

MOOD AND AFFECTIVE STATE RESPONSE TO AN
ACUTE BOUT OF NON-COMBATIVE
BOXING TRAINING

By

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CHAPTER I

INTRODUCTION

Today, thanks in large part to immunization and antibiotics and public health campaigns (Insel & Roth, 2004), people are living longer than ever before. In the year 2000, the average life expectancy for an American female was 79.5 years while it was 74.1 years for an American male (CDC, 2004). Compared to an overall average life expectancy of only 47.3 years in 1900 (Insel & Roth, 2004), this nearly doubled increase in years of life is clearly significant. Aside from this focus on quantity of life, however, it is also important to strive for heightened quality of life. If quality of life is poor, living longer takes on less meaning. Thus, helping individuals improve their quality of life should be a key focus for health and fitness professionals.

One way to improve quality of life is to improve mood and affective states. Mood states can be defined as transient, subjective feelings (Berger, Pargman, & Weinberg, 2002). Affect is more global and can be broken down into two primary dimensions—positive and negative affect. Positive affect is a reflection of the “extent to which a person feels enthusiastic, active, and alert.” High energy, full concentration, and pleasurable engagement characterize an individual with high positive affect while sadness and lethargy characterize an individual with low positive affect. Negative affect is defined as “a general dimension of subjective distress and unpleasurable engagement that subsumes

a variety of aversive mood states, including anger, contempt, disgust, guilt, fear and nervousness.” Accordingly, a person with low negative affect would be more calm and serene than a person with higher negative affect (Watson, Clark, & Tellegen, 1988). Thus, when relating affective states to mood states, it is apparent that a number of mood states influence positive affect while several others influence negative affect (Berger et al., 2002).

But, how might someone improve mood and affective states? As the reviewed literature in Chapter II of this study suggests, participation in physical activity may be one way individuals can manipulate their mood and affective states. Among the physical activities shown to enhance mood and affective states are weight training (Lane, Crone-Grant, & Lane, 2002; McGowan, Talton & Thompson, 1996; Rehor, Dunnagan, Stewart, & Cooley, 2001), circuit training (Rehor, Dunnagan, Stewart, & Cooley, 2001), jogging (Berger & Owen, 1998), running (Szabo, Frenkl, Janek, Kalman, & Laszay, 1998), racquetball (Rehor, Dunnagan, Stewart, & Cooley, 2001), step aerobics (Kennedy & Newton, 1997), cycling and cycle ergometry (Daley & Welch, 2004; Hansen, Stevens, & Coast, 2001; Motl, Berger, & Wilson, 1996), and Taekwondo (Toskovic, 2001). The present study was conducted to determine if non-combative boxing training could be added to this inventory of potential mood and affective state enhancers.

For favorable mood changes to occur, it is evident that people must enjoy the activity in which they are participating (Berger et al., 2002). However, an activity that one person deems enjoyable may not be enjoyable to another person. Consequently, it is important that individuals are provided with options so that they might select an activity that is appropriate for the individuals’ personalities and interests. Because non-combative

boxing training may be of interest to some individuals, it serves as a potential activity that interested individuals could integrate into their lives in an effort to optimize their overall quality of life. With improvements in quality of life, the longer life expectancy Americans look forward to today becomes considerably more meaningful.

Statement of the Problem

The problem in this study was to examine the influence of a single session of non-combative boxing training on mood and affective states in male and female subjects between the ages of 18 and 24 years. The researcher compared the non-combative boxing training group to a control group that watched a health-related video. The Profile of Mood States (POMS) was used to measure levels of Tension, Depression, Anger, Vigor, Fatigue, and Confusion before and after the non-combative boxing training and control interventions. The Positive and Negative Affect Schedule (PANAS) was used to measure positive and negative affective states before and after the non-combative boxing training and control interventions.

Purpose of the Study

Many arguments can and have been made against participation in competitive boxing. Far less research has been conducted on the benefits of boxing, presumably because the negative aspects seemingly outweigh the positive aspects. However, it is typically the combative element of boxing that sparks so much controversy. If the combative element of boxing were removed and individuals engaged in boxing training minus any person-to-person contact, such as sparring or actual boxing bouts, could

additional positive aspects be revealed? Specifically, what effects does non-combative boxing training have on mood and affective states? The purpose of the present study was to address this latter question. It was the goal of the researcher to 1.) identify a positive aspect of boxing training and 2.) identify another physical activity that has the potential to enhance mood and affective states.

Significance of the Study

Exercise psychologists as well as other professionals in the health and fitness industry are in a position to introduce people to activities that may alter their mood and affective states. It is important that people be interested in and enjoy the activity in which they are participating for favorable mood and affective state changes to occur.

Consequently, having several physical activities from which these individuals can choose is essential. Based on the investigator's interactions with people, non-combative boxing training appears to be an appealing activity for numerous individuals. Since the present study reveals that favorable mood and affective state changes may result from non-combative boxing training, health and fitness professionals could recommend non-combative boxing training as an option for those wishing to improve their mood and affective states. If non-combative boxing training turns out to be an activity that such individuals enjoy and favorable changes in mood and affective states result, these individuals might also find that their psychological health as well as their overall quality of life also improves.

Assumptions

The following assumptions were made:

1. Results of the POMS were an accurate reflection of subjects' mood states at the time of completion.
2. Results of the PANAS were an accurate reflection of subjects' affective states at the time of completion.
3. The subjects were honest when completing the Physical Activity Readiness Questionnaire (PAR-Q).
4. The subjects were honest and accurate when reporting that they were moderately active prior to participation in the study.
5. The subjects viewed the non-combative boxing training as non-competitive.

Limitations

The research may be limited by the following:

1. The POMS is a self-report survey.
2. The PANAS is a self-report survey.
3. Experimental subjects were significantly different from control subjects on the Depression and Anger subscales of the POMS and on the Negative Affect dimension of the PANAS prior to being exposed to their respective intervention.

Delimitations

1. Subjects were male and female students at Oklahoma State University between the ages of 18 and 24 years.

2. Subjects were required to complete the PAR-Q prior to participation in this study, with the understanding that any subject who showed contraindications to physical activity based on the PAR-Q would be excluded from the study.
3. Subjects were limited to individuals who indicated that they were currently moderately active.
4. Data was collected from subjects on only one occasion.

Hypotheses

The following null hypotheses were investigated:

H₀1: There will be no significant differences between the experimental group and the control group on any pre-intervention POMS subscores.

H₀2: There will be no significant differences between the experimental group and the control group on any post-intervention POMS subscores.

H₀3: There will be no significant differences between the experimental group and the control group on any pre-intervention PANAS scores.

H₀4: There will be no significant differences between the experimental group and the control group on any post-intervention PANAS scores.

Definition of Terms

Aerobic activity—Any activity that utilizes large amounts of oxygen and can be continued for a relatively long period of time. Examples of aerobic activity include jogging and long-distance cycling and swimming (Moran & McGlynn, 2001).

Affect—Affect is “a term denoting broad psychological states of positive and negative feelings that change from moment to moment” (Berger et al., 2002) Affect can be broken down into two major dimensions—positive affect and negative affect. Positive affect is a reflection of the “extent to which a person feels enthusiastic, active, and alert” while negative affect is defined as “a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear and nervousness” (Watson et al., 1988).

Circuit training—Circuit training refers to a type of physical activity in which intervals of weight training activity are alternated with intervals of aerobic activity. For instance, an individual might perform a weight training exercise for 1 minute followed by aerobic activity for 1 minute and continue this alteration until the bout of circuit training is complete (Rehor et al., 2001).

Cycle ergometry—Cycle ergometry involves the use of a stationary bicycle that is equipped with a device that is capable of eliciting and measuring varying workloads; it allows for easy adjustment of workload (Hatfield, 2004).

Exercise—“Planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness” (American College of Sports Medicine, 2000).

Exercise-Induced Feeling Inventory (EFI)—This is a survey designed specifically to measure feeling states in response to physical activity. The EFI contains 4 subscales—Revitalization, Tranquility, Positive Engagement, and Physical Exhaustion—with 3 adjectives for each subscale. For each adjective, individuals completing the EFI are asked to rate on a scale of 1 to 6 how they feel, with 1 being “do not feel” and 6 being “feel very strongly” (Berger et al., 2002).

Graded exercise test—A treadmill or cycle ergometer test where workload is gradually increased until an increase in workload no longer results in a further increase in oxygen consumption (Hatfield, 2004).

Interval training—Type of physical activity that “alternates between two different activities, such as walking and jogging, or between two different rates of speed” (Dictionary.com, 2004).

Moderately Active—Participation in physical activity on at least three days per week, for at least 30 minutes per bout, and at a moderate level of intensity. Generally speaking, moderate intensity would be comparable to walking 3 to 4 miles per hour (American College of Sports Medicine, 2000). For the present study, the intensity of the non-

combative boxing training was measured using the percentage of maximum heart rate. Moderate-intensity non-combative boxing training was that eliciting a heart rate between 60% and 80% of predicted maximal heart rate. Predicted maximal heart rate can be calculated by subtracting a person's age from 220 (Berger et al., 2002).

Mood states—Transient, subjective feelings that have “cognitive, behavioral, neurochemical, and psychophysiological manifestations” (Berger et al., 2002).

Non-combative boxing training—Typically, boxing training involves sparring in addition to other activities where interpersonal combat is not involved, such as bag punching, jump roping, shadow boxing, and footwork drills. Non-combative boxing training refers to boxing training that is free of sparring or any other type of physical contact with another individual.

Physical Activity—“Bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure” (American College of Sports Medicine, 2000).

Physical Activity Readiness Questionnaire (PAR-Q)—This questionnaire is designed to identify individuals who have contraindications to increasing levels of physical activity and who should seek medical clearance from a physician before becoming more active (American College of Sports Medicine, 2000).

Physical fitness—“A set of attributes that people have or achieve that relates to the ability to perform physical activity” (American College of Sports Medicine, 2000).

