COLLEGIATE FEMALES' STATE ANXIETY LEVELS FOLLOWING WATER EXERCISE INTERVALS

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LEVELS FOLLOWING WATER

EXERCISE INTERVALS

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CHAPTER I

INTRODUCTION

In recent years, the wellness/health movement in the United States of America has gained increasing popularity. Sova (1992) summarized the movement as the jogging craze of the sixties and seventies, the aerobic dance frenzy of the seventies and early eighties, the cross training total fitness regimen of the late eighties and nineties, and finally the present day pursuit of health and fitness.

This pursuit of health and fitness has been the impetus for the formation of school and community-based wellness programs; the opening of numerous health, fitness and exercise establishments; the development of corporate wellness programs; and the growth of emotional health programs. The increased interest in health/wellness is greatly supported by schools, professional organizations, media, and businesses. Americans receive health information through libraries, reports, brochures, magazines, billboards, newspapers, commercials, talk shows, the internet, and computers. Such information covers various topics on health statistics, equipment, exercise programs,

videos, tapes, cooking, recreational activities, and emotional/spiritual self help programs which are consistent with the exercise-fitness revolution.

Americans are aware that psychological health is a very important factor in achieving a sense of well being (Chopra, 1993; Donatelle & Davis, 1994; Kaplan, Sadock, & Grebb, 1994). Psychological health is delineated into the three factors of mental health, spiritual health, and emotional health (Donatelle & Davis, 1994). The intellectual "thinking" component of psychological health is termed the mental health. Within the "thinking" component of mental health, problems are solved, facts are remembered, interpretation occurs, situations are evaluated, and reasons are explored. Spiritual health, as defined by these authors, provides the individual with a sense of having a meaningful purposeful life. This sense is supported by the belief that there is some unifying force in the greater scheme of existence. The affective "feeling" component of psychological health is the emotional health. Emotions are feelings experienced in complex dynamic patterns. This transitory emotional state includes love, hate, joy, despair, caring, pain, fear, frustration, and anxiety (Donatelle & Davis, 1994). The authors state that the interrelationship of these three factors in psychological

health should be considered when addressing the whole person (Donatelle & Davis, 1994).

The role of anxiety in psychological health has become a topic of considerable interest (Bowyer, 1988; Feuerstein, 1993; Hicks, 1988; Koltyn, Shake & Morgan, 1993; United States Department of Human Services, 1996). Research conducted in the area of anxiety and water programs has primarily dealt with elite athletes and their performance in water sports such as diving, swimming, scuba diving, recreational springboard diving, and aquarunning (Berger & Owen, 1983, 1987, 1988, & 1992A; Bowyer, 1988; Town & Bradley, 1991). The anxiety research information is limited regarding the psychological effects associated with water exercise.

Because water exercise interval training has grown rapidly and gained increasing popularity among all fitness levels and age groups, it is important to know its psychological effects. In an effort to enhance understanding in this area, this investigation was designed to assess the effectiveness of water exercise intervals on collegiate females' state anxiety levels.

Need for the Study

In order for water exercise instructors to aid participants in understanding psychological health, they

must learn more about anxiety. Water programs in various forms, including water sports and water exercises, are being promoted as having many psychological benefits (Berger & Owen, 1987; Bowyer, 1988; Feuerstein, 1993; Hicks, 1988; House, 1991; Jones, Parker, & Edwards, 1994; Knecht, 1989; Koltyn, Shake & Morgan, 1993; Midtlyng & Nelson, 1988; Sova, 1992; Weiss & Jamieson, 1989). There is minimal scientific documentation regarding the psychological benefits of water exercise intervals.

The purpose of this investigation was to examine and document the psychological state anxiety levels in collegiate females using water exercise intervals and those of a psychology control group. Since few studies have focused on the psychological effects of water exercise intervals on state anxiety levels, it is believed that the findings will enable water exercise instructors to better understand those effects.

Significance of the Study

Because water exercise interval training is becoming increasingly popular among all age groups and fitness levels, it is important to know its psychological effects. Conclusions regarding the psychological effects of water exercise intervals on state anxiety levels among participants have not yet been determined. This

investigation was designed to assess the effectiveness of using water exercise intervals to reduce state anxiety levels among collegiate females.

Statement of the Problem

The problem of this investigation was to determine if an exercise intervals regimen reduces state anxiety in collegiate females. To address this central problem, four specific problems were addressed. The first problem area was to determine if differences in state anxiety existed between participants on the STAI S-Anxiety scale pre-test. The second problem area was to determine if differences in state anxiety existed between participants on the STAI S-Anxiety scale post-test. The third problem area was to determine if differences existed within the control group on the STAI S-Anxiety scale pre-test to post-test situations. The fourth problem area was to determine if differences existed within the water exercise intervals group on the STAI S-Anxiety scale pre-test to post-test situations.

Hypotheses

The following null hypotheses were tested at the .05 level of significance.

H_o1. There is no significant difference between participants, water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale pre-test.

H_o2. There is no significance difference between participants, water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale post-test.

H_o3. There is no significant difference within the psychology control group on the STAI S-Anxiety scale pre-test to post-test situations.

H_o4. There is no significant difference within the water exercise intervals group on the STAI S-Anxiety scale pre-test to post-test situations.

Delimitations

The study had the following delimitations:

1. The same facility and program protocol were used for each treatment session. Instructors for the water exercise intervals classes had current certifications as American Red Cross Water Safety and Lifeguard Instructor Trainers.

2. Only collegiate female volunteers were used in the study. Participants had previous experience with program protocol.
3. Treatment class sessions were held for fifty minutes, two days per week, for five weeks. Class sessions were held at the same time each day.
4. Only subjects who were present and participated on both testing days were utilized in the study.

Limitations

The following limitations were anticipated prior to initiating the research protocol:

1. Subjects were not selected nor assigned to groups randomly.
2. The investigation relied on self-report inventories and was based on the personal appraisal and experiences of the respondents.
3. There was no control over factors outside of the class situations which might influence state anxiety in this sample.
4. The time in the school semester for data collection might have influenced state anxiety in this sample.

Assumptions

The following basic assumptions were accepted:

1. Subjects were mobile, comfortable exercising in water, had an established pattern of class attendance, and were familiar with the hydrodynamic principles of water exercise.
2. Water exercise participants worked at their desired intensity levels. The control group participants continued with a normal pattern of life.
3. The swimming pool and classroom environments were conducive to accurate testing.
4. Subjects understood directions, completed and responded honestly to the STAI S-Anxiety scale.

Definitions

The following terms are specifically defined as given when used in this investigation.

Anxiety - "a changing emotional state which is characterized by subjective feelings of tension, apprehension, nervousness and worry, and by activation or arousal of the autonomic nervous system" (Spielberger, 1983, p. 4).

Deep Water Exercise - vertical movements performed with the feet lightly touching the bottom of the swimming pool or not at all (Sanders, 1993).

Intervals - a progressive, systematic conditioning program with excellent participant appeal. Interval training

is a program that combines high-intensity portions with moderate-or-low intensity portions (Sova, 1992).

Shallow Water Exercise - water that is xiphoid process depth when measured with the individual standing on the bottom of the swimming pool (Sanders, 1993).

State Anxiety (S-Anxiety) - the response to non-dangerous situations manifested with elevations in the intensity of the transitory state anxiety reactions (Spielberger, 1983).

State Anxiety Scale Form Y-1 (STAI S-Anxiety scale) - a questionnaire which consists of twenty questions that evaluate how participants feel at the moment of response (Spielberger, 1983).

State Trait Anxiety Inventory (STAI) - an inventory developed by Spielberger (1983) to measure state and trait anxiety.

State Trait Anxiety Inventory State Anxiety Scale (STAI S-Anxiety scale Form Y-1) - a self report scale which measures how participants feel at the moment of response (Spielberger, 1983).

Trait Anxiety - related to personality and is a relatively stable tendency or disposition to perceive a wide variety of objectively non-dangerous situations as threatening (Spielberger, 1983).

Water Exercise - "continuous rhythmical movements performed in shallow or deep water at variable rates, repetitive moves, varying levels of difficulty to tone major muscle groups of the body, and performed to maintain or improve selected elements of the components of physical fitness" (Midtlyng & Nelson, 1988, p. 4).

Water Program - any type of activity performed in the medium of water.

CHAPTER II

LITERATURE REVIEW

A review of the literature reveals very little information concerning the psychological effects of water exercise. Due to the paucity of available research on the effects of water exercise, comparable land based exercise research, articles, unpublished studies, papers, presentations, personal interviews, and projects were mentioned as references for comparison to published research.

Published aquatic research may not pertain to water exercise. This review of literature is an attempt to summarize the available information and research, including the pertinent literature related to the following three areas: (1) anxiety while participating in the medium of water; (2) water program characteristics; and (3) water exercise - exercise prescription.

State Anxiety While Participating in the Medium of Water

The accumulating psychological health literature is complex and plagued with disagreement as to the number and nature of emotions. According to Willis and Campbell (1992), there have been over two hundred emotional states identified involving the qualitative constructs of one's life. Edwards (1995, p. 444) cited the following 40 frequently researched emotions contained in research literature: "acceptance, admiration, aggression, anger, anguish, anticipation, anxiety, apprehension, contempt, curiosity, delight, desire, despair, disgust, elation, embarrassment, fear, friendship, grief, guilt, happiness, hate, hostility, interest, joy, love, pleasure, pity, pride, rage, remorse, resentment, sadness, scorn, shame, shyness, sorrow, surprise, terror, and wonder."

Spielberger (1983, p. 5) concentrated his psychological research on the trait anxiety and state anxiety components. He defined trait anxiety (T-Anxiety) as "related to personality and is a relatively stable tendency or disposition to perceive a wide variety of objectively non-dangerous situations as threatening." In contrast to trait anxiety, he defined state anxiety (S-Anxiety) as "the response to non-dangerous situations manifested with

elevations in the intensity of the transitory state anxiety reactions" (Spielberger, 1983). For the purposes of this investigation, anxiety was selected as the emotional state.

Anxiety can be classified as normal anxiety or pathological anxiety (Kaplan, Sadock, & Grebb, 1994). Normal anxiety always precedes pathological anxiety (Brewer, 1997; Kaplan, Sadock, & Grebb, 1994). Autonomic symptoms such as headache, perspiration, heart palpitations, tightness in the chest, tremors, hyperventilation, muscle tension/aches and mild stomach discomfort often occur with the normal anxiety characteristics of a diffuse, unpleasant, or vague sense of apprehension. In contrast to normal anxiety, pathological anxiety manifests itself in severe mental dysfunction which often disturbs the emotions (G. Brewer, personal communication, April 22, 1997).

Virtually all human beings experience sensations of anxiety (G. Brewer, personal communication, April 22, 1997; Kaplan, Sadock, & Grebb, 1994; Spielberger, 1983). "Anxiety is a normal accompaniment of growth, of change, of experiencing something new and untried, and of finding one's own identity and meaning in life" (Kaplan, Sadock, & Grebb, 1994, p. 573). In certain threatening situations, it is advantageous to respond with anxiety. The distinction between pathological anxiety and normal anxiety is in the intensity and duration of the inappropriate and appropriate

behaviors, respectively. For the purposes of this investigation, everyday normal anxiety is the topic of interest.

