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THE UNIVERSITY OF ALBERTA

The Effects Of A Resistance Training Program On Selected Psychological Variables In Sedentary Females

by

Roy Howse

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled The Effects Of A Resistance Training Program On Selected Psychological Variables In Sedentary Females submitted by Roy Howse in partial fulfilment of the requirements for the degree of Master of Arts.

Murray R. Smith
Supervisor

Date Sept 30, 1986

Abstract

Forty sedentary female subjects were recruited by an advertising campaign and assigned to treatment and control groups by means of random assignment. Subjects were measured on physical strength and the psychological variables of anxiety, self-concept and assertiveness. Pre-treatment results evidenced no difference between groups on the dependent variables.

The experimental group participated in a 10 week, 3 X per week resistance training routine. The controls refrained from regular, vigorous physical activity during that period.

Thirty subjects completed the study in accordance with the experimental conditions (16 experimentals and 14 controls). Treatment attendance for the experimental group averaged 87.6%.

Subjects were post-tested on all dependent variables. As well, the experimentals were debriefed and interviewed to ascertain their subjective evaluations.

Objective measures revealed significant improvements for the experimentals in strength, trait anxiety and physical self-concept. No change was found in assertiveness. Other areas of self-concept demonstrated a trend towards improvements for the experimentals. They did not, however, achieve significance. Control values remained unchanged except for lower body strength which decreased from pre to post tests.

Subjective data support the strength, anxiety and physical self-concept changes. Anxiety reduction appears to have resulted from a combination of the distractive qualities of the program as well as the cathartic release it allows. Most subjects indicated that physical self-concept could be optimally enhanced by tailoring the exercise program to meet individual goals. Finally, the social component of the treatment was found to be a highly enjoyable aspect of the study and may be salient with respect to adherence.

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I. Introduction

During the past 20 years, North American society has witnessed unprecedented change in attitude towards physical activity. More and more people now feel that regular exercise is a vital component of a desirable, healthy lifestyle. One only has to look at the proliferation of health clubs, aerobic dance classes and exercise videos as well as the multitude of joggers on city streets as evidence on this phenomena. Indeed, the Canada Fitness Survey (Gov't of Canada, 1983) reported that 56% of Canadians over 10 years of age are considered physically active during their leisure time.

What has prompted this dramatic upsurge? Certainly social imitation, vis a vis role-modeling, has played an important role. However, the underlying causes run deeper than this. Central to the current trend is the claim that exercise makes you look and feel better. It is a widespread belief that regular, vigorous, physical activity leads to benefits in several domains. Not only is one's physical appearance and somatic health thought to be enhanced, but it is felt that certain psychological characteristics are also improved. This belief stems from the interactionist position that the body and mind are interrelated, rather than dichotomous structures (Folkins, 1981). Therefore, positive somatic adaptations can exert beneficial effects on one's psychological make-up as well.

While there is much empirical evidence to support the claims of physiological enhancements, the research on psychological improvements is not as convincing. Initially much of the "evidence" rested on anecdotal reports of well-known running "gurus" (Cooper, 1968; Fixx, 1974). This was referred to as the "feeling good" phenomena. As the field grew, researchers began to narrow down and analyse certain psychological dimensions thought to be involved. Specifically the constructs of anxiety, depression, mood states and self-concept received the bulk of the attention. Most of these early studies, however, were case reports rather than experiments. Therefore, the issue of causality could not be properly addressed. Eventually, researchers attempted to empirically test the exercise hypothesis. However methodologies and procedures were riddled with inadequacies. Small samples, lack of control groups and unaccounted regression effects were but a few of the shortcomings encountered. Recently, research designs have become more sophisticated and methodologies more rigorous. Therefore greater credance can be given to their findings. However, this accounts for but a small

fraction of the overall literature in this area. Indeed, much work remains to be done in order to substantiate initial findings.

Another problem is that research has focused almost exclusively on aerobic exercise. Precious little information exists on the effects of other forms of physical activity which is not aerobic in nature. One such exercise that is now enjoying widespread popularity is resistance-training. Increasing numbers of individuals of both sexes are "pumping" their way to what they believe are fitter and more attractive bodies. As was the case with aerobic exercise, the physiological effects are obvious and easily documented. What remains to be resolved is the psychological ramifications of the activity.

The implications of this inquiry are obvious. Many health professionals are now prescribing aerobic exercise as a means of enhancing mental function. It stands to reason that the more knowledge we have of the psychological consequences of various types of exercise, the better we can tailor the treatment to meet the needs of the clients. In this manner exercise therapy can be optimized and its full potential realized.

This study will analyse the effects of an introductory weight-training program on the constructs of self-concept, anxiety and assertiveness. It is hoped that the findings will provide further insight into this relevant but underdeveloped field of study.

II. Conceptualizations of Anxiety

A. Introduction

Over the course of the past 40 years, the concept of anxiety has become the focus of intense interest among experts from a variety of disciplines. May (1950) has referred to the mid-twentieth century as the "age of anxiety" and cites representative works from the arts, science, politics, religion, philosophy as well as psychology which explore this phenomena. Prominent illustrations of this include W. H. Auden's poem "The Age of Anxiety" and Leonard Bernstein's similarly entitled symphony.

Within the psychological realm, a preoccupation with anxiety is reflected in the burgeoning empirical literature devoted to it. Spielberger (1972) reports the percentage of anxiety studies relative to the total number of studies cited in Psychological Abstracts has increased eight-fold from the 1930s to 1972. He also observes that approximately 5,000 books and articles dealing with anxiety were published between 1950 and 1970. Subsequent to that, Endler and Edwards (1982) state that during the 1970s a further 3,500 anxiety-related articles were published.

It is of little surprise then that a topic which has generated such intense scrutiny has been interpreted from a variety of theoretical perspectives. Anxiety has variously been posited as either a stimulus, a response, a drive, a motive or a trait (Endler and Edwards, 1982). Its origins have been postulated to stem from sexual repression, conditioned responses to pain, over-stimulation of the cerebral cortex, interruption of organized behaviour and appraisal of threat to one's self-concept, to mention but a few (Epstein, 1972).

It is not within the scope of this discussion to detail the abundant reservoir of theoretical perspectives that address anxiety. Rather it is the intent of the author to emphasize the salient ideas and concepts which resulted in his definition of anxiety as it portends to this study.

B. Early Psychodynamic Perspective

While Freudian formulations, replete with their inherent emphasis on the unconscious regulation of sexual impulses, do not provide us with a comprehensive theory of anxiety, they do shed some light on certain aspects.

Freud defined anxiety as "something felt," an unpleasant emotional state associated with feelings of apprehension, tension and dread (Spielberger, 1972a). He outlined an anxiety state as involving: (1) a specific unpleasurable quality; (2) efferent or discharge phenomena, and; (3) the perception of these. He differentiated between anxiety and other unpleasant affective states, such as anger and depression, by recognizing the unique combination of experiential and physiological qualities that gave anxiety a special "character of unpleasure."

In Freud's earlier writings, he contended that anxiety resulted from repressed libidinal urges (Meares, 1980). This view was subsequently modified to regard anxiety as an internal response to a danger situation. Importantly, he classified anxiety into two categories: objective and neurotic. Objective anxiety is synonymous with fear and is associated with real, objective external threat. Neurotic anxiety, on the other hand, is linked to threats which are internal in origin and ambiguous in nature. The threat is a function of repressed childhood associations of sexual precociousness and ensuing parental punishment. In adult years, when a partial breakdown in sexual repression occurs, it triggers a renewed perception of threat. However, because the original punishment is also repressed, the individual is not aware of why he/she is feeling anxious. Freud labelled this type of anxiety state as "free-floating" or "objectless."

C. Behavioural Perspective

While Freud was refining his conceptualizations, another school of psychological thought had evolved into the dominant force of the era. Behaviourism brought with it an emphasis on logical positivism. Thus the focus shifted from the intuitive, introspective analysis of Freud, to the quantifiable theories of Pavlov, Watson, Hull and the like. In this framework, little attention was paid to the development of a substantive definition of anxiety. As Izard (1972) states, "Many writers, particularly those inclined to controlled experimental studies in the laboratory, simply start writing about anxiety as though

everyone knows what it is . . ." (p. 54).

Despite that criticism, Bootzin and Max (1980) contend there is now general agreement among behaviourists as to the various responses which constitute anxiety: "Verbal reports of apprehension, impending danger, inability to concentrate, feelings of tension and expectations of being unable to cope: behavioural responses, including attempts to avoid the situation, impaired speech and motor coordination, inhibition of ongoing behaviour and performance deficits on complex cognitive tasks; and physiological responses such as muscle tension, increased heart rate and blood pressure, rapid respiration, dryness of mouth, drop in resistance in galvanic skin response, coldness in extremities, nausea, diarrhea and frequent urination" (p. 36).

