ABSTRACT

BRADBURY, E. The effects of aerobic activity on psychological mood states in college-age females. M.S. in Adult Fitness - Cardiac Rehabilitation, December 1989. 63 pp. (N.K. Butts)

This study was conducted to determine the effects of participation in 8 wks of aerobic activity on psychological mood states (tension, depression, anger, vigor, fatigue, confusion and total mood disturbance). 82 college-age females enrolled in the UW-La Crosse Intramural aerobic activity classes. Classes met 2/wk for 1 hr. The Profile of Mood States (POMS) was administered at the first class session and again after 8 wks. Attendance was recorded throughout the 8 wks. Ss were catagorized according to tests completed and attendance. Group 1 completed the pretest and attended < 15 classes. Group 2 completed both tests and attended < 15 classes. Group 3 completed both tests and attended > 15 classes. Oneway ANOVA's and MANOVA's along with ferquency distributions were computed. Initially at least 50% of the Ss in each group scored better than the normative mean for all mood states with the exception of depression and vigor in Group 1 who scored below 50%. When the 3 groups were compared, the pretests of Group 1 indicated vigor to be sig ($p < .05$) lower compared to the other groups. There was no sig ($p > .05$) diff among Groups 2 and 3 on the pre- or posttests. After the 8 wks, Groups 2 and 3 reported sig ($p < .05$) less tension, less depression, less TMD and greater vigor. In addition Group 2 was sig ($p <. 01$) less confused. These results indicated that there were pyschological benefits obtained from participation in aerobic activity classes. In addition, it appears that negative mood profiles reported on the POMS during the pretest may possibly identify individuals who are more likely to drop out of an exercise program.

THE EFFECTS OF AEROBIC ACTIVITY ON PSYCHOLOGICAL MOOD STATES IN COLLEGE-AGE FEMALES

A Thesis Presented

to

The Graduate Faculty

University of Wisconsin-La Crosse

In Partial Fulfillment

of the Requirements for the

Master of Science Degree

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by

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We recommend acceptance of this thesis in partial fulfillment of this candidate's requirements for the degree:

Master of Science Degree in Adult Fitness/Cardiac Rehabilitation

The candidate has completed her oral report.

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DEDICATION

I would like to dedicate this thesis to my very special family. They have given me encouragement, support, drive, and determination to make it through another chapter in my life. Thanks, I could never have made it without you. I Love You.

I was never alone through all my trials and tribulations because the Lord was always with me. Without this support from the Lord nothing in my life would be possible. Thanks for giving me guidance and direction in this challenging world.

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CHAPTER I

INTRODUCTION

"The paradox appears to be that one must exercise to relax."

Harris (1985)

In addition to the positive physiological benefits of exercise, individuals should be informed of the potential psychological benefits obtained through exercise. People claim that the fast pace of daily routines leaves them too tired, too depressed, or too stressed mentally to do any physical exercise. In reality, though, they might "feel better" if exercise was incorporated into their daily lifestyle. According to Mutrie (1987) this state of "feeling better" after exercise is defined as positive mood changes (i.e., decrease in anxiety and tension). It is not the body that needs exercise but rather the mind because of excess anger, anxiety, depression, tension, etc. The old adage, "a sound body ensures a sound mind," does not always hold true. In the past, the emphasis has been more on the physiological than psychological benefits from exercise such as improved functions of the cardio-respiratory systems and body composition. In recent years researchers have begun to explore the possible psychological benefits that may be derived from physical exercise. Some of these feelings, according to Harris (1985), include "exhilaration, euphoria, ecstasy, peak experience getting high, or being spacy" (p. 46).

In the past there has been skepticism about the field of psychology and its role in exercise. Often times the psychological field has been stereotyped as only dealing with mental illness and "crazy" people. In recent years, however, these harsh accusations have been deteriorating, and psychological studies have become more acceptable.

Initially an individual usually enters an exercise program for physiological reasons (i.e., weight loss, increase cardiovascular fitness, etc.) but often continues exercise for other, possibly psychological, purposes. According to Harris (1985) people continue to exercise for three reasons: (1) they preceive exercise to be fun; (2) they generally feel good; and, (3) they become more attuned to their body and are aware of what activities elicit positive responses. In talking with people involved in Cardiac Rehabilitation and Adult Fitness exercise programs at the University of Wisconsin-La Crosse, their reasons for staying in the program were psychological/social with the physiological benefits being secondary. Research conducted by Glasser (1976), Heaps (1978), Mutrie (1987), and Emery Pinder, and Blomental (1989) offered written documentation to substantiate these testimonies. In 1976 Glasser coined the term "Positive Addiction" which described the physical and psychological benefits received by individuals committed to an activity.

Purpose

Numerous authors (Gondola & Tuckman, 1982; Morgan, 1980; Wilson, Morley & Bird, 1980) have studied the psychological mood changes associated with physical exercise. The purpose of this study was to

determine what, if any, psychological benefits are obtained from participating in eight weeks of an aerobic activity.

Hypothesis

The null hypothesis was stated as: there would be no change in psychological moods (i.e., tension, depression, anger, vigor, fatigue, and confusion) as a result of participating in aerobic activity classes for eight weeks.

Delimitations

All the participants in the aerobic activity classes voluntarily enrolled in the classes for their own personal benefit.

From these individuals, 100 were randomly selected to participate in the study.

Subjects completed the pretest during the initial class.

The posttest was administered eight weeks later either during the session or individually.

Attendence was taken at every class to determine exactly how many sessions each individual attended.

Limitations

The intensity of the aerobic activity classes may have varied because of the different teaching methods of the instructors. This may have affected the psychological benefits that the subjects reported.

Due to occassional outside conflicts, subjects could have attended aerobic activity classes other than those specifically selected for the study.

There was no way to control traumatic events that happened in the subject's life during the study.

No physiological variables were measured to determine if there was any improvement in cardio-respiratory functions from participating in the eight week study.

Unfortunately when most of the posttests were given, students were involved in taking midterm exams.

Since some of the subjects were unable to complete the posttest prior to their spring vacation, those subjects completed the posttest immediately upon returning from vacation.

All subjects were female.

Assumptions

The following assumptions were made in this study:

The subjects answered the Profile of Mood States (POMS) truthfully and not in an automatic fashion.

The POMS uses a Likert scale for the rating of the adjectives which was assumed to yield interval data.

The subjects kept a noncompetitive frame of mind during the aerobic activity.

The subjects worked to the best of their physical ability to reach their target heart rate zone for a 30-minute period.

The POMS is both a valid and a reliable instrument for measuring psychological mood states.

The subjects did not change any of their physical activity habits outside of the class.

Definition of Terms

Aerobic Activity - moderate, noncompetitive, aerobic exercise with all the routines performed to music of the instructor's choice. Each

class session was an hour: 30-minutes of stretching and conditioning and 30-minutes of moderate cardiovascular exercise.

Moderate cardiovascular exercise - determined by taking the constant 220 minus the individual's age and multiple this value by both 60-85%. The two values obtained identify the heart rate zone the subject should strive to achieve during the 30 minutes of moderate exercise. The heart rate zone was used to accommadate the subjects' individual physical abilities.

Profile of Mood States (POMS) - a paper and pencil test consisting of 65, five-point adjectives, addressing six different mood states: tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia and confusion-bewilderment.

According to McNair, Lorr, and Droppleman (1971) the above mood states are defined as:

Tension-Anxiety - an increase musculo-skeletal tension felt within the individual and observed by others.

Depression-Dejection - a feeling of personal inadequacy.

Anger-Hostility - showing little compassion/sympathy towards others.

Vigor-Activity - heightened levels of energy.

Fatigue-Inertia - low levels of energy - weariness.

Confusion-Bewilderment - a feeling of disorganization, lost emotionally and unsure of self.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

The following narrative discusses how mood states relate to physical exercise. In addition to a historical approach some of the issues addressed in this review are: problems measuring psychological changes, today's ranges, negative addiction, theories for mood changes, recipients and their benefits, the Iceberg Profile, sex differences, physiological and psychological fitness, exercise drop-out and a summary.

History

In the past twenty years the area of exercise and how it affects individuals psychologically has expanded dramatically. Research conducted prior to the 1960's were fairly vague and had crude instrumentation. In addition these studies were extremely biased for the reason that results were based only on male subjects. Later results by Folkins, Lynch, and Gardner (1972) and Mutrie (1987) showed that women, not men, appeared to have greater positive psychological changes after exercise.

By the early 1970's researchers were modifying and creating new instruments to measure psychological mood states. The new tests were a conglomeration of many past instruments with new factors incorporated. One test that was developed in this time period was the Profile of Mood

States (POMS) by McNair et al. (1971). According to McNair et al. (1971) this instrument was a product of 100 other instruments used in the past. The developmental study conducted by Lorr, Daston and Smith (1967) resulted in an instrument with eight mood factors. Five of these factors were used later in POMS.

In the study by Norcross, Guadagnoli, and Prochaska (1984) two diverse populations, psychiatric outpatients and adult smokers, were examined to identify the replication capabilities of the POMS. The results revealed that three of the factors, anger-hostility, vigor-activity, and fatigue-inertia were replicated indicating that the POMS is internally consistent.

A later study conducted by Boyle (1987) compared the overlap of factors of the POMS and the Eight State Questionnaire (8SQ). Boyle (1987) showed that the POMS factor tension-anxiety significantly predicted similar mood factors of the 8SQ. In addition, the POMS factor fatigue-inertia predicted all of the related 8SQ factors with the exception of guilt. The POMS factor tension-anxiety correlated highest with the 8SQ factor anxiety. Finally, the POMS factor fatigue predicted the 8SQ factor fatigue the best. In addition, it was reported that each scale had its own unique way of measuring mood states. These results indicated that the POMS is a valid tool to use for measuring changes in mood states.

Since the initial development and first tests of POMS, it has gone through a few changes. McNair et al. (1971) reviewed the different forms of POMS prior to the 1971 form. The 1961 form of POMS included only 55 adjectives, a four-point rating scale, and addressed six

different affective states. The second form, in 1964, increased the total number of adjectives to 57. The third form also presented in 1964 had 60 mood adjectives and the mood affect confusion was still under refinement. All these forms had been administered to psychiatric patients and the adjectives were rated based on the time set of the past week and the day of the test. By 1967 a fourth form of the POMS had been developed. This form had 67 adjectives, a five-point rating scale and the time set for rating adjectives was "Right Now" meaning how the individual was feeling at that very moment. In addition this form was administered to normal college students. The final form used today consists of 65, five-point adjectives assessing six different mood states (tension-anxiety, depression-dejection, anger-hostility, vigor-activity, and confusion-bewilderment) with a time set of feelings in the past week including the day of the test.