Anxiety as defined by Kaplan, Sadock, and Grebb (1994, p. 574) is "an altering signal; it warns of impending danger and enables the person to take measures to deal with the threat." The authors differentiated between the emotions of anxiety and fear by defining fear as "the response to a threat that is known, external, definite, or nonconflictual in origin; anxiety on the other hand is the response to a threat that is unknown, internal, vague, or conflictual." The distinction between fear and anxiety is complex at times because fear can be caused by displacement of repressed, unconscious, and internal objects which are then associated with objects contained in the external world (Kaplan, Sadock, & Grebb, 1994).

The behavioral or learning theories of anxiety have provided researchers with intervening programs which can reduce the intensity of anxiety responses. Anxiety is classified as a conditioned response to specific stimuli in the environment according to behavioral theories (Kaplan, Sadock, & Grebb, 1994).

In a model of classic conditioning, a person who is not afraid of water may have an unpleasant experience such as falling into the water. This sudden submersion in water

could be a very alarming experience and completely destroy confidence. Subsequent exposure to water may cause that person to feel uneasy. Through generalization, such a person may come to dislike all water related activities.

"As an alternative causal possibility, persons may learn to have an internal response of anxiety by imitating the anxiety responses of their parents" (Kaplan, Sadock, & Grebb, 1994, p. 576). An example of an imitated response would be when a person observes a parent's anxious reaction to swimming or other water activities and then displays the same response. The person is copying the parent's negative reaction to the water activity. In the above two cases, treatment is usually in the form of a desensitization program (Hicks, 1988; Kaplan, Sadock, & Grebb, 1994).

Kaplan, Sadock, and Grebb (1994) defined a desensitization program as one in which there are repeated exposures to the anxiety causal mechanism, combined with cognitive psychotherapeutic approaches. A psychotherapeutic approach is one in which cognitive conceptualization is utilized when treating anxiety.

The cognitive conceptualization approach is based on causal models of anxiety. Kaplan, Sadock, and Grebb (1994, p. 576) wrote "cognitive conceptualization of nonphobic anxiety states is one in which faulty, distorted, or counterproductive thinking patterns accompany or precede

maladaptive behaviors and emotional disorders." They further described the symptoms as being manifested in an individual's overestimation of the degree and probability of harm associated with a given situation. In addition to the overestimation disposition, the individual has a tendency to underestimate the ability to cope with perceived threats to psychological well being. The resultant thought processes are concentrated in loss of control and fear of dying that follow the physiological sensations such as headache, perspiration, heart palpitations, tightness in the chest, tremors, hyperventilation, muscle tension/aches and mild stomach discomfort. These counterproductive thought processes if unaddressed, can lead to pathological anxiety. As stated earlier, pathological anxiety manifests itself in severe mental dysfunction which often disturbs the emotions (G. Brewer, personal communication, April 22, 1997).

Hicks (1988) conducted a study in which she investigated how aquaphobics coped with water-related traumas. An aquaphobic person is one who has a morbid or special fear of water, that is, fear of entering a swimming pool, bath, or body of water where one may drown (Hicks, 1988). Before the desensitization program, the subjects reported that their water related traumas consistently produced the sense of loss of control and a life threatening fear of the water. After the desensitization program, the

subjects responded to participation in the water with relaxed states. These relaxed states tended to produce a tolerance of the feared object, situation, event, or condition. Hicks' conclusion was that the feelings associated with the traumatic water-related incidents were successfully altered through the desensitization program.

In the National Survey of Water Exercise Participants, Midtlyng and Nelson (1988) wrote that approximately 91.4% of the 1,180 subjects, 90% of whom were females, reported that they experienced no difficulty with water exercise. Extreme breathlessness, dizzy spells, or chest discomfort was reported by less than 2% of the remaining respondents in the survey. The other 4.5% indicated the following write-in difficulties:

- some breathlessness;
- cramps at times;
- sometimes fatigued;
- legs ache;
- muscle soreness;
- soreness in foot;
- feet cramping;
- bad elbow, usually hurts by the end of class;
- limited arm range;
- injured toes from jumping;

- some discomfort in feet;
- getting pulse down; and
- sprained lower back muscles. (p. 87)

The number of respondents who reported difficulties was extremely low, giving support to water exercise as a viable exercise. It is important to note that for a very small number of individuals, water exercise is not the universal panacea for them.

When exercises are performed in the medium of water, participants are exposed to numerous factors which are inherently different from those associated with land exercise (Aquatic Exercise Association, 1995; Baretta, 1993; Elder & Campbell, 1993; Grayston, 1990; Moschetti, 1990; Robbins & Midtlyng, 1994; Skinner & Thompson, 1982; Sova, 1992; Westfall, 1993). These factors are potential anxiety causing mechanisms due to the feel of exercising in the environment of the water. The following discussion will cover the four predominant factors of temperature, buoyancy, hydrostatic pressure, and resistance when associated with movement in the water. The following discussion is not intended to be all inclusive, but rather provide a sound foundation for this investigation of water exercise and its relationship to state anxiety.

When participants enter the water, one of the first factors affecting exercise in the medium of water is

temperature. A person entering the water feels the immediate transfer of heat from the body. The temperature of the swimming pool water is cooler than the human body thus facilitating the heat loss. For some individuals this is refreshing and for others a source of anxiety. When the body temperature drops far below skin temperature, the body responds by shivering (Baretta, 1993). The shivering can be an uncomfortable sensation for some people. In water, thermal regulation, the balance of the human body's temperature is maintained by metabolic heat being produced by the exercise and heat loss (Knecht, 1989).

Wiener (1980) states that when emotionally charged or crisis type situations arise, phrases often recited include: (1) chill, (2) cool it, (3) stay cool, or (4) keep cool. Terms relating to the water are frequently used in daily conversations. The figurative expressions are made real when in the medium of water. Wiener writes that the physical coolness of the water is directly related to the immediate drop in body temperature. He further explains that responses to hot stress grow more temperate and less severe because of the physical coolness of the water. Wiener concluded that this coolness somehow inspires positive mental thought processes.

Petruzzello, Landers, and Salazar (1993) conducted one of the first land based investigations establishing a

relationship between body temperature and anxiety with respect to exercise. The study consisted of examining twenty males using a thirty minute running protocol after manipulating three clothing conditions. The clothing conditions were designed to elevate core body temperature as follows: (1) normal - regular running clothing, (2) warm - full leg lycra tights, long sleeve T-shirt, nylon running pants, and a nylon sweat jacket, and (3) cool - shirt and shorts dampened with cold water prior to beginning the run. Findings indicated that anxiety was reduced following all three conditions, but that only a small percentage of the variance in anxiety was accounted for by the temperature manipulations. Petruzzello, Landers, and Salazar concluded that for a reduction in exercise related anxiety to occur, an elevated body temperature may not be necessary.

Sova (1992) states that temperature ranges for the average indoor pool are from the high 70's to the low 90's (degrees Fahrenheit). The Aquatic Exercise Association's (AEA) "Aquatic Fitness Professional Manual" recommends a range of 80-85 degrees Fahrenheit for the typical water exercise class. AEA advocates that at this temperature the body is better able to dissipate body heat when exercising and participants are more comfortable in the water. A constant temperature is desirable to promote psychological

stability associated with entering the water. Participants knew what to expect regarding temperature.

A predominant factor on land is gravity as opposed to buoyancy in the water. Buoyancy is the lifting effect of the water. This force produces kinesthetic perceptions which are different from those perceptions experienced when exercising against gravity on land. Buoyancy works in opposition to gravity (Baretta, 1993; Moschetti, 1990).

A causal mechanism by which buoyancy may impact psychological health is its lifting effect. The water lifts and therefore cushions the participant's footstrike impact on the bottom of the swimming pool during exercise (Sova, 1992). The cushioning effect decreases the risk of impact injury in the water (Knecht, 1989). Anxiety associated with possible injury may be less likely due to buoyancy.

The water is a minimal to nonweight bearing, lifting, reduced impact medium. When submerged in neck deep water, the body's buoyancy is approximately 10% of its normal air weight (Knecht, 1989; Moschetti; 1990; Sova, 1992). For example, if a person weighs 160 pounds on land, in neck deep water the person would weigh approximately 16 pounds. As a direct result of this reduced body weight, exercisers often report that they feel a greater range of movement (ROM) and sense of control in the water. An individual's unique ROM is very important. Westfall (1993) advocates that in order

to develop flexibility and recruit more muscle fibers while exercising in the water, the utilization of one's personal ROM is most effective.

Hydrostatic pressure is defined by Baretta (1993) as the force exerted by a fluid on all body parts when immersed. Moschetti (1990) and Sova (1992) state that the increase in hydrostatic pressure is approximately 0.433 pounds per square inch for every one foot increase in water depth. Moschetti (1990) explained that when standing upright in the swimming pool, the hydrostatic pressure is greater surrounding the feet when compared to the chest area. The force exerted by hydrostatic pressure causes a faster venous return of the circulating blood from the working muscles (Baretta, 1993; Moschetti, 1990; Sova, 1992). The effects of this pressure could precipitate feelings of anxiety due to the compressing, squeezing sensations experienced in the water.

Resistance is the drag effect felt by participants as they move through the water (Baretta, 1993; Elder & Campbell, 1990; Sova, 1992). Movements through the water are retarded by resistance. That is, as people exercise in the water, movements are slowed down because of the resistance of the water. Participants control the amount of resistance felt while exercising in the water by adjusting surface area, speed of limbs, and lever length. The water's

resistive properties can be challenging and yet relaxing. People often report the sensations of massaging effects as a result of moving in the water. When people are in the medium of water, the sense of touch is sharpened (Wiener, 1980).

Potential anxiety causal mechanisms due to the feel of exercising in the environment of the water are very important to consider when designing anxiety reducing programs. Temperature should be comfortable for all the participants. Buoyancy provides an uplifting feeling and reduces impact injuries. Hydrostatic pressure could cause pain as a result of the pressure force. Resistance is ever present when exercising in the water and provides a challenge to every movement. Water exercise is a constant combination of these four forces at work.

The effects of water programs on anxiety reduction have been noted anecdotally by water participants and instructors for numerous years. The intuitive based reports have been firmly established on generalized statements by researchers, testimonies, and instructor observations. The following discussion will present information linking the reduction of anxiety with participation in water.

The potential for altering mental thought patterns and subsequent emotions through exercise is latent within all people (Wiener, 1980). Once the potential is realized, its

effects can be manifested in the form of behavior modification. Wiener (1980) found that swimmers described profound psychological change that gave their lives new directions and perspectives. These swimmers were convinced that their improved mental and emotional conditions resulted from their swimming activity. Katz (1996, p. 6) wrote "swimming in warm water or warm weather helps restore the body. Water is buoyant. It is resistant. It is aerobic. It is soothing. It is refreshing. It is sensuous. It is mentally restorative. It is relaxing. And, it is fun."

In reference to water exercise, Prudden (1980, p. 189), a fitness leader, wrote: "after myotherapy, after operations, warm water relaxes muscles and allows one to defy gravity and establish or reestablish rhythms forgotten or blotted out by pain." Sova (1992, p. 35) wrote "the benefits of water exercise are both internal and external, short range and long lasting. Exercise is preventive medical maintenance that can begin paying off immediately." Additionally referencing water exercise, Robbins and Midtlyng (1994, p. 2) wrote the following:

> The benefits of improved physical fitness for exercisers, including water exercisers, have been established in the three categories of physiological, the internal changes; physical, the

external changes; and psychological, the mental and emotional changes. The collective benefits experienced through water exercise keep exercisers 'turned on' to a lifetime of physical activity.