This approach introduces the notion of overt behaviours as characteristics of anxiety and details the "efferent or discharge phenomena" alluded to by Freud. It also expands upon the experiential qualities to encompass perception of coping abilities as a salient factor in an anxiety state.

Learning theory differs primarily from psychoanalytic postulations of anxiety acquisition in that it emphasizes the salience of proximal stimuli as opposed to distal (Bootzin and Max, 1980). In psychoanalytic theory, neurotic anxiety is interpreted in terms of intrapsychic conflict with childhood origins (distal stimuli). Learning theory posits anxiety as being a response to some immediate preceding stimuli which is maintained by reinforcing consequences.

However, a serious flaw with learning theory is an over-reliance on stimulus properties at the expense of considering individual differences. Thus, while learning theory has contributed much to the deliniation and quantification of anxiety responses, it appears inadequate to account for the discrepancies in individual behaviour with respect to anxiety.

D. Cognitive-Affective Perspective

During the past 20 years, cognitive based theories of anxiety have gained considerable acceptance. From this standpoint, anxiety is viewed as a response mediated by cognitive mechanisms.

Lazarus (1972) defines anxiety as "an emotion based on the appraisal of threat, an appraisal which entails symbolic, anticipatory and uncertain elements" (p. 246-247). In this approach the threat is not of an immediate, concrete nature implying physical harm. Rather, it is perceived as placing in jeopardy one's cognitive integrity: the concepts, values or cognitive schema to which one is heavily committed. Anticipatory characteristics include not only apprehension of future expectancies but also the inability to adequately comprehend present events, thus imbueing the future with ambiguity and ominous foreboding. Threat uncertainty arises from one or several unresolved issues what will happen, whether it will happen, when it will happen and what can be done about it.

Appraisal is the key concept in Lazarus' theory. It is envisaged as a three stage process based on situational and dispositional factors. Situational refers to the "entire context in which the stimulus is embedded in" (p. 242). Dispositional factors include individual traits, beliefs, attitudes and coping resources. A stimulus is initially appraised as to its potential beneficience or harm. Secondary appraisal evaluates the ability of one's coping responses to enact a positive outcome. A subsequent reappraisal is then initiated based on the outcome of one's response or upon further reflection about the original stimulus.

Spielberger (1972a) conceptualizes anxiety as both a trait (A-trait) and a transitory phenomena (A-state). He too regards anxiety as a response to cognitive evaluation, however he posits that within the individual resides a variable propensity for anxiety proneness. This trait is therefore an extremely salient determinant of an anxiety response. Those high in A-trait are predisposed to interpret a wider range of circumstances as threatening and respond with increased elevations of A-state than those relatively low in A-trait.

Izard (1972), while conceding that cognitive processes play an integral role in many emotional encounters, argues that emotion can also be activated by other means independent of cognition. He believes that changes in the density of neural firing as well as innate neural programs that are selectively responsive to only certain stimuli can on their own activate emotion. Indeed, he posits the fundamental emotion of interest is a motive which guides perceptual-cognitive activity in the selection of sensory data. Rather

than viewing emotion as a response, it should be regarded as a process, influencing and interacting with other personality and interpersonal structures.

In Izard's theory, emotions are dichotomized into the fundamental and the complex. He hypothesizes that there are nine fundamental emotions which form the building blocks for complex emotions such as love, hate, depression and anxiety. Therefore, he regards anxiety not as a unitary concept but as a variable combination of fundamental emotions. He defines anxiety as involving fear and two or more of the fundamental emotions of distress, shame (including shyness and guilt), anger and the positive emotion of interest-excitement.

E. Conclusion

All of the previous conceptualizations offer valuable insights into the complex phenomena of anxiety. However, it can be safely stated that as of yet no single comprehensive theory, integrating all relevant, albeit divergent, perspectives has evolved. Since the mid-1970's a paucity of new approaches is evident. This stems in part from a shift of emphasis from anxiety to the more general rubric of stress. It is generally accepted that anxiety is a specialized type of stress. However, stress is a complex phenomena which encompasses much more than just the negative affect of anxiety. It is also associated with positive experiential qualities such as exhilaration (Cox, 1978). Unfortunately, many researchers tend to use the terms anxiety and stress interchangeably (Endler and Edwards, 1982). Due to this confusion, little progress has been made at arriving at a consensual understanding as to the nature of anxiety.

F. Definition

Anxiety is regarded as an unpleasant affective state characterized by: 1) feelings of apprehension, tension, dread and the inability to cope; 2) physiological arousal, and; 3) maladaptive behavioural responses including avoidance behaviour and impairment on complex cognitive and fine motor tasks.

Anxiety states, although sometimes activated through overstimulation of the cerebral cortex, generally require a cognitive appraisal of threat which is ambiguous anticipatory and symbolic in nature and places in jeopardy one's concept of self. It is

based on situational and dispositional factors of which one's inherent potential for anxious behaviour (trait anxiety) is extremely relevant.

III. Self Concept Theory

A. Introduction

Although theories concerning the individuality of man date back to ancient times, the term self-concept is of 20th century origins. Earlier references to self concerned metaphysical concepts such as "will," "spirit" and "soul." As such the discussion of self was embedded within the confines of philosophical and theological dogma. Self was generally regarded as some sort of non-physical inhabitant of the organism, responsible for regulating and guiding behaviour. It was this "psychic agent" which imbued the individual with a sense of identity that transcended the relative impermanence of the physical being.

Modern psychological interpretations firmly reject the equation of metaphysical terms, such as soul, with self. This "inner manikin" approach to identity and behaviour has been replaced in favour of scientific postulations governed by the principle of causality. In this context, the term self has come to have two distinct meanings. On one hand, self is referred to as a process: a group of psychological abstractions, such as thinking, remembering and perceiving, which emphasize the subjective, experiencing organism. On the other hand, the self-as-object reflects how an individual views and evaluates himself. Thus, the self-as-object may be thought of as the contents of experience rather than experience per se. Depending upon the theoretical perspective, self can be thought of as either of the two previous definitions or as a global phenomena comprising both conceptions in an integrated manner.

B. William James' Theory

Current psychological formulations owe much to the cogent writings of William James (Burns, 1979). James, while recognizing both the self-as-process and self-as-object as integrated components of an organized whole, devoted much energy in detailing the "Empirical Me" or self-as-object. He defined it in the most general sense as the total of all a man calls his (i.e., traits, abilities, attitudes, avocations, possessions, etc.). He classified these constituents into four categories of descending importance with regard to one's self-esteem: spiritual, material, social and bodily selves.

Self-esteem, he believed, is related to the particular self-image an individual possesses or aspires to, and his success or failure in maintaining or enhancing it. Thus for James, personal adequacy was a key component in a healthy self-concept.

C. Psychodynamic Perspective

Psychodynamic thought, as stated in Symonds' theory of self and ego (Hall, 1970), places more importance on the self-as-process. In this theory the ego, which can be interpreted as the group of psychological processes previously described, is responsible for balancing the needs of inner drives against the realities of society. The self consists of how an individual perceives, conceives, values and responds to oneself. Symonds points out, however, that conscious perceptions are sometimes at odds with unconscious appraisals. Individuals may not be aware they are being defensive in their conscious perceptions thus creating a flawed self-concept which reflects a poorly integrated personality. He also posits that the ego and self are interactive in nature. If the ego copes successfully in satisfying inner drives within the confines of outer reality, the individual will think well of himself. Conversely, a high level of self-esteem or self-confidence enables the ego to function more effectively. Essentially, though, a healthy ego is a prerequisite to enhanced self-esteem and therefore is of central importance.

D. Symbolic Interaction Perspective

Another view of self, which emphasizes the objective self, falls within the scope of symbolic interactionism. The theory presupposes that behaviour is a function of the personal meanings, derived through individual interpretations of shared transactions (social interaction) within the socio-cultural environment (Burns, 1979). George Mead (1934) posits that we are not born with an innate sense of self. However, because others react to us as unique entities, we gradually aquire an awareness of ourselves as objects. This socially-formed self is therefore heavily influenced by external attitudes. Our self-image and self-esteem reflect our interpretations of these attitudes. As individuals, our concern about what others think of us causes behaviour to be governed largely by introjected societal values. Therefore, the development and differentiation of

self is dependent upon the socio-cultural environment we transact within.

E. Phenomenological Perspective

More recent theorizing on the subject of self-concept has taken place under the ambit of phenomenology. A fundamental tenent of this perspective is that behaviour is largely governed by the personal meaning that experiences hold for the individual. It is how one interprets a situation rather than its objective stimulus properties. Thus, people live within their own subjective reality and base decisions concerning behaviour upon this awareness.