Problems Measuring Psychological Changes

The problems with studying changes in mood states lies in the fact that the answers are all subjective. In contrast physiological changes are more objective and can be directly measured.

To this date there are no hard and fast rules or guidelines to be followed when attempting to determine what psychological benefits occur with exercise. Williams and Getty (1986) stated that "even if exercise does improve psychological well-being, it is not known why this occurs or what types of exercise and intensity of exercise are needed for changes to occur" (p. 1099). Each researcher seems to have his/her own opinion and criteria of exercise that will promote positive psychological changes. There is some overlap, however, and until more

research is conducted society will have to settle with broad ranges in exercise levels.

Today's Ranges

As stated above there are only broad ranges suggested for exercise levels which may elicit positive mood shifts. Researchers have divided exercise levels into five categories: mode, frequency, intensity, duration, and enjoyment.

Mode

Mode, in general, is defined as the type of activity and its components. According to Berger and Owen (1988) the mode of an physical activity should be: (1) aerobic (i.e., jogging, swimming, and aerobic dance); (2) noncompetitive, for the simple reason that an individual competes enough within themself; (3) predictable, meaning that the individual has sole control of the pace, time, distance and is free from environmental distractions; and, (4) rhythmical, the activity should allow the individual's mind to wander and not have to concentrate on the activity at hand. Morgan and Horstman (1976) identified this mindlessness participation as dissociation from the activity.

In earlier research, Glasser (1976) stated similar criterion as above with a few additional points which should be followed to lead to a positive addiction in either exercise, yoga or meditation. These points include: (1) the activity should be independent of other individuals; (2) the individual should believe that the activity has positive effects (i.e., psychologically and physiologically); (3) the individual should believe that improvement will occur over time, but this improvement should only be judged by the individual; and, (4) most important, the

activity should to be completed without self criticism. Finally another researcher, Harris (1985), stated that the activity should be nonpurposeful, meaning that the activity should not be viewed as medicine or treatment but rather a joy.

Frequency

Frequency is related to how often the exercise should be completed and is usually addressed in numbers of times per week. Glasser (1976) recommends individuals should exercise daily. In 1979 Morgan suggested that exercise should be completed 3 to 7 times per week. Morgan (1985) and Berger and Owen (1988) stated that the feeling of "well being" is evident for 2-5 hours after exercise, thus the activity needs to be repeated several times per week to maintain the psychological "fix."

It has been reported by Glasser (1976), Summers, Sargent, Levey, and Murray (1982), and Mutrie (1987) that people who miss their regularly scheduled exercise session yield negative moods (i.e., guilt, irritability, depression, tension and sluggishness). Researchers have attempted to determine the effects of exercise deprivation but are having difficulties finding regularly exercising subjects willing to stop exercising even for one day. The psychological benefits that they receive through exercise outweigh any type of gift or monetary reimbursement given for participting in a study.

Intensity

Intensity addresses the issue of how hard the exercise should be and is usually measured in terms of heart rate. Here is where the controversy sets in. Morgan and Horstman (1976) indicated that high exercise intensities (80% VO_2 max) will elicit positive mood changes.

On the other hand, deVries (1981) recommended low exercise intensities (30%-60% of the difference between resting and maximal heart rate). Yet other researchers (Berger & Owen 1988; Glasser, 1976) suggested moderate exercise intensities. Browman (1981) is in agreement with moderate intensities and further stated that extreme levels of exercise are more apt to cause psychological disturbances.

Duration

Duration focuses on the question of how long each exercise session should last and is often stated in minutes. Duration, like intensity, is also a controversial element when focusing on exercise and mood changes. The studies conducted by Morgan (1979) and Berger and Owen (1988) recommended exercise should last 20-30 minutes. However Glasser (1976) suggested exercise to extend from 40-60 minutes.

Enjoyment

The final criteria for exercise is one that researchers may never be able to define. The criteria pertains to the individual's own enjoyment of the exercise. The most important guideline of physical exercise, according to Berger and Owen (1988), is that it must be pleasing to the individual or the possibility of obtaining psychological benefits is greatly reduced.

ACSM Exercise Guidelines

In 1978 ACSM recommended exercise guidelines for physiological benefits in normal populations. These guidelines stated that the mode of exercise should involve large muscle mass, be able to sustain the activity for a period of time, and be aerobic. The intensity should range from 65-90% of maximal heart rate with a frequency of three to

five days a week. The duration of the exercise should last between 15-60 minutes. These guidelines are quite similar to those suggested above for psychological benefits indicating that both physiological and psychological benefits may possibly be received when working at moderate levels.

Negative Addiction

There comes a point where positive addiction changes into negative addiction. The philosophy of "if a small amount is good than a greater amount is better," is the wrong attitude to take with exercise. Just like anything else in life excess amounts may elicit negative results or behaviors. According to Morgan (1979) and Browman (1981) negative addiction interferes with life's responsibilities and obligations. Negative addiction to exercise takes precedence over all other things, work, family and friends. These secondary responsibilities only come into play if there is time after exercise. In addition the addict will continue exercising to the point of near crippling extremes to continue to receive the psychological "high." If the addict is forced to stop exercising he/she will search extensively for a quick cure. Morgan (1979) further stated that "running should be a means to an end and the end should be achievement of positive health-both physical and mental" (p. 69). Exercisers must maintain the proper perspective about exercise for vocational, social, biological and psychological reasons.

Theories for Mood Changes

At the present time researchers have not been able to isolate the cause-effect relationship for why individuals encounter psychological benefits from exercise. However researchers have proposed several

different theories for mood changes after exercise. Mutrie (1987) presented three different mechanisms for the changes: biochemical, physiological and psychological processes.

The biochemical process focused upon the possibility of increased endorphins in the body being released into the blood plasma and transported to the central nervous system. The outcome of this increased endorphin level is what lay media refers to as a "runner's high." In Gondola and Tuckman's (1982) study of average and elite marathon runners, the results indicated that both males and females were significantly less tense, less fatigue, less depressed, less confusion and had greater vigor compared to college age males and females. There was no significant difference in anger. The authors concluded that an individual does not have to be an elite marathoner to be a recipient of psychological benefits. Gondola and Tuckman suggested that increased endorphin levels may be the reason for these changes. However they were not willing to state a firm cause and effect relationship between endorphins, exercise, and psychological changes.

Research conducted by Markoff, Ryan, and Young (1982) questioned the theory of mood changes mediated by increased endorphin levels after exercise. Their study involved the administration of the POMS before and after running a minimum of one hour. The results showed that there was a significant reduction in tension-anxiety and anger-hostility between the pre and post exercise evaluation. This preliminary study indicated that mood states signficantly change in runner when measured immediately after the run. The actual experiment focused on POMS values collected pre-run, post-run and post-injection. The injection consisted

of sterile water (placebo) or Naloxone (type of endorphin). Immediately after the run there was a significant decrease in anger-hostility and depression-dejection. Tension-anxiety showed no significant reduction after running. However there was a significant difference in this factor post-injection, but it occurred in both the placebo and Naloxone groups. The authors concluded that mood changes may not be caused by endorphins. In addition, it may take a period of time after exercise before the mood changes are evident.

Williams and Getty (1986) hypothesized that normal subjects would improve psychological mood states and physical fitness after 10 weeks of aerobic exercise (i.e., jogging of aerobic dance). Their second hypothesis was that depressed subjects would decrease their level of depression and have a corresponding increase in their beta-endorphin levels after exercise. The POMS instrument was used to measure mood changes and a step test was used to evaluation cardiovascular parameters.

The results for the normal subjects showed only a significant increase in vigor, a decrease in resting heart rate, and a faster recovery heart rate. The nonaerobic and control group showed no psychological or physical changes. For the depressed subjects who were exercising there was only a significant decrease in recovery heart rate. The control subjects who did not exercise decreased in their fitness level. The authors had to reject their hypothesis that exercise would have positive affects on mood states in the normal subjects since tension and depression levels did not change significantly. In addition their results led to the rejection of the hypothesis that mood changes

in the depressed subjects did not appear to be caused by endorphins. Williams and Getty's (1986) results support those stated previously by Markoff et al. (1982).

Mutrie (1987) addressed a second possible theory, physiological process, for why psychological benefits are obtained from exercise. This theory was subdivided into two parts: muscle tension and work capacity. The first part stated that exercise had a tranquilizing affect on muscle tension thus reducing anxiety and tension levels after the activity. A study by deVries (1981) supported this idea by the electromyograph to measure muscle tension after exercise. deVries' (1981) study had subjects on their first visit perform a bench stepping activity for five minutes then measured muscle tension after the exercise. On a subsequent visit the same subjects acted as their own control group and muscle tension was measured without performing exercise. The results revealed a significant decrease in neuromuscular activity after exercise, thus indicating exercise had a calming and relaxing affect on muscle tension. The second part of this theory is directed at the individual's increased work capacity. This idea addressed the possibility of increased energy levels due to the increased level of physical fitness. Tucker et al. (1986), Wilfley and Kunce (1986) and Mutrie (1987) suggested that daily tasks may be completed with less fatigue, less stress and more energy.

The third theory Mutrie (1987) presented was the psychological process which is divided into three components. The first component focused on the feeling of mastery of an exercise or activity which gives the individual increased self confidence, increased self-esteem and a

sense of accomplishment. The second component focused on exercise as a distraction from life's problems and stresses. The final component dealt with the addiction to exercise, meaning that a person felt something was absent if regular exercise was missed. Earlier research conducted by Glasser (1976) strongly supports this concept.

Recipients and Their Benefits

According to deVries (1981) and Morgan and Goldston (1987), health care professionals (i.e., physicians and phychiatrists) are looking at exercise as an alternative means to costly psychiatric therapy and drug treatments with adverse side effects for the prevention and treatment of mental health problems and negative mood states. Morgan and Goldston (1987) discussed a survey conducted in 1983 involving about 2000 primary-care physicians. The survey revealed that 85% of the physicians routinely prescribe regular exercise programs for patients suffering from depression.

Running Studies

Since the fitness craze started, running has been the most popular mode of exercise. For this reason most of the research on the psychological benefits after exercise has focused on runners. Wilson et al. (1980) compared psychological mood states of marathoners, joggers, and non-exercisers. The results indicated that marathoners and joggers had significantly lower depression anger, confusion, and higher vigor compared to the non-exercisers as measured by POMS. When comparing marathoners to joggers, there was a significant decrease noted in depression, anger, confusion and vigor. These results indicate that the

psychological benefits from jogging (1-2 miles, 3-5 days per week) do not appear to be as great as those reported by marathoners.