The general benefits reported by the 1,180 respondents in the National Survey of Water Exercise Participants, by Midtlyng and Nelson (1988) are as follows:

- improved muscular strength and endurance;
- reduced back pain and stiffness;
- less arthritic pain;
- relieved stress;
- increased back flexibility;
- much improvement in pain in back and neck;
- blood pressure has gone down;
- helps with arthritis;
- my arthritis feels like it is gone;
- overcame early childhood fear of water;
- helped my breathing when started a running program; and
- motivation to exercise at home. (p. 87)

Midtlyng and Nelson's National Survey (1988) reported that respondents who continued to exercise beyond one year and upward to five years supported the attraction and retention aspects of water exercise programs. People who use the

medium of water to exercise, generally will stick with the program. Midtlyng and Nelson (1988, p. 13) further reported that the five year exercisers exhibited "water dependency or addiction" tendencies.

Another mental thought pattern which highly correlates and contributes to enhanced psychological states is enjoyment (Berger, Owen, & Man, 1993). It is very unlikely that people would adhere to an unpleasant exercise regimen. Unpleasant experiences do not promote positive psychological benefits and exercise adherence. Klonoff, Annechild, and Landrine (1994) conducted a study predicting exercise adherence in women. Findings indicated that psychological and physical discomfort predicted non-exercise adherence. Therefore, it is conceivable that a pleasant exercise experience could make a person "feel better" and "stick with" the exercise program. Klonoff, Annechild, and Landrine concluded that in the general population in order to increase exercise initiation and adherence, immediate symptom relief benefits of exercise should be emphasized.

Laughter will often accompany enjoyment. In terms of the benefits of laughter, DeCluitt (1988, p. 31) wrote the following:

> No longer shunned by the medical community, laughter has been proven to increase respiratory exchange, heart rate, muscular activity, and body

> temperature, and it stimulates the production of beta-endorphins, the chemicals ordinarily produced by a "runner's high," the feeling of exhilaration a runner experiences.

Laughing helps all people and can be very beneficial in times of stress (Adler, 1968).

Berger, Owen and Man (1993) support the theory that exercise should promote abdominal breathing in order to be anxiety reducing. Laughter and abdominal breathing are interrelated. Together both can contribute to enhanced psychological states.

Furthermore, physiopsychic harmony, a mental landscape of exercise, is linked to the medium of water (Wiener, 1980). Wiener (1980) explained that being in the water is like the amniotic fluid surrounding a fetus awaiting birth. He further suggested that the water eases the connection between corpus, mind, and environment. This mental landscape eases the mind, helps release daily tension, and develops the body. Wiener also considered this time in the water as a release from life and jobs. This "time out" is closely related to distraction where the mind is drawn away or diverted.

Sova (1992, p. 2) summarized the relationship of mental attitude and exercise as follows:

> The mental attitude of the regular exerciser is improved not only by a psychological phenomenon but also by a physical one. While the exact effects of powerful hormones called endorphins are not clear yet, they seem to be related to pain, emotions, the immune system, exercise, and the reproductive system. The feelings of well being that come with vigorous exercise have been traced to endorphins. They also may have an effect on mental problems. For instance, patients experiencing depression often have low levels of endorphins.

Sova (1992) further states that there is a mind-body connective correlation with intelligence, alertness, and mental sharpness which contributes in the decision making process (p. 2).

Psychological health, in terms of altering mental thought processes, is a very important factor in achieving a sense of well being (Chopra, 1993; Donatelle & Davis, 1994; Kaplan, Sadock, & Grebb, 1994; Sova, 1992). This sense of well-being and other psychological benefits may be achieved in a relatively brief period of time (Yeung, 1996). The amount of time varies for each individual. Psychological factors which influence well being in connection with water exercise still require much scientific research.

Experimental evidence has supported the link between water programs and anxiety reduction. One such study (Berger & Owen, 1992A) compared swimming with Hatha Yoga. Hatha Yoga mood benefits support the theory that exercise does not need to be aerobic to produce mood benefits. The female participants reported similar mood benefits for both swimming and Hatha Yoga. The researchers also noted that the greater mood changes occurred for those individuals who had a habitual pattern of attendance. The participants attended class on a regular basis. To encourage physical activity by adults, instructors should place maximum emphasis on the immediate mood benefits of exercise (Berger & Owen, 1992A). Implications are for instructors to verbally explain the immediate benefits of water exercise participation to participants at all times during the program. The times include prior to beginning, during, and after the water program.

Additional support for the utility of water programs in reducing anxiety was demonstrated by Berger and Owen (1987) in two similar studies. In the first study, swimmers reported significantly less State Anxiety (STAI S-Anxiety) after swimming than before and the same results were obtained in the second study. The swimmers were less anxious after swimming than before.

Knecht (1989) conducted a comparative study of females participating in a ten week aquatic exercise program and a control group. Findings indicated that there was a decrease in anxiety levels for each session but anxiety levels did not decrease between testing days. The State-Trait Anxiety Inventory was administered on three different occasions to the subjects. These findings support the position that water programs are associated with reduced levels of anxiety and that anxiety is transitory in nature between testing days.

A fairly extensive volume of land based exercise literature has been developed which associates lifestyle, exercise habits, and exercise adherence with psychological changes in anxiety. Gudbrandsson, Julius, Jamerson, Smith, Krause, and Schork (1994) studied recreational exercise and cardiovascular risk status in a rural community in Michigan. The study was conducted using health surveys which extended over three decades. Findings indicated that the sedentary group was more anxious, angry, and felt more pressure than the more physically active subjects. The sedentary lifestyle was directly associated with the anxiety. The researchers concluded that in order to beneficially affect cardiovascular status, exercise habits should be enhanced.

In summary, the findings related to state anxiety while participating in the medium of water suggest that a

reduction in anxiety is associated with participation in water programs. Experimental research generally supports this conclusion. Water program participation leads to reduced anxiety under certain conditions. In order for water exercise instructors to aid participants in understanding anxiety, a better understanding of the interrelationship of water programs and psychological health is needed.

Water Program Characteristics

The interrelationship of water exercise and psychological health literature is growing but limited. Due to the complex nature of constructs of this relationship, psychological effects are often difficult to ascertain, interpret, and are sometimes contradictory in nature (Berger, Owen & Man, 1993; Willis & Campbell, 1992).

The two variables, water exercise programs and anxiety, encompass many characteristics. Berger and Owen (1988) composed a taxonomy to distinguish the anxiety reducing water program characteristics. They established these characteristics as a means of functionally describing the parameters which are likely to result in a positive reduction of anxiety. The characteristics included: (1) enjoyment, (2) competitive and recreational activity,

(3) aerobic, anaerobic, or a combination of the two, (4) individual or group activity, (5) skilled and unskilled participants, and (6) acute and chronic exercise. Berger and Owen (1988) did not attempt to be exhaustive in their list of characteristics, but rather, suggested a means of classifying water anxiety reducing programs. Felts (1989) used the taxonomy for a generalized application in his study to establish the relationship between the quantitative indices of the exercise experience and the psychological benefits. For the purposes of this investigation, the water program characteristics selected included: enjoyment, recreational activity, combination type activity, unskilled participants, and acute exercise.

A subtaxonomy to distinguish the different water program characteristics was developed by the researcher for program classification in this investigation. According to the Berger and Owen's (1988) characteristics, water programs were classified into two categories: (1) water sport activities and (2) water exercise.

Water sport activities are designed to train athletes in a specific sport, such as bicycling or tennis. The emphasis is on developing the muscle strength, flexibility, and skills specific to a given sport (Sova, 1992). Examples of water sport activities include: swimming, scuba diving, springboard diving, aquarunning, and deep and shallow water

running. Water sports use the body positions of horizontal, vertical, and/or a combination of both positions. Water sport activities were not the topic of this investigation.

In contrast to water sports, water exercise positions are usually vertical in nature. Water exercise is defined as "continuous rhythmical movements performed in shallow or deep water at variable rates, repetitive moves, varying levels of difficulty to tone major muscle groups of the body, and performed to maintain or improve selected elements of the components of physical fitness" (Midtlyng & Nelson, 1988, p. 4). Examples of universally used names for water exercise programs include: hydro-cal aerobics, water aerobics, aqua aerobics, waterobics, wave aerobics, aquadynamics, deep water exercise and swimnastics. Water exercise programs can be delineated into shallow water exercise and deep/suspended water exercise.

Water exercise programs generally consist of a combination of shallow and deep/suspended water moves (Midtlyng & Nelson, 1988; Sova, 1992). Shallow water exercise is vertical movements performed in the water when the water depth is measured to be xiphoid process height with the individual standing on the bottom of the swimming pool (Sanders, 1993). Deep/suspended water exercise is vertical movements performed with the feet lightly touching the bottom of the swimming pool or not at all touching

(Sanders, 1993). Midtlyng and Nelson (1988, p. 20) reported:

> The prevalent practice of using a combination of locations for the main exercise workout, enables instructors to accommodate participants whose swimming abilities differ, and to utilize a variety of water exercises at the pool wall as well as shallow and deep water.

Water sport activities and water exercise have distinctly different characteristics. For the purposes of this investigation, water exercise was selected for the program protocol. More specifically, water exercise intervals were used. Water exercise intervals consist of a progressive, systematic conditioning program which utilizes high intensity portions combined with moderate-or-low intensity portions classified into work/rest cycles (Sova, 1992).

Water Exercise - Exercise Prescription

State anxiety and psychological well-being relate to such factors as frequency, intensity, duration, resistance training, and length of program associated with water exercise. Psychological constructs about these factors are interrelated with a person's physiological, psychological,

and psychophysiological health components (Robbins & Midtlyng, 1994; Sova, 1992).

In studies of the effects of physical activity on frequency, intensity, duration and resistance training, the most frequently studied exercise prescription guidelines have been established by the American College of Sports Medicine (ACSM) in 1990. ACSM (1990) published an updated version of an exercise prescription designed to develop the health related physiological components of cardiovascular-respiratory fitness, muscular endurance, muscular strength, flexibility, and body composition. The guidelines are based on frequency, intensity, duration, and resistance training associated with conditioning programs. In physiological conditioning programs, frequency refers to the number of exercise days per week, intensity is how vigorous the workout is, duration is the length of time per workout, and resistance training refers to strength training. Refer to Table I for the specific ACSM (1990) guidelines.

Table I

American College of Sports Medicine Guidelines

1. Frequency of training: 3-5 days per week

2. Intensity of training: 60-90% of maximum oxygen uptake (HR_{max}) or 50-85% maximum oxygen uptake (VO_{2max}) or HR_{max} reserve.

3. Duration of training: 20-60 minutes of continuous aerobic activity. Duration is dependent on the intensity of the activity: thus, lower intensity activity should be conducted over a longer period of time. Because of the importance of "total fitness" and the fact that it is more readily attained in longer duration programs, and because of the potential hazards and compliance problems associated with high intensity activity, lower to moderate intensity activity of longer duration is recommended for the nonathletic adult.