Carl Rogers, a proponent of this viewpoint, provides a rich and comprehensive theory of self (Rogers, 1959). Rogers believes that all behaviour is powered by an innate drive referred to as the "actualizing tendency." The focus of this master motive is the survival, growth and enhancement of the organism. It subsumes all other drives because they too must be fulfilled in order for the individual to continue and develop. The actualizing tendency is an extremely positive force that causes people to become more differentiated, independent and socially responsible. All of an organism's experiences are evaluated in light of this internal frame of reference. Those that enhance it are approached while those that are detrimental are avoided.

Another key concept of this paradigm is that of the "phenomenal field." This refers to all the experiences, conscious and unconscious that are potentially available to awareness. This totality of experience constitutes the subjective reality the individual exists within.

The self-concept is a differentiated portion of the phenomenal field in which one's perceptions and conceptions of identity are housed. Self-concept "may be thought of as an organized configuration of perceptions of the self. . . . It is composed of such elements as the perceptions of one's characteristics and abilities; the percepts and concepts of self in relation to others and to the environment; the value qualities which are perceived as associated with experiences and objects; and goals and ideals which are perceived as having positive or negative valence" (Rogers, 1951, p. 136). Awareness of self is not innate but rather develops out of transactions with the environment--particularly the social environment. Its differentiation and enhancement is

guided by the actualizing tendency.

Inherent within the self-concept, is the development of a learned need for "positive self-regard" or self-esteem, as well as the emergence of the "ideal self"--the personification of an individual's aspirations with respect to self. "Incongruence," or psychological maladjustment, is often linked to these two constructs and can occur under three conditions: 1) when the degree of correspondence between self-concept and ideal self is minimal; 2) when positive self-regard is dependent upon the introjected values others that are inconsistent with the organism's self and actualizing needs; and 3) when self-concept does not faithfully mirror the experiences of the organism.

An incongruent state is characterized by feelings of threat and the onset of anxiety. In response, an individual will often distort or deny experience in order to maintain the integrity of the self-concept. Self-concept is highly resistant to change because it lends stability to the personality, permitting the individual to predict behaviour.

Rogers regards self-concept as an essential determinant of behaviour. "Most of the ways of behaving which are adopted by the organism are those which are consistent with the concept of Self." (1951, p. 507). All interpretations and motivations are chanelled through it. The organism functions as to maintain a congruency between experience and self.

In conclusion, Rogers' theory contains elements of both self-as-process and self-as-object. The actualizing tendency, constantly seeking out appropriate activities, reflects the self-as-doer-psychological processes initiating and carrying out a plan of action. However, the resident objective properties of self serve to influence the needs and goals of the actualizing tendency. In this way, Rogers has fused the two concepts into a synthesized, complex phenomena.

F. Definition

Self-concept refers to a complex and dynamic set of beliefs, derived from environmental transactions, and each with corresponding values, about one's being, that distinguishes the individual as a unique entity.

IV. Assertiveness

A. Introduction

The concept of assertiveness, as it is understood today, is rooted in Wolpe's (1958) work. Prior to that time, it had been interpreted in the traditional, lexical sense (Salter, 1977). In this context, assertiveness was defined as the "act of assertion" (Webster, 1974) which in turn meant "to state or declare positively, often forcefully and aggressively." (Webster, 1974). Wolpe basically redefined the meaning to include behaviour that was quite the opposite of the original intent. "The word assertive . . . refers not only to more or less aggressive behaviour, but also the outward expression of friendly, affectionate and other non-anxious feelings. It covers the same ground as Salter's (1949) word expressive." (Salter, 1977; p. 33).

Although this definition did not catch on right away, it was the impetus towards a global conceptualization of assertion which focussed upon appropriate expression of feelings, thoughts and beliefs. Rather than viewing assertive behaviour as relating solely to the defence of one's personal opinions, it now encompassed the expression of positive sentiment towards others.

Present formulations emphasize a "mutality" of respect for one's own rights and the rights of others. Lange and Jakubowski (1976) state assertion "involves standing up for personal rights and expressing thoughts, feelings and beliefs in direct honest and appropriate ways which do not violate another person's rights." (p. 7). Similarly, Alberti's (1977) definition makes reference to the expression of feelings and exercising of one's rights ". . . without denying the rights of others. . ." (p. 22). Thus, assertiveness has now come to represent a wide range of socially-appropriate behaviour in which one's personal effectiveness is enhanced without violating the integrity of others.

B. Assertion, Aggression and Non-Assertion

It is only recently that assertion and aggression have come to be viewed as distinctly different concepts (Salter, 1977). Although there is some commonality in that they can both be vehicles to insure the protection of one's rights, the inherent goals and the methods of attainment differ markedly.

Aggression has been defined as "directly standing up for one's personal rights and expressing thoughts, feelings and beliefs in a way which is often dishonest, usually inappropriate and always violates the rights of the other person." (Lange and Jakubowski, 1976; p. 10). The goals of such behaviour is domination and winning, forcing the other person to lose. It is insured by humiliating, degrading, belittling or overpowering others so that they are unable to adequately express or defend their needs and rights (Lange and Jakubowski, 1976).

Assertion, on the other hand, has the goals of communication, mutual respect and fair play between both parties. There is room for compromise when the needs and rights of individuals conflict. The manner in which these transactions are carried out is characterized by rationality and calmness, rather than emotionality and intimidation.

Non-assertive behaviour involves "violating one's own rights by failing to express honest feelings, thoughts and beliefs-and consequently permitting others to violate oneself, or expressing one's thoughts and feelings in such an apologetic, diffident, self-effacing manner that others can easily disregard them." (Lange and Jakubowski, 1976; p. 9). This is a maladaptive behaviour which implies lack of respect for one's own needs. Its goals are to appease others and avoid any potential conflicts.

Alberti (1977) has pointed out that while discrimination between assertiveness, aggression and non-assertiveness may appear rather obvious, in actual practice it is often not. For instance, cultural differences in behavioural expectations may cause some assertive behaviours to be interpreted as aggressive and vice-versa. Also important is the intent of the individual and the response of the other, which reflects the effect the particular behaviour had on the person. If the intent was to force one's own will upon someone without respect for their rights, then even if the behaviour follows other assertive criteria, it cannot be truly thought of as assertiveness. Similarly, the response of the other person reflects how the behaviour has been interpreted. Thus, the effects of the action are involved in defining it. Finally the specifics of the behaviour itself (i.e., the verbal message, tone of voice, body posture and gestures, etc.) are moot in labelling the experience. Alberti therefore proposes that the context, response, intent and behaviour (CRIB) of each act should be examined before it can be adequately defined.

C. Definition

Lange and Jakubowski's (1976) definition has been selected to represent the author's conceptualization of assertive behaviour: "Assertion involves standing up for personal rights and expressing thoughts, feelings and beliefs in direct, honest and appropriate ways which do not violate another person's rights." (p. 7).

V. Review of Literature

A. Introduction

As was alluded to in the introduction, much of the research in this area has been correlational in design which does not allow one to infer causality. Furthermore, clinical populations have frequently been used which pose constraints on generalizability. Another problem is that some of the instruments used to assess psychological function have been developed to detect psychopathology. Therefore, they may be insensitive to changes in normal populations.

While these are limitations, recent research has improved upon previous work by using control groups, large heterogenous samples, placebo treatments, etc. The instrumentation problem is more difficult to address. Some researchers have employed physiological measures that are indicative of certain aspects of psychological function (Keller, 1984; Sinyor et al., 1983; Zimmerman, 1981; Cox et al, 1979). However, the need remains for the development of appropriate inventories for normal populations if a broad spectrum of psychological consequences is to be investigated. The non-invasiveness of this approach is another important factor which bears consideration.

The literature does suggest that physical exercise is associated with improvements in several psychological constructs. This review will present a cross-section of findings from relevant areas which will be of interest to this study.

B. Self-Concept

Collingwood (1971) found that increases in physical performance led to significant improvement in body attitude, self-concept, self-acceptance and significant decreases in real versus ideal-self discrepancies. Unfortunately, this study did not employ a control group and used only a small number of obese subjects. However, in a subsequent study (Collingwood, 1972) a better design was utilized (a larger sample and a control group) and similar findings were revealed. Also, significant improvements in intellectual, emotional and interpersonal behaviour were reported.

Improvements in self-concept were found by Hilyer (1979). In this study, 3 groups of 40 college students were randomly assigned to either a control, a running or

a running and counselling group for a period of 10 weeks. Significant increases in self-concept were found in both running groups among those with initially low self-concept scores. Appropriate statistical analysis was used to control for regression effects.