In a study of first time marathoners Summers et al. (1982) focused on why middleage people run marathons, what they experienced during the race and what they felt after completing the race. An extensive pre and post race questionnaire was used to evaluate these questions. The results showed that more subjects began running to maintain or improve fitness. Subjects gave the response of personal challenge to the question of why they wanted to run a marathon. Upon completion of the race, individuals reported a sense of personal achievement, self-satisfaction, self-confidence and improved self-image. During and after the race the subjects gained personal insight as to what their body limitations and capabilities were. The authors concluded that running a marathon was a positive experience and produced a deep personal understanding and gratification within oneself.

The studies on marathoners by Gondola and Tuckman (1982), reviewed previously, and Morgan (1978) concluded that one does not have to be an elite runner to achieve psychological benefits from running.

In 1983 Gondola and Tuckman conducted another study relating psychological changes in females runners of varying running classes. This study included an intermediate class of runners which was absent in the authors' 1982 study. There were three classes: individuals training to run a 10K race, individuals who run 10K races, and marathoners. The investigators hypothesized that the subjects who run 10K races would demonstrate a healthier psychological profiles based on POMS results compared to the other two running classes. The statistical analysis

indicated that the 10K runners were significantly less tense than the other two classes. The 10K subjects had equivalent levels of anger compared to the aspiring 10K runners. Significantly lower depression and anger levels were noted for the 10K subjects compared to the marathoners. The 10K group was significantly more vigorous than the aspiring 10K class but equivalent to marathoners. There was no significant difference among the groups for the factors of fatigue or confusion. These results indicated that moderate levels of running seem to elicit the best psychological benefits.

Multi-mode Studies

There have been a few studies which focused on other exercise modalities. Gurley, Neuringer, and Massee (1984) compared psychological improvement of individuals in dance, fencing, basketball, kayaking and academic classes. A questionnaire patterned after the Osgood's Semantic Differential Technique was used to measure well-being. The dancers had an overall significant improvement in well-being as a result of their activity. In addition, the dancers had a significantly higher well-being when compared to the other sports participants and academic classes. These results are weak because basketball, kayaking, and fencing are not considered, by mode criterion stated previously, as activities that would yield many psychological improvements. The study would have been more creditable had the researchers compared dance to running.

In another multi-mode study Berger and Owen (1988) concentrated on four different modes of exercise: swimming, body conditioning, Hatha yoga and fencing. The POMS was used to measure mood changes. The

results for the swimmers indicated a significant reduction in tension and confusion on day 1. However on day 2 and 3 of testing these results were not evident. Even though these results were not dramatically different, the swimmers reported an overall healthy profile before and after exercise leaving little room for change. This was evident by the graphic Iceberg pattern as defined by Morgan (1980). The subjects involved in body conditioning reported a significant increase in fatigue after exercise. Their graphic results did not illustrate the traditional Iceberg profile like the swimmers. The day-time yoga class significantly improved in four of the POMS factors, depression, anger, fatigues, and confusion after exercise. The evening yoga class experienced a significant improvement in tension, depression, fatigue, and vigor after exercise. The yoga subjects on all three evaluation days were significanly less angry and less confused after exercise. The fencing participants only reported a significant increase in vigor. These results indicated that different levels and modes of exercise yield varying degrees of psychological changes.

Rehabilitation Purposes

Not only do the elite or recreational athletes perceive positive mood changes but cardiac rehabilitaition patients benefit psychologically from exercise. The increasing trend of involving cardiac patients in exercise has a dual purpose. According to Collingwood (1972), Folkins (1976) and Emery et al. (1989) aerobic exercise helps these individuals regain physical fitness and boost their mood states. The reseachers' results indicated that exercise decreased anxiety, depression and anger and increased physical work capacity.

Iceberg Profile

Investigators have been using the POMS to evaluate psychological mood states in all different levels of athletic participation. Using the POMS, Morgan (1980) coined a specific pictorial image, the "Iceberg Profile." This pattern was seen when certain mood states were reported (see Appendix A for an example of the iceberg profile). The characteristics of this profile graph vigor above the mean and tension, depression, anger, fatigue, and confusion below the mean. The Iceberg Profile has been apparent in world class and Olympic athletes. In addition, Berger and Owen's (1988) study showed that after exercise recreational participants reported psychological moods characteristic of the Iceberg Profile.

Sex Differences

Only tentative conclusions have been made concerning sex differences in psychological benefits from exercise. According to Mutrie (1987) the reason for this is because: (1) some studies did not include females; (2) when females were included they usually were not in proportion to the number of male subjects; and, (3) some studies did not consider sex as a factor in their statistical analysis. The author summarized the tentative conclusions by saying both men and women perceive positive psychological changes from exercise, however, women report a greater change. On the other hand, women suffer more negative effects if regular exercise is missed.

Research by Folkins et al. (1972) concluded that women in a jogging class improved psychologically more than their male counter parts. The authors, however, attributed this to the possibilities that the women

were more mentally distressed and their physiological fitness was poor initially.

Physiological and Psychological Fitness

Morgan and Goldston (1987) made the statement, based on their previous studies, that there is an inverse relationship which exists between physical fitness and mental health. Numerous researchers are finding that it is the initial physiological and psychological levels which seem to dictate the amount of psychological improvement after exercise (Browman, 1981; Folkins et al., 1972; Folkins & Sime, 1981; Morgan et al., 1970; Morgan & Goldston, 1987; Wilfley & Kunce, 1986). Since all the subjects in Morgan's et al. (1970) study were considered in good physical health their results indicated no statistical significance between fitness and psychological levels. However the individuals did report some positive psychological changes.

Using certain physiological measurements Folkins et al. (1972) and Pollock, Cho, Reker, and Volaka (1979) demonstrated a correlation between heart rate and diastolic blood pressure with the mood states of depression, tension, anger, and anxiety. This indicates that there does appear to be some correlation between physiological and psychological fitness. Tucker, Cole, and Friedman (1986) concluded that with an increase in fitness the mind and body operate more effectively and efficiently.

As stated previously, initial physical and psychological levels appear to play a strong role in the degree of positive mood changes that are observed after exercise. Other researchers seem to believe that there are other factors as well. Heaps (1978) stated that it is the

individual's attitude about their physical fitness level that seemed to be related to certain psychological changes. Heaps summarized his results by saying "there is a definite psychological benefit following consistant exercise and physical change. This benefit results not from the physical improvement per se, but from the emotional or psychological perception of the physical and personal value of continued exertion" (p. 406).

Exercise Drop-Out

One of the biggest problems that affect exercise programs, either group or individual, is the factor of adherance. According to Wilfley and Kunce (1986) individuals who completed an eight-week exercise program had a significantly higher level of persistance, fitness, physical self-concept, and level of reduced tension compared to those subjects who dropped out of the exercise program. In their study persistance was significantly correlated with the POMS factor vigor. Ironically it is those individuals that discontinued the exercise that tend to have the most to gain by staying involved in the activity. In a discussion of exercise adherence, Dishman (1987) stated that individuals having a higher negative mood profile are more likely to drop out of an exercise program. The reverse of this is true with individuals having a higher positive mood profile tended to continue their exercise program.

Summary

After reviewing the related literature it is apparent that a relationship does exist between exercise and psychological mood states. Unfortunately, at the present time, researchers have not been able to formulate the exact modalities and regiments of exercise which elicit

psychological changes. More studies need to be conducted using other modalities, varying exercise levels and comparing the results obtained to running studies focusing on the same concept.

Three theories have been presented to explain the cause-effect relationship, but once again researchers have not achieved conclusive evidence which substantiates one theory more than the other. Since this concept of psychological benefits from exercise is relatively new, not enough studies have been conducted to test these theories and validate the results with duplicate studies.

The changes in psychological mood states from exercise have been measured by the POMS and research by Morgan (1980) has described a healthy psychological profile. Future research needs to compare the POMS to other psychological testing tools to add validity and reliability when recommending guidelines for modalities and exercise levels.

CHAPTER III

METHODS

Introduction

This study was an attempt to determine if individuals experienced any psychological benefits (i.e., decrease in tension, depression, anger, fatigue, confusion and an increase in vigor) from aerobic activity. The Profile of Mood States (POMS) was used to measure these potential psychological benefits obtained from aerobic activity.

Selection of Subjects

The Intramural Program at the University of Wisconsin-La Crosse offered seven different aerobic activity classes during the Spring semester of 1989. Four of these classes were offered in the late afternoon and early evening. All seven classes were available for a small fee to all students and employees at the university.

One hundred students were randomly selected by using a computer generated list of 100 numbers randomly distributed between 1 and 450. All the subjects were selected from the four late afternoon and early evening classes. The 100 numbers were evenly distributed between the four classes. Initial contact with the subjects was made during enrollment for the classes according to the order in which they signed up and at the first session of the classes as students walked into the gymnasium. All the subjects that participated in the study were female students.

The subjects were given a form (see Appendix B) at enrollment or the first session of class to complete and return to the researcher. The top portion of the form explained the requirements of the study and other general information concerning the study. The bottom half of this form asked for their name, address and phone number. The subjects were to complete this bottom portion and return it to the researcher if they were willing to participate in the study.

Grouping of the Subjects

After the collection of the data the subjects were grouped according to attendance and tests completed. Group 1 attended fewer than 15 classes with an average of 6 visits (range: 1-11) and completed the pretest. Group 2 attended fewer than 15 classes with an average of 9 visits (range: 2-14) and completed both the pre- and posttests. Group 3 fulfilled the study requirements by attending more than 15 classes with an average of 19 visits (range: 16-26) and completing both the pre- and posttests.

Aerobic Activity Classes

Each of the four classes surveyed met twice a week for one hour. The subjects were involved in one or two of the four classes based on their own personal desires. The aerobic activity was moderate, non-competititve aerobic exercise set to music of the instructor's own choosing. The class was divided into two 30-minute segments: 30 minutes of stretching and conditioning and 30 minutes of moderate cardiovascular exercise. The class leaders suggested that the participants exercise in their target heart rate zone. To determine the appropriate zone the participants were instructed to subtract their age from the constant 220

and then multiply that value by 60-85% to obtain the exercise heart rate zone. This zone was used to accommodate the subjects' individual physical abilities. This method of calculating exercise heart rates was explained during the first session of class and repeated periodically thoughout the eight weeks. During the moderate cardiovascular exercise, the instructor had the participants monitor their heart rates and adjust their individual intensity level appropriately to maintain a proper heart rate.

