilitation fields (Ives, Sosnoff 2000). It is estimated that 60% to 90% of patient visits to a physician's office are stress related and not easily treatable or even understood by allopathic medicine, thus contributing to the rise in alternative/mind-body strategies (Herrick, Ainsworth 2000). The fundamental premise behind the mind-body connection is that thoughts, emotions, attitudes, and behaviors affect physiologic function, and vice-versa. Mind-body exercise encompasses many exercise and movement methods, including yoga (Ives, Sosnoff 2000).

### **Yoga**

The word yoga has many interpretations and often is defined as to join or yoke mind, body, and spirit (Herrick, Ainsworth 2000). Yoga can be traced back approximately 4,000 years where it was refined and practiced in India. Yoga is not based on religion, and you do not have to subscribe to a specific methodology or belief system

to practice it (Harrelson, Swann 2003). Today, an estimated 11 million Americans practice yoga on a regular basis (Herrick, Ainsworth 2000).

Over yoga's 4,000-year evolution, several types of its practice have developed (Harrelson, Swann 2003). Most styles of yoga are based on the eight-fold path described in the Yoga Sutra, a text written about 2,000 years ago by a sage named Patanjali. The eightfold path consists of postures, breathing practices, progressive steps in concentration and meditation, and ethical behaviors (Herrick, Ainsworth 2000). Hatha yoga focuses primarily on the physical body and mainly encompasses postures and breathing. Raja yoga, also referred to as Ashtanga yoga, focuses on mental control through meditation. Karma yoga focuses on selfless action and service to others. Jnana yoga focuses on intellectual or philosophical approach and emphasizes questioning, meditation and contemplation. Bhakti yoga involves such practices as chanting and prayer and focuses on devotion and selfless love. Tantra yoga is characterized by certain rituals designed to awaken the energy believed to be along the spine. Mantra yoga is characterized by chanting of mantras, which are a sound or sounds that resonate in the body and is reported to evoke certain energies during meditation. (Harrelson, Swann 2003)

Hatha yoga is the most common type of yoga practiced in the West. It concentrates on the body and focuses on various postures and patterned breathing. Its goal is to strengthen the whole person-body, mind, and spirit (Harrelson, Swann 2002). While practicing postures, one pays attention to lengthening the spine, linking movement with breath, and placing awareness on what is experienced in the body in each moment. If one's attention wanders, an intention is established to keep coming back to an

awareness of the breath, the movement, and the moment. A central tenet in yoga is that of controlling the fluctuations of the mind (Herrick, Ainsworth 2000).

Most of the reported benefits of regular yoga practice are anecdotal in nature, and only recently has the physiological impact of yoga begun to be studied, but so far a general consensus holds that yoga can be beneficial to participants in a variety of ways (Harrelson, Swann 2003). Ives, et al (2000) found that yoga can reduce stress, decrease hypertension, exert cardiorespiratory benefits, positively influence flexibility, reduce asthma symptoms, and improve mood states. Birkel, et al (1998) found that yoga, especially for the older adult, can improve flexibility, balance, muscular strength, coordination, muscle control, and posture, as well as the ability to relax and concentrate. These benefits were also associated with the prevention of falls in the older adult (Birkel 1998). Greendale, et al (2002) found that yoga for women with hyperkyphosis may produce better posture. Herrick, et al (2000) found that yoga practitioners often described having more energy, vitality, and balanced emotions.

### **Bikram Yoga**

Yoga contains several different types of practice, including Hatha, Raja, Karma, Jnana, Tantra, and Mantra. Within each of the different types of yoga have come several schools of thought regarding the practice or form of yoga. These schools or forms are generally tied to a guru or swami and determine the amount of a particular type that is incorporated into that practice (Harrelson, Swann 2003). Bikram yoga is an example of a form of yoga that comes from the Hatha type of yoga that was developed by a yoga guru.

Bikram Choudhury, the founder of Bikram yoga, worked for five years with Western doctors to develop his own system of 26 classic postures. They are practiced in

the exact same order in a room heated to 95-105 degrees. The heat promotes more flexibility, detoxification, and realignment of the body. Bikram yoga is rigorous, but each posture in the sequence is designed to safely stretch and open the body in preparation for the next posture. The following table (Table I) exhibits the postures performed, and their order, in a standard Bikram yoga class. Diagrams of the postures can be found in Appendix A.

**TABLE I**  
**BIKRAM YOGA POSTURE SEQUENCE**

| <b>Posture #</b> | <b>Posture Name</b>                        |
|------------------|--|
| 1                | Pranayama breathing                        |
| 2                | Ardha Chandrasana with Padahastana         |
| 3                | Utkatasana                                 |
| 4                | Garudasana                                 |
| 5                | Dandayamana Janushirasana                  |
| 6                | Dandayamana Dhanurasana                    |
| 7                | Tuladandasana                              |
| 8                | Dandayamana Bibhaktapada Paschimottanasana |
| 9                | Trikanasana                                |
| 10               | Dandayamana Bibhaktapada Janushirasana     |
| 11               | Tadasana                                   |
| 12               | Padangustasana                             |
| 13               | Savasana                                   |
| 14               | Pavana Muktasana                           |
| 15               | Sit up                                     |
| 16               | Bhujangasana                               |
| 17               | Salabhasana                                |
| 18               | Poorna salabhasana                         |
| 19               | Dhanurasana                                |
| 20               | Sputa Vajrasana                            |
| 21               | Ardha Kurmasana                            |
| 22               | Ustrasana                                  |
| 23               | Sasangasana                                |
| 24               | Janursirasana and Paschimottanasana        |
| 25               | Ardha Matsyendrasana                       |
| 26               | Khapalbhati breathing                      |

## **Summary**

Because mind-body exercises, such as yoga, are spreading rapidly throughout the health, fitness and rehabilitation fields and are becoming widely popular in fitness facilities (Ives, Sosnoff 2000), it is imperative that scientific research be conducted to determine the benefits stemming from participation in yoga. While multiple studies have focused on the physiological effects of yoga participation and found numerous physiological benefits, fewer studies have focused solely on the psychological effects of yoga participation. Those studies that have been conducted have linked yoga participation with positive psychological benefits including reduced stress, decreased depression, improved concentration and improved mood (Ives, Sosnoff 2000). Very few studies have been conducted that strictly focus on yoga participation and mood benefits. More scientific studies are necessary to examine the relationship between yoga participation and mood. Specifically, more scientific research is necessary to examine the relationship not only between yoga and overall mood, but also between yoga and the subscales of mood including tension, depression, anger, vigor, fatigue, and confusion. This study will focus on furthering the research regarding yoga and mood, specifically focusing on Bikram yoga and mood.