While the previous research examined psychological measures in relation to improvements in cardiovascular fitness, Tucker (1982) looked at the effect of weight training on self-concept. One hundred and five college males were randomly selected by a cluster sampling strategy then divided by self-selection into experimental and control groups. The treatment consisted of two 50-minute workouts per week for a 16-week period. The experimentals demonstrated significant improvement on seven of nine self-concept categories while the controls did not change on any of the measures.

In a subsequent study (Tucker, 1984), 142 randomly selected subjects were tested for muscular strength and a variety of personality characteristics. Results showed that relative muscular strength was significantly related to body cathexis, extraversion, neuroticism and global self-concept. Curvilinear relationships were found between relative strength and neuroticism as well as relative strength and global self-concept. In general, relatively stronger individuals were more satisfied with their body, more outgoing, more confident, more emotionally stable and more impulsive than weaker individuals.

C. Depression

The effectiveness of jogging versus psychotherapy as a treatment for depression was studied by Griest et al. (1979). The treatment, which lasted for 10 weeks, consisted of the random assignment of 25 moderately depressed subjects to either a jogging, a time-limited psychotherapy, or a time-unlimited psychotherapy condition. Although no statistical tests were reported, it was found that jogging was "at least as effective a psychotherapy" in treating the subjects.

Brown (1978) investigated the relationship between depression and various forms of exercise in 167 college students. The students were self-selected into either jogging, wrestling, tennis, softball or "various exercises" groups. Six students served as a control. The program consisted of thrice-weekly exercise sessions for a period of

eight weeks. Results revealed that jogging led to a significant reduction in depression scores as did wrestling, tennis and "varied exercises" while no decrease was found in the softball and control groups. This would suggest that specific types of exercise are effective in a therapeutic context. Jogging was found to be the most effective depression reduction agent. Similarly, it is the most dependent on aerobic metabolism. However, because random assignment was not employed, self-selection presents a rival hypothesis.

The study which employs the best experimental design was conducted by McCann and Holmes (1984). Forty-three mildly depressed females were randomly assigned either a 10-week control, placebo or aerobic exercise treatment. The placebo condition consisted of relaxation training which is opposite in nature to vigorous exercise and is not actually used as a depression therapy. Statistical analysis revealed no significant pre-treatment expectancy differences between the exercise and placebo groups. The results indicated that the exercise group evidenced greater improvements in aerobic capacity and greater reduction in depression than the other groups. These findings lend considerable credence to the previous claims of other studies.

D. Trait Anxiety

The psychological effects of semester-long participation of college students in a jogging program was evaluated by Folkins et al. (1972). Significant decreases in trait anxiety and depression accompanied gains in aerobic capacity in women but not in men. No changes were found in the archery and golf groups which served as controls. This indicates that the psychological effects may be related to improved functional efficiency of the cardiovascular system.

In a subsequent study (Folkins, 1976), significant reductions in anxiety and depression were reported in conjunction with fitness improvements with a group of high coronary-risk male subjects who participated in a 12-week aerobic exercise program. A matched control demonstrated no changes either physiologically or psychologically.

Blumenthal (1382) reported improvements in state and trait anxiety in 16 subjects who participated in a 10-week walk-jog program. While the experimental group also

improved in aerobic capacity, a matched control group of sedentary individuals didn't show physical or psychological adaptations.

Recently, an ingenous design (Goldwater and Collis, 1985) allowed for random assignment of sedentary male volunteers into a 6-week aerobic exercise program or a placebo treatment of similar duration. The placebo treatment stressed skill development, characterized by sporadic physical activity rather than continuous exercise. The aim was that both groups would perceive themselves as participating in a fitness program, but only the experimentals would derive cardiovascular improvement. While the design was flawed in that both groups demonstrated aerobic improvements, the degree of improvement was significantly greater in the treatment group. With respect to psychologic measures, the experimentals decreased significantly in anxiety and improved significantly on three subjective measures of well-being: energy, happiness and tenseness. No decrease in anxiety was found in the controls, however, improvements in energy and extroversion were reported.

E. State Anxiety

A substantial body of literature supports the contention that acute aerobic exercise decreases state anxiety. Early studies (Morgan, 1973; Muller, 1975; Driscoll, 1976) that reported significant reductions following exercise are now supported by more recent research (Young, 1979; Morgan, 1980; Sinyor et al., 1983; Blumenthal et al., 1982).

Evidence points to an initial increase in state anxiety in response to aerobic exercise followed by decreases afterwards (Morgan, 1973; Morgan, 1980). It would seem that exercise must be of sufficient intensity in order to be effective. Under light cardiovascular exercise conditions no significant decreases were found by Morgan (1971) and Sime (1977). However, under exercise conditions of 70 to 80% VO_2 max, state anxiety is consistently decreased (Morgan, 1973; Morgan, 1976; Morgan, 1980).

Also, findings indicate that there are significant differences in reduction between trained and untrained individuals. Sinyor et al. (1983) found that trained subjects had significantly greater decrements than trained. Blumenthal (1982) found that trained subjects decreased in state anxiety while untrained actually increased.

Morgan (1980) demonstrated that perception can mediate the relationship between exercise and anxiety. He randomly assigned 30 subjects to 3 groups: meditation, placebo and control. All 3 groups exercised at 80% VO_2 max until exhaustion. The control group received no extraneous information, however, the placebo group was given a lactose capsule and informed it would reduce pain and fatigue. The meditation group was instructed in Benson's relaxation response and were told that this would also reduce fatigue and discomfort. It was found that state anxiety was arrested or even decreased during exercise for the placebo and meditation groups while the control rose as normal. All groups experienced post exercise decreases. Interestingly, the three groups did not differ in their cardiovascular or endocrineal response. This finding suggests that cognitive mediation plays an important role in the anxiety process during exercise while reinforcing the notion that aerobic exercise is linked to post-exercise decreases in state anxiety.

F. Mood States

Improvement in mood states in conjunction with exercise programs have been reported by several researchers (Kowal et al., 1978; Lynch et al., 1978; Tredway, 1978; Nowlis, 1979). However, as reported by Folkins (1981), none of these studies used a true experimental design.

The previously mentioned Blumenthal et al. study (1982) employed a design that provided a control group and also attempted to minimize expectancy effects. While there were no initial group differences in the six categories measured by the Profile of Mood States Inventory, the treatment group showed improvements in vigour, tension reduction, fatigue reduction and confusion. No decreases were found for the control group and in the case of depression their scores actually increased.

G. Locus of Control

While there is very little research available about the effects of exercise on locus of control, there has been some descriptive work done on athletes. Generally, it has been found that sports participants demonstrate a greater degree of internal control than non-athletic populations (Rotter, 1966; Hogg, 1982).

One study that did evaluate the effects of improved fitness on locus of control was carried out by Duke et al. (1977). Children participating in a sports fitness camp demonstrated increased aerobic fitness accompanied by a shift towards more internal control. While a control group was used, random assignment was not possible so a self-selection factor may have been present.

This is an area in need of further investigation as there are strong correlations between high levels of trait anxiety, depression and externality of control (Archer, 1979; Johnson and Sarason, 1979). Thus, locus of control may be an instrumental factor in psychological function.

H. Summary

Findings are quite consistent in regards to the beneficience of exercise on psychological and affective function. However, the lack of rigorous methodologies has detracted from the validity of the findings. While some studies allow for causality to be inferred, the bulk of the work must still be regarded as correlational. Furthermore, most of the research has focused only on aerobic exercise. There is a need to continue evaluating the effectiveness of various forms of physical activity, within the scope of sophisticated experimental designs, if the full potential of the field is to be tapped.

VI. The Problem

A. Statement of the Problem

The central purpose of this study will be to investigate the extent to which participation in an anaerobic resistance-training program is associated with psychological change.

B. Subsidiary Problems

1. Does the strength-training program produce significant improvements in strength?
2. Do changes in self-concept, state and trait anxiety, and assertiveness accompany strength gains?

C. Null Hypotheses

1. There will be no significant difference on pre-test and post-test means within and between groups in strength, anxiety, self-concept, and assertiveness.

D. Justification

Physical exercise is now enjoying widespread popularity as a therapeutic strategy to enhance psychological function. Health professionals from various disciplines are embracing it as a means to help not only those exhibiting psychopathological symptoms, but non-clinical populations as well. It is therefore considered as being able to alleviate psychological disturbances as well as optimizing cognitive-limbic functioning.

While these hypotheses are gaining increasing acceptance, the empirical evidence to support them is still somewhat limited. As was mentioned in the review of literature, the bulk of the work done so far has not been of sufficient scientific rigour to be considered conclusive. However, an emerging body of knowledge resulting from improved research practices indicates that, exercise can be of psychological value. What is needed is continued work in a variety of cognitive domains in order to further explore relationships and verify initial findings.