Test Administration

Pretest

The pretest was administered the first night of each class prior to the start of the aerobics class. The subjects were given individual verbal instructions (see Appendix C) for the tests as it was handed to them. McNair et al. (1971) stated that the purpose of these instructions is "to emphasize a period both sufficiently long to depict the subject's typical and persistent mood reactions to his/her current life situations and sufficiently short to assess acute treatment effects" (p. 5). Since the test only takes an average of five minutes to complete, there was no problem for the subjects to complete the test prior to the start of class. The tests were completed in the gymnasium where the class was held.

During the eight-week period the researcher attended each class to take attendance and give positive reinforcement to all the subjects. In addition periodically subjects were contacted by telephone to encourage their continuation of the class.

Posttest

The posttest, for the majority of the subjects whether they had completed the 16 required classes or not, was administered eight weeks after the start of the class. However some of the subjects were not able to complete the posttest at this time. These subjects were immediately surveyed upon returning from their spring break vacation. The same testing conditions, instructions and distribution methods of the pretest were used for the posttest with all the subjects.

Unfortunately over the eight-week period some of the subjects dropped out of the class. The researcher contacted most of these subjects by telephone and scheduled special times for their individual posttest. However, some subjects did not follow through in completing the posttest. Consequently only pretest results were available on these subjects.

Instrumentation

The Profile of Mood States (POMS) by McNair et al. (1971) is a rapid way of assessing affective states. It consists of 65 adjectives divided into six different moods: Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigor-Activity, Fatigue-Inertia and Confusion-Bewilderment. Each different mood is addressed by 7-15 different adjectives with no item overlap. According to Eichman (1978) there is considerable redundancy of the adjectives and this yields an extremely high internal consistancy. A five-point adjective rating scale (Not At All, A little, Moderately, Quite A Bit and Extremely) was used to score the different adjectives.

It was recommended by McNair et al. (1971) that the POMS is most effective when administered to subjects 18 years-of-age or older. The reason for this is younger individuals may not understand the meaning of all the different adjectives used on the profile.

Validity/Reliability

Over the course of the POMS development there have been changes in the number of mood states being measured, the number of adjectives to measure the mood states and the number of points on the rating scale. The POMS manual (McNair et al., 1971) addressed several different studies which were used in the development of the test and norms. McNair et al. (1971) summarized the studies by saying that the six affective states were "identified, measured reliably and replicated" in the outpatient and normal populations (p. 6).

When correlating the six different mood states, tension-anxiety had overall lower scores for the normal group as compared with outpatient scores. The other five affective states yielded comparable results in both populations. The reliability and validity tests that have been conducted, unfortunately, have focused mainly on the psychiatric outpatient population instead of the normal population. According to McNair et al. (1971) these tests showed that test-retest reliability ranged from 0.65 for vigor up to 0.74 for depression which were lower than the desirable levels of 0.80 to 0.90. They attributed these results to a large time span between the first and second tests which allowed for possible mood swings and fluctuations.

According to Eichman (1978) besides the fact that POMS only takes a short time to complete, the face validity is high because the adjectives and mood rating scale are extremely easy to comprehend.

Norms

According to McNair et al. (1971) the norms for college students were based on a sample of 340 men and 516 women that participated in psychoparmacological experiments and those who completed psychological test batteries for standardization. Since little variance was recorded for the two sexes, tentative norms presently group both males and females together. These are only tentative norms because they are based on one study and the population was not a good representation of normal college students. However in reviewing the related literature there was no study that challenged the credibility of the norms.

Scoring

The researcher did all the scoring by hand following the instructions provided by McNair's et al. (1971) manual. Each mood state had between 7-15 different adjectives. To determine the score for each factor the respective adjective scores were totaled. The adjectives were scored in the same direction with the exception of "relaxed" under the mood of tension-anxiety and "efficiency" under confusion-bewilderment. After all the mood factors were calculated a constant of 100 was added to all scores. The reason for this was that the statistical program used later for analysis could not compute negative data scores.

Ranges/Values

As previously mentioned the college norms are tentative. The following values and ranges were obtained from McNair et al. (1971).

Tension-Anxiety has a possible score of 36 points. The mean is 13.5 ±7.5. A lower score represents a healthier psychological level of this mood state.

Depression-Dejection has a possible score of 60 points. The mean is 14 ±11. A lower score represents a healthier psychological level of this mood state.

Anger-Hostility has a possible score of 48 points. The mean is 9.5 ±7.5. A lower score represents a healthier psychological level of this mood state.

Vigor-Activity has a possible score of 32 points. The mean is 15.5 ±6.5. Unlike the other mood states a higher score on this factor represents a healthier psychological mood state.

Fatigue-Inertia has a possible score of 28 points. The mean is 10.5 ±6.5. A lower score represents a healthier psychological level of this mood state.

Confusion-Bewilderment has a possible score of 28 points. The mean is 11 ±5.5. A lower score represents a healthier psychological level of this mood state.

All six affective states have a possible score of zero. If such a score is reported it indicates that the individual has a healthy psychological mood state for that particular factor. However a score of zero for vigor would indicate a negative mood state for this particular

factor. The reason for this is that vigor is weighed negatively in relation to the other factors.

A positive result on the POMS would consist of the vigor-activity score above the mean score and the other five mood states below the mean score. This pattern of mood states is a representation of the Iceberg Profile.

The reader is reminded that in this study all scores had the constant 100 added to each one for statistical purposes only. This, however, did not affect the results in anyway after statistical treatment. This constant was subtracted out and the results are reported in actual values.

Total Mood Disturbance (TMD)

In addition to each individual mood state, McNair et al. (1971) suggested that a grouping of the six mood scores may be a reliable representation of an individuals'total mood disturbance because of the "intercorrelations among the six primary POMS factors" (p. 9). Since there has not been any validity tests or norms developed for TMD, it was not certain how valid this score was for assessing an individual's overall mood state.

When scoring the TMD the six mood states were totaled weighing "vigor-anxiety" negatively. According to McNair et al. (1971) the TMD value should be compared to the "anger-hostility" factor scale.

Statistical Analysis

There were four different statistical tools used to analyze the demographic and pre- and posttest data. Descriptive analysis was used to calculate means, standard deviations, minimum and maximum values for

each group. Frequency distributions were calculated to determine if there was any pattern established in the data. Oneway ANOVA's were computed to determine the level of significance between the three different groups. Finally MANOVA's were calculated to determine if there were any significant changes within group 2 and 3 from the pretest to posttest. A 0.05 level of significance was set for the statisical analysis of this study.

CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to determine what, if any, psychological benefits are obtained from participating in eight weeks of an aerobic activity. This chapter discussed demographics of subjects and the results of the subjects' initial mood levels, group comparisons, pre- and posttest comparisons, the Iceberg Profile, total mood disturbance (TMD), and practical implications.

Demographics of Subjects

Initially there were 100 subjects randomly selected to participate in this study. Of the 100 subjects, 82 volunteered. The 18 individuals that chose not to participate either did not start the class or felt that they could not meet the 16 class requirement in the eight weeks.

The researcher administered both pre- and posttests and kept complete and accurate attendance records. Subjects were categorized according to the tests completed and attendance. Group 1 completed the pretest and attended fewer than 15 classes. Group 2 completed both pre- and posttests and attended fewer than 15 classes. Group 3 fulfilled all the study requirements by completing both pre- and posttests and attended more than 15 classes. Table 1 presents the means, standard deviations and ranges for age, height, and weight for each group. There was no significant ($p > .05$) difference found in the demographic factors

among the groups, indicating that the subjects' physical characteristics were similar.

Table 1. Means, standard deviations and ranges for physical characteristics of all three groups

Variable	Group 1 (n = 16)	Group 2 (n = 31)	Group 3 (n = 35)
age (yrs)			
mean	20.1	20.0	19.7
standard deviation	1.8	1.4	1.1
range	18-23	18-24	18-22
height (in)			
mean	65.6	66.2	65.4
standard deviation	1.7	2.5	2.7
range	63-68	60-70	60-72
weight (lbs)			
mean	132.9	135.0	131.8
standard deviation	13.9	18.7	13.5
range	113-155	97-185	109-162

Group 1 = Completed pretest and attended < 15 classes
Group 2 = Completed pre-and posttests and attended < 15 classes
Group 3 = Completed pre-and posttests and attended > 15 classes

Initial Mood Levels

Frequency distributions were computed to determine the subjects' initial mood states compared to the normative mean values. Table 2 lists the normative means for each factor, the number and percent of subjects that scored at or below the mean except vigor which would be above the mean. In Group 1 less than 50% of the subjects were below the normative mean for depression. In addition, less than 50% of Group 1 was above the normative mean for vigor. This indicated that the

Table 2. Frequency and percent of scores above the normative mean according to groups

Variable	Norm Means	Pre-test #	Pre-test %	Post-test #	Post-test %
Tension					
Group 1	14	9	56.3	--	--
Group 2	14	29	93.5	31	100.0
Group 3	14	31	88.6	33	94.3
Depression					
Group 1	14	7	43.8	--	--
Group 2	14	24	77.4	26	83.9
Group 3	14	25	71.4	30	85.7
Anger					
Group 1	10	11	68.8	--	--
Group 2	10	18	58.1	24	77.4
Group 3	10	25	71.4	31	88.6
Vigor *					
Group 1	15	7	43.7	--	--
Group 2	15	22	67.7	30	96.8
Group 3	15	27	77.1	33	91.4
Fatigue					
Group 1	11	14	87.5	--	--
Group 2	11	29	93.5	30	96.8
Group 3	11	32	91.4	31	88.6
Confusion					
Group 1	11	13	81.3	--	--
Group 2	11	31	100.0	31	100.0
Group 3	11	33	94.3	34	97.1

= Number of Subjects
% = Percent of Subjects
* = A high score on vigor is optimal
T = Tension A = Anger F = Fatigue
D = Depression V = Vigor C = Confusion

psychological mood states of Group 1 were not as stable as those of Group 2 and 3 in the area of depression and vigor.

Numerous researchers (Browman, 1981; Folkins et al., 1972; Morgan, Roberts, Brand & Feinerman, 1970; Morgan & Goldston, 1987; Wilfley & Kunce, 1986) believe initial psychological mood levels may dictate the amount of improvement which may be obtained through an exercise program. The researchers concluded that individuals who are experiencing psychological difficulties and have negative initial mood levels will show a significant improvement in mood with exercise. However subjects with healthy initial scores are less likely to improve significantly in mood states after exercise.

Group Comparisons

Oneway ANOVA's were computed to determine whether there was a signifcant difference among the three groups' pretest means of the six mood states. Table 3 lists the pre- and posttest means, standard deviations, ranges and indicates whether significance was achieved. The vigor factor was the only mood state which was significantly ($p < .05$ and $p < .01$, respectively) higher in Groups 2 and 3 when compared to Group 1. There were no significant ($p > .05$) differences reported among the groups on the other five mood states. In addition, pre- and posttest means were compared for Groups 2 and 3 with no significant ($p > .05$) differences found.