Positive and Negative Affect Schedule (PANAS)—This survey is used to measure two global and separate dimensions of mood—positive affect and negative affect. It contains 20 adjectives, 10 pertaining to positive affect and ten pertaining to negative affect. Individuals completing the PANAS are asked to rate on a scale of 1 to 5 how each adjective relates to them, with 1 being “very slightly or not at all” and 5 being “extremely” (Watson et al., 1988).

Profile of Mood States (POMS)—This survey is used to measure six subscales of mood states. The subscales include Tension, Depression, Anger, Vigor, Fatigue, and Confusion. There are a total of 65 adjectives on the POMS, with 7 to 15 adjectives comprising each subscale. Individuals completing the POMS are asked to rate how strongly each adjective applies to them on a scale of 0 to 4, with 0 being “not at all” and 4 being “extremely.” In addition to discerning individual subscores, Total Mood Disturbance can also be evaluated. Total Mood Disturbance is calculated by adding the subscores for Tension, Depression, Anger, Fatigue, and Confusion and then subtracting the Vigor subscore from this total (McNair, Lorr, & Droppleman, 1971).

Profile of Mood States—Adolescents/Brumel University Mood Scale (POMS-A/BRUMS)—This survey was originally called the Profile of Mood States—Adolescents but has since been renamed the Brumel University Mood Scale (Lane et al., 2002). It is a

shortened version of the POMS survey. Like the POMS, it contains the same subscales of Tension, Depression, Anger, Fatigue, Vigor, and Confusion, but only 24 adjectives are used compared to the 65 used with the POMS. Individuals completing the POMS-A/BRUMS are asked to rate how strongly each adjective applies to them on a scale of 0 to 4, with 0 being “not at all” and 4 being “extremely” (Terry, Lane, Lane, & Keohane, 1999).

Racquetball—“A sport played with racquets and a hollow, rubber ball on a special indoor court” (Webster’s Online Dictionary, 2004).

Self-efficacy—“The belief in one’s ability to take action and perform a specific behavior” (Insel & Roth, 2004).

Shadow boxing—“Sparring with an imaginary opponent” (Webster’s Online Dictionary, 2004).

Sparring—A component of boxing training in which two individuals engage in combative boxing in the boxing ring often in preparation for a competitive boxing bout. A key difference between sparring and a boxing bout is that sparring is practice and is not judged; therefore, sparring does not affect a boxer’s win-loss record.

State-Trait Anxiety Inventory (STAI)—This survey is designed to measure anxiety and includes two scales—one to measure state anxiety and another to measure trait anxiety.

The State Anxiety scale is used to assess how anxious a person feels at that moment while the Trait Anxiety scale is used to assess a person's general level of anxiety. Each scale contains 20 statements, and individuals completing the STAI are asked to indicate how well each statement relates to them on a scale of 1 to 4, with 1 being "not at all" and 4 being "very much so" (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

Step aerobics—"A type of exercise usually done to music in which you quickly step on and off a slightly raised surface" (Cambridge Advanced Learner's Dictionary, 2004).

Subjective Exercise Experience Scale (SEES)—This is a survey designed specifically to measure mood response to physical activity. The SEES is divided into 3 subscales—Positive Well-being, Psychological Distress, and Fatigue. It contains 12 adjectives, 4 for each subscale. Individuals completing the SEES are asked to rate the degree to which each adjective applies to them on a scale of 1 to 7, with 1 being "not at all" and 7 being "very much so" (Berger et al., 2002).

Taekwondo—Type of martial art training that often involves moving kicks, punches, and blocking. These motions can be performed alone or in varied combinations (Toskovic, 2001).

Weight training—"Exercise program using free or stationary weights for the purpose of increasing strength, endurance, power, skill, and flexibility" (Moran & McGlynn, 2001).

CHAPTER II

REVIEW OF LITERATURE

Introduction

Sports and various types of physical activity have inherent risks, and boxing is certainly no exception. In fact, compared to other athletes, boxers were reported to be the most frequently injured athletes in the United States in 2002 (American Sports Data, Inc., 2005). Not surprisingly then, much of the boxing-related research seems to focus on the negative aspects of this sport (Hazar, Beyleroglu, Subasi, & Or, 2002; Jordan, Matser, Zimmerman, & Zazula, 1996; Matser, Kessels, Lezak, Troost, & Jordan, 2000; Zazryn, Finch & McCrory, 2003). Far less research has looked at more positive aspects of participation in boxing and boxing training (Samuels & Gibb, 2002). The present study sought to add to the potential positive aspects of boxing, specifically non-combative boxing training, by examining the effects of non-combative boxing training on mood and affective states. No study has focused specifically on the impact of boxing or boxing training on mood and affective states, but researchers have examined the effect of boxing on at least one other dimension of psychological health—self-efficacy (Samuels & Gibb, 2002). In addition, there is a much greater body of research investigating the effects of other types of physical activity on mood and affective states (Annesi, 2002; Berger & Owen, 1998; Daley & Welch, 2004; Hansen et al., 2001; Kennedy & Newton, 1997;

Lane et al., 2002; McGowan et al., 1996; Motl et al., 1996; Rehor et al., 2001; Szabo et al., 1998; Toskovic, 2001). Some of the more current research on boxing and boxing training is reviewed first. Then, a review of recent studies examining the effect of physical activity on mood and affective states follows. Finally, literature pertaining to intensity and duration of physical activity in relation to mood and affective states is discussed.

Negative Aspects of Boxing

Neurological damage resulting from boxing competition and sparring has been an area of interest and concern in boxing research. Evidence suggests that impaired cognitive function may be both an acute (Matser et al., 2000) and chronic (Jordan et al., 1996) consequence of participation in boxing. For instance, Jordan and colleagues (1996) investigated cognitive function via neuropsychological testing in professional boxers. More specifically, these researchers selected neuropsychological tests that measured general intelligence, language skills, constructional skills, attention and concentration, memory, visual motor coordination, concept formation, cognitive stability and flexibility, and planning. Jordan and associates also obtained information from the boxers pertaining to their careers and training practices. Among the variables of interest were age, amateur and professional boxing record, length of career, history of knockout or technical knockout, and sparring exposure. Of these variables, the only one found to negatively affect performance on the neuropsychological tests was the amount of sparring. The specific cognitive functions affected were attention, concentration, and memory.

While the Jordan et al. (1996) study focused on the chronic effects of boxing on cognitive functioning, a more recent study by Matser and cohorts (2000) took an acute approach. These researchers compared the cognitive functioning in male amateur boxers to male controls. For the boxers, neuropsychological testing was conducted both before and after a boxing bout. The control group underwent neuropsychological testing both before and after completing a bag-punching task. Among the areas of cognitive functioning assessed in this study were word-learning skills, planning and organization, visual motor coordination, attention and concentration, and memory. Compared to the control group, the boxers exhibited cognitive impairments in planning, attention, and memory. Consequently, both the Jordan et al. (1996) study and the Matser et al. (2000) study support the notion of boxing-generated neuropsychological damage.

Ocular injuries are yet another potential end result of boxing. Hazar and associates (2002) addressed this issue in a study of elite amateur Turkish boxers. In this study, boxers and a control group of sportsmen who were not boxers underwent ophthalmological examinations. Although one boxer had an atrophic retinal hole, the general finding was that the incidence of ocular damage in these boxers was considerably less than that suggested by previous research. It is important to note, however, that the subjects in Hazar and colleagues' study were amateur boxers, and amateur boxers compete wearing protective headgear. Professional boxers, on the other hand, do not compete wearing headgear and may, therefore, be more susceptible to ocular injury. This notion seems to be supported by Zazryn, Finch and McCrory (2003).

Zazryn and associates (2003) conducted a longitudinal study of Australian professional boxers. After analyzing injury data from a Victoria, Australia fight database,

Zazryn and cohorts found the face and head to be the most commonly injured regions of the body. Within these regions, the most common sites of injury were the eye, eyelid, and eyebrow. Although ophthalmological examinations were not utilized in the Zazryn et al. study, one might speculate that frequent injury to the eye region could also lead to a relatively high rate of ocular injury. Certainly, eye injury and visual impairment as well as neuropsychological damage are substantial risks—risks that should at least be taken into consideration by those partaking in amateur or professional boxing and/or sparring.

Positive Aspects of Boxing

The aforementioned research draws attention to some of the negative aspects of boxing. In contrast, research examining more positive aspects of boxing, in general, and boxing training, in particular, is quite limited. Much of the support for boxing and boxing training seems to be derived more so from anecdotal evidence than from empirical evidence. For instance, Fees (2001) cites boxing training as a “useful way to develop general athletic skills including muscular strength, power, and endurance (9).” Certainly, those who are familiar with rigorous boxing training may be quick to agree with Fees. However, she makes no reference to empirical evidence to support her claims. Though empirical evidence is limited, it is unlikely that even those individuals opposed to participation in boxing would deny the potential physiological benefits of regular boxing training. They may also agree with some of the purported psychological benefits, such as increased self-confidence and courage (American Academy of Pediatrics, 1997). In fact, there is empirical evidence to suggest that boxing enhances self-efficacy (Samuels & Gibb, 2002). Using a Physical Education Self-Efficacy Scale they created, Samuels and

Gibb (2002) found that participation in a boxing physical education course generated significant increases in self-efficacy for boxing itself as well as in self-efficacy for leadership initiative. Overall self-efficacy was also significantly enhanced. The other activity examined in this study, swimming, did not yield these significant increases in self-efficacy when a post hoc simple effects analysis was conducted.

One key element in the physical education courses in the Samuels and Gibbs study was the competitive, combative nature of the boxing course that was not a component of the swimming course. This leads to the question, would similar increases in self-efficacy have been observed had the competitive, combative component of boxing been eliminated or are these characteristics essential to improved self-efficacy? In relation to the present study, might the competitive, combative component of boxing also be necessary to produce significant changes in mood and affective states? Or, perhaps removing this component will produce more favorable mood and affective state changes, as it has been suggested that relatively non-competitive types of physical activity are more conducive to positive changes in mood states (Berger et al., 2002). Although each of these questions is worthy of investigation, the present study focused only on the effects of noncompetitive, non-combative boxing training on mood and affective states.