4. Mode of activity: any activity that uses large muscle groups, can be maintained continuously, and is rhythmical and aerobic in nature, e.g. walking-hiking, running-jogging, cycling-bicycling, cross country skiing, dancing, rope skipping, rowing, stair climbing, swimming, skating, and various endurance game activities.

5. Resistance training: Strength training of a moderate intensity, sufficient to develop and maintain fat-free weight (FFW), should be an integral part of an adult fitness program. One set of 8-12 repetitions of eight to ten exercises that condition the major muscle groups at least two days per week is the recommended minimum.

ACSM (1990) has provided the foundation of exercise prescription guidelines for physiological variables. The ACSM (1990) recommendations for developing physiological components may not pertain to psychological components because of the different characteristics associated with each.

Frequency

Frequency is the number of days per week a person exercises. ACSM (1990) recommends three to five days per week. A regular exercise program included in a weekly schedule produces physiological benefits by the participant becoming more fit. It is postulated that improvements in physical fitness also will serve as an adjunctive value in psychological improvements (Morgan, Roberts, & Feinerman, 1971). Persons who exercise three or more days per week have learned to pace themselves, interpret various physical sensations, and to relax while exercising (Berger & Owen, 1988).

Researchers support the need to exercise frequently to maintain psychological benefits, because stress reduction benefits can be gained during short term exercise bouts (Barabasz, 1991; Berger & Owen, 1983; House, 1991; Jones & Edwards, 1991). A frequency of two days per week was

utilized in the study conducted by House (1991). Findings indicated a significant reduction of perceived mental state stress following the month-long, two days per week study. In a similar study conducted by Jones and Edwards (1991), a preexisting group of water exercise participants who exercised two days per week were tested before and after a single bout of exercise, findings indicated a significant reduction in state anxiety following the exercise session.

Intensity

Intensity is defined as how hard the workout is in relation to 60-90% of maximum oxygen uptake (HR_{max}) or 50-85% maximum oxygen uptake (VO_{2max}) or HR_{max} reserve by ACSM (1990) when pertaining to physiological variables. Researchers disagree as to the intensity requirements surrounding the reduction of anxiety. The same information is not available concerning psychological variables as related to intensity of water exercise. The following discussion is extrapolated from comparable land exercise and water sport studies.

In a participant intensity rated study of runners, Acevedo, Rinehardt, and Kraemer (1994) found that the highly trained runners reported less positive effects at higher exercise intensities and that the perception of effort increased in proportion with intensity. The scale used in

this investigation to rate intensity was the Borg rating of perceived exertion (RPE) Scale and the affect scale was the Feeling Scale. The runners' rating of a high perceived exertion tended to be related to lower affect scores at low and high intensities of running. The researchers did not find a relationship between RPE and intensity level for moderate intensities of running. Therefore, they concluded that during exercise the constructs associated with RPE of intensity, "what one feels," and affect feeling, "how one feels," are distinctly different characteristics.

Dishman, Farquhar, and Cureton (1994) conducted a study of men and their responses to preferred intensities of exertion in differing activity levels. They concluded that the role of anxiolytic (anxiety reducing) effects of exercise are still unclear. Their findings did reveal that only the high active participants demonstrated a significant reduction in state anxiety after self selecting the intensity level. They concluded that exercise intensity may result in anxiety reduction based upon the physical activity.

In a study by Berger and Owen (1992B), swimming, intense exercise, and anxiety were studied. The participants exercise intensity exceeded ACSM (1990) guidelines and the swimmers reported decreased state anxiety late in the semester, but not at the onset of the

investigation. The researchers speculated that in order for an activity to be stress reducing, individuals need physical conditioning and this is why the early anxiety reports did not indicate a decreased anxiety state level. In another case Berger and Owen (1987) conducted an intense study during summer school in which there were no changes in the mood of the participants as a result of the intensity of the activity.

A negative relationship between acute effects of aerobic exercise and mood was found in a study conducted by Steptoe and Cox (1988). Thirty two females each riding a Monark Type 864 bicycle ergometer for eight minutes in high or low intensity trials reported increases in anxiety and fatigue after the high intensity exercise bout. The subjects did not report increased anxiety levels after the low intensity exercise bout.

The relationship of intensity and affect are not automatic. Anxiety can be reduced or increased by exercising too intensely. The optimal level of intensity to produce psychological benefits was not conclusively revealed in the present literature review. However, according to Berger and Owen (1992B), if psychological benefits are desired participants should avoid exercising too intensely, probably moderately, rather than mildly. For the purposes

of this investigation, participants self selected intensity levels.

Duration

Based on ACSM (1990) guidelines, duration of training should be 20-60 minutes of continuous aerobic activity to obtain physiological benefits, see Table 1.

Knecht (1989) reported a decrease in anxiety using 20-30 minutes of aqua exercise. Weiss and Jamieson (1989), found that with 30-37 minutes of hydro-cal aerobics, 100% of the participants reported that they felt better. In studies by House (1991) and Jones, Parker and Edwards (1994), 40-45 minutes of water aerobics reduced states of anxiety in the samples of collegiate females. Berger and Owen (1983, p. 431), in a study using swimming for 50 minute sessions reported the following results:

1. self-selected swimmers reported "feeling better;"
2. both swimming groups showed enhanced moods;
3. mood changes associated with exercise occur in a "normal" population; and
4. there are gender differences in mood, but not in the amount of mood change, associated with swimming.

Although the duration parameter has been examined, it is not conclusive as to the amount of time required for psychological effects to occur. It appears that the time for the participant to gain psychological benefits is approximately 20-50 minutes of aerobic activity.

Resistance Training

ACSM (1990) recommends a moderate intensity of resistance training in order to develop and maintain fat-free weight (FFW). ACSM further recommends that adult fitness programs should contain resistance training as an integral component of that training. The above guidelines were developed to enhance the physiological variable of muscular strength. Muscular endurance is closely related to muscular strength (Sova, 1992). To date, only a few attempts have been made to determine the psychological effects of resistance training in relationship to muscular strength/endurance in the water.

One of the earliest investigations of energy expenditure concerning water exercise was conducted by Vickery, Cureton, and Langstaff (1983). They concluded that for people who have low physical work capacity, aqua dynamics could be a beneficial conditioning program.

In three similar water studies conducted by Sanders (1993), Knecht (1989), and Ruoti (1990), results revealed significant improvements in muscular endurance following participation in their eight week, ten week, and twelve week water exercise programs, respectively. In the study by Ruoti (1990), it also was concluded that the aqua dynamic exercise program produced significant improvement in the onset of blood lactate accumulation. It is postulated that these significant strength improvement findings are directly related to the multidimensional resistance of the water during water exercise.

Using a deep water program as the protocol, Baretta (1993) studied twelve females and five males for fourteen weeks. Hand bars, styrofoam dumbbells, were utilized for ten minutes during the exercise session. The hand bars added resistance for the participants. Baretta found significant strength improvements in shoulder horizontal extension, shoulder horizontal flexion, and shoulder flexion. Baretta concluded that significant strength gains are achieved through deep water exercise.

In a land study, Raglin, Turner, and Eksten (1993) contrasted leg ergometry and weight training in relationship to psychological benefits. State anxiety was measured using the State-Trait Anxiety Inventory (STAI S-Anxiety Form Y-1). Findings indicated that the exercise mode was the

determining factor in the effects of physical activity on state anxiety. Leg ergometry results following exercise indicated a steady decrease in state anxiety at the twenty minute assessment and a significant state anxiety reduction by the sixty minute assessment. They concluded that this finding supports the fact that aerobic modes of exercise are associated with reduction in anxiety. In contrast, state anxiety levels were significantly elevated above baseline immediately following weight training. However, the state anxiety levels returned to baseline when assessed twenty minutes and sixty minutes following the weight training exercise. They concluded that weight training does not reduce state anxiety.

In another effect of weight training on state anxiety study by Koltyn, Raglin, O'Connor, and Morgan (1995), findings were identical to the results found above by Raglin, Turner, and Eksten (1993). Together these two studies indicate that immediately following weight training, state anxiety is not altered in college students.

To summarize the land based studies, state anxiety is not reduced as a result of weight training. However, the literature concerning resistance training indicates that significant improvements in strength occur through participation in water exercise programs. Water provides

resistance to every movement, therefore this is a topic of concern, but is not part of this investigation.

Length of Exercise Programs

In general, chronic physiological components require a long term period of approximately eight or more weeks for the body to adapt to the physiological changes. Acute physiological changes can be seen in short term bouts of exercise such as increased heart rate, perspiration, and respiration rate.

Research on changes in the psychological components after exercise participation have generally concentrated on changes associated with long term periods of exercise, however, accumulating research suggests that long term periods may not be necessary to elicit psychological changes (Felts, 1992; Pierce & Pate, 1994; Maloney, Cheney, Spring, & Kanusky, 1986; McGowan & Pierce, 1991; Morgan, Roberts, & Feinerman, 1971).

In a study by Maloney, Cheney, Spring, and Kanusky (1986), a sixteen week program was compared to a five week program. The study compared the physiological and psychological effects of a physical fitness program. Findings indicated that physiological changes did occur following the long term sixteen week program and the short

term five week program. The magnitude of the significant change, however, was greater for the long term program when compared to the short term program. Furthermore, the authors concluded that although the physiological adaptations did take time, a psychological change is transitory and therefore, does happen with both a sixteen week program as well as a five week program.

One psychological study concerning water exercise, supports the contention that anxiety can be reduced after participating in a single bout of exercise (Jones & Edwards, 1991). Collegiate females were pre-tested and post-tested following forty five minutes of water exercise. Findings revealed a reduction in state anxiety following the water exercise.

The above studies are encouraging due to the time restraints experienced by many Americans today. Psychological benefits can be gained in brief periods of time as well as longer extended periods of time.

To summarize, the mood benefits associated with exercise are interrelated with frequency, intensity, duration, resistance training, and length of the program. However, the optimal exercise prescription to achieve psychological benefits for these variables has not been conclusively established.

Summary

Physiological adaptations make clear and obvious measurable changes in a person's physical make-up while psychological adaptations are unclear. In light of the literature review it is conceivable to believe that state anxiety and water exercise can be conceptualized as a psychophysiological phenomenon.

There is research literature supporting the theory that psychological health is best viewed within the mind-body context. Hence, the decision in the present investigation to focus on the psychological component of anxiety is discretional in nature. This approach was taken to enhance the understanding of psychological health as it relates to water exercise intervals.

CHAPTER III

METHODS AND PROCEDURES

INTRODUCTION

The purpose of this investigation was to determine if differences in state anxiety levels existed between and within collegiate females in two groups - the water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale pre-test to post-test situations. Specifically, two independent t tests and two paired samples t tests were used to determine whether the means of two groups, the water exercise intervals and the psychology control group, differ reliably from each other. The .05 level of significance was used for all statistical tests.

The procedures were divided into the following sections: (a) primary procedures, and (b) secondary procedures. The primary procedures included: (a) subject selection and description; (b) study approval, participant brief and consent forms; and (c) instrument selection. The secondary procedures for this investigation consisted of: (a) training; (b) research design; (c) experimental group;

(d) control group; (e) data collection; and (f) research design and statistical analysis.