## **CHAPTER III**

### **METHODOLOGY**

#### **Introduction**

The purpose of this study was to determine differences in mood states before participation and immediately following participation in a standard Bikram yoga class, among regular Bikram yoga participants. The purpose of this study was also to examine differences in mood states before participation and immediately following participation (or the equivalent duration of) in a standard Bikram yoga class, between regular Bikram yoga participants versus a sedentary population. In the following sections the methods and procedures of the study will be clearly defined. This section will define the subjects in the study and how they were recruited, describe the data collection method for mood states; outline the preliminary procedures of the study; and briefly discuss the analysis that was used to report the study's findings and conclusions.

#### **Subjects**

The subjects in this study were both male and female (15 male, 19 female) who were at least 18 years of age (mean age = between 40-44) and were either participants in Bikram yoga classes at Tulsa Yoga Quest or employees of LAMAMCO Drilling Company. The study's proposal was approved by the Institutional Review Board (IRB) at Oklahoma State University before the recruitment process began. Subjects were recruited through flyers placed at Tulsa Yoga Quest and LAMAMCO Drilling Company and recruitment announcements made at yoga classes and weekly staff meetings. To qualify for the study, subjects recruited from Tulsa Yoga Quest needed to have regularly (at least one time per week for the past three consecutive months) attended Bikram yoga



classes and subjects from LAMAMCO Drilling Company needed to meet the American College of Sports Medicine's definition of a sedentary lifestyle. A total of 34 subjects participated in the study (15 male, 19 female). The data collection portion of the study was conducted over a total of three days, with each data collection session lasting approximately two hours (i.e. one day for data collection from the experimental group, one day for data collection of the males from the control group, and one day for data collection of the females from the control group).

### **Instrumentation**

The instruments used in this study include the following:

- 1) The Profile of Mood States (POMS), a validated, 65-item inventory containing six subscales that include Tension, Depression, Anger, Vigor, Fatigue, and Confusion, to measure mood states of participants. The POMS lists 65 adjectives that the user is supposed to rate (from not at all to extremely) regarding how he/she has been feeling in the last week. The Review of Literature provides a detailed explanation of the POMS. Appendix B provides examples of the adjectives and rating scale used in this study. An additional survey used included demographic questions such as age, race, gender, marital status, and socioeconomic status (Appendix C).

### **Preliminary Procedures**

Subjects who participated were asked to arrive at the test site (either Tulsa Yoga Quest studio or LAMAMCO Drilling Company office) 30 minutes prior to the start of testing, during which time the researcher explained in detail the purpose and procedures of the study. The researcher also stressed to the subjects that they would be identified

solely based upon a number and that anonymity was assured. Subjects were informed of all risks and benefits of the study, both orally and in writing, with a script approved by the Oklahoma State University Institutional Review Board (Appendix D). Subjects were asked to read and sign an informed consent form that was collected by the researcher and stored in the researcher's secured, locked file box. The researcher assured the subjects that confidentiality would be maintained through all phases of the study.

Once the subjects completed the informed consent form, they were ready to proceed with participation in the intervention.

### **Operational Procedures**

The intervention took place over three days. The intervention, per group, took place for one day only and lasted approximately two hours. Day one consisted of the intervention and data collection from the experimental group, day two consisted of the intervention and data collection from the male portion of the control group, and day three consisted of the intervention and data collection from the female portion of the control group. Both the experimental (Tulsa Yoga Quest) and the control (LAMAMCO Drilling Company) groups completed a brief demographic survey approximately 15 minutes prior to their intervention that was collected by the researcher and stored in the researcher's secured, locked file box to be used as a comparative tool between the control and experimental groups. Also at that time, both the experimental (Tulsa Yoga Quest) and the control (LAMAMCO Drilling Company) groups completed the Profile of Mood States mood inventory survey either prior to participation in a Bikram yoga class for 90 minutes or prior to passively reading in a quiet room for 90 minutes. The initial completed Profile of Mood States mood inventory surveys were collected by the

researcher and stored in the researcher's secured, locked file box. No data was collected during the 90-minute intervention that included the experimental group participating in a Bikram yoga class and the control group participating in passive reading of self-selected material. When the subjects were finished with either 90 minutes of Bikram yoga (experimental group) or 90 minutes of passive reading (control group) both groups again completed the Profile of Mood States mood inventory survey. The final completed Profile of Mood States mood inventory surveys were collected by the researcher and stored in the researcher's secured, locked file box.

Both the experimental and the control group were informed of an optional follow-up meeting conducted by the researcher approximately six weeks after testing to inform them of relevant findings from the study.

### **Statistical Analysis**

All analyses were performed on SPSS 11.0 and a .05 level of significance for all statistical tests. Using a 2 x 2 repeated measures ANOVA (2 groups, 2 data points of time), mood states from the Profile of Mood States survey were examined. If a significant F value was obtained, appropriate post-hoc procedures were used to explore the results.

## **CHAPTER IV**

### **RESULTS AND DISCUSSION**

#### **Introduction and Descriptive Data**

This chapter reports on the data analysis of the study and then discusses the results in relationship to the stated hypotheses. The intended purpose of the study was to determine any differences in mood states before participation and immediately following participation in a standard Bikram yoga class, among regular Bikram yoga participants. The intended purpose of this study was also to examine differences in mood states before participation and immediately following participation (or the equivalent duration of) in a standard Bikram yoga class, between regular Bikram yoga participants versus a sedentary population.

The study included 34 subjects, 15 male and 19 female. The participants in the control group totaled 18, 10 male and 8 female. The participants in the experimental group totaled 16, 5 male and 11 female. Age and demographic categorizations can be seen in Tables II and III.