Physical Activity and Mood and Affective States

Though research on boxing training and its impact on mood and affective states is lacking, several studies have investigated the effects of numerous other types of physical activity, including weight training, circuit training, racketball, running, and Taekwondo, on mood and affective states (Annesi, 2002; Lane et al., 2002; McGowan et al., 1996;

Rehor et al., 2001; Szabo et al., 1998; Toskovic, 2001). These studies, which are discussed next, tend to support the notion that participation in physical activity may be an effective way to favorably alter mood states as well as the more global states of positive and negative affect.

In their research, McGowan, Talton and Thompson (1996) used the POMS to assess the effect of an acute bout of weight training on mood and affective states in college students enrolled in a weight training class. A conventional college lecture class served as the control group. The subjects in the weight training group and the subjects in the control group first completed the POMS at the beginning of their respective class period. Then, at the conclusion of the class period, both groups again completed the POMS. For the weight training group, significant decreases between pre- and posttest scores were detected on the Tension, Depression, Anger, and Vigor subscales of the POMS. The control group, on the other hand, yielded no significant differences between pre- and posttest POMS subscores. Accordingly, these results suggest that weight training may be useful in manipulating mood states, with possibly the greatest improvements on negative affect.

Lane, Crone-Grant, and Lane (2002) also looked at the effect of weight training on mood states, but they used only female participants. The POMS-A/BRUMS was administered before and after two weight training sessions. Lane and colleagues were also looking at the effect of acute physical activity on mood states, but they asked subjects to engage in two weight training bouts, which were one week apart. Following the first weight training session, Lane and colleagues found a significant decrease in Depression subscores and a significant increase in Fatigue subscores from pretest to

posttest. Following the second weight training session, they found that Depression subscores had again decreased significantly from pretest scores. Lane and cohorts' findings add more support to the notion of favorable mood and affective state changes following weight training.

Rehor and cohorts (2001) also used the POMS, examining the effects of an acute bout of circuit training, weight training, or raquetball on mood states, recruiting subjects from intact college activity labs. The POMS was administered immediately before and immediately after each activity. After converting raw data to T scores, the researchers found that weight training had generated, from pretest to posttest, a "dramatic" increase on the Vigor subscore and a "slight" decrease on the Tension, Depression, Anger, and Confusion subscores. Also, from pretest to posttest, circuit training produced a "dramatic" increase on the Vigor subscore, a "moderate" increase on the Fatigue subscore, "slight" decreases on the Depression and Confusion subscores, and a more "dramatic" decrease on the Anger subscore. For racquetball, from pretest to posttest, a "small" increase on the Vigor subscore, a "slight" decrease on the Fatigue subscore, and a "dramatic" decrease on the Depression subscore was detected. With these favorable changes in negative mood states, Rehor and colleagues' findings suggest that acute bouts of physical activity, in this case weight training, circuit training, and raquetball, may decrease negative affect. Their results also provide evidence that positive affect may be enhanced via physical activity, as an increase in the Vigor subscores on the POMS is indicative of this.

In his research, Annesi (2002) focused on the impact of cardiorespiratory exercise on fatigue and energy following three acute bouts of exercise and after 14 weeks of

exercise adherence. Previously sedentary women were asked to exercise a minimum of two times per week at moderate intensity for 20 to 40 minutes, using any of the following machines: treadmills, exercise bicycles, elliptical machines, or rowing machines. For analysis of acute effects, Annesi used the Physical Exhaustion and Revitalization subscales of the EFI to measure fatigue and energy on three occasions: at the onset of the study, midway through the study, and at the conclusion of the study. To analyze chronic effects, Annesi used the Fatigue and Vigor subscales of the POMS to measure fatigue and energy at the onset of the study and again at the conclusion of the study. On each of the three occasions where acute effects of exercise were measured, Annesi found significant reductions in Physical Exhaustion subscores, suggesting reduced fatigue after an acute bout of exercise, and significant increases in Revitalization subscores, suggesting increased energy after an acute bout of exercise. Using the POMS to assess chronic effects of exercise, he found that the Fatigue subscores had significantly decreased and the Vigor subscores had significantly increased compared to the subscores at the onset of the study. In addition, those who had high Fatigue subscores at the onset of the study had significantly greater reductions in Fatigue subscores after exercise training than did those who started out with low Fatigue subscores. Thus, Annesi offers additional evidence to strengthen the claim that participation in physical activity may enhance positive affect. Further, his study is the first of those mentioned in this review that provides support for chronic exercise participation and the generation of enhanced mood and affective states.

Szabo and associates (1998) investigated the anxiety and mood states of runners on non-running days compared to running days. The participants in their study were asked to complete the EFI and the State Anxiety scale of the STAI before going to bed

each day for 21 days. Subjects were also asked to report any major stressors as these may alter mood; no subject reported any major stressors. Researchers found that State Anxiety and Exhaustion were significantly less and Tranquility, Revitalization, and Positive Engagement were significantly greater on running days compared to non-running days. After adjusting for effect size, these differences were small. Nonetheless, this study still coincides with the studies mentioned earlier as it suggests that favorable mood and affective state alterations may be a consequence of physical activity, in this case running. It also offers further support for the benefits of chronic participation in physical activity as the participants in this study were all regular runners.

Perhaps most relevant to the present study is Toskovic's (2001) examination of mood and affective states following an acute bout of dynamic Taekwondo activity in college students. Subjects in the experimental group were enrolled in a beginning Taekwondo class while subjects in the control group were enrolled in a lecture class. Subjects in the Taekwondo group completed the POMS before and after 75 minutes of Taekwondo activity, and subjects in the control group completed the POMS before and after a 75-minute classroom lecture. Compared to pretest measures, the Taekwondo subjects reported significantly less Tension, Depression, Anger, Fatigue, and Confusion and greater Vigor following the intervention while the control subjects garnered no posttest mood benefits. In addition, the Taekwondo subjects also experienced significant improvements in Total Mood Disturbance; whereas, the control subjects did not reap this benefit. With favorable changes on every subscale of the POMS, Toskovic's research strongly supports this type of activity as a potential enhancer of mood and affective states. Because Taekwondo is arguably more similar to boxing than any of the other

activities mentioned, it seemed plausible that non-combative boxing training could also have the potential to benefit mood and affective states. Toskovic's study and the present study are also similar in that cyclic motions comprise both Toskovic's Taekwondo and the non-combative boxing training, which is a deviation from the short bursts of intense activity that traditionally characterize Taekwondo and boxing training.

Based on the aforementioned research, it seems reasonable to conclude that acute bouts of physical activity may be useful in generating favorable changes in mood and affective states. Additionally, evidence is available to support chronic aerobic activity as a mechanism to enhance mood and affective states on an ongoing basis. Although boxing training and its effect on mood and affective states had not been researched prior to the present study, it seemed plausible that favorable alterations in mood and affective states might also be a consequence of this activity, particularly when the competitive, combative element of boxing training (i.e. sparring) was removed. Before conducting the present research, however, the researcher had to make a decision as to what intensity and duration would be used for the non-combative boxing training activity. Consequently, before concluding this chapter, research on intensity and duration of physical activity as these relate to mood and affective states is discussed to give explanation for the intensity and duration of non-combative boxing training that was selected for use in the present study.

Intensity of Physical Activity and Mood and Affective States

Non-combative boxing training, like many other physical activities, has the potential to be a high- or moderate-intensity activity, depending on how hard individuals

push themselves. In *Foundations of Exercise Psychology*, Berger and colleagues (2002) suggest that high intensity physical activity may be more likely to elicit undesirable mood state changes than its low- and moderate-intensity alternatives. In this section, the connection between the intensity of physical activity and mood and affective states will be examined.

Kennedy and Newton (1997) examined the effect of moderate-intensity versus high-intensity step aerobics on mood states. Mood states were assessed via the administration of the POMS before and after the step aerobics activity. Step aerobics eliciting a heart rate equal to 60% of maximum heart rate or less was classified as low-intensity; whereas, step aerobics eliciting a heart rate of 75% of maximum heart rate or greater was classified as high-intensity. Regardless of intensity, Kennedy and Newton found that Tension, Depression, Fatigue and Anger decreased and Vigor increased following the step aerobics activity. Furthermore, those subjects in the high-intensity step aerobics group reported even less Fatigue and Anger than the low-intensity group. Thus, the results of this study suggest that physical activity at 75% of maximum heart rate or greater may capitalize on the enhancement of mood states more so than low-intensity physical activity at 60% of maximum heart rate or less. However, what happens if the intensity of physical activity becomes too great? Motl and colleagues' (1996) research helps answer this question.

In their research, Motl, Berger, and Wilson (1996) explored the effects of an acute bout of moderate-intensity cycling and two levels of high-intensity cycling on mood states in male cyclists. The POMS was the instrument employed in this investigation, and subjects completed it before and after each of the three cycling bouts. Moderate-intensity

cycling was that eliciting a heart rate of 69% of maximum. Interval training at 90% of maximum heart rate and graded exercise testing at 95% of maximum heart rate served as the two high-intensity interventions. Results indicated that the moderate-intensity cycling was beneficial to the cyclists' mood states, generating decreases on the Depression, Anger, Fatigue and Confusion subscales of the POMS and an increase on the Vigor subscale. The high-intensity interval training at 90% of maximum heart rate resulted in an increase on the Fatigue as well as the Vigor subscale, indicating both an unfavorable and favorable change. The high-intensity graded exercise testing at 95% of maximum heart rate resulted only in mood state decrements, spawning increases on the Depression, Anger, Fatigue, and Confusion subscales. While providing persuasive support for the enhancement of mood states from moderate-intensity cycling, Motl and colleagues also offer convincing evidence that if the intensity of physical activity becomes too great, the only mood state changes that are likely to occur are undesirable ones.

Offering further support for the enhancement of mood states via moderate-intensity physical activity is Berger and Owen's (1998) research. In this study, the POMS was completed before and after 20 minutes of jogging at 55%, 75%, and 79% of maximum heart rate. For all three intensities, the investigators found comparable post-jogging decreases in Tension, Depression, Anger, Fatigue, and Confusion and increases in Vigor. Thus, Berger and Owen lend further support for moderate-intensity physical activity as an enhancer of mood states. Furthermore, like Kennedy and Newton (1997), Berger and Owen suggest that low-intensity physical activity also has the potential to improve mood states. In fact, in Kennedy and Owen's investigation, the low-intensity jogging at 55% of maximum heart rate seemed to be equally beneficial in improving

mood states compared to the moderate-intensity jogging at 75% and 79% of maximum heart rate.