While research efforts must be intensified, the scope of the inquiry should be broadened as well. The theoretical underpinnings upon which the exercise-mental

enhancement hypothesis rests is derived from a monastic view of the human organism. This holds that the mind and body are two highly interrelated structures. One does not act independently of the other, therefore any changes in one will have ramifications for the other. In order to refine and build upon the existing theory, research must be diverse enough to encompass a wide variety of physical activities that may lead to differential psychological effects.

Almost all the literature so far pertains to the influence of aerobic exercise on mental function. While this does represent an extremely popular form of exercise, it by no means reflects the wide spectrum of activities people engage in under the rubric of exercise. Diverse pursuits such as weight-training, volleyball, canoeing, golf and sprinting are considered as valid forms of exercise by many individuals. None of these activities are primarily aerobically based. It is necessary to determine whether non-aerobic exercise exerts effects on psychological domains.

From a practical standpoint, broadening the scope of the research increases the relevancy of exercise therapy simply because greater numbers of people can be accessed. Furthermore, as our knowledge becomes more extensive it may be possible to optimally integrate exercise with personality, therefore greatly enhancing the efficacy of the treatment.

The choice to investigate weight-training constitutes an attempt to expand the scope of the field, while at the same time creating information with practical applications. The decision on the modality was based on two factors. First, weight-training is a very popular activity attracting members from both sexes. Thus, it represents a powerful intervention strategy in terms of applicability. Second, it is very different in both content and outcome from aerobic exercise. It is dependant on a different energy pathway and the adaptations associated with it, both from a visual and a functional perspective, are unique. Thus, if one is to accept the hypothesis that somatic changes can also affect psychological parameters, the potential for weight-training to have its own set of psychological consequences is great.

From the preceding discussion, it is clear that weight-training rerpresents a popular form of exercise. It is hoped that by analysing the psychological ramifications, further insight into the complex but fascinating mind-body relationship will be furnished.

E. Operational Definitions

Aerobic Exercise:	prolonged, continuous, repetitive movements of large muscle groups, that is contingent primarily upon the oxygen pathway for energy production.
Anaerobic Exercise:	vigourous, intense, short-term physical activity that requires the principal involvement of the ATP-PC and lactic acid systems for energy production.
Sedentary:	having not participated in regular, vigourous exercise since August 1, 1985.
Regular Exercise:	2-3 times per week for at least a period of one month.
Vigourous Exercise:	either aerobic or anaerobic exercise.
Strength:	the torque capacity of the extensors of the right knee and the transverse flexors of the right shoulder as measured in foot pounds by the Cybex Dual Channel Isokinetic Dynamometer.
Self-concept:	the values derived from the Tennessee Self-Concept Scale (Fitts, 1965).
State Anxiety:	the values derived from the State and Trait Anxiety Inventory (Spielberger, 1970).
Trait Anxiety:	the values derived from the State and Trait Anxiety Inventory (Spielberger, 1970).
Assertiveness:	the values derived from The Assertion Inventory (Gambrill, 1975).

VII. Methodology

A. Research Design

A "before and after" design as described by Christensen (1980) was employed. This involved the random assignment of volunteers into experimental and control groups. Subjects were measured on dependent variables both prior to and following the duration of the treatment. Appropriate statistical analysis was carried out to determine between and within-group differences. In addition, post-treatment interviews of the experimentals were conducted in order to gain insight into the experiential qualities the treatment held for them.

Randomization controls for many extraneous variables which may contaminate the results (Christenson, 1980). However, due to the nature of the recruitment procedure (i.e., soliciting volunteers), self-selection effects may pose a threat to external validity. The sample may possess certain characteristics which differentiate them from the population they were drawn from. As well, expectancy is not completely controlled for as there was no placebo treatment. This could be regarded as a confounding factor with respect to internal validity. However, the author attempted to minimize this problem by keeping the subjects ignorant as to focus of the study. The psychological measures were referred to as "self-report inventories" and no mention of the dependent psychological variables was made. The subjects were at no time overtly aware of the experimental hypothesis.

B. Subject Selection

Forty-two female subjects were recruited through a poster and newspaper advertising campaign.

The selection criteria specified that all participants must be female, sedentary, over sixteen years of age and did not clinically suffer from menstrual distress.

All respondents to the advertisements were re-contacted by phone. They were informed about the format of the study but without specific reference to the purpose. In order to facilitate random assignment, potential subjects were told that, subsequent to the completion of the experimental treatment, another weight-training program would be

offered to the control group. Thus, everyone would eventually receive the program. The respondents were then informed specifically as to the experimental conditions (see Appendix A). If the individual was still interested, she was screened with respect to the selection criteria (see Appendix B) and physical readiness. Those who met criteria were mailed information packages acknowledging their acceptance into the study and detailing specifics as to times, dates, dress requirements and directions.

Following the psychological pre-testing, subjects were randomly assigned to groups, by means of a table of random numbers. They were informed as to their status immediately after completing their initial strength assessment.

C. Testing Procedures

Pre-testing

Pre-testing on psychological measures was conducted by the author in a standardized manner (see Appendix C) at 5:30 P.M. on January 13th, 1986 in room E-120 of the Van Vliet Centre at the University of Alberta.

Strength was assessed between 5:30 and 9:30 P.M. on January 15th at the University's Research and Training Centre for the Physically Disabled. It consisted of an isokinetic test of torque production capacities in relation to right knee extension and right horizontal shoulder flexion. The author served as an assistant to a trained individual in the testing procedure (see Appendix D).

Post-testing

Psychological post-testing was held on April 14th, 1986 at the same time and in the same room as the pre-testing. The format differed in that the subjects had only to complete the three psychological inventories and the adjunctive questions regarding menstrual cycle discomfort. Also, any control subjects who had failed to submit their "Monthly Activity Questionnaire" forms were required to fill them out before the commencement of testing.

Mechanical breakdown of the testing instrument forced the strength assessment to be carried out over two days (April 17th and 23rd). Also, due to certain unforeseen

events, the professional who coordinated the pre-testing was unavailable and was replaced by another trained individual. The author was available only for the first session. It was not possible to replicate the exact order of testing of the subjects.

D. Instrumentation

Menstrual Distress Questionnaire (MDQ)

The MDQ (Moos, 1969) is the most frequently used inventory to assess menstrual cycle discomfort (Bancroft and Backstrom, 1985). It consists of 47 menstrual distress symptoms rated on a 6-point scale according to severity of experience. Respondents are asked to assess the symptoms during the pre-menstrual, menstrual flow and intermenstrual phase. A score of 95 or above on either the pre-menstrual or flow phases demonstrates significant menstrual-related discomfort. Scores of 70 or above for the inter-menstrual phase indentifies individuals with neurotic complaining tendencies and therefore results should be interpreted with extreme caution (Moos, 1969).

Validity is evidenced in its ability to distinguish between groups who claim not to be affected by menstrual distress and others that do (Chuong et al., 1985).

The inventory is reported to have high internal consistency and test-retest reliability (Markum, 1976). Calculated split-half r's for 94 women divided in two groups, using both an odd-even and a random assignment division of questions, ranged from .89 to .93. All were significant at the .01 confidence level. Test-retest reliability was found to be .80 and .88 for the respective groups. Both correlations were significant at the .01 level.

Due to the nature of menstrual-related discomfort, it may be a confounding factor in many psychologic measures (Moos, 1968). Symptoms such as depression, excessive anxiety, forgetfulness, etc. may distort a true representation of one's perceptions and behaviour. Because the clinically significant cut-off point is somewhat arbitrary, additional questions were posed to the subjects to determine whether they were presently suffering from any menstrual symptoms, what those symptoms were and whether they believed it was affecting their responses (see Appendix E). This

adjunct to the MDQ was administered in both the pre and post-testing. This process, in conjunction with the MDQ, provided a measure of control for a menstrual distress response bias.

Psychological Measures

1. The State-Trait Anxiety Inventory (STAI)

The STAI (Spielberger, 1970) is a 40 item, self-evaluation questionnaire designed to assess transitory anxiety (A-state) and anxiety proneness (A-trait). It is composed of 20 items which reflect how the subject feels at that point of time (A-state), and a further 20 statements which reveal certain normative feeling states of the individual (A-trait). Responses are calibrated by means of a four-point Likert-scale.

Spielberger (1970) has reported on the instrument's validity and reliability Concurrrent validity between A-trait and the IPAT Anxiety Scale (Cattell and Scheier, 1963) and A-trait and the Taylor Manifest Anxiety scale (Taylor, 1953) is .75 and .85 respectively. Construct validity for A-state is reflected in its ability to discriminate between feeling states in relaxed, normal and stressful conditions on over 1,000 male and female undergraduate students.