**TABLE II****Total Subjects (N) and group (n) Descriptive Statistics**

| <b>Group</b> | <b>Age</b> | <b>N</b> | <b>Percent</b> |
|--------------|------------|----------|----------------|
| Control      |            | 18       |                |
|              | 25-29      | 6        | 33.3           |
|              | 30-34      | 1        | 5.6            |
|              | 35-39      | 1        | 5.6            |
|              | 40-44      | 4        | 22.2           |
|              | 45-49      | 1        | 5.6            |
|              | 50-54      | 3        | 16.7           |
|              | 55-59      | 1        | 5.6            |
|              | 60-64      | 1        | 5.6            |
| Experimental |            | 16       |                |
|              | 30-34      | 1        | 6.3            |
|              | 35-39      | 1        | 6.3            |
|              | 40-44      | 5        | 31.3           |
|              | 45-49      | 3        | 18.8           |
|              | 50-54      | 4        | 25             |
|              | 60-64      | 2        | 12.5           |
| Total        |            | 34       |                |
|              | 25-29      | 6        | 17.7           |
|              | 30-34      | 2        | 5.9            |
|              | 35-39      | 2        | 5.9            |
|              | 40-44      | 9        | 26.5           |
|              | 45-49      | 4        | 11.8           |
|              | 50-54      | 7        | 20.6           |
|              | 55-59      | 1        | 2.9            |
|              | 60-64      | 3        | 8.8            |

**TABLE III**  
**Subject Demographics**

|                       | <b>Experimental</b> | <b>Control</b> | <b>Total</b> |
|-----------------------|---------------------|----------------|--------------|
| <b>Race</b>           |                     |                |              |
| <b>Caucasian</b>      | 14                  | 17             | 31           |
| <b>Indian</b>         | 0                   | 1              | 1            |
| <b>Asian</b>          | 1                   | 0              | 1            |
| <b>Other</b>          | 1                   | 0              | 1            |
| <b>Marital Status</b> |                     |                |              |
| <b>Married</b>        | 12                  | 16             | 28           |
| <b>Single</b>         | 0                   | 1              | 1            |
| <b>Divorced</b>       | 4                   | 1              | 5            |
| <b>Education</b>      |                     |                |              |
| <b>H.S. Diploma</b>   | 1                   | 9              | 10           |
| <b>4 yr college</b>   | 10                  | 8              | 18           |
| <b>Grad School</b>    | 4                   | 1              | 5            |
| <b>Trade School</b>   | 1                   | 0              | 1            |
| <b>Income</b>         |                     |                |              |
| <b>&lt;20k/yr</b>     | 3                   | 0              | 3            |
| <b>21k-50k/yr</b>     | 2                   | 8              | 10           |
| <b>51k-75k/yr</b>     | 3                   | 4              | 7            |
| <b>76k-100k/yr</b>    | 2                   | 2              | 4            |
| <b>101k-150k/yr</b>   | 2                   | 2              | 4            |
| <b>151k-200k/yr</b>   | 1                   | 2              | 3            |
| <b>&gt;201k/yr</b>    | 3                   | 0              | 3            |

### Hypotheses

Two hypotheses were tested to determine if there were significant differences in individual mood state scores within the experimental group. Two hypotheses were tested to determine if there were significant differences in total mood disturbance scores within the experimental group. Two hypotheses were tested to determine if there were significant differences in individual mood state scores between the experimental group

and the control group both pre-intervention and post-intervention. A final two hypotheses were tested to determine if there were significant differences in total mood disturbance mood state scores between the experimental group and the control group both pre-intervention and post-intervention.

The following null hypotheses were tested at the .05 level of significance using a 2 x 2 repeated measures ANOVA (2 groups, 2 data points of time). Mood states were measured using the Profile of Mood States mood inventory survey.

### Results

#### TENSION

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale tension (Table IV). The post-test revealed that there were significant differences between the control and experimental group and within the experimental group (Tables IV and V). The experimental group (those participating in a standard Bikram yoga class) decreased in their level of tension while the control group did not.

**TABLE IV**

**Mean Pre-Test and Post-Test Mood State Scores for Tension**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST<br/>M±SD</b> | <b>POST-TEST<br/>M±SD</b> |
|--------------|----------|--------------------------|---------------------------|
| Control      | 18       | 10.5±5.58                | 8.4±6.64                  |
| Males        | 10       | 10.5±6.96                | 9.8±8.32                  |
| Females      | 8        | 10.5±3.62                | 6.8±3.45                  |
| Experimental | 16       | 10.2±6.60                | 3.6±4.50                  |
| Males        | 5        | 7.7±5.57                 | 1.8±3.54                  |
| Females      | 11       | 11.6±6.93                | 4.6±4.80                  |
| Total Group  | 34       | 10.4±6.00                | 6.1±6.12                  |

**TABLE V**  
**2 x 2 Repeated Measures ANOVA for Tension**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 112.0     | 1         | 112.0     | 2.03     | .164        |
| Error         | 1824.4    | 33        | 55.3      |          |             |
| Time          | 326.6     | 1         | 326.6     | 22.76    | .000        |
| Time x Group  | 89.8      | 1         | 89.8      | 6.26     | .017        |
| Error         | 473.5     | 33        | 14.4      |          |             |
| Total         | 2826.3    | 69        |           |          |             |

### DEPRESSION

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale depression (Table VI). The post-test revealed that there were no significant differences between the control and experimental groups and within the experimental group (Tables VI and VII).

**TABLE VI**  
**Mean Pre-Test and Post-Test Mood State Scores for Depression**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST</b><br><b>M±SD</b> | <b>POST-TEST</b><br><b>M±SD</b> |
|--------------|----------|--------------------------------|---------------------------------|
| Control      | 18       | 8.56±7.37                      | 6.33±6.40                       |
| Males        | 10       | 6.30±5.54                      | 6.00±6.46                       |
| Females      | 8        | 11.38±8.73                     | 6.75±6.74                       |
| Experimental | 16       | 8.00±5.24                      | 3.06±2.88                       |
| Males        | 5        | 5.83±4.40                      | 3.17±4.12                       |
| Females      | 11       | 9.18±5.47                      | 3.00±2.19                       |
| Total Group  | 34       | 8.29±6.34                      | 4.74±5.21                       |



**TABLE VII****2 x 2 Repeated Measures ANOVA for Depression**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 64.13     | 1         | 64.13     | 1.11     | .300        |
| Error         | 1907.36   | 33        | 57.8      |          |             |
| Time          | 224.317   | 1         | 224.317   | 25.880   |             |
| Time x Group  | 32.317    | 1         | 32.317    | 3.73     | .062        |
| Error         | 286.026   | 33        | 8.667     |          |             |
| Total         | 2514.15   | 69        |           |          |             |

**ANGER**

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale anger (Table IIX). The post-test revealed that there were no significant differences between the control and experimental groups and within the experimental group (Tables IIX and IX).