Glass and Chvala (2001) provide indirect support for moderate-intensity physical activity being the most conducive to the enhancement of mood and affective states. With their research, they sought to determine the preferred level of intensity for subjects during treadmill, cycle ergometer, and stairstepper exercise. Results indicated that the subjects self-selected moderate levels of intensity. Even though Glass and Chvala's research did not involve the measurement of mood or affective states, it does propose that individuals find moderate-intensity physical activity most enjoyable over low- and high-intensity physical activity. As previously mentioned, it is extremely important for individuals to derive enjoyment from an activity if they wish to experience desirable alterations in mood and affective states. Thus, the findings of Glass and Chvala support the notion that physical activities performed at a moderate level of intensity might be most conducive to desirable changes in mood and affective states.

When looking at the combined results of these studies, the most support appears to be for moderate-intensity physical activity. Clearly, from Motl and colleagues' (1996) research, it can be seen that intensities that elevate the heart rate too much increase the likelihood of mood decrements and should be avoided when mood state enhancement is the primary objective. It is also evident that low-intensity exercise may be effective in the enhancement of mood states. However, to maximize potential benefits to mood and affective states, moderate-intensity physical activity appears to be the best option.

Duration of Physical Activity and Mood and Affective States

If a person's goal is to bring about desirable psychological changes, Berger and colleagues (2002) suggest engaging in physical activity for 20 to 40 minutes. For enhancement of mood states in particular, they recommend a duration of 20 to 30 minutes. In this section, some pertinent literature on the duration of physical activity and mood and affective states is reviewed briefly to provide rationale for the duration of non-combative boxing training selected for use in the present study.

In their research, Hansen and cohorts (2001) sought to determine the duration of physical activity that is sufficient to generate enhanced mood states. They explored the effect of 10-, 20-, and 30-minute cycle ergometry trials on mood states in females. The POMS was administered before and after each trial of cycle ergometry as well as before and after a 30-minute resting trial. Following 10 minutes of cycle ergometry, subjects reported an increase in Vigor and a decrease in Fatigue as well as Total Negative Mood. In addition to the changes produced after the 10-minute trial, the 20-minute trial also generated a decrease in Confusion. Following 30 minutes of cycle ergometry, the subjects experienced no added benefits over the 20-minute trial. Accordingly, the results of this study suggest that as little as 10 minutes of physical activity might be enough to favorably alter mood states; however, a duration of 20 minutes might come closer to maximizing the improvement of mood states, which coincides with Berger and colleagues (2002) recommendation of 20 to 30 minutes.

Daley and Welch (2004) recently explored the effects of 15 minutes and 30 minutes of cycle ergometry on affective states before, during, and after exercise, using the SEES as their assessment tool. They measured affective states 5 minutes after cycle

ergometry as well as 30 minutes, 1 hour, and 2 hours afterwards. Daley and Welch found the same affective state responses regardless of exercise duration. With regard to Positive Well-being, the only significant findings were greater scores 5 minutes after exercise compared to during exercise and greater scores 2 hours after exercise compared to baseline scores. Psychological Distress scores were significantly lower 5 minutes after exercise than during exercise and significantly lower 2 hours after exercise than at baseline. As for Fatigue scores, these were significantly lower 30 minutes and 1 hour after exercise compared to 5 minutes after exercise. Fatigue scores were also significantly lower 2 hours after exercise than at baseline. Thus, this study provides evidence that favorable changes in affective states may occur for up to 2 hours after cycle ergometry regardless of whether a person engages in the activity for 15 minutes or 30 minutes.

It appears that very short durations of physical activity, even 10 minutes, may be enough to produce favorable mood and affective state changes. However, to maximize any potential benefits to mood and affective states, it seems that a longer duration of physical activity may be necessary. Thus, Berger and associates' (2002) recommended duration of 20-30 minutes serves as a credible guideline to follow in route to mood and affect state enhancement.

Summary

Certainly, boxing training is not risk free as evinced by the literature. However, removing the combative element of boxing training eliminates a substantial portion of the risk, particularly risk of neuropsychological damage and ocular injuries. Evidence strongly supports physical activity as an effective means to favorably alter mood and

affective states. Physical activities shown to enhance mood and affective states include: weight training (Lane, Crone-Grant, & Lane, 2002; McGowan, Talton & Thompson, 1996; Rehor, Dunnagan, Stewart, & Cooley, 2001), circuit training (Rehor, Dunnagan, Stewart, & Cooley, 2001), jogging (Berger & Owen, 1998), running (Szabo, Frenkl, Janek, Kalman, & Laszay, 1998), racquetball (Rehor, Dunnagan, Stewart, & Cooley, 2001), step aerobics (Kennedy & Newton, 1997), cycling and cycle ergometry (Daley & Welch, 2004; Hansen, Stevens, & Coast, 2001; Motl, Berger, & Wilson, 1996), and Taekwondo (Toskovic, 2001). It was conceivable that non-combative boxing training might also elicit desirable changes in mood and affective states.

Upon reviewing the literature pertaining to intensity of physical activity and mood and affective states, it appears that a low to moderate level of intensity is likely to generate enhanced mood and affective states (Berger & Owen, 1998; Kennedy and Newton, 1997; Motl et al., 1996). However, when the intensity becomes too great, decrements to mood and affective states become increasingly likely (Motl et al., 1996). Consequently, a moderate level of intensity at 60% to 80% of predicted maximal heart rate was chosen for use in the present study. Investigations of the effect of duration of physical activity on mood and affective states suggests that as little as 10 to 15 minutes of activity had the potential to enhance mood and affective states (Daley & Welch, 2004; Hansen et al., 2001). However, to maximize any potential improvements in mood and affective states, research by Hansen and colleagues (2001) suggests that a duration of at least 20 minutes may be necessary. Consequently, for the present study, a duration of 31 minutes, which included a 4-minute warm-up, 21 minutes of non-combative boxing training, a 4-minute cool-down, and two 1-minute breaks, was selected.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to examine the influence of an acute bout of non-combative boxing training on mood and affective states. This chapter details the methodology utilized in the completion of the study. Prior to the recruitment of subjects, this methodology was approved by the Institutional Review Board at Oklahoma State University.

Chapter III is divided into three categories: preliminary procedures, operational procedures, and follow-up procedures. The preliminary procedures are further divided into the following subcategories: selection of subjects, selection of instruments, selection of sites, selection of non-combative boxing training equipment and supplies, and selection of video for control intervention. The operational procedures are further divided into the following subcategories: preliminary meeting, familiarization trials for non-combative boxing training subjects, data collection trial for the non-combative boxing training intervention, data collection trial for the control intervention, and statistical analysis.

Preliminary Procedures

Selection of Subjects

Male and female subjects between the ages of 18 and 24 years were recruited from undergraduate courses at Oklahoma State University. The investigator visited undergraduate health and human performance and leisure classes, briefly explained the study, and asked for volunteers. The investigator distributed a recruitment flyer, which is shown in Appendix A, to all students interested in partaking in the study. In addition to recruiting subjects from classes, recruitment flyers were also posted around the Oklahoma State University campus and at local gyms.

To be eligible for participation in the study, subjects were required to be moderately active. To be considered moderately active, subjects had to engage in some type of physical activity at least three days per week. Furthermore, the activities in which the individuals participated had to be of at least moderate intensity, which is equivalent to walking 3 to 4 miles per hour for many individuals (American College of Sports Medicine, 2000). Additionally, the average duration of each bout of physical activity had to be at least 30 minutes. These parameters were put into place to help ensure that the subjects possessed a level of physical fitness sufficient to successfully and safely complete the non-combative boxing training and the accompanying warm-up and cool-down.

Initially, 41 subjects, 19 males and 22 females, signed up to participate in the study. Half of these males and half of these females were randomly assigned to the non-combative boxing training group. The remaining male and female volunteers were assigned to the control group. Following the initial randomization, an additional 13

subjects, 9 males and 4 females, signed up to participate in the study; thus, the total number of subjects who signed up to participate was 54, 28 males and 26 females. The researcher had predetermined that any male who signed up to participate after randomization would be assigned to the experimental group if there was an even number of male subjects in each group. However, if the experimental group already contained one more male subject than the control group, the person signing up would be assigned to the control group. For example, after randomization, the experimental group contained 10 males while the control group only contained 9 males. Therefore, the first male to sign up after randomization was assigned to the control group. Then, the next male to sign up after randomization was assigned to the non-combative boxing training group. This process was continued until all males signing up after randomization had been assigned to a group. The same assignment logic was used for females signing up after randomization.

A total of 43 subjects completed the study. This final sample included 22 non-combative boxing training subjects, 10 males and 12 females, and 21 control subjects, 9 males and 12 females. To help prevent the attrition of control subjects, each control subject was given the option of participating in up to 3 days of non-combative boxing training in the week following data collection.

Selection of Instruments

The following instruments were included in the present study:

1. The Physical Activity Readiness Questionnaire (PAR-Q)—This questionnaire is designed to identify individuals who have contraindications to moderate-intensity physical activity and who should seek medical clearance from a physician before

engaging in physical activity. The PAR-Q is regarded as “valid, cost-effective, and time-efficient” (American College of Sports Medicine, 2000). As a safety precaution in the present study, the researcher opted to exclude any subject who answered “yes” to any question on the PAR-Q. No exclusions were necessary, however, because all subjects answered “no” to each question on the PAR-Q. The PAR-Q is shown in Appendix B.