Test-retest reliabililty for A-trait ranges from .73 to .86 in college undergraduates. Reliability for A-state is low (.16.- .54), which is to be expected given the transitory nature of anxiety states. Both measures are internally consistent with alpha coefficients ranging from .83 to .92.

The STAI is relatively quick to administer (15 minutes on average) and is reported to have adequate reliability and validity. It has been used in a wide variety of research settings, including the field of psychologic effects of exercise (Blumenthal et al., 1982; Morgan, 1980; 1976). It has proven sensitive enough to reflect anxiety changes in non-clinical subjects.

2. The Tennessee Self-Concept Scale (TSCS)

The TSCS (Fitts, 1965) is a self-administered, Likert-scale inventory consisting of 100 self-descriptive statements. Of the 100 items, 90 assess self-concept, while the other 10 reflect self-criticism.

Fitts (1965) identifies three categories which measure one's internal frame of reference: self-identity (what I am statements); self-satisfaction (how I feel about myself statements); and behaviour (what I do statements). These categories are further cross-referenced with regards to a more external focus, interpreting self in five distinct areas: physical self; moral-ethical self; personal self; family self; and social self. In addition, the total of the ninety self-concept statements comprise an overall measure of self-esteem.

All references to validity and reliability are found in Fitts' (1965) manual. Content validity, with regard to the proper classification of items, was ensured by including only those items which received unanimous agreement of seven expert judges. Discriminative validity of the TSCS is evidenced in its ability to differentiate between pathological, normal and well-integrated personality type (total n= 1,064).

Reliability was .92 on total positive scores (self-esteem) for sixty college students who were re-tested two weeks after the initial assessment. The test-retest reliability for the various subscales range from .70 to .90.

The TSCS provides a comprehensive analysis of one's perception of self which is consistent with a phenomenological approach to identity. The Likert-scale format is less likely to distort actual feeling the way a "yes" or "no" approach will. In addition, it is a widely used instrument that has already been employed in a previous weight-training study (Tucker, 1984) and at that time proved sensitive to changes in self-concept in a non-clinical setting.

3. The Assertion Inventory

The Assertion Inventory (Gambrill, 1975) is a self-administered, 80 item, Likert-scale questionnaire designed to provide information on assertive behaviour from two perspectives: the degree of discomfort an individual experiences acting assertively and, the judged probability of engaging in such a behaviour.

Gambrill (1975) reports the Inventory discriminates between clinical and normal populations and has proven sensitive to changes in assertive behaviour linked to assertiveness-training programs. In addition, a significant correlation (Spearman rank correlation = .465, $p < .05$) was found between changes in observer ratings of discomfort and changes in Inventory scores.

On a test-retest procedure conducted on 49 undergraduate students, a correlation of .87 for degree of discomfort and .81 for response probability was evidenced (Gambrill, 1975).

The Inventory is quick to administer, is of adequate reliability and validity, and has proven sensitive to change with normal populations. As well, the conceptualization of assertive behaviour as comprising the probability of occurence in concert with the experiential qualities these actions hold for the individual, is consistent with assertiveness-training programs (Alberti, 1977). Analysis of overt behaviour alone does not reflect the instrumentality of assertiveness with respect to personal effectiveness.

Strength Assessment: Cybex Testing

The "Cybex," a product of Lumex Inc., Ronkonkoma, New York, is one of the few truly isokinetic dynamometers commerically available. It allows for voluntary isometric and concentric contractions to be performed at a pre-determined constant velocity. The resistance it provides throughout a range of motion exactly matches the strength curve for the movement. This enables identification of peak torque capacity specific to the action and the corresponding velocity (Sale & Norman, 1982). The particular model used in this study (the Cybex 2 Dual Channel Dynometer) measures applied torque in foot-pounds. For the purposes of this study, foot-pounds will be converted to Newton-meters.

Other strength measurement instruments also provide variable resistance. However, with the exception of the Omnitron, they lack the precision afforded by Cybex. This is because they operate on a fixed average resistance curve which does not account for individual variations (Sale & Norman, 1982). Thus, Cybex is considered by many as the most valid measure of maximal torque.

Test to test variation of 10% has been reported by Thorstensson (1976) (in MacDougal et al., 1982). This is probably attributable to motivational differences rather than any mechanical shortcomings.

Cybex testing is "state of the art." It allows not only for extremely precise measurement of force output but can also be set up to accommodate a variety of movements. Consistent with the specificity of training principle (Fox and Matthews, 1981), the testing procedure was geared to approximate both the movement and the velocity of two training exercises performed on Nautilus equipment. The velocity was set at 60° per second which corresponded with the suggested training speed. Right knee extension on the Cybex closely mirrored the Nautilus "leg extension exercise" except that the training exercise calls for simultaneous extension of both knees. Right horizontal shoulder flexion varied in the same respect. Also, the training exercise was performed in a seated position with elbows flexed at 90° while the measurement procedure called for full extension of the elbow from a supine position. However, both tests and their related training movements corresponded in that the primary joint action, and therefore the prime movers, were the same.

E. Experimental Treatment

The treatment consisted of thrice-weekly strength-training sessions, lasting for a duration of 10 weeks. They were held at the University of Alberta's Research and Training Centre for the Physically Disabled. The program included a brief, preliminary warm-up followed by a comprehensive strength-training routine performed on Nautilus equipment (see Appendix F). Subjects trained in mutually agreed upon pairs.

F. Adherency Monitoring Procedures

Attendance was taken at each training session to monitor compliance with the 90% attendance requirements (see experimental conditioning, appendix A). Verbal checks were carried out regularly to determine whether the experimentals were participating in other forms of exercise which would contravene the experimental conditions.

The controls were asked to refrain from regular, vigorous exercise (see summary of operational definitions) for the duration of the study. Two forms designed

to assess monthly activity patterns were sent out with self-addressed envelopes at monthly intervals. The subjects were asked to return the completed forms as soon as possible.

G. Data Analysis

The psychological inventories were optically scored at the University of Alberta s Computing Science Department. Cybex print-outs of torque production were manually plotted by the author in foot-pounds.

Before any analysis of the data were performed, an overall alpha level of .05 was set. When probability exceeded this, the null hypothesis was accepted.

Group means and standard deviations on all dependant variables for both the pre and post tests were computed.

A series of two-way analyses of variance with repeated measures were performed to identify any treatment over time effects. Barlett-box and Cochran tests for homogeneiety of variance were enacted if significance was achieved.

Any significant treatment over time effects were analysed by a planned comparison procedure (Bonferoni test) to determine whether anticipated differences had occurred. Due to the stringency of the Bonferoni method, an alpha level of .1 was set in order to minimize the risk of type 2 errors.

Qualitative analysis consisted of categorizing statements pertaining to similar subject matter. These categories were then analysed with respect to the congruity of the statements (i.e., those expressing similar opinions). Anecdotal remarks which provided insights into the experiential qualities of the treatment were noted and taken into account when evolving the discussion of the results.

H. Limitations

1. Due to time constraints, the treatment may be of insufficient duration to produce significant changes in dependant psychological variables.
2. The subject matter under investigation does not lend itself well to implementation of a true placebo treatment. The deletion of this important design procedure detracts from the determination of causality.

3. Although recruited subjects are randomly assigned to experimental groups, the design is not truly randomized. Subjects volunteer to participate. Thus, self-selection effects may be present.
4. Space considerations dictate that a less than optimal number of subjects can be included in the study. Internal and external validity are negatively affected.
5. The validity of Cybex results depends greatly on the motivation of the subjects. There is no way to insure consistent motivation.

I. Delimitations

1. The subjects are all female, relatively young and mostly work in a campus environment. Thus, generalizability is somewhat limited.
2. No analysis will be carried out to determine which types of personality or physical somatotypes benefit most from resistance-training.
3. No comparison of resistance-training and other forms of exercise are involved.
4. Due to the adoption of an alpha level of .05 and because of the relatively small number of subjects, the possibility of a Type 1 error is enhanced.
5. No mid-treatment analysis will be enacted. Thus, possible fluctuations and trends during the treatment will not be examined.
6. The design will not determine if possible effects are retained after cessation of the treatment.
7. As resistance-training is often carried out on an individual basis, the decision to use a group format detracts from generalizability of the results.
8. The decision to institute primarily strength-building treatment rather than a muscular endurance format, and the exclusion of aerobic forms of exercise, may not be the optimal method to improve body image for the majority of the subjects.

VIII. Results

A. Subject Information

Of the original 40 subjects selected, 30 completed the study. Their data formed the basis for analysis.