**TABLE IIX****Mean Pre-Test and Post-Test Mood State Scores for Anger**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST<br/>M±SD</b> | <b>POST-TEST<br/>M±SD</b> |
|--------------|----------|--------------------------|---------------------------|
| Control      | 18       | 10.39±7.22               | 6.72±7.44                 |
| Males        | 10       | 8.70±8.27                | 7.30±9.18                 |
| Females      | 8        | 12.5±5.43                | 6.00±5.01                 |
| Experimental | 16       | 7.47±7.44                | 2.29±3.58                 |
| Males        | 5        | 5.50±4.23                | 2.67±5.20                 |
| Females      | 11       | 8.55±8.72                | 2.09±2.63                 |
| Total Group  | 34       | 8.97±7.37                | 4.57±6.23                 |

**TABLE IX****2 x 2 Repeated Measures ANOVA for Anger**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 235.925   | 1         | 235.925   | 3.33     | .077        |
| Error         | 2335.42   | 33        | 70.77     |          |             |
| Time          | 341.850   | 1         | 341.850   | 19.31    |             |
| Time x Group  | 9.965     | 1         | 9.965     | .563     | .458        |
| Error         | 584.235   | 33        | 17.704    |          |             |
| Total         | 3507.395  | 69        |           |          |             |

**VIGOR**

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale vigor (Table X). The post-test revealed that there were significant differences between the control and experimental groups and within the experimental group (Tables X and XI). The experimental group (those participating in a standard Bikram yoga class) increased in their level of vigor while the control group did not.

**TABLE X****Mean Pre-Test and Post-Test Mood State Scores for Vigor**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST<br/>M±SD</b> | <b>POST-TEST<br/>M±SD</b> |
|--------------|----------|--------------------------|---------------------------|
| Control      | 18       | 15.89±5.79               | 15.17±7.58                |
| Males        | 10       | 17.2±6.34                | 16.4±6.75                 |
| Females      | 8        | 14.25±4.92               | 13.63±8.72                |
| Experimental | 16       | 17.82±5.69               | 21.82±6.41                |
| Males        | 5        | 19.0±6.66                | 22.83±8.59                |
| Females      | 11       | 17.18±5.33               | 21.27±5.27                |
| Total Group  | 34       | 16.83±5.74               | 18.4±7.71                 |

**TABLE XI****2 x 2 Repeated Measures ANOVA for Vigor**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 322.672   | 1         | 322.672   | 4.58     | .040        |
| Error         | 2326.413  | 33        | 70.5      |          |             |
| Time          | 46.97     | 1         | 46.97     | 3.926    | .056        |
| Time x Group  | 97.48     | 1         | 97.48     | 8.15     | .007        |
| Error         | 394.806   | 33        | 11.96     |          |             |
| Total         | 3188.341  | 69        |           |          |             |

**FATIGUE**

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale fatigue (Table XII). The post-test revealed that there were no significant differences between the control and experimental groups and within the experimental group (Tables XII and XIII).

**TABLE XII****Mean Pre-Test and Post-Test Mood State Scores for Fatigue**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST</b><br><b>M±SD</b> | <b>POST-TEST</b><br><b>M±SD</b> |
|--------------|----------|--------------------------------|---------------------------------|
| Control      | 18       | 10.06±6.12                     | 8.78±5.49                       |
| Males        | 10       | 8.30±5.06                      | 8.00±5.83                       |
| Females      | 8        | 12.25±6.94                     | 9.75±5.26                       |
| Experimental | 16       | 6.59±5.21                      | 3.18±3.61                       |
| Males        | 5        | 3.83±1.60                      | 2.50±2.07                       |
| Females      | 11       | 8.09±5.92                      | 3.55±4.28                       |
| Total Group  | 34       | 8.37±5.88                      | 6.06±5.41                       |

**TABLE XIII****2 x 2 Repeated Measures ANOVA for Fatigue**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 359.51    | 1         | 359.51    | 8.57     | .006        |
| Error         | 1384.78   | 33        | 41.96     |          |             |
| Time          | 96.14     | 1         | 96.14     | 7.78     | .009        |
| Time x Group  | 19.91     | 1         | 19.91     | 1.61     | .213        |
| Error         | 407.86    | 33        | 12.36     |          |             |
| Total         | 2268.2    | 69        |           |          |             |

**CONFUSION**

The pre-test revealed that there were no significant differences between the control and experimental groups for the mood subscale confusion (Table XIV). The post-test revealed that there were significant differences between the control and experimental groups and within the experimental group (Tables XIV and XV). The experimental group (those participating in a standard Bikram yoga class) decreased in their level of confusion while the control group did not.

**TABLE XIV****Mean Pre-Test and Post-Test Mood State Scores for Confusion**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST<br/>M±SD</b> | <b>POST-TEST<br/>M±SD</b> |
|--------------|----------|--------------------------|---------------------------|
| Control      | 18       | 6.50±4.46                | 6.00±4.12                 |
| Males        | 10       | 5.10±3.73                | 6.10±3.81                 |
| Females      | 8        | 8.25±4.92                | 5.88±4.73                 |
| Experimental | 16       | 7.47±4.33                | 4.00±2.26                 |
| Males        | 5        | 5.50±3.73                | 3.17±2.14                 |
| Females      | 11       | 8.55±4.41                | 4.45±2.30                 |
| Total Group  | 34       | 6.97±4.36                | 5.03±3.45                 |

**TABLE XV****2 x 2 Repeated Measures ANOVA for Confusion**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 4.63      | 1         | 4.63      | .179     | .68         |
| Error         | 853.37    | 33        | 25.86     |          |             |
| Time          | 68.92     | 1         | 68.92     | 14.64    | .001        |
| Time x Group  | 38.57     | 1         | 38.58     | 8.19     | .007        |
| Error         | 155.37    | 33        | 4.71      |          |             |
| Total         | 1120.86   | 69        |           |          |             |

**TOTAL MOOD DISTURBANCE**

The pre-test revealed that there were no significant differences between the control and experimental groups for the total mood disturbance score (Table XVI). The post-test revealed that there were significant differences between the control and experimental groups and within the experimental group (Tables XVI and XVII). The experimental group (those participating in a standard Bikram yoga class) improved in their total mood disturbance score while the control group did not.