2. The Profile of Mood States (POMS)—This instrument serves as a measure of six specific mood states—Tension, Depression, Anger, Fatigue, Vigor, and Confusion. The POMS consists of a total of 65 adjectives, with 7 to 15 adjectives comprising each mood subscale. Individuals completing the POMS are asked to rate how strongly each adjective applies to their feelings on a scale of 0 to 4, with 0 being “not at all,” 1 being “a little,” 2 being “moderately,” 3 being “quite a bit,” and 4 being “extremely.” The POMS has been shown to be both a reliable and valid instrument (McNair, Lorr, & Droppleman, 1971). The POMS was chosen as the instrument to measure mood states in the present study because of its widespread use in the literature investigating the effects of various modalities of physical activity on mood states (Annesi, 2002; Berger & Owen; 1998; Hansen et al., 2001; Kennedy & Newton, 1996; McGowan et al., 1996; Motl et al., 1996; Rehor et al., 2001; Toskovic, 2001). Accordingly, using the POMS allows the results of the present study to be easily compared to much of the existing research on mood states. The POMS is shown in Appendix C.

3. The Positive and Negative Affect Schedule (PANAS)—This survey is used to measure two global and separate dimensions of mood—positive affect and negative affect. It contains 20 adjectives, 10 pertaining to positive affect and 10 pertaining to negative affect. Individuals completing the PANAS are asked to rate on a scale of 1 to 5 how each adjective relates to their feelings, with 1 being “very slightly or not at all,” 2 being “a little,” 3 being “moderately,” 4 being “quite a bit,” and 5 being “extremely.” Evidence suggests that the PANAS is valid as well as reliable (Watson et al., 1988). The PANAS was chosen for use in the present study because of the researcher’s desire to also examine the effects of non-combative boxing training on mood states from a more global perspective. The PANAS allows for this with its two discrete dimensions. The PANAS is shown in Appendix D.

Selection of Sites

A lecture classroom was selected as the site for the preliminary meetings. All bouts of non-combative boxing training, including familiarization trials and the data collection trial, were conducted in a group fitness room where punching bags were housed. The data collection trial for the control group was conducted in a conference room.

Selection of Non-Combative Boxing Training Equipment and Supplies

Among the equipment and supplies used for the non-combative boxing training were hand wraps, jump ropes, punching bags, and heart rate monitors. The hand wraps provided protection to the hands and wrists of subjects when performing bag punching. The jump ropes were plastic speed ropes. Jump ropes of various lengths were available to

accommodate the varying heights of subjects. The punching bags were water-based standing bags. The water in the base of the bags is meant to help stabilize the bag when punched. Subjects wore *Polar* heart rate monitors so that subjects could easily monitor their heart rates, with the goal of keeping heart rates within the desired range of 60 to 80% of predicted maximal heart rate.

Selection of Video for Control Intervention

A health-related video was selected for use in the control intervention. Specifically, the video discussed cholesterol and was titled *Serum Cholesterol and the LDL Receptor: The Evolution of Understanding* (Dunavan, 1986). The video was approximately 28 minutes in length. A brief description of the video was given prior to the presentation of the video; thus, the duration of the video was comparable to the duration of the non-combative boxing training activity, which lasted for 31 minutes.

Operational Procedures

Preliminary Meeting

Approximately two weeks prior to data collection, the investigator held preliminary meetings. Subjects only needed to attend one preliminary meeting; however, four meetings on different dates and at different times were offered in an effort to accommodate each subject's schedule. The researcher set up individual meetings with those subjects who were unable to attend one of the scheduled meetings.

During the preliminary meeting, the investigator informed the subjects of the purpose of the study and of the procedures that were involved in the study. Subjects were informed that they had been randomly assigned to either the experimental group, which

would engage in non-combative boxing training, or the control group, which would be asked to watch a health-related video. Subjects were also informed that if they had been assigned to the control group, the researcher would give them the option of participating in up to three days of non-combative boxing training in the week following data collection. Subjects were then informed verbally and in writing of the risks and benefits of the study. Subjects were assured that the Oklahoma State University Institutional Review Board had approved the study, and they were asked to sign the Informed Consent Form, which is shown in Appendix E.

Next, subjects were asked to complete the PAR-Q, which is shown in Appendix B. The researcher informed them upon completion of the PAR-Q that any person who answered “yes” to any question on the PAR-Q would be excluded from the study. No exclusions were necessary, however, as all subjects answered “no” to each question on the PAR-Q. Then, subjects were asked to complete the Subject Information Sheet, which is shown in Appendix F. This sheet asked subjects to report their age so that predicted maximal heart rates could be calculated. Subjects were also asked to provide an active email address so that the researcher could correspond with them if necessary. The Subject Information Sheet also contained questions to help verify that each subject qualified as “moderately active.” All subjects met this requirement of “moderately active.” Subjects were guaranteed that the Informed Consent Form, the PAR-Q, and the Subject Information Sheet would be stored in a secure location. Further, subjects were informed that the POMS and PANAS surveys would be stored in a separate secure location. Subjects were assured that all personal information would remain confidential.

After the Informed Consent Forms, PAR-Qs and Subject Information Sheets were collected, the researcher advised each subject of what group he/she had been assigned to—the non-combative boxing training group or the control group. Again, the control subjects were reminded that they would have the opportunity to participate in up to 3 days of non-combative boxing training following the data collection trial. Experimental subjects were presented with a list of several times at which the non-combative boxing training would be conducted and asked to sign up for timeslots that would accommodate their schedules. More specifically, the experimental subjects were asked to sign up for two timeslots to complete the two familiarization trials as well as a third timeslot in the following week to complete the data collection trial. Control subjects were presented with a list of several times at which the control video would be watched and asked to sign up for the timeslot that would accommodate their schedules. The same timeslots that were offered to the experimental subjects were offered to the control subjects. Following the preliminary meeting, the researcher sent each subject an email to confirm to which group they had been assigned and the time(s) he/she had chosen to participate in the assigned activity.

Familiarization Trials for Non-Combative Boxing Training Subjects

In the week prior to data collection, the subjects in the non-combative boxing training group were asked to engage in two familiarization trials to introduce them to the non-combative boxing training. These trials were identical to the data collection trial, which is detailed in the next section, except subjects were not asked to complete the POMS and the PANAS surveys before and after the non-combative boxing training. It was also during these familiarization trials that subjects were shown how to put on their

protective hand wraps and heart rate monitors. Subjects were required to attend both familiarization trials to be included in the data collection trial. The investigator sent each experimental subject a reminder email 24 hours prior to each familiarization trial.

Data Collection Trial for the Non-Combative Boxing Training Intervention

The investigator sent a reminder email to the experimental subjects approximately 48 hours prior to the data collection trial. Experimental subjects were instructed to meet in the group fitness room at the time they selected in the preliminary meeting. Subjects were instructed to first put on the protective hand wraps and a heart rate monitor. Then, the subjects were asked to complete the POMS and PANAS surveys according to how they were feeling at that moment. At the top of the POMS and PANAS surveys, subjects were asked to write their initials, the last four digits of their social security number, and an “M” or “F” to indicate whether they were male or female. This identification code was used to compare pre- and post-POMS and PANAS survey results. It took approximately 5 to 10 minutes to complete these two surveys.

Next, the experimental subjects were instructed to begin the 4-minute warm-up. Subjects warmed up by walking around the room for 3 minutes and then performing 1 minute of light shadow boxing. After the warm-up, subjects were prompted to begin the non-combative boxing training. The non-combative boxing training consisted of jumping rope, bag punching drills, and footwork drills. Subjects were asked to punch the bags with light to moderate force to avoid injury to their lower knuckles, which were still exposed even though hand wraps were worn. Punching with light to moderate force also helped keep the intensity level from becoming too elevated. The footwork drill consisted of movement around the punching bag while bouncing on the balls of the feet.

Subjects engaged in each activity for one minute before being prompted to switch to the next activity. The sequence of the three activities—jumping rope, bag punching drills, and footwork drills—was completed a total of seven times. Upon the 15th minute of activity, the subjects were prompted to take a one-minute break. Immediately, subjects were asked to assess heart rates, and then, subjects were prompted to get a drink of water. They were then instructed to resume the non-combative boxing training. This break plus the seven 3-activity sequences of non-combative boxing training totaled 22 minutes. Prior to the cool-down, subjects were prompted to take another break. Again, heart rates were evaluated immediately and then subjects were encouraged to get a drink of water. Next, subjects were asked to walk around the room for four minutes to cool down. The exact layout of activity for the non-combative boxing training subjects is outlined in Table 1 on the next page.

Immediately following the cool-down, subjects were asked to complete the POMS and PANAS surveys according to how they were feeling at that moment. Again, they were instructed to put their initials, the last four digits of their social security number, and an “M” or “F” to indicate whether they were male or female at the top of the POMS and PANAS surveys so that their pre- and post-POMS and PANAS survey results could be analyzed. All data was collected between the hours of 12:00pm and 7:00pm.

Because extremely high intensity activity may be more likely to negatively impact mood and affective states, the subjects were instructed to try to maintain a moderate level of intensity. Moderate intensity was that eliciting a heart rate of 60% to 80% of predicted maximal heart rate. Any subject whose heart rate, when evaluated at minute 15, was greater than 80% of predicted maximal heart rate was advised to reduce the intensity of

the non-combative boxing training. Any subject whose heart rate, when evaluated at minute 15, was less than 60% of predicted maximal heart rate was encouraged to increase the intensity of the non-combative boxing training.