Thirty-five subjects completed the pre-testing. Of that total, 18 were assigned to the experimental group and 17 to the control. Three control subjects were not included in the data analysis because of non-compliance with the experimental conditions, as were two experimentals who dropped out of the study. One control subject was unavailable for both post-treatment strength assessments, while two experimentals did not take part in the post-testing for upper body strength. That particular control subject's initial strength scores were deleted from computation of group strength values as were the two experimentals' scores with respect to upper body measures.

Analysis of the Moos MDQ results revealed that none of the subjects could be classified as "chronic complainers" (see Appendix G). One control subject was diagnosed as having significant menstrual distress. However, she indicated on both the pre and post-tests, that she was not at that time suffering from any symptoms. Therefore, her data was considered valid and submitted for analysis.

Treatment attendance ranged from 76 to 93% for the 29 sessions, with the mean and standard deviation being 87.6% (± 5%). It was decided to include all the treatment subjects who completed the study in the data analysis.

Table 1 lists the pertinent demographic data of the subjects. The age of the two groups were quite similar (experimental $\bar{x}$ = 22.5, ± 3.6, control $\bar{x}$ = 23.7, ± 5.4). Most of the subjects were single (81% of the experimentals, 72% of the controls) and most either worked or studied at campus locations (experimentals = 81%, controls = 93%). There were more treatment subjects who were strictly students than controls (75% as compared to 50%). However, when including those subjects who were both students and members of the workforce the difference was less substantial (experimentals = 81%, controls = 71%).

Table 1

Subject Demographic Data

	Experimental	Control
Number in group	16	14
Age		
Mean	22.5	23.7
St. deviation	3.6	5.4
Occupation		
Student	12 (75)[1]	7 (50)
Working	3 (19)	4 (29)
Both	1 (6)	3 (21)
Occupational Environment		
On campus	13 (81)	13 (93)
Off campus	3 (19)	1 (7)
Marital Status		
Single	13 (81)	10 (72)
Married	3 (19)	3 (21)
Separated	0	1 (7)

[1]percentages in parentheses

B. Strength Variables

Table 2 provides information on pre and post-test group means and standard deviations. Consult Appendix H for list of abbreviations.

Two-way analysis of variance with repeated measures revealed a significant treatment over time effect for right knee extension but not for right horizontal shoulder flexion (see Table 3, Figure 1, and Appendix I). Variance, as determined by the Cochran and the Bartlett-box tests, was homogeneous for the lower body measures (see Appendix K).

Post hoc analysis employing a Bonferoni test (see Appendix J) of multiple comparisons revealed that both groups were not initially significantly different. However, the control group demonstrated a significant decrease in strength on the post-test. The experimentals had a somewhat higher post-test mean, but it did not reach significance. As a result of these changes, the control group was significantly weaker than the experimentals on the post-test measure.

Although the Cybex results did not evidence that the treatment had been successful, there were strong indications, vis a vis the increments in subjects' workloads, that their strength had indeed increased.

In order to further investigate this, subjects' final training resistances were compared to their initial maximal repetitions (RMs) which were measured prior to the commencement of the treatment (see Table 4). This analysis suggests that there was a highly significant strength increase. On average, final training resistances exceeded the corresponding initial RMs by 20%. This means, that for the most part, subjects were able to perform 8 to 10 repetitions of upper body exercises and 12 to 15 of lower body exercises at resistances in excess of what they could initially do on one maximal effort.

Table 2

Group Means and Standard Deviations for Dependant Variables

	Experimental		Control	
Variable[2]	Pre	Post	Pre	Post
1. Rt Knee Ext	146.2[3] (23.0)[4]	165.4 (19.5)	133.1 (24.4)	124.5 (18.2)
2. Rt Horiz Sh Flex	42.6 (11.4)	42.6 (10.4)	32.8 (6.8)	29.2 (5.2)
3. A-state	32.8 (11.0)	32.5 (8.8)	30.1 (5.6)	38.0 (12.9)
4. A-trait	36.8 (8.3)	33.6 (7.7)	34.6 (6.4)	34.6 (7.2)
5. AADD	96.4 (20.5)	984. (19.1)	101.4 (22.1)	99.4 (23.0)
6. ASRP	103.9 (11.7)	100.7 (16.9)	107.1 (12.5)	102.6 (14.3)
7. ASDIF	7.6 (14.5)	3.1 (16.9)	9.9 (21.9)	.2 (12.5)
8. T.P	344.6 (24.3)	354.8 (27.5)	347.2 (18.1)	347.4 (25.0)
9. Iden	126.6 (7.6)	124.8 (8.9)	125.6 (7.2)	124.2 (8.3)
10. Ssat	106.2 (10.0)	111.6 (13.2)	109.6 (7.9)	111.4 (12.1)
11. Beh	111.8 (9.4)	116.4 (10.5)	111.9 (5.7)	111.8 (7.7)
12. Phsf	63.3 (7.7)	65.8 (8.7)	67.6 (5.0)	66.7 (4.4)
13. Mesf	71.4 (6.4)	73.0 (6.5)	71.2 (4.8)	70.9 (7.1)
14. Pesf	66.7 (7.2)	70.6 (6.4)	67.4 (4.2)	69.3 (7.1)
15. Fasf	72.2 (8.3)	73.0 (7.9)	70.2 (7.7)	69.6 (7.6)
16. Sosf	71.0 (4.4)	72.3 (4.8)	70.8 (6.1)	70.9 (5.9)
17. Scr	33.8 (5.3)	33.7 (7.4)	32.8 (4.1)	34.1 (3.3)

[2]refer to Appendix M: List of Abbreviations

[3]values for knee extension and shoulder flexion in Newton-meters

[4]standard deviations in parenthesis

Table 3

Summary Table of F-Ratios for Right Knee Extension

Part of Model	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	3157.62	3157.62	7.42	1.0	27.0	0.0111
CASES(GRP)	11482.96	425.29				
GRAND MEAN	602332.44	602332.45	12414.12	1.0	27.0	0.0
TIME	16.34	16.34	0.34	1.0	27.0	0.5665
GRP TIME	405.58	405.58	8.36	1.0	27.0	0.0075*
TIME CASES(GRP)	13110.04	48.52				

* $p < .05$

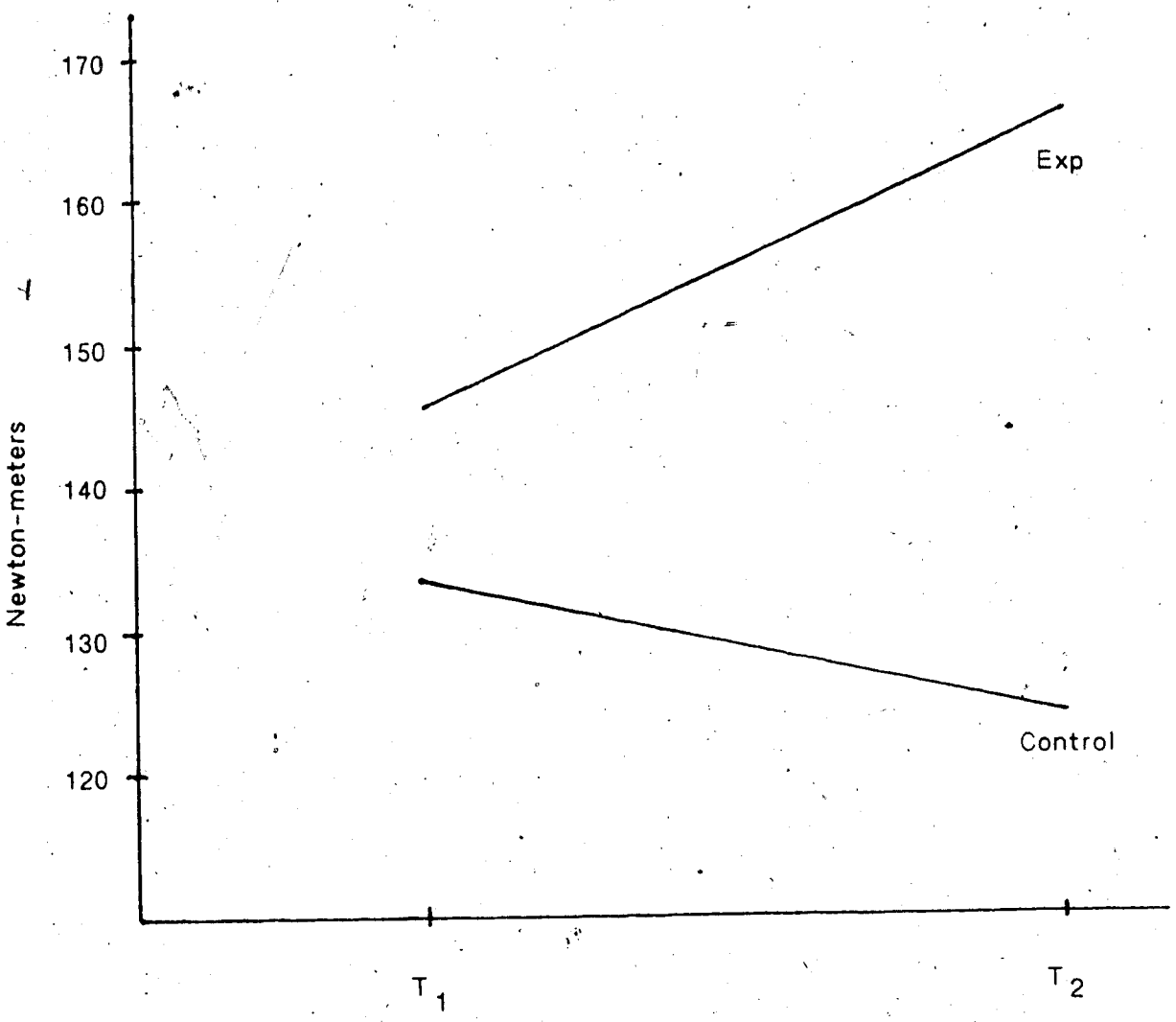

Figure 1: Pre and post-test group means for right knee extension

Table 4

Initial Repetition Maximums (RM) and Final Training Resistances (FTR)