**TABLE XVI****Mean Pre-Test and Post-Test Mood State Scores for Total Mood Disturbance**

| <b>GROUP</b> | <b>N</b> | <b>PRE-TEST<br/>M±SD</b> | <b>POST-TEST<br/>M±SD</b> |
|--------------|----------|--------------------------|---------------------------|
| Control      | 18       | 30.1±27.75               | 21.1±27.11                |
| Males        | 10       | 21.7±28.01               | 20.8±32.05                |
| Females      | 8        | 40.6±25.18               | 21.5±21.53                |
| Experimental | 16       | 21.9±25.11               | -5.6±18.12                |
| Males        | 5        | 9.3±18.00                | -9.5±22.37                |
| Females      | 11       | 28.8±26.45               | -3.6±16.16                |
| Total Group  | 34       | 26.1±26.44               | 8.1±26.57                 |

**TABLE XVII****2 x 2 Repeated Measures ANOVA for Total Mood Disturbance**

| <u>Source</u> | <u>SS</u> | <u>df</u> | <u>MS</u> | <u>F</u> | <u>sig.</u> |
|---------------|-----------|-----------|-----------|----------|-------------|
| Group         | 5333.02   | 1         | 5333.02   | 5.03     | .032        |
| Error         | 35025.32  | 33        | 1061.37   |          |             |
| Time          | 5852.03   | 1         | 5852.03   | 32.75    | .000        |
| Time x Group  | 1510.43   | 1         | 1510.43   | 8.45     | .006        |
| Error         | 5897.06   | 33        | 178.7     |          |             |
| Total         | 53617.86  | 69        |           |          |             |

**Discussion of Results**

This study compared the mood state scores of two groups, one sedentary (control group) and one active in Bikram yoga (experimental group), both before and immediately following participation in a standard Bikram yoga class (or the equivalent duration of) using the Profile of Mood States mood inventory survey. This section will expound upon the above strategies and compare the results to findings in the literature.

Based upon the initial findings in this study, overall, participation in Bikram yoga improves mood. However, a closer examination reveals some important findings that can help us understand the exact mood modifications that take place. The initial mood state scores, both individual and total mood disturbance, for both the control and experimental groups were not significantly different, meaning that initially, both groups had very similar mood states. However, upon completion of the intervention (either participation in a standard Bikram yoga class or passively reading for 90 minutes) the two groups' mood states showed significant differences in several areas. Upon completion of the standard Bikram yoga class, the experimental group showed improvements in tension, vigor, and confusion, as well as their overall total mood disturbance scores. Upon

completion of passively reading for 90 minutes, the control group showed no significant differences or changes from their initial mood state scores; neither the six subscale scores nor total mood disturbance scores.

## TIME

Although each subject was informed of the investigative procedures that would be used on the day of testing, few experimental group participants arrived 30 minutes prior to the start of class as was recommended. This caused the experimental group participants to feel hurried while filling out the initial POMS mood inventory survey. This could have affected their overall total mood disturbance scores, as well as the individual mood state scores of tension, depression, fatigue, and confusion. Those participants arriving with less than 10 minutes left before the start of class were not allowed to participate in the study, as they did not have adequate time to complete the initial survey. This contributed to the overall number of participants in the experimental group being less than hoped for, but did not affect the other experimental group participants nor the integrity of the study. For some of the experimental group participants, feeling hurried initially could have affected of their pre-test answers to the POMS mood inventory survey to reflect a less desirable mood state than what was reflected from their post-test answers to the POMS mood inventory survey as a more desirable mood state. This could have contributed to hypotheses two, four, six and eight being rejected because once the experimental group participated in class and became more focused and relaxed, their individual mood state scores and total mood disturbance scores improved.

## PROFILE OF MOOD STATES

This study used the Profile of Mood States mood inventory survey as the instrument for measuring participants' moods. This instrument proved to be very user-friendly and required very little explanation. Most participants, both from the experimental and control groups, completed the survey with ease. However, a few participants did have difficulty understanding what some of the various words that were used to describe feelings meant. Several participants also mentioned that the mood measuring instrument felt like "taking a test" and showed slight apprehension. This too could have affected some of both the experimental and control group participants' pre-test answers to the POMS mood inventory survey. This could have affected their individual mood state scores of confusion as well as their total mood disturbance score. For the control group, if this did affect their answers to the POMS then it did so both prior to and following the intervention. For the experimental group, this influence of "apprehension" regarding completing the POMS could have contributed to their less desirable mood state score of confusion prior to the intervention. Perhaps the time spent in the yoga class helped to provide clarity for the experimental group participants that caused them to have significantly different mood state scores of confusion post-intervention. This change in the mood state score of confusion for the experimental group to a more desirable level could also be contributed to the participants being more familiar with the testing instrument, since they had just used the same instrument 90 minutes earlier. This seems unlikely, though, because if that were the case, the control group should have experienced similar effects but they did not.



## RECRUITMENT

The recruitment process in this study involved posting fliers and sending out company-wide memos with specific information regarding the study and requirements for participants. This method proved to be mostly successful, as there were many qualified participants, however some of the volunteer participants (specifically in the experimental group) did not meet the qualifying criteria for participation in the study. Those not meeting the criteria were not allowed to participate in the study, thus lowering the overall number of participants from the anticipated number, but not affecting the other participants or the integrity of the study.

## IMPLICATIONS

The findings of this study concur with the findings of similar research that has been previously conducted (Herrick, Ainsworth 2000). The practice of yoga, in this particular study Bikram yoga, can improve individual mood states as well as overall mood. This study found that the experimental groups' individual mood state scores of tension, vigor, and confusion all were significantly different at the post-test. This study also found that the experimental groups' total mood disturbance scores were significantly different at the post-test. Both of these show positive mood enhancements in the group that participated in Bikram yoga. These positive mood enhancements were not present in the control group who did not participate in yoga. Because the practice of yoga is a combination of relaxation, mind-body connection, and physical exertion, it seems very likely that the practitioner would experience noticeable mood improvements, as have been seen in this study.