Table 1—Outline of Activity for Non-Combative Boxing Training Group

Warm-Up	Minutes 1-3	Walk around room
	Minute 4	Light shadow boxing
Non-Combative Boxing Training	Minute 5	Jump roping
	Minute 6	Bag punching drill
	Minute 7	Footwork drill
	Minute 8	Jump roping
	Minute 9	Bag punching drill
	Minute 10	Footwork drill
	Minute 11	Jump roping
	Minute 12	Bag punching drill
	Minute 13	Footwork drill
	Minute 14	Jump roping
	Minute 15	Measure heart rate and Water break
	Minute 16	Bag punching drill
	Minute 17	Footwork drill
	Minute 18	Jump roping
	Minute 19	Bag punching drill
	Minute 20	Footwork drill
	Minute 21	Jump roping
	Minute 22	Bag punching drill
	Minute 23	Footwork drill
	Minute 24	Jump roping
Minute 25	Bag punching drill	
Minute 26	Footwork drill	
Cool-Down	Minute 27	Measure heart rate and Water break
	Minutes 28-31	Walk around room

Data Collection Trial for the Control Intervention

The investigator sent a reminder email to the control subjects approximately 48 hours prior to the data collection trial. Control subjects were instructed to meet in the conference room at the time they selected in the preliminary meeting. The subjects were first asked to complete the POMS and PANAS surveys. The control subjects were asked to write their initials, the last four digits of their social security number, and an “M” or “F” to indicate whether they were male or female at the top of the POMS and PANAS surveys. It took approximately 5 to 10 minutes to complete these two surveys. Then, the subjects were asked to view a video on cholesterol for approximately 30 minutes. After watching the video, control subjects were again asked to complete the POMS and PANAS surveys, placing the same identification code of initials, the last four digits of their social security number, and an “M” or “F” to indicate whether they were male or female at the top of the PANAS and the POMS surveys to allow for pre- and posttest comparisons. Following the completion of data collection, the control subjects were given the opportunity to sign up for participation in the post-study non-combative boxing training. All data was collected between the hours of 12:00pm and 7:00pm.

Statistical Analysis

All statistical analyses were completed using the SPSS 11.0 version for Windows. Due to pre-intervention differences between the experimental and the control group on the Depression and Anger subscales of the POMS and on the Negative Affect dimension of the PANAS, it was decided to use an analysis of gain scores. Gain scores were calculated for each subject by subtracting the pre-intervention score from the post-intervention score for each subscale of the POMS and for both dimensions of the

PANAS. Then, in each analysis, the mean gain score for the experimental group was compared to the mean gain score for the control group using an independent samples t-test. The level of significance for the statistical tests was 0.05.

Follow-Up Procedures

Once the data had been analyzed, both the experimental and the control subjects were notified via email of an optional presentation to disclose relevant findings from the study.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

This study was designed to examine the influence of non-combative boxing training on mood and affective states. Oklahoma State University students were recruited and subsequently assigned to one of two groups: the experimental group, which participated in non-combative boxing training or the control group, which observed a health-related video. In the week prior to the data collection trial, experimental subjects completed two familiarization trials to acclimate to the non-combative boxing training. Then, for the data collection trial, experimental subjects were asked to complete the POMS and the PANAS once before and again after engaging in the non-combative boxing training. The control subjects were asked to complete the POMS and the PANAS before and after watching a health-related video. Chapter IV first restates the hypotheses for this study and then reveals the results of the study. Chapter IV is concluded with a discussion of these results.

Hypotheses

Four null hypotheses were tested. One was tested to determine if there were any significant differences between the experimental and the control group on any subscale of

the POMS prior to the intervention. Another hypothesis was tested to determine if there were any significant differences between the experimental and the control group on any subscale of the POMS following the intervention. A third hypothesis was tested to determine if there were any significant differences between the experimental and the control group on either dimension of the PANAS prior to the intervention. A final hypothesis was tested to determine if there were any significant differences between the experimental and the control group on either dimension of the PANAS following the intervention. Each null hypothesis was tested at the 0.05 level of significance using two-tailed, independent samples t-tests.

Results

Group means and standard deviations for the six subscales of the POMS and both dimensions of the PANAS are displayed in Table 2 on the following page. As noted on the pages below, pre-intervention differences occurred on three dependent variables. Therefore, it was decided to use an analysis of gain scores. Each subject's score was converted to a gain score by subtracting the pre-intervention score from the post-intervention score. In each analysis the experimental group mean gain score was compared to the control group mean gain score using an independent t-test with a 5% significance level.

Table 2—Pre- and Post-Intervention Group Means and Standard Deviations

POMS SUBSCALE	GROUP	N	PRE-INTERVENTION	POST-INTERVENTION
			M ± SD	M ± SD
Tension	Experimental	22	8.2 ± 4.09	6.4 ± 3.90
	Control	21	7.0 ± 6.12	6.4 ± 4.44
Depression	Experimental	22	3.2 ± 2.81	1.5 ± 3.04
	Control	21	1.6 ± 1.99	2.5 ± 2.77
Anger	Experimental	22	5.6 ± 4.23	3.7 ± 4.11
	Control	21	2.9 ± 3.57	1.9 ± 2.44
Fatigue	Experimental	22	5.7 ± 4.14	5.0 ± 3.77
	Control	21	6.7 ± 4.69	7.8 ± 5.09
Vigor	Experimental	22	16.2 ± 6.17	19.8 ± 4.59
	Control	21	16.5 ± 6.29	10.7 ± 7.89
Confusion	Experimental	22	6.5 ± 3.96	4.9 ± 2.52
	Control	21	5.6 ± 3.44	6.2 ± 3.00
PANAS DIMENSION	GROUP		PRE-INTERVENTION M ± SD	POST-INTERVENTION M ± SD
Positive Affect	Experimental	22	31.1 ± 7.87	33.4 ± 7.02
	Control	21	31.4 ± 7.62	23.0 ± 8.69
Negative Affect	Experimental	22	15.1 ± 3.27	12.8 ± 2.81
	Control	21	12.6 ± 2.25	12.9 ± 3.21

Tension

On the Tension subscale of the POMS, there was no significant pre-intervention difference between the experimental and control group (Table 3). There was also no significant post-intervention difference between the experimental group and the control group (Table 4).

Table 3—Pre-Intervention t-test for Tension

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	8.2 ± 4.09	0.75	0.46
Control	21	7.0 ± 6.12		

Table 4—Post-Intervention t-test for Tension

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-1.77	-0.69	0.50
Control	21	-0.62		

Depression

On the Depression subscale of the POMS, there was a significant pre-intervention difference between the experimental and control group, with the experimental group having a higher Depression score (Table 5). Post-intervention, there was also a significant difference between the experimental and the control group (Table 6). The experimental (non-combative boxing training) group experienced a post-intervention decrease in Depression while the control group did not.

Table 5—Pre-Intervention t-test for Depression

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	3.2 ± 2.81	2.10	0.04
Control	21	1.6 ± 1.99		

Table 6—Post-Intervention t-test for Depression

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-1.68	-2.82	0.01
Control	21	0.90		

Anger

On the Anger subscale of the POMS, there was a significant pre-intervention difference between the experimental and control group (Table 7). The experimental group

had a higher Anger score than the control group. Following the intervention, there was not a significant difference between the experimental and the control group for Anger.

Table 7—Pre-Intervention t-test for Anger

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	5.6 ± 4.23	2.25	0.03
Control	21	2.9 ± 3.57		

Table 8—Post-Intervention t-test for Anger

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-1.82	-0.93	0.36
Control	21	-1.00		

Fatigue

On the Fatigue subscale of the POMS, there was no significant pre-intervention difference between the experimental and control group (Table 9). Post-intervention, there was also not a significant difference between the experimental and control group (Table 10).

Table 9—Pre-Intervention t-test for Fatigue

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	5.7 ± 4.14	-0.70	0.49
Control	21	6.7 ± 4.69		

Table 10—Post-Intervention t-test for Fatigue

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-0.73	-1.49	0.15
Control	21	1.14		

Vigor

On the Vigor subscale of the POMS, there was no significant pre-intervention difference between the experimental and control group (Table 11). Post-intervention, however, there was a significant difference between the experimental and control group (Table 12). The experimental (non-combative boxing training) group experienced a post-intervention increase in Vigor while the control group did not.

Table 11—Pre-Intervention t-test for Vigor

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	16.2 ± 6.17	-0.16	0.88
Control	21	16.5 ± 6.29		

Table 12—Post-Intervention t-test for Vigor

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	3.59	5.69	0.00
Control	21	-5.76		

Confusion

On the Confusion subscale of the POMS, there was no significant pre-intervention difference between the experimental and control group (Table 13). Post-intervention, however, there was a significant difference between the experimental and the control

group (Table 14). The experimental (non-combative boxing training) group experienced a decrease in Confusion following the intervention while the control group did not.

Table 13—Pre-Intervention t-test for Confusion

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	6.5 ± 3.96	0.78	0.44
Control	21	5.6 ± 3.44		

Table 14—Post-Intervention t-test for Confusion

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-1.59	-2.35	0.02
Control	21	0.62		

Positive Affect

On the Positive Affect dimension of the PANAS, there was no significant pre-intervention difference between the experimental and control group (Table 15). Post-intervention, there was a significant difference between the experimental and the control group for Positive Affect (Table 16). The experimental (non-combative boxing training) group experienced an increase in Positive Affect while the control group did not.

Table 15—Pre-Intervention t-test for Positive Affect

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	31.1 ± 7.87	-0.16	0.87
Control	21	31.4 ± 7.62		

Table 16—Post-Intervention t-test for Positive Affect

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	2.36	6.30	0.00
Control	21	-8.48		

Negative Affect

On the Negative Affect dimension of the PANAS, there was a significant pre-intervention difference between the experimental and the control group (Table 17). The experimental group had a higher score for Negative Affect than the control group. Post-intervention, there was also a significant difference between the experimental and the control group (Table 18). The experimental (non-combative boxing training) group experienced a decrease in Negative Affect while the control group did not.

Table 17—Pre-Intervention t-test for Negative Affect

GROUP	N	PRE-INTERVENTION M ± SD	t-SCORE	SIGNIFICANCE
Experimental	22	15.1 ± 3.27	2.93	0.01
Control	21	12.6 ± 2.25		

Table 18—Post-Intervention t-test for Negative Affect

GROUP	N	GAIN SCORE	t-SCORE	SIGNIFICANCE
Experimental	22	-2.32	-2.68	0.01
Control	21	0.33		

H₀1: There will be no significant differences between the experimental group and the control group on any pre-intervention POMS subscores. H₀1 was rejected.

H₀2: There will be no significant differences between the experimental group and the control group on any post-intervention POMS subscores. H₀2 was rejected.

H₀3: There will be no significant differences between the experimental group and the control group on any pre-intervention PANAS scores. H₀3 was rejected.

H₀4: There will be no significant differences between the experimental group and the control group on any post-intervention PANAS scores. H₀4 was rejected.