Primary Procedures

Subject Selection and Description

In this research investigation, many instructional method problems were addressed prior to beginning the study or were eliminated from the research paradigm. A paradigm, as defined by Cox (1985), is a scheme or model that helps the researcher to explain and test a theory. In state anxiety research, the goal is to control or eliminate as many confounding variables as possible, so that the observed effect can be attributed in this investigation to the presence of the water exercise intervals program at the present moment.

One instructional problem addressed was the attendance and attrition of participants. The study began during week twelve of a sixteen week semester. The participants had an established habitual pattern of attendance by this time in the semester. The researcher hoped to minimize attrition. In order to be included in the investigation, participants had to be present and participating on both testing days.

participants and Introductory Psychology students enrolled at Rose State College during the Spring Semester of 1997.

Seventy-seven Rose State College students, who volunteered to serve as subjects for this study, were enrolled in a water exercise class (N = 33) or an Introductory Psychology class (N = 44). The water exercise class consisted of twenty seven females and six males, while the Introductory Psychology class consisted of twenty four females and twenty males. Males were excluded from the final analyses.

Participants had to be present for both testing days in order to be included in the investigation. Seven water exercise females were absent for the post-test evaluation and were dropped from the study. Four psychology control females were absent for the post-test evaluation and were dropped from the study. The final total number of female subjects included in this investigation was forty, water exercise intervals group (n = 20) and psychology control group (n = 20).

The water exercise interval sessions were conducted at the Rose State College Aquatic Center swimming pool on Tuesday and Thursday for group one and on Monday and Wednesday for group two, from 5:30 p.m. - 6:20 p.m., during the Spring Semester of 1997. The two groups were combined

to form the water exercise intervals group. The final water exercise intervals group consisted of n = 20 females.

The Introductory Psychology control classes were held in the Social Sciences Building on Tuesday and Thursday for group one, from 7:05 p.m. - 8:20 p.m., on Monday and Wednesday for group two, from 5:30 p.m. - 6:30 p.m., and on Monday and Wednesday for group three, from 8:30 p.m. - 9:45 p.m., during the Spring Semester of 1997. The three groups were combined to form the control group. The final psychology control group consisted of n = 20 females.

Participants in this investigation had habitual patterns of attendance prior to the beginning of the investigation. The investigation began during week twelve of a sixteen week semester. All testing was conducted at Rose State College. Data were analyzed at Oklahoma State University using a personal computer. The computer program used for analysis was the Statistical Package for the Social Sciences (SPSS).

Study Approval, Participant Brief and Consent Forms

This research investigation was approved by the Oklahoma State University Institutional Review Board Human Subjects Review (see Appendix A) and the Rose State College

Social Sciences Division (see Appendix B). Approval was received prior to beginning the research study.

The Self Evaluation Study Participant Brief explained the study and the participants' rights while being involved with the study (see Appendix C). In order for the selected subjects to participate in the investigation, each person in the water exercise intervals group had to sign the following documents: the Oklahoma State University Waterobics Self Evaluation Study Consent Form (see Appendix D) and the Rose State College Waterobics Self Evaluation Study Consent Form (see Appendix E). Each person in the psychology control group had to sign the following documents: the Oklahoma State University Psychology Consent Form (see Appendix F) and the Rose State College Psychology Consent Form (see Appendix G). Participants in both groups had to complete the Health Questionnaire (see Appendix H). The participant brief and consent forms were completed prior to the pre-test inventory. Data from these instruments were valuable in determining the sample demographics.

Instrument Selection

The State-Trait Anxiety Inventory (STAI): Comprehensive Bibliography by Spielberger lists over 3,300 studies and reviews in which this inventory has been

successfully utilized. The original inventory was developed in 1968 by Spielberger, Gorsuch, Lushene, Vagg, and Jacobs in order to assess anxiety situations. Anxiety as defined by Spielberger (1983, p. 4) is a "changing emotional state which is characterized by subjective feelings of tension, apprehension, nervousness, and worry, and by activation or arousal of the autonomic nervous system." Anxiety is divided into state and trait. Trait Anxiety (T-Anxiety) is personality related and is the disposition or a relatively stable tendency to perceive a wide variety of non-dangerous situations as threatening. State Anxiety (S-Anxiety) is the transitory response manifested with elevations in the intensity of the state anxiety reactions to such situations (Bowyer, 1988; Hackfort and Spielberger, 1989; Spielberger, 1983).

The STAI consists of two separate self-reporting trait (anxiety proneness) and state (situational anxiety) sections made up of twenty questions each. This investigation utilized the STAI S-Anxiety scale only in order to measure state anxiety levels at the present time in collegiate participants (see Appendix I). The STAI S-Anxiety scale sub-test is a frequently used, forced choice questionnaire. Each item forces the respondents to circle the numbers 1 - 4 on the form which correspond to their feelings concerning the individual twenty items: (1) not at all, (2) somewhat,

(3) moderately so, and (4) very much so. The numbers describe the level of feeling intensity at the present moment. Scores range on a continuum from low anxiety (20) to high anxiety (80). The answers which are neither right nor wrong, simply indicate how she feels in the present or at the moment.

The STAI S-Anxiety scale is equally divided into anxiety-absent and anxiety-present responses. The anxiety-absent items are scored in reverse and the anxiety-present items are scored the same as the circled responses. Both sets of scores are added together for a total score which ranges from low anxiety (20) to high anxiety (80).

Spielberger (1983) reports test-retest reliability for state inventories from 0.16 to 0.31 over periods of one hour to 104 days for college students. The relatively low test-retest reliability of the STAI S-Anxiety scale is expected due to the transitory situational nature of state anxiety. The test of state anxiety evaluates how participants feel at the moment of response (Spielberger, 1983).

State anxiety measures are internally consistent with alpha coefficients ranging from 0.91 to 0.93 for college students based on 296 males and 481 females (Spielberger, 1983). The high alpha coefficients are more meaningful when compared to the test-retest reliability of the STAI S-Anxiety scale. The high alpha coefficient supported the

selection of this instrument for use in this investigation.

There are no time limits to complete the inventory however, it takes college students approximately five minutes to complete the state form. Instructions are clearly written on the top of each form. The readability of the STAI S-Anxiety scale is sixth grade level, thereby enhancing understandability by respondents.

Secondary Procedures

Training

Subjects participated in a five week water exercise intervals program. The program was progressive in nature and consisted of full body components utilizing all joint actions in the body. Each exercise session was fifty minutes in length. The exercise session consisted of the following phases: (1) warm-up phase of five to ten minutes; (2) active aerobic interval phase of twenty five to thirty minutes; and (3) a cool down phase of five to ten minutes. The active aerobic interval phase utilized a one minute to one minute fifteen second interval time format. The water exercise intervals consisted of the following moves: bicycles, cross country, figure 8, forward knee raise,

flutter kicks, jogs, jumpers, jumping jacks, lateral knee raise, leg lifts, pull through, scissors, spins, and trunk rotation (see Appendix J).

The investigation began during week twelve of a sixteen week semester. Participants were trained prior to the beginning of the study in the use of the water, selecting desired water depth, equipment selection, and how to rate intensity level. The prior handling of the above issues eliminated method problems and accommodated participants at all ability levels.

Participants were free to select equipment. Equipment for this investigation consisted of flotation belts, ski belts, hydro-fit cuffs or bells, hand bars, foam logs, and aqua joggers. Each participant self selected equipment based on her previous experiences of the first eleven weeks of the semester. During this time participants were allowed to use all of the various pieces of equipment.

In addition to selecting equipment, subjects also selected the water depth in which to exercise. The water depth ranged from three feet deep to twelve feet deep. The selected water depth and area of the swimming pool to exercise in was the participant's individual decision.

Research Design

A pre-test and a post-test were used to assess the state anxiety level of each individual. A self evaluation questionnaire was used to determine state anxiety levels between and within two groups of participants, the water exercise intervals group and the psychology control group.

The independent variables were treatment at two levels and time at two levels. The dependent variable was the score from the STAI S-Anxiety scale completed by the subjects.

Experimental Group

Subjects in the experimental group (n = 20 females) received two 30 minute water exercise intervals sessions per week for five weeks. Total class time was 50 minutes.

Control Group

Subjects in the control group (n = 20 females) attended class two days per week for five weeks. The control group participants were instructed to continue with a normal pattern of life.

Data Collection

After all consent forms and health questionnaires were completed, each subject completed the pre-test STAI S-Anxiety scale approximately five minutes prior to the start of the water exercise intervals or the psychology control sessions. Subjects completed the post-test STAI S-Anxiety scale approximately five minutes after the water exercise intervals or the psychology control sessions at the completion of the investigation.

The researcher administered the inventory on the pool deck and in the psychology classroom on all occasions. The reasons for this study were outlined in the Self Evaluation Study Participant Brief which explained the study and the participants' rights while being involved with the study (see Appendix C) so that a nonthreatening environment would prevail. Subjects were assured of confidentiality, that there were no right or wrong answers, and that final results would be reported on a group basis.

Research Design and Statistical Analysis

A self evaluation questionnaire was used to determine state anxiety levels between and within participants in two groups, the water exercise intervals group and the

psychology control group. The independent variables were treatment and time. The dependent variable was the score from the STAI S-Anxiety scale completed by the subjects. The statistical analysis consisted of using two independent t tests and two paired samples t tests. Statistical analyses were performed on the null hypotheses at the .05 level of significance.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this investigation was to determine if differences in collegiate females' state anxiety levels existed between and within participants in two groups, the water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale pre-test to post-test situations.

Similarities and differences between the water exercise intervals and psychology control groups are presented in this section. The following three sample demographic characteristics are presented: (1) age, (2) classification in school, and (3) health status.

Age

The mean age of the sample was 34.63 years with a range from a minimum of 18 years to a maximum of 57 years. The standard deviation was 13.05 years. The water exercise intervals group mean age was 39.85 years with a standard

deviation of 14.47 years. The psychology control group mean age was 29.40 years with a standard deviation of 9.09 years. Refer to Table II for age demographic information.

Table II

Age Demographic Information

Group	19 - 39 Years	40 - 49 Years	50 - 65 Years
Water Exercise Intervals n = 20	10	1	9
Psychology Control n = 20	16	4	0

Findings indicated that the water exercise intervals group participants were approximately ten years older than the psychology control group participants. The introductory course in psychology showed enrollment by a younger, more homogeneous group than that enrollment in the water exercise intervals class. The Introductory Psychology course is a general education credit course taken by traditional degree students. The water exercise intervals class had a credit and non-credit offering, which attracted non-traditional students.

Classification in School

Five categories were used to identify the educational level of subjects. They are as follows: (1) freshman, (2) sophomore, (3) junior, (4) senior, and (5) other. The other category indicated subjects who were taking the course for non-credit. The number of freshmen in the water exercise intervals group was three and in the psychology control group thirteen. The number of sophomores in the water intervals exercise group was four and in the psychology control group six. The number of juniors in the water exercise intervals group was two and in the psychology control group none. The number of seniors in the water exercise intervals group was one and in the psychology control group none. The number of others in the water exercise intervals group was ten and in the psychology control group one. The two extreme age groups represent the largest number of subjects; water exercise intervals group being other while the psychology control group was largely composed of freshmen. It is conceivable that an Introductory Psychology class would consist of a large number of freshmen and that a water exercise intervals evening course would consist of a large number of subjects classified as other (non-credit). These individuals enrolled in the community based non-credit portion of the

water exercise class. This is typical of Rose State College exercise evening class participants. In addition to community participants, faculty and staff enroll in the fitness classes on an on-going basis. Refer to Table III for classification in school year information.