Wilfley and Kunce's (1986) study related persistance to vigor. They concluded that those individuals with a lower score on vigor were less persistant in their exercise program. The authors found vigor to be significantly higher in the exercisers when compared to the

Table 3. Comparing pre-and posttests between and within according to groups

Variable	Pre-test		Post-test		
	Mean	SD	Mean	SD	P
Tension					
Group 1	10.5	7.29	--	--	--
Group 2	7.2	5.32	4.3	4.63	.01
Group 3	7.1	4.98	5.1	5.22	.05
Depression					
Group 1	15.0	11.78	--	--	--
Group 2	9.7	7.41	6.7	6.95	.05
Group 3	10.0	7.50	7.0	7.49	.05
Anger					
Group 1	9.1	7.38	--	--	--
Group 2	7.6	5.52	7.0	5.91	NS
Group 3	7.3	6.09	5.5	4.71	NS
Vigor +					
Group 1	14.0	5.39	--	--	--
Group 2	17.3	5.09*	20.8	4.00	.001
Group 3	18.8	5.70**	22.3	4.01	.001
Fatigue					
Group 1	8.3	5.07	--	--	--
Group 2	6.2	3.33	5.4	3.10	NS
Group 3	6.4	4.67	5.7	4.15	NS
Confusion					
Group 1	6.6	6.73	--	--	--
Group 2	3.5	3.67	1.6	3.15	.01
Group 3	4.0	4.33	2.7	4.13	NS
TMD					
Group 1	31.2	27.29	--	--	--
Group 2	16.8	22.89	4.1	23.33	.01
Group 3	16.4	26.53	4.3	21.89	.01

TMD = Total Mood Disturbance
+ = A high score on vigor is optimal
* = Group 2 was significantly more vigorous than Group 1 ($p < 0.05$)
** = Group 3 was significantly more vigorous than Group 1 ($p < 0.01$)

nonexercisers. The results in the present study corresponds with those of Wilfley and Kunce (1986). Group 1 had a low attendance record (mean = 6 visits) and a low initial vigor score of 14. On the other hand, individuals with a higher level of vigor score demonstrated a greater level of persistance as was evident by Groups 2 and 3. Group 2 averaged nine class visits in eight weeks and had an initial vigor score of 17.3. Group 3 showed the highest mean attendance of 19 class visits and a initial vigor score of 18.8. There was no significant ($p > .05$) difference between the vigor scores of Groups 2 and 3. Dishman (1987) addressed this issue by stating that individuals reporting negative initial psychological profiles are more apt to drop out of an exercise program. He concluded that if the subjects had continued exercising they would have improved their psychological profile.

Pre- and Posttest Comparisons

Table 3 presents pre- and posttest means, standard deviations and the level of significant difference for each factor. MANOVA's were computed for all six mood factors and TMD on Groups 2 and 3 to determine if there was a significant difference between pre- and posttest mood states. The MANOVA's revealed that both groups showed significantly less tension ($p < .05$), less depression ($p < .05$), less TMD ($p < .01$) and more vigor ($p < .001$) during the posttest. In addition Group 2 was significantly ($p < .01$) less confused. Neither group indicated a significant ($p > .05$) decrease in anger or fatigue. Based on these results the null hypothesis was rejected.

Numerous researchers (Berger & Owen, 1988; Browman, 1981; Glasser, 1976; Gondola & Tuckman, 1982 & 1983; Morgan, 1978 & 1979; Morgan & Goldston, 1987; Wilson et al., 1980) advocated that persistant moderate aerobic activity improves psychological mood states (i.e., tension, depresion, anger, vigor, fatigue, and confusion) significantly in elite and average exercisers. The study by Gondola and Tuckman (1983) was an excellent example of the psychological benefits obtained through moderate running by average runners. They found that individuals of average ability, running moderate amounts (10K races) exemplified a healthier mood profile than those aspiring to run 10K races or those who run marathons.

Even though a majority of the subjects in the current study initially scored better than the normative means, Groups 2 and 3 still showed a significant ($p < .05$) improvement on at least three of the six mood factors and on TMD. This improvement is in contrast to what previous researchers (Bowman, 1981; Folkins et al., 1972; Morgan, 1970; Morgan & Goldston, 1987; Wilfley & Kunce, 1986) have surmised, since there was a significant improvement in this study in mood states when subjects reported an initial healthy mood level. This study further contradicted the initial level concept, since 100% of the subjects in Group 2 reported low initial levels of confusion yet they still significantly improved this factor after the eight week period.

Iceberg Profile

To further illustrate the significant difference experienced in mood states after the eight weeks, Figures 2 and 3 show pre- and posttest means of each factor for Groups 2 and 3, respectively. Both