## **CHAPTER V**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **Introduction**

The purpose of this chapter is to summarize the findings outlined in the previous chapter; discuss the conclusions that were drawn from the study; and make recommendations for future research in the area of yoga and mood states. The findings and conclusions were based upon data gathered from both an experimental and control group over three days. The purpose of this study was to determine differences in mood states before participation and immediately following participation in a standard Bikram yoga class, among regular Bikram yoga participants. The purpose of this study was also to examine differences in mood states before participation and immediately following participation (or the equivalent duration of) in a standard Bikram yoga class, between regular Bikram yoga participants versus a sedentary population.

The study included 34 subjects, 15 male and 19 female. The sedentary or control group consisted of 18 total subjects and the yoga or experimental group consisted of 16 total subjects. Each subject initially completed the Profile of Mood States mood inventory survey before either participating in a standard Bikram yoga class (experimental group) or passively reading for 90 minutes (control group). Upon the completion of either the standard Bikram yoga class or passively reading, each subject again completed the Profile of Mood States mood inventory survey.

## **Summary**

Two hypotheses were tested to determine if there were significant differences in individual mood state scores within the experimental group. Two hypotheses were tested to determine if there were significant differences in total mood disturbance scores within the experimental group. Two hypotheses were tested to determine if there were significant differences in individual mood state scores between the experimental group and the control group both pre-intervention and post-intervention. A final two hypotheses were tested to determine if there were significant differences in total mood disturbance mood state scores between the experimental group and the control group both pre-intervention and post-intervention. Repeated measures of analysis (ANOVA) were used to analyze the hypotheses while additional analysis was done using a Neuman-Keuls range test.

The following null hypotheses were tested at the .05 level of significance. Investigation of each hypothesis was made on comparison between and within the two groups over the intervention period.

Ho1: There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the pre-test in the experimental group. Hypothesis was accepted.

Ho2: There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the post-test in the experimental group. Hypothesis was rejected.

**Ho3: There will be no significant differences in total mood disturbance scores at the pre-test in the experimental group. Hypothesis was accepted.**

**Ho4: There will be no significant differences in total mood disturbance scores at the post-test in the experimental group. Hypothesis was rejected.**

**Ho5: There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the pre-test between the experimental and control group. Hypothesis was accepted.**

**Ho6: There will be no significant differences in individual mood state scores of tension, depression, anger, vigor, fatigue, and confusion at the post-test between the experimental and control group. Hypothesis was rejected.**

**Ho7: There will be no significant differences in total mood disturbance scores at the pre-test between the experimental and control group. Hypothesis was accepted.**

**Ho8: There will be no significant differences in total mood disturbance scores at the post-test between the experimental and control group. Hypothesis was rejected.**

## **Conclusions**

Because of the findings of this research involving participation in Bikram yoga and its implications on mood, as well as previous supporting research, it is recommended that participation in Bikram yoga could be used as a mood enhancing modality. Bikram yoga participation could be used as a means of improving the individual mood states of tension, vigor, and confusion as well as improving total mood.

## **Recommendations for Future Studies**

Although this study is unique in comparison to the current literature regarding Bikram yoga and mood states, it has shown strong indicators of positive mood benefits that are associated with participation in Bikram yoga. In many ways, this study may be viewed as a pilot study that can assist future researchers in studying this topic. Listed below are recommendations and ideas for future exploration:

1. A similar study needs to be conducted using a much larger experimental and control group.
2. A similar study needs to be conducted using another instrument that measures mood states.
3. A similar study needs to be conducted using additional instruments to measure stress levels and self-efficacy in conjunction with mood states.
4. A similar study needs to be conducted that measures mood states in males versus females in conjunction with yoga participation.
5. A similar study needs to be conducted using another style of yoga, to better understand how each specific style of yoga might influence mood.

6. A similar study needs to be conducted that also measures physiological variables in conjunction with mood states.

## REFERENCES

- American College of Sports Medicine (2000). *ACSM guidelines for testing and exercise prescription, 6<sup>th</sup> edition*. Baltimore, MD: Lippincott, Williams & Wilkins.
- Adams, J. (2003). Exploring yoga to relieve post-menopausal symptoms. *Holistic Nursing Practice, 17*, 166-167
- Arent, S., Etnier, J. (2000). The effects of exercise on mood in older adults : A meta analytic review. *Journal of Aging and Physical Activity, 8*, 407-430.
- Australian Nursing Federation. (2001). Exercise improves mood. *Australian Nursing Journal, 8*, 16-21.
- Berger, B.G., Pargman, D., & Weinburg, R.S. (2002). *Foundations of Exercise Psychology*. Morgantown, WV: Fitness Information Technology, Inc.
- Birkel, D. (1998). Activities for the older adult: Integration of the body and the mind. *Journal of Physical Education, Recreation & Dance, 69*, 23-28.
- Birkel, D. (2000). Hatha yoga: Improved vital capacity of college students. *Alternative Therapies in Health and Medicine, 6*, 55-63.
- Butryn, T., Furst, D. (2003). The effects of park and urban settings on the moods and cognitive strategies of female runners. *Journal of Sport Behavior, 26*, 335-346.
- Choudhury, B. (2004). Bikram yoga. *YogaExpo™*  
[www.yogaexpo.com/yoga](http://www.yogaexpo.com/yoga)
- Conboy, J. (1994). The effects of exercise withdrawal on mood states in runners. *Journal of Sport Behavior, 17*, 188-204.
- Da Costa, D., Dobkin, P., Dritsa, M., Fitzcharles, M. (2001). The relationship between exercise participation and depressed mood in women with fibromyalgia. *Psychology, Health and Medicine, 6*, 301-311.
- Greendale, G., McDivit, A., Carpenter, A., Seeger, L., Huang, M. (2002). Yoga for women with hyperkyphosis: Results of a pilot study. *American Journal of Public Health, 92*, 1611-1614.
- Harrelson, G., Swann, E. (2003). Yoga, Part I: An introduction. *Alternative & Complementary Concepts, 8*, 32-34.