Table III

Classification in School Information

Group	Freshman	Sophomore	Junior	Senior	Other
Water Exercise Intervals n = 20	3	4	2	1	10
Psychology Control n = 20	13	6	0	0	1

Health Responses

Health responses were coded with the number of yes answers used as the coding scheme. Subjects were asked to respond to twelve questions by answering yes or no. A positive response indicated that the individual in the sample had some level of health risk or health behavior that could affect exercise levels. The data are presented based

on the number of yes responses. Among the twenty individuals in the water exercise intervals group, all but two respondents had one or more positive responses, while in the psychology control group five respondents indicated no positive responses. In the water exercise intervals group, nine respondents had four or more positive responses, while in the psychology control group only one respondent had four or more positive responses.

Further data analysis revealed that only one of the forty females in the sample had been advised by a doctor to avoid exercise. Ten water exercise intervals group participants had a family history of heart disease, while eighteen of the psychology control group indicated no family history of heart disease. Four water exercise intervals participants and two psychology control participants indicated lung problems. There were no smokers in the water exercise intervals group and only four in the psychology control group. Seventeen water exercise intervals participants and nineteen psychology control participants indicated that they did not have high blood pressure. Only one participant in both groups indicated that they had diabetes. Fourteen water exercise intervals participants and twenty psychology control participants indicated that they did not have Hyperlipidemia. Eight water exercise intervals participants and nine psychology control group

participants indicated that they had a weight problem of 25 pounds or more. Leading a sedentary or inactive lifestyle was indicated by seven water exercise intervals participants and two psychology control group participants. Seven people in the water exercise intervals group indicated that they had arthritis, whereas there were none in the psychology control group. Six people in the water exercise intervals group and two in the psychology control group indicated having a bad back. One half of the water exercise intervals group participants were on medication, whereas only five in the psychology control group indicated they were taking medication. Refer to Table IV for health responses demographic information by group.

Table IV

Health Responses Demographic Information

Health Question	Water Exercise Intervals n = 20		Psychology Control n = 20	
	Yes	No	Yes	No
1. Have you ever been advised by a doctor to avoid exercise?	1	19	0	20
2. Do you have a family history (siblings, parents, uncles, etc.) of heart disease?	10	10	2	18
3. Do you have any lung problems? Asthma, arteriosclerosis, emphysema, etc.	4	16	2	18
4. Do you smoke?	0	20	4	16
5. Do you have high blood pressure (hypertension)?	3	17	1	19
6. Do you have diabetes?	1	19	1	19
7. Do you have Hyperlipidemia (high cholesterol and triglycerides levels)?	6	14	0	20
8. Do you have a weight problem (25 pounds or more)?	8	12	9	11
9. Do you lead a sedentary or inactive lifestyle?	7	13	2	18
10. Do you have arthritis?	7	13	0	20
11. Do you have a bad back?	6	14	2	18
12. Are you on any medications?	10	10	5	15

The following section is organized around statements of null hypotheses. The pattern is as follows:

1. statement of the research question;
2. statement of the null hypothesis;
3. statement of the alternative hypothesis;
4. statistical test used to test the null hypothesis;
5. statistical and descriptive statistics table; and
6. discussion of results about hypothesis.

Hypothesis 1

Research Question 1

Is there a statistically significant difference in the pre-test state anxiety scores between students who are in water exercise intervals and those who are in psychology?

Null Hypothesis 1

There is no significant difference in state anxiety levels between participants in the two groups, water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale Form Y-1 pre-test.

Alternative Hypothesis 1

There is a difference in state anxiety levels between the two participant groups, the water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale Form Y-1 pre-test.

Null Hypothesis 1 Statistical Test

To analyze statistical significance, the statistical test used to examine the H_o1 was an independent t test. The alpha level is .05. The t test for independent samples was used to examine the difference between the means of the two independent groups on the pre-test measurement of state anxiety levels. Each of the 40 collegiate females were asked to rate her level of state anxiety using the questionnaire prior to beginning the investigation. Each group, water exercise intervals and psychology control, consisted of twenty collegiate females. The two sets of twenty scores were then compared statistically. The circumstance is that the two separate groups of subjects were assessed with the same instrument. The question is whether there exists a significant difference between the two groups' pre-test state anxiety scores. Another question is whether this difference is sufficiently large enough to

justify the conclusion that the two groups are from the same population.

Statistical and Descriptive Table for Hypothesis 1

This section contains statistical and descriptive information about the two groups, see Table V.

Table V

t test for Independent Samples for

Pre-test

STAI S-Anxiety Scores by Group

Group	Number of Subjects	df	Mean	Standard Deviation	t	p
Water Exercise	20	38	33.20	11.12	-1.76	.086
Psychology	20		38.85	9.04		

alpha is .05

Discussion of Results for Hypothesis 1

The results of the analysis as shown indicate the water exercise intervals group mean score was 33.20; whereas, the

mean score for the psychology group was 38.85. The calculated t value of -1.76 was shown to have a probability of .086 which exceeded the alpha level of .05. As a result, the null hypothesis was not rejected. There is no significant difference between the means on the pre-test scores for the water exercise group and the control group. Thus, the water exercise intervals group and the psychology control group were shown to be similar in anxiety level.

Based on the data results that there is no significant difference between means on the pre-test STAI S-Anxiety scale scores for the water exercise intervals group and the psychology control group, the statistical analysis, independent t test, was run using the post-test scores.

Hypothesis 2

Research Question 2

Is there a statistically significant difference in the post-test state anxiety scores between students who are in water exercise intervals and those who are in the psychology control group?

Null Hypothesis 2

There is no significant difference in state anxiety levels between participants in the two groups, water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale Form Y-1 post-test.

Alternative Hypothesis 2

There is a difference in state anxiety levels between the participants in the two groups, the water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale Form Y-1 post-test.

Null Hypothesis 2 Statistical Test

To analyze statistical significance, the statistical test used to examine the H_o2 was an independent t test. The alpha level is .05. The t test for independent samples was used to examine the difference between means of the two independent groups on the post-test measurement of state anxiety. Each of the forty collegiate females were asked to rate their level of state anxiety using the questionnaire at the conclusion of the study. Each group, water exercise intervals and psychology control, consisted of twenty

collegiate females. The two sets of twenty scores were then compared statistically. The circumstance is that the two separate groups of subjects were assessed with the same instrument. The question is if there exists a significant difference between the two groups' post-test scores. Another question is whether this difference is sufficiently large enough to justify the conclusion that the two groups are from the same population.

Statistical and Descriptive Table for Hypothesis 2

This section contains statistical and descriptive information about the two groups, see Table VI.

Table VI

t test for Independent Samples for

Post-test

STAI S-Anxiety Scores by Group

Group	Number of Subjects	df	Mean	Standard Deviation	t	p
Water Exercise	20	38	28.20	5.625	-4.05	<.001
Psychology	20		40.60	12.483		

alpha is .05

Discussion of Results for Hypothesis 2

The results of the analysis as shown indicate the water exercise intervals group mean score was 28.20; whereas, the mean score for the psychology group was 40.60. The calculated t value of -4.05 was shown to have a probability of less than .001 which is significant at the alpha level of .05. As a result, the null hypothesis was rejected. There is a significant difference between the means on the post-test scores for the water exercise intervals group and the psychology control group. Thus, the water exercise intervals group and the psychology control group were shown to be different at the end of the investigation.

Based on the data results that there is a significant difference between means on the post-test STAI S-Anxiety scale scores for the water exercise intervals group and the psychology control group, the statistical analysis, paired samples t test, was run on the control group.

Hypothesis 3

Research Question 3

Is there a statistically significant difference within the psychology control group on the pre-test to post-test situation?

Null Hypothesis 3

There is no significant difference within the control group participants on the STAI S-Anxiety scale Form Y-1 from pre-test to post-test in state anxiety levels.

Alternative Hypothesis 3

There is a statistically significant difference within the control group participants on the STAI S-Anxiety scale Form Y-1 from pre-test to post-test in state anxiety levels.

Null Hypothesis 3 Statistical Test

To analyze statistical significance, the statistical test used to examine the H_o3 was the paired samples t test. The alpha level is .05. The t test for paired samples was

used to examine the difference between means within the psychology control group on the pre-test to post-test situation. Each of the twenty collegiate females in the psychology control group provided two scores, pre-test and post-test. The two sets of twenty scores were then compared statistically. The circumstance is that each subject provided a repeated measure. Each subject had paired scores, pre-test and post-test. The question is if there exists a significant difference within the pre-test and post-test means. Another question is whether this difference is sufficiently large enough to justify the conclusion that the psychology group changed within from the beginning of the investigation to the end. Finally, if significance is found within the psychology control group, what happened is relevant to this investigation.

Statistical and Descriptive Table for Hypothesis 3

This section contains statistical and descriptive information about the psychology control group, see Table VII.

Table VII

t test for Paired Samples for

Psychology Control Group

STAI S-Anxiety Scores by Time

Group	Number of Subjects	df	Mean	Standard Deviation	t	p
Pre-test	20	19	38.85	9.039	.742	.467
Post-test	20		40.60	12.483		

alpha is .05

Discussion of Results for Hypothesis 3

The results of the analysis as shown indicate the pre-test mean score was 38.85; whereas, the post-test mean score was 40.60. The calculated t value of .742 was shown to have a probability of .467 which exceeded the alpha level of .05. As a result, the null hypothesis was not rejected. The higher post-test mean of 40.60 is not statistically significant when compared to the lower pre-test mean of 38.85. Although statistically the within differences were nonsignificant, it is practical to note that the psychology control group anxiety levels did increase. This indicates a

trend toward an increase in state anxiety levels from pre-test to post-test within the psychology control group. The control group showed low anxiety levels at the beginning of the investigation and conditions of life are credited with this trend toward the increase in state anxiety.

Based on the data results that there is a nonsignificant difference within the psychology control group, the statistical analysis, paired samples t test, was run on the water exercise intervals group.

Hypothesis 4

Research Question 4

Is there a statistically significant difference within the water exercise intervals group on the pre-test to post-test situation?

Null Hypothesis 4

There is no significant difference within the water exercise intervals group participants on the STAI S-Anxiety scale Form Y-1 from pre-test to post-test in state anxiety levels.

Alternative Hypothesis 4

There is a statistically significant difference within the water exercise intervals group participants on the STAI S-Anxiety scale Form Y-1 from pre-test to post-test in state anxiety levels.

Null Hypothesis 4 Statistical Test

To analyze statistical significance, the statistical test used to examine the H_o4 was the paired samples t test. The alpha level is .05. The t test for paired samples was used to examine the difference between means within the water exercise intervals group on the pre-test to post-test situation. Each of the twenty collegiate females in the water exercise intervals group provided two scores, pre-test and post-test. The two sets of twenty scores were then compared statistically. The circumstance is that each subject provided a repeated measure. Each subject had paired scores, pre-test and post-test. The question is if there exists a significant difference within the group on the pre-test and post-test means. Another question is whether this difference is sufficiently large enough to justify the conclusion that the water exercise intervals group changed within from the beginning of the investigation

to the end. Finally, if significance is found within the water exercise intervals group, what happened is relevant to this investigation.