Discussion of Results

This study compared the mood and affective state responses to non-combative boxing training, which was the experimental intervention, to the mood and affective state responses to the observation of a health-related video, which served as the control intervention. The POMS was used to measure pre- and post-intervention mood states while the PANAS was used to measure pre- and post-intervention affective states. In this section, the researcher addresses several issues that may be useful for future investigations or for the application of these findings. Among the issues addressed are the pre-intervention differences between the experimental and the control group, the intensity of non-combative boxing training, the assignment of subjects to groups, and the enjoyment of non-combative boxing training. Chapter IV is concluded by comparing the present research to the literature and discussing the implications.

Pre-Intervention Differences Between Groups

As noted in the results section, pre-intervention differences were detected on the Depression and Anger subscales of the POMS and on the Negative Affect dimension of the PANAS. The non-combative boxing training group had the higher scores on each of these variables. The researcher speculates that these differences may be the result of the conditions under which the POMS and the PANAS surveys were completed. The control subjects completed the POMS and the PANAS while sitting in comfortable chairs at a conference table. The experimental subjects, on the other hand, did not have a table to write on or chairs to sit in. Instead, most subjects in the experimental group sat on the floor while completing the POMS and the PANAS; other experimental subjects stood and used the wall for support while completing the surveys. Thus, the group fitness room, which is where the experimental subjects completed the POMS and the PANAS, was less conducive to writing than the conference room, which is where the control subjects completed the POMS and the PANAS. Mood and affective states may have been affected by these conditions, yielding pre-intervention differences between the control group and the experimental group.

Intensity of Non-Combative Boxing Training

Many experimental subjects in the present study found it difficult to keep their heart rates below 80% of predicted maximum. The two familiarization trials helped, as subjects learned to pace themselves during these trials. However, the question remains, could benefits to mood and affective state have been greater if subjects were allowed to self-select their intensity rather than being confined by the parameters of this study?

Assignment of Subjects

Initially, 41 individuals signed up for participation in this study. Stratified random assignment based on gender was used to assign these subjects to either the experimental group or the control group. Following this initial randomization, an additional 13 subjects were allowed to sign up. These volunteers were assigned in a manner that allowed for an equal number of male and female subjects in each group. For instance, the first male to sign up after the initial randomization was assigned to the control group because the control group contained only 9 males while the experimental group contained 10. Although allowing these individuals to sign up late increased the study's sample size, it may have also diminished the effectiveness of the randomization.

Enjoyment of Non-Combative Boxing Training

Many subjects expressed that they enjoyed the non-combative boxing training. This is particularly promising since enjoyment is a critical element to achieving enhanced mood and affective states.

Comparison of Present Study to the Literature

The findings of the present study coincide with much of the existing research on mood and affective states. Because of the widespread use of the POMS in investigations of physical activity and mood states, comparisons to the existing research can easily be made. With a reduction on the Depression subscale of the POMS, non-combative boxing training shares this beneficial mood state change with the following activities: weight training (McGowan et al., 1996; Rehor et al., 2001), circuit training (Rehor et al, 2001), racquetball (Rehor et al. 2001), Taekwondo (Toskovic, 2001), step aerobics (Kennedy & Newton, 1997), cycling (Motl et al., 1996), and jogging (Berger & Owen, 1998). With a

reduction on the Confusion subscale of the POMS, non-combative boxing training shares this beneficial decrease with: weight training (Rehor et al., 2001), circuit training (Rehor et al., 2001), Taekwondo (Toskovic, 2001), cycling/cycle ergometry (Motl et al., 1996; Hansen et al., 2001), and jogging (Berger & Owen, 1998). Finally, with an increase on the Vigor subscale of the POMS, non-combative boxing training shares this favorable change in mood state with: weight training (Rehor et al., 2001), circuit training (Rehor et al., 2001), racquetball (Rehor et al., 2001), Taekwondo (Toskovic, 2001), step aerobics (Kennedy & Newton, 1997), cycling/cycle ergometry (Motl et al., 1996; Hansen et al., 2001), and jogging (Berger & Owen, 1998).

Concurrence between POMS and PANAS

The results from the PANAS in the present study helped solidify the results from the POMS. Non-combative boxing training generated a decrease in Negative Affect. Because depression and confusion are mood states that affect Negative Affect, this reduction in Negative Affect coincides with the reduction in Depression and Confusion seen on the POMS. Positive Affect, on the other hand, was increased as a result of non-combative boxing training. Again, this is exactly what would be expected since Vigor, which is a mood state affecting Positive Affect, increased on the POMS.

Implications

Generally speaking, people in today's society are living long lives, which, at first glance, seems marvelous. However, a long life does not equal a high quality of life. Health and exercise professionals, including psychologists, exercise physiologists, personal trainers, and physicians, are constantly interacting with individuals who could benefit greatly from a heightened quality of life. So, why not prescribe to these

individuals a chemical-free solution— physical activity—that could possibly improve mood and affective states? Any improvements to mood and affective states could enhance overall psychological health, which, in turn, could improve quality of life.

The results of the present study are meaningful because another physical activity, non-combative boxing training, has been identified that may serve as an effective mechanism to enhance mood and affective states. Certainly, many other types of physical activity appear to enhance mood and affective states as evinced by the literature review. Accordingly, one might ask why researchers even need to identify more physical activities that have the potential to enhance mood and affective states. The answer to this question is really quite simple. Enjoyment of the activity is critical to the enhancement of mood and affective states. A given activity may be enjoyable to one person but unpleasant to another. Consequently, individuals need multiple activities from which they can choose if they are seeking enhanced mood and affective states. Non-combative boxing training undoubtedly does not appeal to everyone, but for those people who do enjoy participation in non-combative boxing training, this study suggests that beneficial changes in mood and affective states could be a consequence.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

Chapter V first summarizes the purpose and methodology of the present study. Next, the findings are discussed, particularly as these relate to the null hypotheses. Then, the conclusions that have been drawn based on the results of this study are discussed. Finally, the chapter is concluded with recommendations for future research.

Summary of Purpose and Methodology

The purpose of the present study was to examine the influence of an acute bout of non-combative boxing training on mood and affective states. Non-combative boxing training consisted of jumping rope, bag punching drills, and footwork drills. Students enrolled at Oklahoma State University who were between the ages of 18 and 24 years were recruited to participate in the study. A total of 54 individuals, 28 males and 26 females, volunteered for participation. Half of the male volunteers and half of the female volunteers were assigned to the experimental group, which engaged in non-combative boxing training. The other half of the volunteers were assigned to the control group, which watched a health-related video. A total of 43 subjects completed the study,

including 22 experimental subjects (10 males and 12 females) and 21 control subjects (9 males and 12 females).

In the week prior to data collection, members of the experimental group were asked to complete two familiarization trials, which were identical to the data collection trial except mood and affective state data were not collected. At the data collection trial, the experimental group completed the POMS and the PANAS before and after participating in non-combative boxing training. Similarly, the control group completed the POMS and the PANAS before and after watching a health-related video.

Summary of Findings

The following four null hypotheses were tested at the 0.05 level of significance:

H₀1: There will be no significant differences between the experimental group and the control group on any pre-intervention POMS subscores. H₀1 was rejected.

H₀2: There will be no significant differences between the experimental group and the control group on any post-intervention POMS subscores. H₀2 was rejected.

H₀3: There will be no significant differences between the experimental group and the control group on any pre-intervention PANAS scores. H₀3 was rejected.

H₀4: There will be no significant differences between the experimental group and the control group on any post-intervention PANAS scores. H₀4 was rejected.

Conclusions

Within the limitations of this study, the following conclusions were reached:

1. Positive changes in mood states are a consequence of participation in an acute bout of non-combative boxing training.
2. Positive changes in affective states are a consequence of participation in an acute bout of non-combative boxing training.

Recommendations for Future Research

1. Similar studies need to be conducted to examine the mood and affective state response to an acute bout of non-combative boxing training in other age groups besides the 18-24-year-old category.
2. A similar study needs to be conducted to examine the mood and affective state response to non-combative boxing training when participants are allowed to self-select the level of intensity.
3. A study needs to be conducted to examine the mood and affective state response to chronic participation in non-combative boxing training.

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APPENDIX A
SUBJECT RECRUITMENT FLYER

RESEARCH SUBJECTS NEEDED

To participate in a research study examining the effects of non-combative boxing training on mood and affective states

Non-Combative Boxing Training activities include:
jumping rope, bag punching drills, and footwork drills



SUBJECTS MUST BE:

- 18-24 years old
- A student at Oklahoma State University
- Moderately Active—(If you engage in moderate-intensity physical activity at least 3 days per week for at least 30 minutes, you qualify)

For more information or to sign up, contact:

KERRY MORGAN

Health & Human Performance Graduate Student

(405) 612-2693

k_d_morgan@hotmail.com

APPENDIX B
PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

Physical Activity Readiness Questionnaire (PAR-Q)

American College of Sports Medicine. (2000). *ACSM guidelines for testing and exercise prescription* (6th ed.). Baltimore, MD: Lippincott, Williams, & Wilkins.

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. Since you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

Yes	No	
<input type="checkbox"/>	<input type="checkbox"/>	1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor?
<input type="checkbox"/>	<input type="checkbox"/>	2. Do you feel pain in your chest when you do physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	3. In the past month, have you had chest pain when you were not doing physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
<input type="checkbox"/>	<input type="checkbox"/>	5. Do you have a bone or joint problem that could be made worse by a change in your physical activity?
<input type="checkbox"/>	<input type="checkbox"/>	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
<input type="checkbox"/>	<input type="checkbox"/>	7. Do you know of <u>any other reason</u> why you should not do physical activity?

If you answered YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want—as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

If you answered NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active—begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal—this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever—wait until you feel better; or
- if you are or may become pregnant—talk to your doctor before you start becoming more active.

Please note: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction.

Name: _____

Signature: _____

Date: _____

Witness: _____

APPENDIX C
PROFILE OF MOOD STATES

Profile of Mood States (POMS)

McNair, D., Lorr, M., & Droppleman, L. (1971). *Profile of Mood States manual*. San Diego, Education and Industrial Testing Service.