Figure 1. Pretest mean scores on the six mood states for Group 1

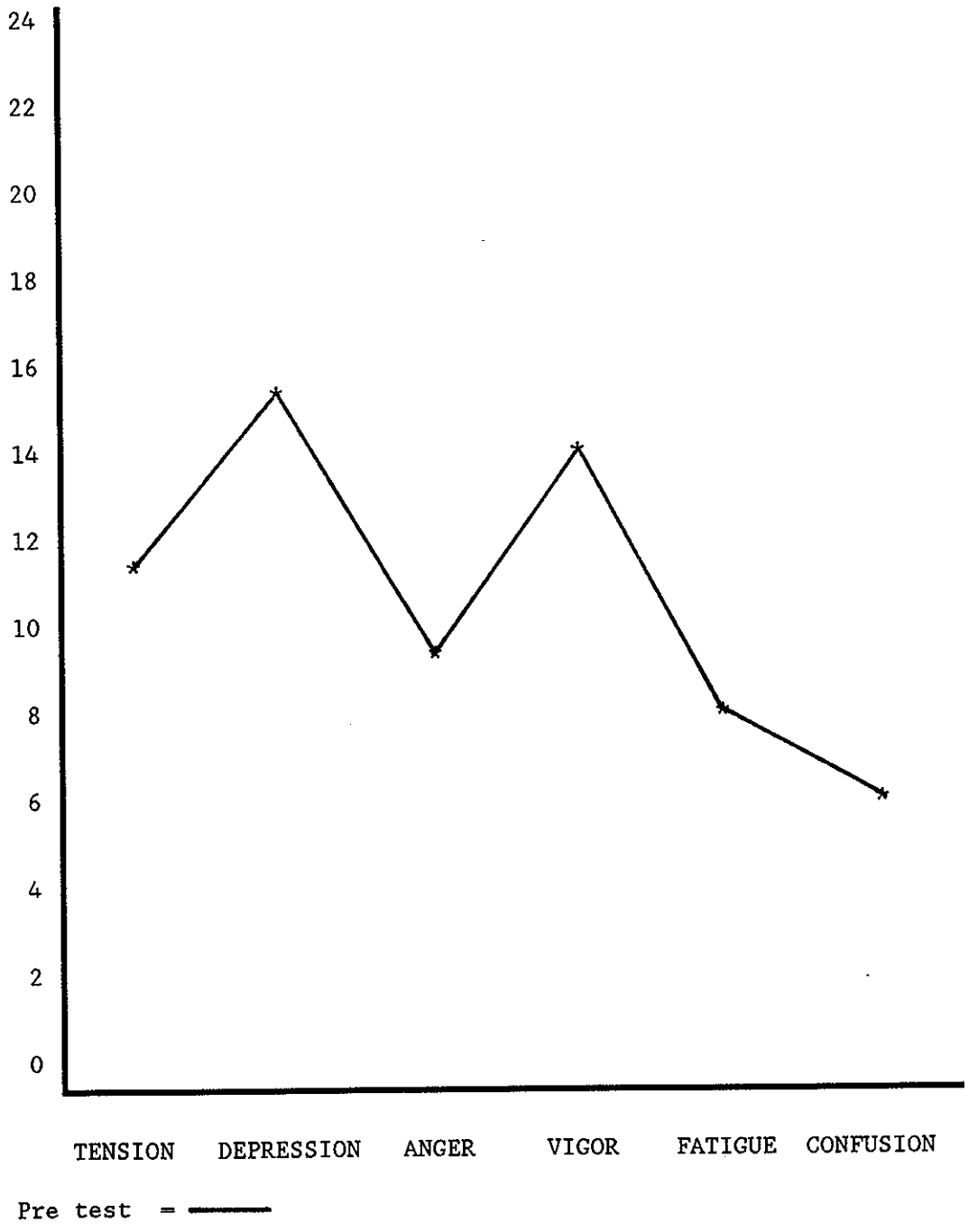


Figure 2. Pre- and posttest mean scores on the six mood states for Group 2

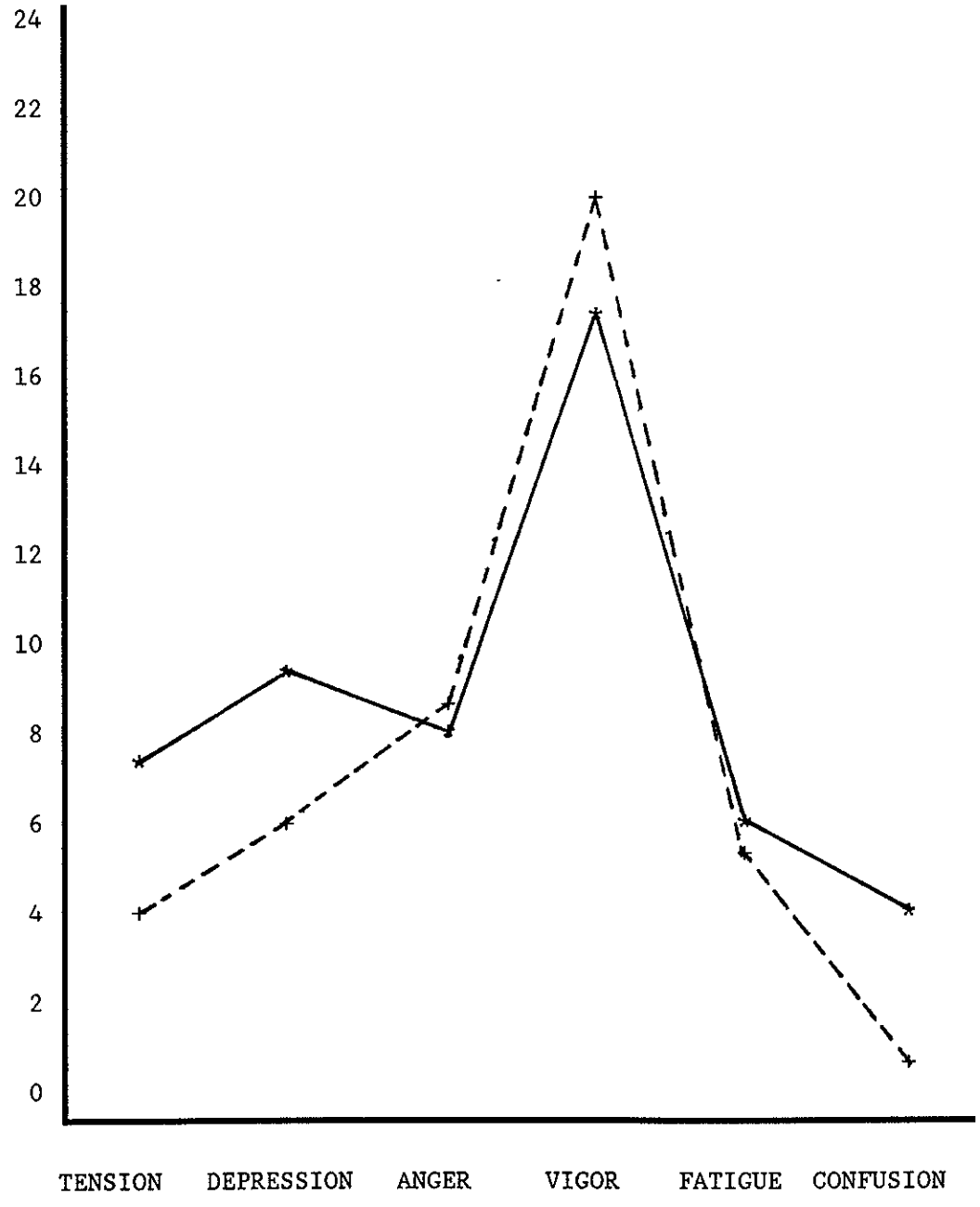
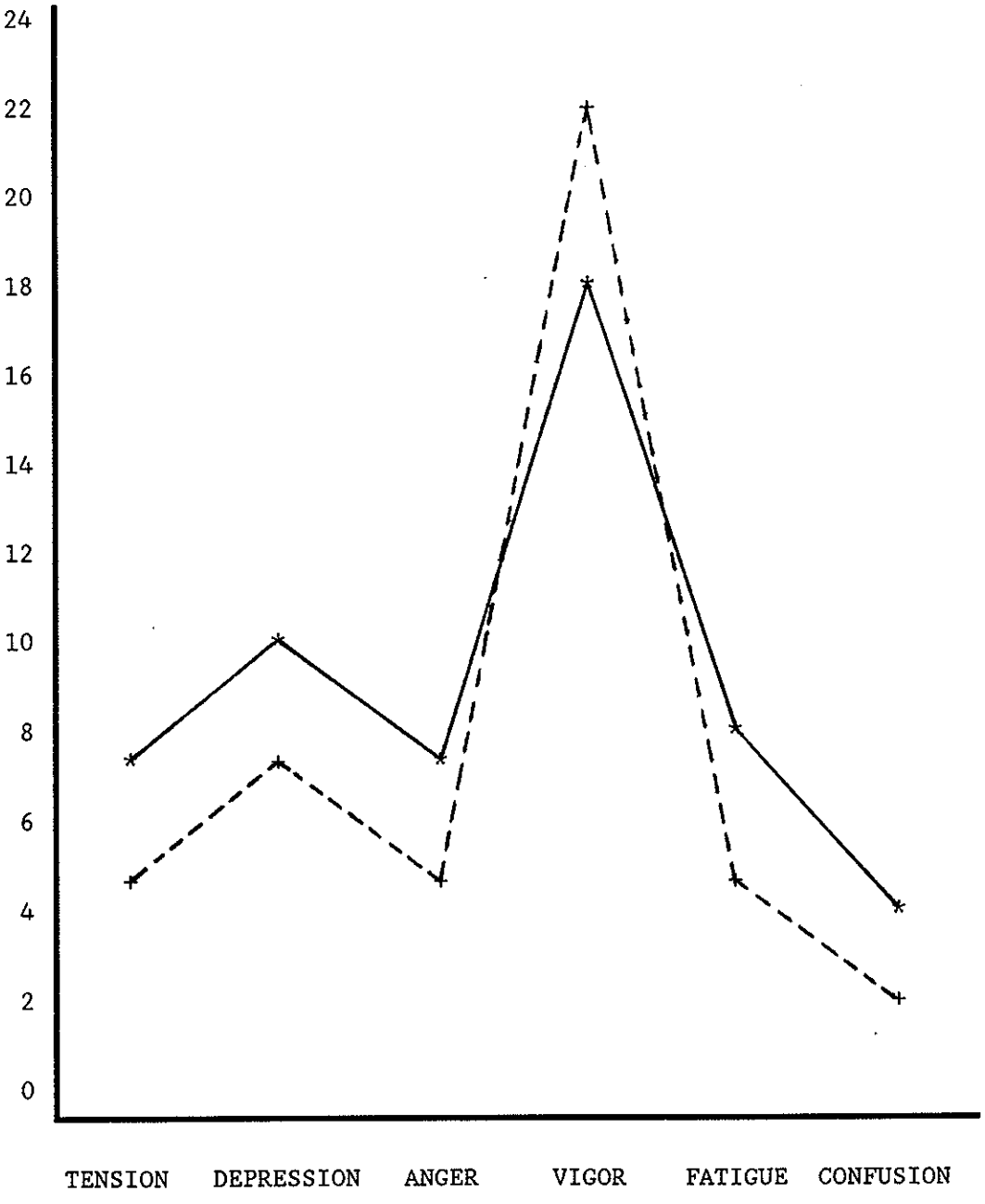


Figure 3. Pre-and posttest mean scores for all of the six mood factors in Group 3



Groups 2 and 3 reported results which graphically represented the pictorial image of the Iceberg Profile which was coined by Morgan (1980). This profile has an unusually high vigor score compared to the other five mood states which fall well below the normative mean. In both graphs the pretest means were higher than those of the posttest with the exception of vigor which was lower on the pretest and higher on the posttest, indicating that these subjects demonstrated a healthy psychological profile. Figure 1 was included to exemplify the fact that those individuals who discontinued the aerobic activity indicated a higher level of tension, depression, anger, fatigue, and confusion with a significantly ($p < .01$) lower vigor on their pretest. Their scores did not resemble the Iceberg Profile which portrays a healthy psychological mood profile. Possibly the POMS may be useful in identifying those individuals who have a greater potential of discontinuing an exercise program.

As noted by Morgan (1980), Gondola and Tuckman (1982) and Berger and Owen (1988) individuals do not have to be elite world class athletes to obtain psychological benefits from exercise. An average exerciser who participates in moderate aerobic exercise displays mood tendencies which resemble the Iceberg Profile. In this study subjects in Groups 2 and 3 reported a mean vigor score above the normative mean and the other five mood state factors were below the normative mean.

Total Mood Disturbance

According to McNair et al. (1971) since there are no normative values for TMD, it should be related to anger. MANOVA's were computed on

anger and TMD within each group. The results showed that the pretests for all groups indicated a significantly ($p < .05$) higher TMD when compared to anger scores. These findings are in opposition to what McNair et al. (1971) claimed. However when posttest scores of Groups 2 and 3 were calculated for anger and TMD, there was no significant ($p > .05$) difference between the two factors. This substantiates McNair's et al. claims. More studies need to focus on TMD in order for norms of this factor to be developed. In addition further studies need to focus on TMD to establish its validity and reliability.

Table 4. Comparing Total Mood Disturbance to Anger

Variable	Pre-test			Post-test		
	Mean	SD	P	Mean	SD	P
Group 1						
Anger	9.1	7.38		--	--	
TMD	31.2	27.29	.01	--	--	--
Group 2						
Anger	7.6	5.52		7.0	5.91	
TMD	16.8	22.89	.01	4.1	23.33	NS
Group 3						
Anger	7.3	6.09		5.5	4.71	
TMD	16.4	26.53	.05	4.3	21.89	NS

TMD = Total Mood Disturbance
Std Dev = Standard Deviation
Group 1 = completed pretest and attended < 15 classes
Group 2 = completed pre-and posttests and attended < 15 classes
Group 3 = completed pre-and posttests and attended > 15 classes

Practical Implications

The practical implications for these results suggests that aerobic activity, at least once a week for 60 minutes may improve individuals' psychological mood states in the area of tension, depression, vigor, and

confusion and overall TMD. This could be extremely beneficial to individuals who are suffering psychological difficults. In addition exercise may be beneficial for normal individuals who are looking to reduce daily stress levels and reach optimal psychological mood states.

Individuals' lives are always going to be filled with stressful situations causing tension, depression, anger, fatigue, and confusion and less vigor. If aerobic exercise, instead of pharmacological or psychiatric therapy, can be used as a coping mechanism against these negative mood states the individuals may benefit both psychologically and physiologically from such an activity.

In addition, a negative mood profile initially identified on the POMS may distinguish individuals that are more likely to discontinue an exercise program. The staff of fitness facilities could use this information to identify individuals who might have a tendency to discontinue exercising. On this basis they could spend more time with these individuals to keep them interested in physical activities. In addition to possibly increasing adherance statistics, it could possibly improve the mood states of the individuals.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was conducted to determine the effects of aerobic activity classes on psychological mood states. The Profile of Mood States (POMS) was used to measure the mood states tension-anxiety, depression-dejection, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment. In addition a total mood disturbance profile (TMD) was computed by combining the scores of the six previous mood states.

Eighty-two, college age females were randomly selected from four aerobic activity classes offered through the University of Wisconsin-LaCrosse Intramural Program. The subjects enrolled in one or two classes based on personal desires. Each class met twice a week for one hour. The POMS was administered the first class session and after eight weeks of aerobic activity, and attendance was taken prior to the start of each class. Based on the tests completed and attendance record the subjects were categorized into three groups. Group 1 attended less than 15 classes and completed the pre test. Group 2 attended less than 15 classes and completed the pre and post test. Group 3 attended more than 15 classes and completed the pre and post test.

The results of the study indicated that Group 2 and 3 showed significantly less tension, less depression, less total mood disturbance and more vigor after eight weeks of aerobic activity. In addition Group

2 reported significantly less confused after eights weeks of aerobic activty. Both groups were significantly more vigorous initially when compared to Group 1. When Groups 2 and 3 were compared to each other there was no significant difference in mood states on either the pre- or posttest. These two groups reported pre- and posttest scores which illustrated the Iceberg Profile. However this pictorial image was not evident on the pretest for Group 1. The subjects' TMD scores were significantly higher than their anger score on the pretest but no significant difference was found on the posttest. This indicates that TMD does not correspond with anger initally but after exercise the two factors appeared to be interrelated by showing no significant differences.