Statistical and Descriptive Table for Hypothesis 4

This section contains statistical and descriptive information about the water exercise intervals group, see Table VIII.

Table VIII

t test for Paired Samples for
Water Exercise Intervals Group
STAI S-Anxiety Scores by Time

Group	Number of Subjects	df	Mean	Standard Deviation	t	p
Pre-test	20	19	33.20	11.115	-1.856	.079
Post-test	20		28.20	5.63		

alpha is .05

Discussion of Results for Hypothesis 4

The results of the analysis as shown indicate the pre-test mean score was 33.20; whereas, the post-test mean score was 28.20. The calculated t value of -1.856 was shown to have a probability of .079 which exceeded the alpha level of .05. As a result, the null hypothesis was not rejected. The lower post-test mean of 28.20 is not statistically significant when compared to the higher pre-test mean of 33.20. Although statistically the within differences were nonsignificant, it is practical to note that the water exercise intervals group's anxiety levels did decrease. This indicates a possible trend toward a decrease in state anxiety levels from pre-test to post-test within the water exercise intervals group. As with the psychology control group the water exercise intervals group showed low anxiety levels at the beginning of the investigation. At the end of the investigation these anxiety levels showed a trend toward lower anxiety levels. The water exercise intervals program must be credited as the cause of this trend.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this investigation was to determine if significant differences in state anxiety levels existed between and within collegiate females in two groups, the water exercise intervals group and the psychology control group, on the STAI S-Anxiety scale. The state anxiety scores were measured twice, pre-test and post-test. A total of forty collegiate females participated in the investigation.

Summary of Findings

Four t tests were completed on the data and examined at the .05 level of significance. The analysis yielded the following results:

1. There was no statistically significant difference between the means of the two groups, the water

exercise intervals group and the psychology control group, on the pre-test. The null hypothesis was not rejected as the two groups did not differ in initial state anxiety levels.

2. There was a statistically significant difference between the means of the two groups, water exercise intervals group and the psychology control group, on the post-test. The null hypothesis was rejected as the psychology control group showed significantly higher state anxiety levels at the post-test situation than the water exercise intervals group.

3. There was no statistically significant difference within the psychology control group. The null hypothesis was not rejected as the psychology control group's pre-test and post-test state anxiety levels did not differ. An analysis of means did reveal a 4% state anxiety level increase trend from pre-test to post-test situations within the psychology control group. State anxiety levels within this group showed a trend toward increasing.

4. There was no statistically significant difference within the water exercise intervals group. The

null hypothesis was not rejected as the water intervals group's pre-test to post-test state anxiety levels did not differ. An analysis of means did reveal a 15% state anxiety level decrease trend from pre-test to post-test situations for the water exercise intervals group. State anxiety levels within this group showed a trend toward decreasing.

Conclusions

Water exercise intervals group participants and psychology control group participants differ in levels of state anxiety after five weeks. The water exercise intervals group state anxiety levels showed a trend to decrease as a result of the water exercise treatment. The psychology control group's state anxiety levels showed a trend to increase.

Exercise has been promoted as the universal panacea for achieving both physiological and psychological benefits. It is well documented, that in order to achieve physiological benefits, ACSM (1990) guidelines need to be followed. Habitual exercise patterns are needed in order to achieve these physiological benefits. The interrelated constructs of frequency, intensity, duration and length of program have

provided an established exercise protocol. The protocol has been well researched and provides a strong foundation worldwide for the physiological variables.

Given the strong physiological foundation and obvious health benefits, it is alarming that more people do not exercise. Hundreds of people will start exercise programs and then not adhere to the program later on. Some of these same people will try over and over with different programs only to quit again and again. Exercise adherence is a definite problem for most people. A common question is "how do instructors get participants to stick with a program?"

It has been posited that an understanding of water exercise intervals effects would be very useful in designing state anxiety reducing programs for collegiate females. In this investigation ACSM (1990) guidelines were not all applicable to the study of psychological variables. The frequency of two days per week and the self selected intensity level produced a reduction in state anxiety for the water exercise intervals group. The actual duration of exercise intervals was 30 minutes and within ACSM (1990) guidelines. The five week program did produce a 15% state anxiety level decrease in the water exercise intervals group. The reduction in anxiety levels from pre-test to post-test within the water exercise intervals group indicated a definite trend reduction in anxiety. This

reduction was not statistically significant, however, it is important to note that this reduction did occur. It is conceivable to believe that if the length of the program was extended the reduction in state anxiety levels would have reached significance within the water exercise intervals group.

The pre-test state anxiety levels of the water exercise intervals group were initially low and mean scores did decrease at the end of the five weeks of treatment. Participants chose to enroll in this class. They were already low in state anxiety levels and were doing what they preferred to do.

The self selecting class premise is one that is conducive with adherence and anxiety reduction. People who self select activities are more likely to enjoy the activity and stick with the program. The class participants said they felt better after class. They also said they looked forward to coming to class. The class participants openly shared their passion for water exercise. This passion was what kept them coming to class even when they did not feel like it.

The water exercise intervals group was excited about participating and learning. The excitement was obvious in the smiles and conversation. The exercise moves utilized in this investigation were challenging yet refreshing. The

participants appeared to be totally committed to the program.

The participants communicated the fact that they intended to continue to take care of themselves by enrolling in class again. On several days, the instructors were asked about future classes.

The water exercise intervals group was empowered by the instructors in the first weeks of class. Participants were allowed to experience the moves, equipment, and water depth at the beginning of the semester. By the start of the investigation the empowered students had selected the desired moves, equipment, and water depth for their exercise program. By allowing the participants to participate in program planning, ownership responsibility was shared.

The psychology control group participants continued to attend class as usual. The mean state anxiety levels of this group increased by the end of the five weeks. On the final day of the investigation prior to administering the post-test questionnaire, students in the psychology control group were given instructions concerning the final exam. The final exam was scheduled for the following week. The researcher had expected the anxiety levels of the psychology control group to remain constant. The anxiety level of this group increased although not statistically significant.

Water exercise intervals group participants and psychology control group participants differ in levels of state anxiety after five weeks. Given the facts of this study, the water exercise intervals group state anxiety levels decreased as a result of the water exercise treatment. The psychology control group's state anxiety levels increased as a result of various factors of personal life and test anxiety.

Reduced state anxiety produces an inner calm considered inner peace. The inner peace feeling is like a euphoria which integrates the psychomotor domain (movement), the cognitive domain (thoughts), and the affective domain (feelings), thus reducing tensions. The weaving together of these constructs maximizes the aspects of psychological health.

Consider the reduction in health care costs if psychologists were not needed as often because people exercised in the water for a brief period of time, two days per week. People could actually be responsible for their own psychological health. They could take control by growing and becoming through self-actualization. Life is a process and people who exercise in the water set the conditions for positive psychological health benefits. These persons are better able to control the intensity of the anxiety responses and its manifestations.

A decision by the Oklahoma State Regents for Higher Education to eliminate academic credit for physical activity skills courses may lead to higher state anxiety among college students. Those students who learn physical skills and exercise regularly show lower state anxiety and learn to address several health risk factors.

Age and health differences which existed between the treatment group and the control group further accentuate this conflict in valuing of education. Education is the process of learning or developing, based upon "drawing out" or educing of knowledge. As those students in the water exercise intervals group learned more about their bodies and responses to exercise, they remained stable or lowered their state anxiety level. This stability at low state anxiety levels enhances the learning process.

Overall, the findings must be tempered by an awareness of the sample size of twenty in each group and the length of the treatment of five weeks. Nevertheless, the data and literature support the existence of enhanced psychological benefits derived from a two day per week, self selected intensity, fifty minutes duration, five week water exercise intervals program. This suggests that water exercise intervals may be a valuable strategy for self controlling the intensity of anxiety responses in collegiate females.

The literature revealed numerous factors that may contribute to the psychological effects of water exercise. Constructs such as learning theories, difficulties experienced in the water, temperature, buoyancy, hydrostatic pressure, resistance, mental thought patterns, enjoyment, physiopsychic harmony, mental attitude, exercise mode, program characteristics, and the exercise prescription all contribute to the psychological effects of water exercise. The optimal dose of these constructs has not been determined.

A great deal remains to be studied in state anxiety and its relationship to water exercise. The researcher hopes this investigation helps serve this critical function. The findings in this investigation are highly promising.

Recommendations

1. A replication of this study using a large random sample of college students to gain a more accurate view of the state anxiety and water exercise relationship. Participants would be assigned to groups rather than self selecting groups.

2. A study to investigate different water exercise programs and the relationship to reduction in anxiety. Circuit

training in the water would be an interesting water exercise program to investigate. This activity contains a variety of variables to investigate.

3. A replication of this study conducted for a longer period of time. There was a definite state anxiety reduction trend as a result of the five week program.

4. A question worthy of investigation is whether the anxiety reduction is related to participant expectations rather than the water exercise intervals class.

5. It would be interesting to study a self selected class of water exercises who may then be deprived of water activity for two months. A comparison of state anxiety levels at four points in time would provide valuable information.

6. Is there a difference in foot strike contact and no foot strike contact in the reduction of state anxiety using water exercise? It is well documented that the repetitive foot strike of jogging has the potential of being anxiety reducing. Does this same information hold true for water exercise in relationship to the buoyancy phenomena?

7. Further investigation of individual STAI S-Anxiety scale scores may reveal personal changes which are not shown in a group analysis.

8. Do different physical activity programs vary in effect upon state anxiety?

9. Further investigation of the relationship between state anxiety and personality would provide valuable information.

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APPENDIX A

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD FOR HUMAN SUBJECTS APPROVAL

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 02-03-97 **IRB#: ED-97-058**

Proposal Title: COLLEGIATE FEMALES' STATE ANXIETY LEVELS FOLLOWING SHALLOW WATER EXERCISE INTERVALS

Principal Investigator(s): Lowell Caneday, Freeta Jones

Reviewed and Processed as: Modification

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: _____ Date: February 7, 1997

Chair of Institutional Review Board

cc: Freeta Jones

APPENDIX B

ROSE STATE COLLEGE APPROVAL FORM

file copy

ROSE STATE COLLEGE

Interoffice Communication

TO: Dr. Terry Britton

FROM: Larry Edwards larry

DATE: March 27, 1997

SUBJECT: Approval for Student Survey

Ms. Freeta Jones, a former aerobics instructor and currently a doctoral candidate at OSU, has asked that she be allowed to administer surveys to RSC students enrolled in our Aquatic Center activities classes. The results of this survey would be part of her dissertation, and after reviewing the materials attached, I recommend approval of her request.

Please let me know if you have any questions or concerns.

Approved

3/27/97

APPENDIX C

SELF EVALUATION STUDY PARTICIPANT BRIEF

Self Evaluation Study Participant Brief

This study is being conducted to investigate your immediate feelings concerning water exercise or a psychology class. Your honest responses will enable instructors to be more effective and helpful.

If you agree as a member of this class to participate in this study, you will answer a self evaluation questionnaire at the beginning of the study and at the end. The questionnaire consists of twenty questions indicating how you feel ***right now***, that is, ***at this moment***. The duration of the study is five weeks of water exercise or psychology class lecture. It is very important for you to attend class regularly to ensure reliable results.