Directions: 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 are feeling right now.

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY		NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
1. Friendly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17. Grouchy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Tense	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18. Blue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Angry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19. Energetic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Worn out	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20. Panicky	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Unhappy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	21. Hopeless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Clear-headed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	22. Relaxed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Lively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	23. Unworthy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Confused	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	24. Spiteful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Sorry for things done	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	25. Sympathetic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Shaky	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	26. Uneasy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Listless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	27. Restless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Peeved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	28. Unable to concentrate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Considerate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	29. Fatigued	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Sad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	30. Helpful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	31. Annoyed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. On edge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	32. Discouraged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
33. Resentful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Nervous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Lonely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Miserable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Muddled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Cheerful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Bitter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Exhausted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Anxious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Ready to fight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Good natured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Gloomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Desperate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Sluggish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Rebellious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Helpless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Weary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
50. Bewildered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Alert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Deceived	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Furious	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Efficient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Trusting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Full of pep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Bad-tempered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Worthless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Forgetful	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Carefree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Terrified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Guilty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Vigorous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Uncertain about things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. Bushed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX D

POSITIVE AND NEGATIVE AFFECT SCHEDULE

Positive and Negative Affect Schedule (PANAS)

Watson, D., Clark, L., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54 (6), 1063-1070.

Directions: 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 are feeling right now.

	VERY SLIGHTLY OR NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY		VERY SLIGHTLY OR NOT AT ALL	A LITTLE	MODERATELY	QUITE A BIT	EXTREMELY
1. Interested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	11. Irritable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Distressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	12. Alert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Excited	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	13. Ashamed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Upset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	14. Inspired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Strong	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	15. Nervous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Guilty	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	16. Determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Scared	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	17. Attentive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Hostile	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	18. Jittery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Enthusiastic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	19. Active	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Proud	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	20. Afraid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX E
INFORMED CONSENT FORM

Informed Consent

I, _____, voluntarily agree to participate in the research study entitled *Mood and affective state response to an acute bout of non-combative boxing training*. I understand that the person responsible for this research is Kerry Morgan, Health and Human Performance graduate student, Oklahoma State University. Kerry can be reached at (405) 612-2693.

The purpose of the study is to determine if participation in an acute bout of moderate-intensity non-combative boxing training influences mood and affective states. Non-combative boxing training refers to training that is free of sparring or any other type of physical contact with another individual. Three activities will comprise the non-combative boxing training in this study—jumping rope, bag punching drills, and footwork drills. These activities will be alternated and performed in 1-minute intervals over a 22-minute span. Prior to beginning the boxing training subjects will warm-up by walking for 3 minutes and then shadowboxing for 1 minute. Following the non-combative boxing training, subjects will cool down by walking for 4 minutes. Subjects will also be prompted to take two 1-minute breaks during the course of the activity so that heart rates can be measured and so subjects can get a drink of water. Thus, the total time necessary to complete the physical activity will be 31 minutes.

Mood states will be measured using the Profile of Mood States (POMS), and affective states will be measured using the Positive and Negative Affect Schedule (PANAS). The POMS and PANAS are both paper and pencil surveys. The study will include two groups, the non-combative boxing training group and a control group that will watch a health-related video for 31 minutes. Subjects in the non-combative boxing training group will complete the POMS and the PANAS immediately before and immediately after the session of non-combative boxing training. Subjects in the control group will complete the POMS and the PANAS immediately before and immediately after watching the health-related video.

I understand that I may be assigned to either the control group or the non-combative boxing training group, as this is a stratified randomized study. Further, I understand that if I am assigned to the non-combative boxing training group, I will be asked to attend 2 familiarization trials in the week preceding data collection. These familiarization trials will be identical to the data collection trial except the POMS and the PANAS will not be completed, and, thus, mood and affective states will not be measured. I also understand that if I am assigned to the control group, I will have the option of attending a 3-day non-combative boxing training workshop in the week following data collection. The data collection trial for both the non-combative boxing training group and the control group will take approximately 45 minutes to an hour.

The inherent risks to the control group are no greater than might ordinarily occur while watching a video. The inherent risks to the non-combative boxing training group may

include cuts, scrapes, bruises, muscle soreness, muscle strains, ligament or tendon sprains, and, in rare cases, coma or death. I have indicated to the researcher that I am currently moderately active as I engage in moderate intensity activity at least 3 days per week for at least 30 minutes. For most people, moderate intensity is equivalent to walking 3 to 4 miles per hour. Because I am currently moderately active, the risks to subjects in the non-combative boxing training group are much the same as those I ordinarily experience during participation in other types of moderate-intensity physical activity.

I understand that in case of injury or illness resulting from this study, emergency medical treatment will be available at the Oklahoma State University Student Health Center or by the researcher dialing 911. I understand that no funds have been set aside by Oklahoma State University to compensate me in the event of illness or injury. Reasons for stopping training may include, but are not limited to, dizziness, imbalance, and chest pain. I also understand that I am not obligated to complete the training and may stop training at any time.

By participating in this study, I may learn whether non-combative boxing training has the potential to alter mood and affective states. The findings of this research can be applied to any person who is physically capable of participating in non-combative boxing training.

To enhance confidentiality, I understand that I will be instructed to write my initials, the last four digits of my social security number, and an "M" or an "F" to indicate whether I am male or female at the top of the POMS and PANAS surveys. This will allow pre- and posttest survey results to be compared. In addition, the POMS and PANAS surveys will be stored in a secure location. All other documentation containing my name will be stored in a separate secure location. Once the study is completed, all documentation will be shredded.

I understand that my participation in this study is voluntary. I also understand that I may withdraw from this study at any time without penalty or loss of benefits. If I have any questions concerning this study or my rights, I may contact Kerry Morgan at (405) 612-2693. I may also contact Beth McTernan, IRB Research Compliance Specialist, 415 Whitehurst, Oklahoma State University, Stillwater, Oklahoma 74078; telephone (405) 744-5700.

I have read and understand this consent form. I sign it freely and voluntarily. I have been provided with a copy of the consent form.

Signature of Participant

Date

I certify that I have personally explained all elements of this consent form to the subject before requesting the subject to sign it.

Signature of Researcher

Date

APPENDIX F
SUBJECT INFORMATION SHEET

Subject Information Sheet

Name: _____

Age: _____

Active Email Address: _____

On average, how many days per week do you currently engage in physical activity?—(please circle one)

0 1 2 3 4 5 6 7

On average, how long do you currently engage in physical activity at a time?—

(please circle one)

Less than 30 minutes

30 minutes

More than 30 minutes

Do you typically engage in moderate-intensity physical activity or greater? For many people, moderate intensity physical activity would be equivalent to walking 3 to 4 miles per hour.—(please circle one)

Yes

No

APPENDIX G
INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

Oklahoma State University Institutional Review Board

Date: Thursday, January 13, 2005
IRB Application No ED0556
Proposal Title: Mood and Affective State Response to an Acute Bout of Non-Combative Boxing Training
Reviewed and Processed as: Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 1/12/2006

Principal Investigator(s)

Kerry Morgan
120 S. Burdick, I-4
Stillwater, OK 74074

Frank Kulling
188 Colvin Center
Stillwater, OK 74078

The IRB application referenced above has been approved. 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.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

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: 405-744-1676, colson@okstate.edu).

Sincerely,


Sue C. Jacobs, Chair
Institutional Review Board

VITA

Kerry Dawn Morgan

Candidate for the Degree of

Master of Science

Thesis: MOOD AND AFFECTIVE STATE RESPONSE TO AN ACUTE BOUT OF
NON-COMBATIVE BOXING TRAINING

Major Field: Health and Human Performance

Emphasis: Applied Exercise Science

Biographical:

Personal Data: Born in Miami, Oklahoma on July 2, 1980, the daughter of V.O. and Konnie Morgan.

Education: Graduated from Welch High School, Welch, Oklahoma in May 1998; received Bachelor of Science degree in Finance with a minor in Accounting and a minor in Health Promotion from Oklahoma State University, Stillwater, Oklahoma in May 2002; completed requirements for the Master of Science degree in Health and Human Performance at Oklahoma State University, Stillwater, Oklahoma in July 2005.

Experience: Fitness Center Attendant, Gym 24, Stillwater, Oklahoma (2002-2004); Graduate Teaching Assistant, teaching Weight Training and Total Wellness, Oklahoma State University, Stillwater, Oklahoma (2003-2005); Graduate Research Assistant, Oklahoma State University, Stillwater, Oklahoma (2004-2005); Personal Trainer, Bodyworks Health Club, Stillwater, Oklahoma (2005).

Professional Memberships: International Sports Sciences Association (Certified Fitness Trainer).

Name: Kerry Dawn Morgan

Date of Degree: July, 2005

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: MOOD AND AFFECTIVE STATE RESPONSE TO AN ACUTE BOUT
OF NON-COMBATIVE BOXING TRAINING

Pages in Study: 78

Candidate for the Degree of Master of Science

Major Field: Health and Human Performance

Scope and Method of Study: The purpose of this study was to examine the influence of an acute bout of non-combative boxing training on mood and affective states. Initially, 54 Oklahoma State University students between the ages of 18 and 24 years volunteered for participation; of these volunteers, 43 completed the study. Participants were assigned to either the non-combative boxing training group or the control group, which watched a health-related video. The Profile of Mood States (POMS) was administered before and after each intervention to measure mood states while the Positive and Negative Affect Schedule (PANAS) was administered before and after each intervention to measure affective states.

Findings and Conclusions: Pre-intervention differences between the non-combative boxing training group and the control group were detected on the Anger and Depression subscales of the POMS and on the Negative Affect dimension of the PANAS. Consequently, it was decided to use an analysis of gain scores. Post-intervention, the non-combative boxing training group experienced significant reductions in Depression, Confusion, and Negative Affect and significant increases in Vigor and Positive Affect. Thus, all changes to mood and affective states generated by non-combative boxing training were favorable. It was concluded that positive changes to mood and affective states are a consequence of participation in non-combative boxing training.

ADVISER'S APPROVAL: Dr. Frank Kulling