Conclusions

Based on the results of this study, the following conclusions were derived. Some of the subjects in the eight weeks of moderate aerobic activity indicated some positive mood shifts. The subjects who attended an average of nine aerobic activity classes in the eight weeks indicated a significant decrease in their tension, depression, confusion, TMD, and an increase in vigor. These subjects' mood state levels were excellent examples of healthy psychological mood profiles. On the other hand, the subjects that dropped out of the aerobic activity classes indicated greater tension, depression, anger, fatigue, confusion and significantly less vigor. These mood states were not indicative of the healthy psychological profile which was exemplified by the previous subjects.

The aerobic activity significantly lowered TMD to the point where it related to the anger factor. This indicated that anger levels may

represent overall psychological mood profiles, however, this should be studied in further detail.

The conclusions of this study indicate that psychological mood benefits are obtained through aerobic activity if completed one hour, at least once a week. Individuals need not be elite world class athletes or suffering from some type of psychological distress to obtain psychological mood benefits from aerobic activity.

Recommendations

Based on the findings of this study, the following recommendations are made for future investigations in this field of exercise and its affects on psychological mood states:

1. Reproduce this study using a second psychological profile which measures similar mood states as that of the POMS and compare the results of the two tests.

2. Compare the results of similar aerobic activity classes to running and walking classes, making attendance required for some and not others.

3. Extend the length of the study to 18 weeks and measure psychological mood states at the beginning of the class, after six, twelve and eighteen weeks.

4. Reproduce this study and incorporate physiological evaluations (i.e., resting and exercise heart rate and blood pressure and weight loss/gain) over the eight weeks and determine if there are any correlations between these physical parameters and psychological mood states.

5. Evaluate the psychological mood states experienced from Phase I to Phase IV in cardiac rehabilitation patients.

6. Reproduce this study using older subjects attending an aerobics classes at a health club.

7. Compare the psychological mood states of the different mileage groups in an adult fitness program.

REFERENCES CITED

REFERENCES CITED

American College of Sports Medicine (1978). Position statement on the recommended quantity and quality of exercise for developing and maintaining fitness in healthy adults. Medicine and Science in Sporsts, 10, vii-x.

Berger, B. G. & Owen, D. R. (1988). Stress reduction and mood enhancement in four exercise modes: swimming, body conditioning, Hatha yoga, and fencing. Research Quarterly for Exercise and Sport, 59(2), 148-159.

Boyle, G.J. (1987). Quantitative and qualitative intersections between the Eight State Questionnaire and the Profile of Mood States, Educational and Psycholgical Measurement, 47, 437-443.

Browman, C.P. (1981). Physical activity as a therapy for psychopathology: A reappraisal. Journal of Sports Medicine, 21, 192-197.

Collingwood, T.R. (1972). The effects of physical training upon behavior and self attitudes. Journal of Clinical Psychology, 28, 583-585.

deVries, H.A. (1981). Tranquilizer effect of exercise: A critical review. The Physician and Sportsmedicine, 9(11), 47-54.

Dishman, R.K. (1987). Exercise adherence and habitual physical activity. In W.P. Morgan & S.E. Goldston (Eds.), Exercise and Mental Health. pp. 57-83. Washington: Hemishere.

Eichman, W.J. (1978). Profile of mood states. In O.K. Buros (Ed.), Mental Measurements Yearbook I (pp. 1016-1018) New Jersey: Buros Institution of Mental Measurements.

Emery, C.f., Pinder, S.L., & Blomental, J.A. (1989). Psychological effects of exercise among elderly cardiac patients. Journal Cardiopulmonary Rehabilitation, 9, 46-53.

Folkins, C.H., Lynch, S., & Gardner, M.M. (1972). Psychological fitness as a function of physical fitness, Archives of Physical Medicine & rehabilitation, 53(11), 503-508.

Folkins, C.H. (1976). Effects of physical training on mood. Journal of Clinical Psychology, 32(2), 385-388.

Folkins, C.H., & Sime, W.E. (1981) Physical fitness training and mental health, American Psycholist, 36(4), 373-389.

Glasser, W. (1976). Positive addiction. Newe York: Harper Colophon Books.

Gondola, J.C., & Tuckman, B.W. (1982). Psychological mood states in "average" marathon runners. Perceptual and Motor Skills, 55, 1295-1300.

Gondola, J.C., & Tuckman, B.W. (1983). Extent of training and mood enhancement in women runners. Perceptual and Motor Skills, 57, 333-334.

Gurley, V., Neuringer, A., & Massee, J. (1984) Dance and sports compared: Effects on psychological well-being. Journal of Sports Medicine and Physical Fitness, 24, 58-68.

Harris, D.V. (1985). Psychological benefits of aerobic exercise. In D. E. Cundiff (Ed.), Implementation of health fitness exercise programs. (pp. 46-49). Virginia: AAHPERD.

Heaps, R.A. (1978). Relating physical and psycholgical fitness: a psychological point of view. Jounal of Sports Medicine, 18, 399-408.

Lorr, M., Daston, P., & Smith, I.R. (1967). An analysis of mood states. Educational and Psychological Measurement, 27, 89-96.

Markoff, R.A., Ryan, P., & Young, T. (1982). Endorphins and mood changes in long-distance running. Medicine and Science in Sports and Exercise, 14(1), 11-15.

McNair, D.M., Lorr, M., & Droppleman, L.F. (1971). Profile of Mood States manual, San Diego, CA.: Educational and Industrial Testing Service.

Morgan, W.P., Roberts, J.A., Brand, F.R., & Feinerman, A.D. (1970). Psychological effect of chronic physical activity. Medicine and Science in Sports, 2(4), 213-217.

Morgan, W.P. & Horstman, D.H. (1976). Anxiety reduction following acute physical activity. Medicine and Science in Sports, 8(1), 62.

Morgan, W.P. (1978, April). The mind of the marathoner. Psychology Today, 11(4), 38-49.

Morgan, W.P, (1979). Negative addiction in runners. The Physician and Sportsmedicine, 7(2), 55-71.

Morgan, W. P. (1980, July). Test of champions: The iceberg profile. Psychology Today, 14, 92-99, 101, 108.

Morgan, W.P. (1985). Affective beneficence of vigorous physical activity. Medicine and Science in Sports and Exercise, 17(1), 94-100.

Morgan, W.P., & Goldston, S.E. (Eds.). (1987). Exercise and Mental Health. Washington: Hemisphere.

Mutrie, N. (1987). The psychological effects of exercise for women. In D. MacLeod, R. Maughan, M. Nimmo, T. Reilly, & C. Williams (Eds.), Exercise-Benefits, Limits and Adaptations. New York: E. & F.N. Spon.

Norcross, J.C., Guadagnoli, E., & Prochaska, J.O. (1984). Factor structure of the profile of mood states (POMS): Two partial replications. Journal of Clinical psychology, 40(5), 1270-1277.

Pollock, V., Cho, D.W., Reker, D., & Volavka, J., (1979). Profile of mood states: The factors and their physiolgical correlations. The Journal of Nervous and Mental Disease, 167(10), 612-614.

Summers, J.J., Sargent, G.I., Levey, A.J., & Murray, K.D. (1982). Middle-aged, non-elite marathon runners: A profile, perceptual and Motor Skills, 54, 963-969.

Tucker, L.A., Cole, G.E., & Friedman, G.M. (1986), Physical fitness: A buffer against stress, Perceptual and Motor Skills, 63, 955-961.

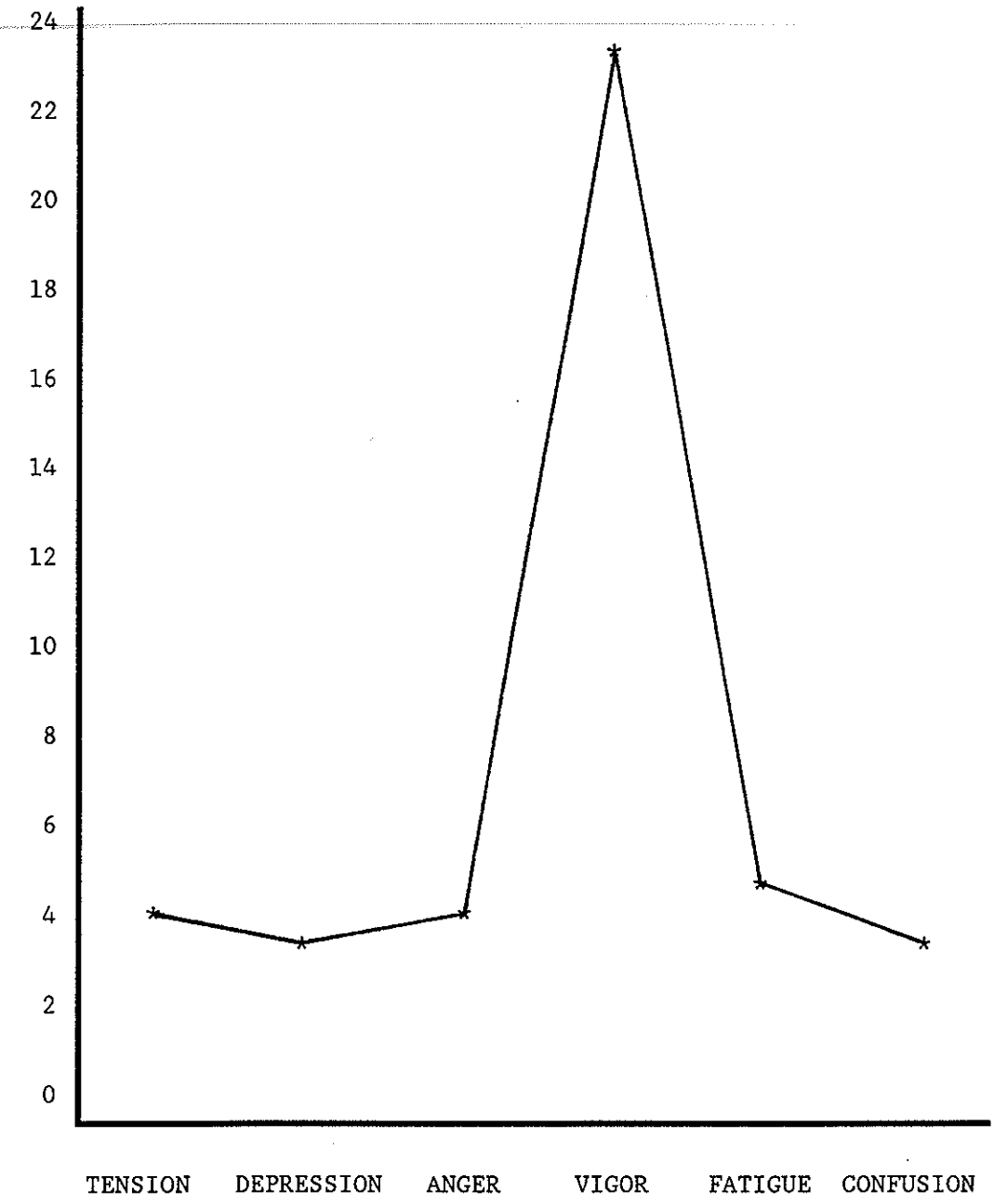
Wilfley, D., & Kunce, J. (1986). Differential physical and psychological effects od exercsie. Journal of Counseling Psychology, 33(3), 337-342.