Data obtained in this study will be kept under lock and key throughout the study and will be destroyed at the end of the study. Data obtained about you will remain confidential with no names being associated with final results. Participation in this study is voluntary and no individual compensation will be given. You are free to refuse to participate, withdraw consent, or stop participation at any time with no penalty to you.

Thank-you in advance for your cooperation during this research study. If you have any questions about the research study please contact Freeta Jones at telephone number (405) 341- 2980 extension 5236 or Gay Clarkson, Institutional Review Board at 305 Whitehurst Hall, Oklahoma State University, Stillwater, OK 74078, at telephone number (405)744-5700.

APPENDIX D

OKLAHOMA STATE UNIVERSITY WATEROBICS SELF EVALUATION STUDY CONSENT FORM

Oklahoma State University
Waterobics Self Evaluation Study
Consent Form

"I, _____, hereby authorize or direct Freeta Jones, or associates or assistants of her choosing, to perform the following treatment or procedure."

1. Participants will be pre-tested and post-tested with the inventory entitled Self Evaluation Questionnaire. This is a pencil and paper self report questionnaire indicating how you feel ***right now***, that is, ***at this moment.*** The researcher or a trained technician will administer the inventories to participants. Pre-test will be administered during week one and the post-test will be administered during week five. Week one will consist of volunteers completing the participant brief orientation, completing consent forms, and a health questionnaire. Week five will be used for the post-test. The treatment portion will consist of five weeks of water exercise.

2. The duration of the study is five weeks.

3. Data obtained in this study will be kept under lock and key throughout the study and will be destroyed at the end of the study. Data obtained about you will remain confidential with no names being associated with final results. Participation in this study is voluntary and no individual compensation will be given. You are free to refuse to participate, withdraw consent, or stop participation at any time with no penalty to you.

4. Participants are encouraged to fully participate and to attend class regularly.

5. A certified lifeguard will be on duty at all times during class. The risks which are associated with water exercise activities include: drowning, eye, skin and ear sensitivity to water, and minimal bodily risk injuries due to contact with the pool bottom. I cannot foresee any major discomforts for any class participants taking part in this research study. This opinion is based on my review of previous studies conducted in this area.

6. It is believed that the findings from this research study will enable instructors to better understand feelings and enhance emotional programming.

"This is done as part of an investigation entitled Self Evaluation Study."

The purpose of the procedure is to compare pre-test and post-test scores on a twenty question self evaluation questionnaire indicating how you feel ***right now***, that is, ***at this moment.***

"I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

"I may contact Freeta Jones at telephone number 341-2980 extension 5236. I may also contact Gay Clarkson, Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700.

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

Date: _____ Time: _____ (a.m./p.m.)

Signed: _____
Signature of Subject

_____
Person authorized to sign for subject, if required

Witness(es) if required: _____

_____

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

Signed: _____
Project Director of his/her authorized representative

APPENDIX E

ROSE STATE COLLEGE WATEROBICS SELF EVALUATION STUDY CONSENT FORM

Rose State College

Waterobics Self Evaluation Study

Consent Form

I voluntarily give my consent to participate in this Self Evaluation Study. I fully understand that there are certain risks associated with participation in any exercise program. I also understand that I will not be penalized if I choose not to participate. My questions concerning the water exercise class have been answered to my satisfaction and all subsequent questions will be answered.

I willingly assume the risks which are associated with water exercise activities such as: drowning, eye, skin, and ear sensitivity to water, and minimal bodily risk injuries due to contact with the pool bottom. This study presents me with the opportunity to participate in a water exercise interval class. The duration of the study is five weeks.

I affirm that I am medically sound and able to participate in this study fully.

_____ _____

Please print your name **Signature**

_____

Signature of Witness

_____

Signature of Researcher

My age is _____.

I am a freshman ____, sophomore _____, junior ____, senior ____, or _____other.

My ethnic background is _____.

APPENDIX F

OKLAHOMA STATE UNIVERSITY PSYCHOLOGY CONSENT FORM

Oklahoma State University
Psychology Consent Form

"I, _____, hereby authorize or direct Freeta Jones, or associates or assistants of her choosing, to perform the following treatment or procedure."

1. Each psychology class participant will be asked to complete the Rose State College- Department of Psychology - Consent Form and the form entitled Oklahoma State University - Psychology Consent Form. Participants will be pre-tested and post-tested using a pencil and paper self report questionnaire containing twenty questions indicating how you feel ***right now***, that is, ***at this moment.***

2. The duration of the study is five weeks.

3. Data obtained in this study will be kept under lock and key throughout the study and will be destroyed at the end of the study. Data obtained about you will remain confidential with no names being associated with final results. Participation in this study is voluntary and no individual compensation will be given. You are free to refuse to participate, withdraw consent, or stop participation at any time with no penalty to you.

4. Participants are encouraged to attend class regularly.

5. Through my review of previous studies in this area, I cannot foresee any risks or discomforts for any Psychology class participant.

6. It is believed that the findings from this research study will enable instructors to better understand feelings and enhance emotional programming.

"This is done as part of an investigation entitled Self Evaluation Study."

The purpose of the procedure is to compare pre-test and post-test scores on a twenty question self evaluation questionnaire indicating how you feel ***right now***, that is, ***at this moment.***

"I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director."

"I may contact Freeta Jones at telephone number 341-2980 extension 5236. I may also contact Gay Clarkson, Executive Secretary, 305 Whitehurst, Oklahoma State University, Stillwater, OK 74078; telephone number: (405) 744-5700.

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

Date: _____ Time: _____ (a.m./p.m.)

Signed: _____
Signature of Subject

_____
Person authorized to sign for subject, if required

Witness(es) if required: _____

_____

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

Signed: _____
Project Director of his/her authorized representative

APPENDIX G

ROSE STATE COLLEGE PSYCHOLOGY CONSENT FORM

Rose State College

Department of Psychology

Consent Form

The Department of Psychology at Rose State College supports the practice of protection for human subjects participating in research. All experiments are approved by a review board and meet Federal Guidelines Protecting Human Subjects. You have the right to withdraw at any time without penalty. Your participation is encouraged, but is strictly voluntary. You can be assured that your name will not be associated in any way with the research findings. Information about you will be kept confidential. The duration of the study is five weeks.

For each experiment in which you participate the specific instructions and requirements will be explained to you at the time of the experimental session. At the conclusion of the study you will be provided with an explanation of the purpose of the study and the results.

You are free to refuse to participate in any procedure or to refuse to answer any question at any time without penalty. You are free to withdraw from a research project at any time without penalty.

By signing this form and agreeing to participate in research you do not waive any of your legal rights.

Thank you for your participation.

_____ _____

Please print your name **Signature**

_____ _____

Signature of Witness **Signature of Researcher**

My age is _____.

I am a freshman ____, sophomore _____, junior ____, senior ____, or _____other.

My ethnic background is _____.

APPENDIX H

HEALTH QUESTIONNAIRE

Health Questionnaire

Name_____

Please respond by answering yes or no to the following questions:

1. Have you ever been advised by a doctor to avoid exercise? ____
2. Do you have a family history (siblings, parents, uncles, etc.) of heart disease? ____
3. Do you have any lung problems? Asthma, arteriosclerosis, emphysema, etc. ____
4. Do you smoke? ____ If yes, how many cigarettes a day? ____1 - 20 ____21- 40
5. Do you have high blood pressure (hypertension)? ____
6. Do you have Diabetes? ____ Please specify_____
7. Do you have Hyperlipidemia (high cholesterol and triglycerides levels)? ____
8. Do you have a weight problem (25 pounds or more)? ____
9. Do you lead a sedentary or inactive lifestyle? ____
10. Do you have arthritis? ____
11. Do you have a bad back? ____
12. Are you on any medications? ____ Please specify_____

Dr. Kenneth Cooper's Requirements

Dr. Kenneth Cooper, M.D. of the Aerobic Research Institute in Dallas, Texas recommends the following guidelines before beginning a vigorous exercise program:

UNDER 30: You can start exercising if you have had a checkup within the past year and the doctor found nothing wrong with you.

BETWEEN 30 and 39: You should have a checkup within three months before you start exercising. The examination should include an electro cardiogram (EKG) taken at rest.

BETWEEN 40 and 59: Same as for the 30-39 group with one important addition. Your doctor should also take an EKG to check your heart while you are exercising. The examination should check your pulse rate during this test and should approach the level it would be during aerobic workouts.

OVER 59: The same requirements as for the 40-59 age group except that the examination should be performed immediately before embarking on any exercise program.

APPENDIX I

SELF-EVALUATION QUESTIONNAIRE

SELF - EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name _____ Date _____

Age _____ Sex: M____ F____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel ***right now***, that is, ***at this moment***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	Not At All	Somewhat	Moderately So	Very Much So
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortune	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

Consulting Psychologists Press
577 College Avenue, Palo Alto, California 94306

APPENDIX J

WATER EXERCISE INTERVALS MOVES

Water Exercise Intervals Moves

bicycles - lay on the side and bicycle to the left, roll to the other side and continue forward. Repeat with legs moving in a backward bicycle motion.

cross country - legs in a stride position from front to back, simulate the cross-country ski movement with arms moving in opposition.

figure 8 - with the back on the wall, alternate moving legs in front of you in a figure 8 manner.

forward knee raise - draw knees to water surface and push down, move arms in walking motion

flutter kicks - small fast kicks from the hip joint.

jogs - alternate knee raise to the water surface and push down (run in place).

jumpers - raise both knees to chest, touch both hands under thighs, return to standing position.

jumping jacks - side straddle hops.

lateral knee raise - laterally rotate knees from the hip joint, draw knees to water surface and push down, move arms in walking motion

leg lifts - lift one leg at a time and return to bottom, repeat using the other leg.

pull through - tuck position and extend legs to the front, tuck position and extend legs to the back, continue to alternate front and back positions.

scissors - adduction and adduction at the hip joint.

spins - tight spin clockwise using right leg, tight spin counterclock using the left leg, repeat alternating legs.

trunk rotation - arms extended to the sides, rotate left and right at the waist.

VITA

Freeta Sue Jones

Candidate for the Degree of

Doctor of Education

Thesis: COLLEGIATE FEMALES' STATE ANXIETY LEVELS FOLLOWING WATER EXERCISE INTERVALS

Major Field: Applied Educational Studies

Minor Field: Health, Physical Education and Leisure

Biographical:

Education: Graduated from Pawhuska Public Schools in 1972; received the Bachelor of Science degree in Health, Physical Education, Recreation and Dance from the University of Oklahoma in 1976; received the Master of Education degree in Community/Junior College Education from Central State University in 1983; completed the requirements for the Doctor of Education degree at Oklahoma State University in July, 1997.

Professional Experience: Elementary science and physical education instructor, Little Axe Public Schools, Norman, Oklahoma, 1977 to 1980; elementary physical education instructor, Fairview Elementary School, Moore, Oklahoma, 1980 to 1985; Health Education Specialist, State Department of Education, Oklahoma City, Oklahoma, 1985 to 1988; instructor of Health, Physical Education, Recreation and Dance, University of Central Oklahoma, Edmond, Oklahoma, 1988 to present.

Professional Organizations: American Alliance for Health, Physical Education, Recreation and Dance; Southern District of the American Alliance for Health, Physical Education, Recreation and Dance; Oklahoma Association for Health, Physical Education, Recreation and Dance; Young Men's Christian Association; and the American Red Cross.