- Heilbronn, F. (2000). The use of hatha yoga as a strategy for coping with stress in management development. *Management Education and Development*, 23, 131-139.
- Herrick, C., Ainsworth, A. (2000). Invest in yourself: Yoga as a self-care strategy. *Nursing Forum*, 35, 32-36.
- Ives, J., Sosnoff, J. (2000). Beyond the mind-body exercise hype. *The Physician and Sportsmedicine*, 28, 67-81.
- Lane, A., Crone-Grant, D., Lane, H. (2002). Mood changes following exercise. *Perceptual and Motor Skills*, 94, 732-734.
- Leveille, S., Cohen-Mansfield, J., Guralnik, J. (2003). The impact of chronic musculoskeletal pain on exercise attitudes, self-efficacy, and physical activity. *Journal of Aging & Physical Activity*, 11, 275-284.
- Mack, M., Huddleston, S. (2000). Mood state changes of students enrolled in physical activity classes. *Perceptual and Motor Skills*, 90, 911-914.
- Plante, T., Rodin, J. (1990). Physical fitness and enhanced psychological health. *Current Psychology*, 9, 3-25.
- Reale, E. (2003). Yoga for health and vitality. *Australian Nursing Journal*, 10, 31.
- Rehor, P., Dunnagan, T., Stewart, C., Cooley, D. (2001). Alteration of mood state after a single bout of noncompetitive and competitive exercise programs. *Perceptual and Motor Skills*, 93, 249-256.
- Rudolph, D., Kim, J. (1996). Mood responses to recreational sport and exercise in a Korean sample. *Journal of Social Behavior & Personality*, 11, 841-850.
- Russell, W., Pritschet, B., Frost, B., Emmett, J., Pelley, T., Black, J., Owen, J. (2003). A comparison of post-exercise mood enhancement across common exercise distraction activities. *Journal of Sport Behavior*, 26, 368-384.
- Russinova, Z., Wewiorksi, N., Cash, D. (2002). Use of alternative health care practices by persons with serious mental illness: Perceived benefits. *American Journal of Public Health*, 92, 1600-1603.
- Snow, A., LeUnes, A. (1994). Characteristics of sports research using the profile of mood states. *Journal of Sport Behavior*, 17, 207-211.
- Spicuzza, L., Gabutti, A., Porta, C., Montano, N., Bernardi, L. (2000). Yoga and chemoflex response to hypoxia and hypercapnia. *The Lancet*, 356, 1495-1498.



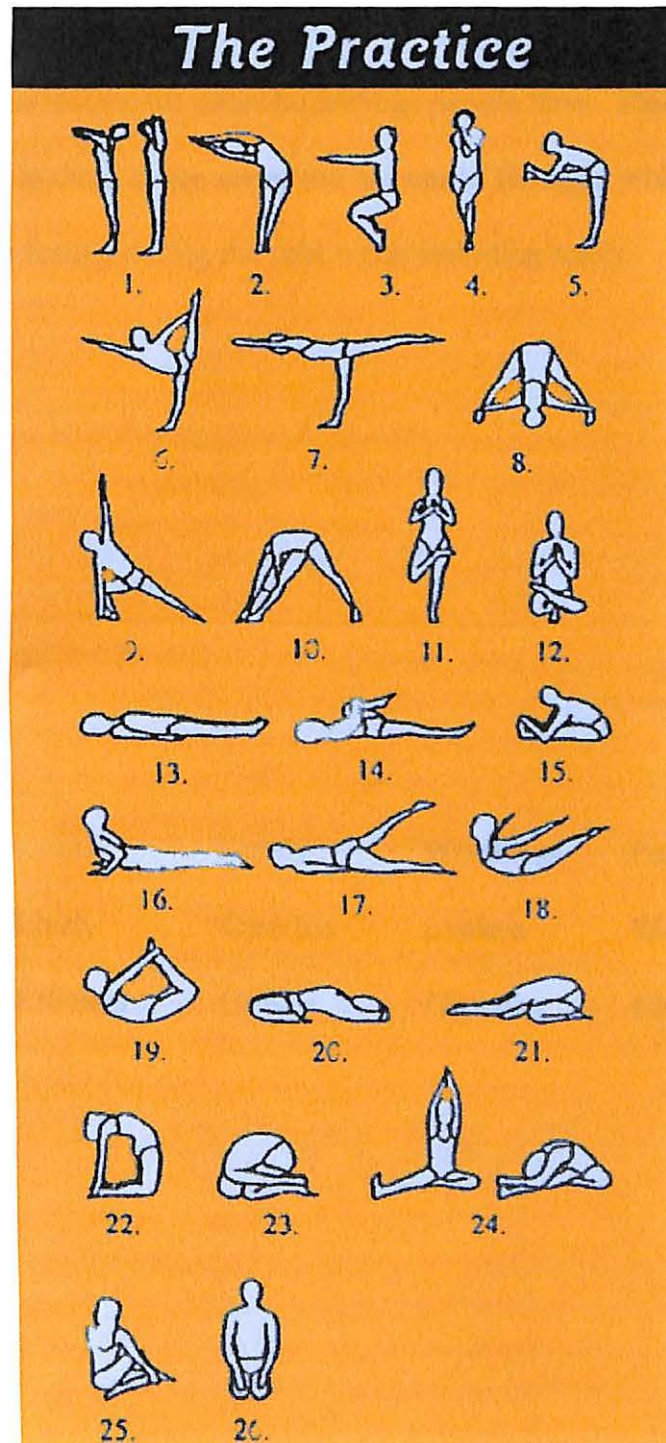
Szabo, A. (2003). The acute effects of humor and exercise on mood and anxiety. *Journal of Leisure Research, 35*, 152-162.

Tobar, D., Stegner, A., Kane, M. (1999). The use of generalizability theory in examining the dependability of scores on the profile of mood states. *Measurement in Physical Education & Exercise Science, 3*, 141-157.

Turnbull, M., Wolfson, S. (2002). Effects of exercise and outcome feedback on mood: Evidence for misattribution. *Journal of Sport Behavior, 25*, 394-406.

## APPENDIX A

### Bikram Yoga Posture Sequence Diagrams



## **APPENDIX B**

### **Testing Instrument**

#### **Profile of Mood States**

##### **Sample Instructions:**

Below is a list of words that describe feelings people have. Please read each one carefully. Then fill in ONE space under the answer to the right which best describes how you have been feeling during the past week including today.