Williams, J.M., & Getty, D. (1986). Effects of levels of exercise on psychological mood states, physical fitness and plasma beta-endorphins. Perceptual and Motor Skills, 63, 1099-1105.

Wilson, V.E., Morley, N.C., & Bird, E.I. (1980). Mood profiles of marathon runners, joggers and non-exercisers. Perceptual and Motor Skills, 50, 117-118.

APPENDIX A

SAMPLE OF AN ICEBERG PROFILE



APPENDIX B

DATE: December 12, 1988

TO: Randomly Selected Aerobic Participants

FROM: Elizabeth Bradbury
Graduate Assistant
UW-L Intramurals

You have been randomly selected to participate in a survey focusing on the possible psychological benefits gained through engaging in aerobic activities. As you know there are many physiological benefits obtained through aerobic exercise but what, if any, psychological benefits are received from aerobic activity.

You are being asked to help measure what these potential psychological benefits might be. In order to do this would you please consent to completing a questionnaire the first night of your aerobics class and the last night before Spring Break (Monday March 13 or Tuesday March 14). The questionnaire will only take 3-5 minutes to complete.

In addition to completing the questionnaire you would need to attend a total of 16 class meetings between now and Spring Break (i.e., 100% attendance for the 8 week period). I will check with you each class period. In case of an emergency you could attend a different class, however this needs to be arranged with me prior to attending a class other than your regular one.

Upon completion of the study, a copy of the results will be made available to you.

I look forward to seeing you the first night of your class. Thank you for your participation.

If you have any questions about the above information feel free to give me a call. Elizabeth Bradbury 784-4627.

NAME:_____ PHONE:_____

ADDRESS:_____

_____

APPENDIX C

Verbal Test Instructions

Please complete this form by filling in your name, date and sex. Then answer all of the questions by shading one circle per adjective. Answer these questions based on how you have been feeling during the past week and today.

Please read the printed instructions at the top of the test before answering any question. Make sure you understand how to complete the form before starting. If you have any question about the directions or an adjective feel free to ask me.

The directions on top of the test are as follows:

> Below is a list of words that describe feelings people have. Please read each one carefully. Then fill in ONE circle under the answer to the right which best describes HOW YOU HAVE BEEN FEELING DURING THE PAST WEEK INCLUDING TODAY.

Please return the completed test to me prior to the start of the class.

APPENDIX D

Raw Data for Group 1

Pre-test

Ss	T	D	A	V	F	C	TMD	VIS
1	7	26	4	12	3	6	34	1
2	12	6	6	21	7	9	19	2
3	8	3	4	10	10	2	17	3
4	18	28	8	10	10	15	59	3
5	7	7	10	18	6	3	15	4
6	18	16	14	17	8	10	49	4
7	0	0	1	13	10	6	14	4
8	19	35	26	13	20	13	100	6
9	15	8	12	0	9	5	49	6
10	15	21	15	14	8	3	48	7
11	9	19	2	16	4	-1	17	7
12	20	35	23	11	17	24	108	9
13	-3	2	2	19	2	0	16	10
14	7	15	7	21	9	5	22	10
15	16	18	9	10	9	8	50	11
16	0	1	3	19	0	-3	-18	11

Ss = Subjects
T = Tension
D = Depression
A = Anger
V = Vigor
F = Fatigue
C = Confusion
TMD = Total Mood Disturbance
VIS = Total Number of Visits in 8 wks

Raw Data for Group 2

	Pre-test							Post-test							
Ss	T	D	A	V	F	C	TMD	T	D	A	V	F	C	TMD	VIS
1	5	13	8	14	3	6	21	5	14	12	12	6	3	24	2
2	10	13	11	18	8	3	27	5	2	6	18	3	3	1	2
3	3	7	3	15	7	3	8	1	2	2	23	5	2	-11	2
4	5	7	8	12	6	1	5	-2	3	10	25	2	-1	-13	2
5	14	30	20	16	13	10	71	5	9	10	20	4	3	11	2
6	5	0	0	17	6	7	1	0	0	3	25	1	-4	-25	3
7	22	3	1	19	8	2	17	14	1	4	19	8	6	15	4
8	4	5	4	25	0	1	-11	3	0	0	24	2	-1	-20	5
9	6	7	5	18	4	-1	3	7	22	20	15	9	4	47	5
10	7	11	10	19	3	7	19	2	9	13	16	7	2	17	6
11	13	26	15	12	10	11	63	12	15	10	16	8	11	40	7
12	7	9	12	23	8	4	17	12	13	13	26	8	2	22	7
13	13	8	3	24	4	4	12	8	1	4	25	5	0	- 7	7
14	4	6	10	21	6	1	6	5	6	7	18	5	4	9	7
15	11	11	10	12	8	9	37	3	4	7	21	7	1	1	8
16	3	7	3	29	1	1	-14	-2	7	2	27	3	0	-17	9
17	-1	0	3	14	9	-2	- 5	-1	0	3	20	2	-1	-17	11
18	16	5	3	7	2	9	28	11	17	14	13	14	5	48	11
19	3	0	3	19	5	0	- 8	8	0	1	19	4	-1	- 7	11
20	8	11	8	15	7	0	19	6	9	5	21	7	3	9	11
21	9	9	8	23	5	2	10	3	3	2	23	7	2	- 6	12
22	6	10	11	18	14	7	30	-2	4	6	26	5	-2	-15	12
23	5	8	4	18	8	4	11	7	16	12	21	9	5	28	12
24	1	1	1	16	4	-2	-11	-1	1	0	23	4	-3	-22	12
25	14	17	14	8	8	4	49	1	8	6	19	6	1	3	13
26	-1	6	2	26	0	-2	-21	10	8	5	18	6	3	14	13
27	11	18	19	20	10	4	42	-3	0	0	30	0	-3	-36	13
28	0	0	0	18	4	0	-14	3	0	1	23	2	-1	-22	14
29	7	16	10	14	7	8	34	1	6	6	18	2	2	- 1	14
30	11	20	16	14	7	5	45	8	26	25	17	11	5	58	14
31	3	18	10	12	8	4	31	4	3	8	20	4	-1	- 2	14

Ss = Subjects
T = Tension
D = Depression
A = Anger
V = Vigor
F = Fatigue
C = Confusion
TMD = Total Mood Disturbance
VIS = Total Number of Visits in 8 Wks

Raw Data for Group 3

	Pre-test							Post-test							
Ss	T	D	A	V	F	C	TMD	T	D	A	V	F	C	TMD	VIS
1	7	14	8	14	10	12	37	2	4	7	20	6	1	0	16
2	6	9	7	16	2	2	10	0	0	5	24	1	-2	-20	16
3	7	7	3	22	2	2	- 1	13	13	7	20	6	9	2	16
4	16	25	18	13	10	7	63	18	32	12	9	19	11	83	16
5	13	7	5	30	8	2	5	10	4	4	30	8	1	- 3	16
6	5	4	0	24	6	1	- 8	7	4	2	22	9	1	1	16
7	6	12	8	18	3	5	16	2	3	4	24	5	0	-10	16
8	14	15	17	29	11	4	32	13	5	12	27	13	2	18	16
9	5	8	4	11	5	3	14	2	3	0	17	0	-1	-13	16
10	-3	0	3	17	2	-2	-17	-3	0	3	20	2	-1	-19	17
11	15	17	12	18	18	9	53	0	6	0	23	3	-1	15	17
12	6	6	15	19	8	3	19	3	4	4	19	6	5	3	17
13	7	15	4	18	6	0	14	7	15	10	24	8	4	20	17
14	3	0	0	25	1	-1	-22	1	1	1	27	2	7	11	17
15	10	11	1	13	8	6	23	1	3	0	24	2	-2	-20	17
16	4	8	12	27	5	0	2	6	15	9	26	7	2	13	18
17	7	6	0	14	8	0	7	5	4	4	24	7	0	- 4	18
18	-1	3	2	24	2	1	-17	9	9	3	24	9	2	8	18
19	9	17	8	8	7	8	41	8	2	8	21	6	7	10	18
20	8	18	6	19	4	9	26	9	9	6	24	2	6	8	19
21	3	3	1	22	2	2	- 1	-1	2	1	21	2	-1	-18	19
22	6	6	8	30	4	1	- 5	2	6	7	26	7	0	- 4	19
23	10	20	17	17	6	5	41	7	19	18	28	7	5	28	20
24	18	25	22	11	20	16	90	6	11	8	23	2	7	11	20
25	13	29	11	7	11	9	66	2	3	2	20	1	0	-12	21
26	6	10	6	19	4	5	12	9	9	7	26	5	3	7	22
27	2	6	17	19	5	2	13	16	3	7	21	7	-1	11	22
28	-2	0	0	21	0	-4	-27	-2	2	0	24	0	-4	-28	23
29	8	4	7	17	6	2	10	5	4	2	18	12	3	8	23
30	5	5	5	17	4	0	2	10	30	20	16	8	11	63	23
31	7	7	1	22	6	5	4	3	4	3	25	6	5	- 4	23
32	8	9	8	23	15	9	26	0	6	3	21	8	2	- 2	25
33	5	7	4	21	1	7	3	8	5	6	25	4	2	0	25
34	15	18	14	15	11	10	53	3	5	7	17	11	3	12	25
35	1	0	1	17	3	1	-11	-3	0	2	22	0	-1	-24	26

Ss = Subjects
T = Tension
D = Depression
A = Anger
V = Vigor
F = Fatigue
C = Confusion
TMD = Total Mood Disturbance
VIS = Total Number of Visits in 8 Wks