##### **Sample Scale:**

0 = Not at all

1 = A little

2 = Moderately

3 = Quite a bit

4 = Extremely

##### **Sample Adjectives:**

|          |           |          |           |        |
|----------|-----------|----------|-----------|--------|
| Tense    | Uneasy    | Lonely   | Worthless | Peeved |
| Deceived | Lively    | Carefree | Listless  | Weary  |
| Muddled  | Efficient | Uneasy   | Grouchy   | Gloomy |

**APPENDIX C**

**1. Are you male or female? \_\_\_\_\_**

**2. Which classification best describes your age?**

- 18-24 \_\_\_\_\_
- 25-29 \_\_\_\_\_
- 30-34 \_\_\_\_\_
- 35-39 \_\_\_\_\_
- 40-44 \_\_\_\_\_
- 45-49 \_\_\_\_\_
- 50-54 \_\_\_\_\_
- 55-59 \_\_\_\_\_
- 60-64 \_\_\_\_\_
- 65-69 \_\_\_\_\_
- 70-74 \_\_\_\_\_
- 75-79 \_\_\_\_\_
- 80+ \_\_\_\_\_

**3. Which classification best describes your race?**

- Caucasian \_\_\_\_\_
- African American \_\_\_\_\_
- American Indian \_\_\_\_\_
- Asian \_\_\_\_\_
- Other \_\_\_\_\_

**4. Which classification best describes your annual income?**

- Under \$20,000 \_\_\_\_\_
- \$21,000-\$50,000 \_\_\_\_\_
- \$51,000-\$75,000 \_\_\_\_\_
- \$76,000-\$100,000 \_\_\_\_\_
- \$101,000-\$150,000 \_\_\_\_\_
- \$151,000-\$200,000 \_\_\_\_\_
- Over \$201,000 \_\_\_\_\_

**5. Which classification best describes your level of education?**

- H.S. Diploma/GED \_\_\_\_\_
- 4-year college degree \_\_\_\_\_
- Graduate degree(s) \_\_\_\_\_
- Technical/Trade school \_\_\_\_\_

**6. Which classification best describes your marital status?**

- Single \_\_\_\_\_
- Married \_\_\_\_\_
- Divorced \_\_\_\_\_
- Widowed \_\_\_\_\_

## **APPENDIX D**

### **INFORMED CONSENT**

#### **A. AUTHORIZATION**

I, \_\_\_\_\_, hereby authorize or direct Carri A. Lewis, or associates or assistants of her choosing, to perform the following treatment or procedure as part of a study by Oklahoma State University determining relationships between Bikram yoga and mood states in the adult population.

#### **B. DESCRIPTION OF RESEARCH AND ASSOCIATED RISKS/BENEFITS**

1. Bikram Yoga and Mood States in Adults.
2. This study, conducted by Oklahoma State University graduate student Carri A. Lewis, involves research using human subjects that has been approved through the Oklahoma State University Institutional Review Board.
3. The purpose of this research is to determine any relationships among participation in Bikram yoga and mood states in the adult population. The expected duration for subjects' participation is estimated at two hours.
4. Each participant will initially complete a demographic survey regarding age, gender, ethnicity, socioeconomic status, and marital status. Each participant will also complete the Profile of Mood States inventory survey prior to (in the case of the yoga participants) and immediately following participation in a Bikram yoga class. The sedentary population will complete the Profile of Mood States inventory survey at the same actual times the yoga participants complete it, however they will not be engaging in any type of physical activity between survey times.
5. There will not be any experimental procedures used.
6. There are no foreseeable risks or discomforts anticipated for the participants in this study, other than those inherent to participation in a Bikram yoga class.
7. By participating in this study, the subjects will aid in the furtherance of research in a relatively unknown area. This could potentially benefit society as a whole by increasing the knowledge regarding the relationships between Bikram yoga and mood states.
8. Confidentiality will be protected by eliminating the use of names. Each participant will be assigned a number, instead of using their name. No identifications will be made when discussing the findings of the research. The primary investigator, Carri A. Lewis, will be the only researcher viewing the data.

9. For more information regarding the following, please contact:
- i. Research inquiries: Carri A. Lewis 918-798-0316
  - ii. Research subjects' rights: IRB office 405-744-5700
  - iii. Additional contact: Sharon Bacher, IRB Executive Secretary, Oklahoma State Univeristy, 415 Whitehurst, Stillwater, OK 74078. Phone: 405-744-5700.

**C. VOLUNTARY PARTICIPATION**

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I also understand that I am free to withdraw my consent and end my participation in this project at any time without penalty after I notify the project director (Carri A. Lewis 918-798-0316).

**D. CONSENT DOCUMENTATION FOR WRITTEN INFORMED CONSENT**

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: \_\_\_\_\_ Time: \_\_\_\_\_ (a.m/p.m)

|   |           |
|---|-----------|
| Name (typed)  | Signature |
| Signature of person authorized to sign for subject, if required |           |

Witness(es) if required: \_\_\_\_\_  
 \_\_\_\_\_

I certify that I have personally explained all elements of this form to the subject or his/her representative before requesting the subject or his/her representative to sign it.

Signed: \_\_\_\_\_  
 Project director Carri A. Lewis

## **APPENDIX E**

The approval form from the Oklahoma State University Institutional Review Board that was obtained prior to conducting this research is shown on the following page.

**Oklahoma State University  
Institutional Review Board**

**Protocol Expires: 3/24/2005**

Date: Wednesday, April 21, 2004

IRB Application No ED0493

Proposal Title: Bikram Yoga and Mood States in Adults

Principal  
Investigator(s):

Carrie A Lewis  
8751 N. 97th E. Ave #803  
Owasso, OK 74055

Steven Edwards  
432 Willard  
Stillwater, OK 74078

Reviewed and  
Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

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Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact me in 415 Whitehurst (phone: 405-744-5700, colson@okstate.edu).

Sincerely,



Carol Olson, Chair  
Institutional Review Board



VITA



**Carri Ann Lewis**

**Candidate for the Degree of**

**Master of Science**

**Thesis: BIKRAM YOGA AND MOOD STATES IN ADULTS**

**Major Field: Health and Human Performance**

**Biographical:**

**Education:** Received Bachelor of Science degree in Health Promotion from Oklahoma State University, Stillwater, Oklahoma in December 2002. Completed the requirements for the Master of Science degree with a major in Health Promotion at Oklahoma State University in December, 2004.

**Experience:** Served as a graduate teaching assistant at Oklahoma State University and as a Fitness Instructor with Hillcrest Exercise and Lifestyle Programs.

**Professional Memberships:** American College of Sports Medicine