Exercise	RM (lbs)	FTR (lbs)	% Difference
1. Arm Cross	28.7 (11.3)[5]	42.5 (7.9)	48
2. Hip and Back	74.3 (21.5)	82.3 (10.4)	11
3. Hip Abduction	67.5 (10.9)	75.6 (7.6)	12
4. Bicep Curl	16.8 (4.0)	26.7 (4.4)	59
5. Tricep Extension	19.7 (6.1)	27.5 (4.6)	40
6. Lat Pulldown	66.6 (13.5)	69.1 (8.1)	4
7. Hip Adduction	59.3 (10.3)	72.6 (7.5)	22
8. Leg Extension	111.3 (24.7)	93.1 (11.1)	-16
9. Hamstring Curl	58.1 (12.9)	60.6 (7.0)	4
Mean Values	55.8 (12.8)	61.1 (7.6)	20.4

[5]standard deviations in brackets

C. Psychologic Variables

Two-way analysis of variance with repeated measures identified a significant treatment over time effect ($p<.05$) for trait anxiety and physical self (see Tables 5, 6 and Figures 2, 3). Variance was found to be homogeneous (see Appendix K).

Post hoc analysis of A-trait scores (Appendix J) revealed that while the two groups did not significantly differ from each other either before or after the treatment, the experimentals did experience a significant reduction in trait anxiety, while the controls did not. The validity of this finding is further enhanced by the qualitative assessment of the experimentals. Although the subjects did not differentiate between state and trait anxiety, all 16 reported decreased anxiety as a result of the program (see Appendix M).

With respect to physical self, a significant improvement was found for the experimentals while no change was demonstrated by the controls. Both groups were not found to be significantly different from each other on the pre and post-tests. These findings correspond with qualitative measures. Of the 16 subjects, all reported a better body image from either a visual appearance (N= 11), a functional perspective (N=9), or both (N=7). Three subjects felt there was no real improvement visually while one believed she had become less attractive. Although all subjects assumed they had increased in strength, this was not related as significant with respect to their body image by seven subjects.

No other psychological variables achieved significant treatment over time effects (see Appendix I). However, with the exception of assertiveness, most experimental scores demonstrated a trend towards significant improvements while the controls either decreased or remained the same.

With respect to qualitative assessment, it should be remembered that the interviews were largely of an unstructured nature whereby the subjects were encouraged to volunteer information which was relevant to them. Thus, while all subjects responded to specific questions concerning the three variables being objectively measured (i.e., anxiety, self-concept and assertiveness), as well as a question regarding the attitude of important others, not all the participants necessarily spoke about similar subject matter.

Seven subjects felt they had become more assertive as a result of strength-training while nine believed there had been no change. Six participants said their level of self-esteem had improved. Five believed they had become more self-disciplined. Likewise, 5 subjects reported to have increased energy, while 7 felt they slept better as consequence of the treatment. Three subjects reported decreased depression. With respect to the social component of the sessions, 12 subjects volunteered that they enjoyed that aspect. Finally, 14 subjects said that important others in their lives had been supportive of their participation in the study, while one stated that reaction had been mixed. One subject could not adequately respond to that question because her close friends and family did not live in the area and were not aware of her involvement.

Table 5

Summary Table of F-Ratios for A-trait

Part of Model	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	5.59	5.59	0.05	1.0	28.0	0.8194
CASES(GRP)	2943.15	105.11				
GRAND MEAN	72809.79	72809.77	10635.64	1.0	28.0	0.0
TIME	39.65	39.65	5.79	1.0	28.0	0.0229
GRP TIME	36.25	36.25	5.30	1.0	28.0	0.0290*
TIME CASES(GRP)	191.68	6.85				

* $p < .05$

Table 6

Summary Table of F-Ratios for Physical Self

Part of Model	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	101.85	101.85	1.20	1.0	28.0	0.2831
CASES(GRP)	2380.90	85.03				
GRAND MEAN	258915.20	258915.20	32829.60	1.0	28.0	0.0
TIME	10.86	10.86	1.38	1.0	28.0	0.2506
GRP TIME	43.66	43.66	5.54	1.0	28.0	0.0259*
TIME CASES(GRP)	220.83	7.89				

* $p < .05$

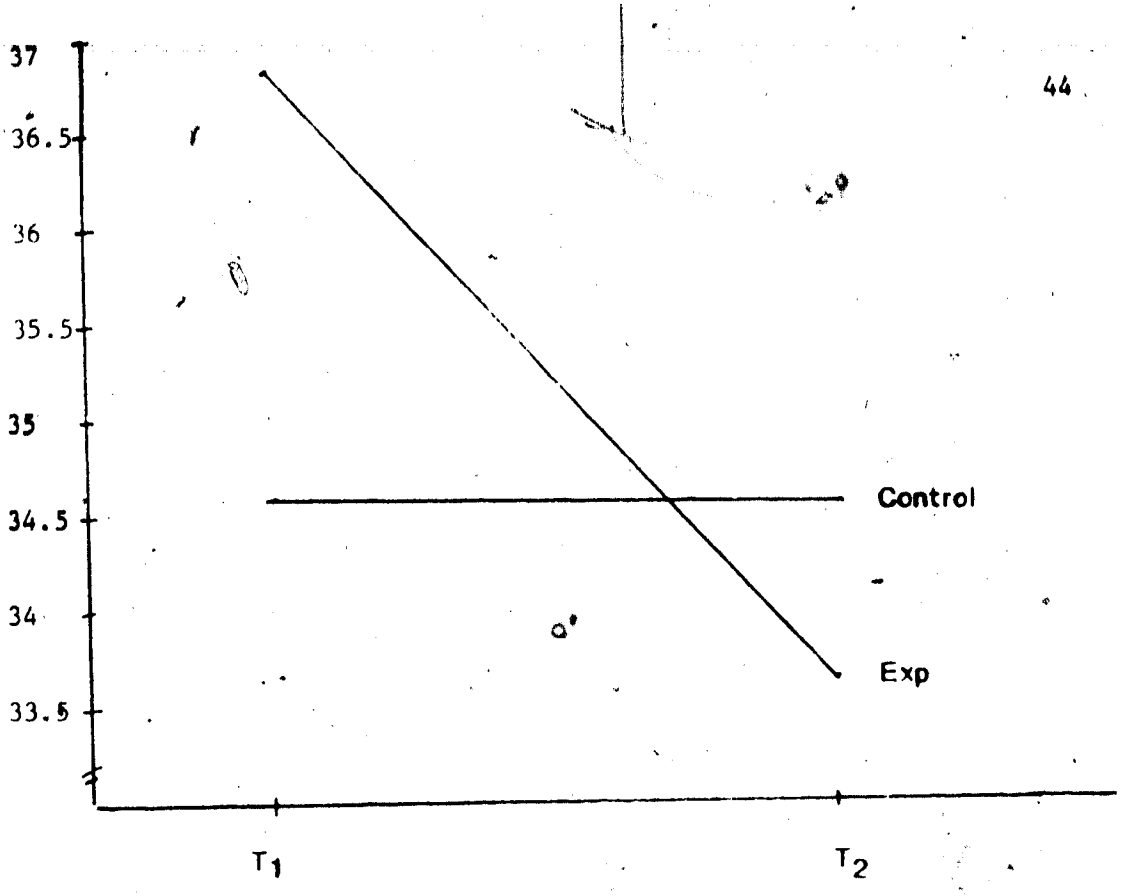

Figure 2: Pre and post-test group means for A-trait

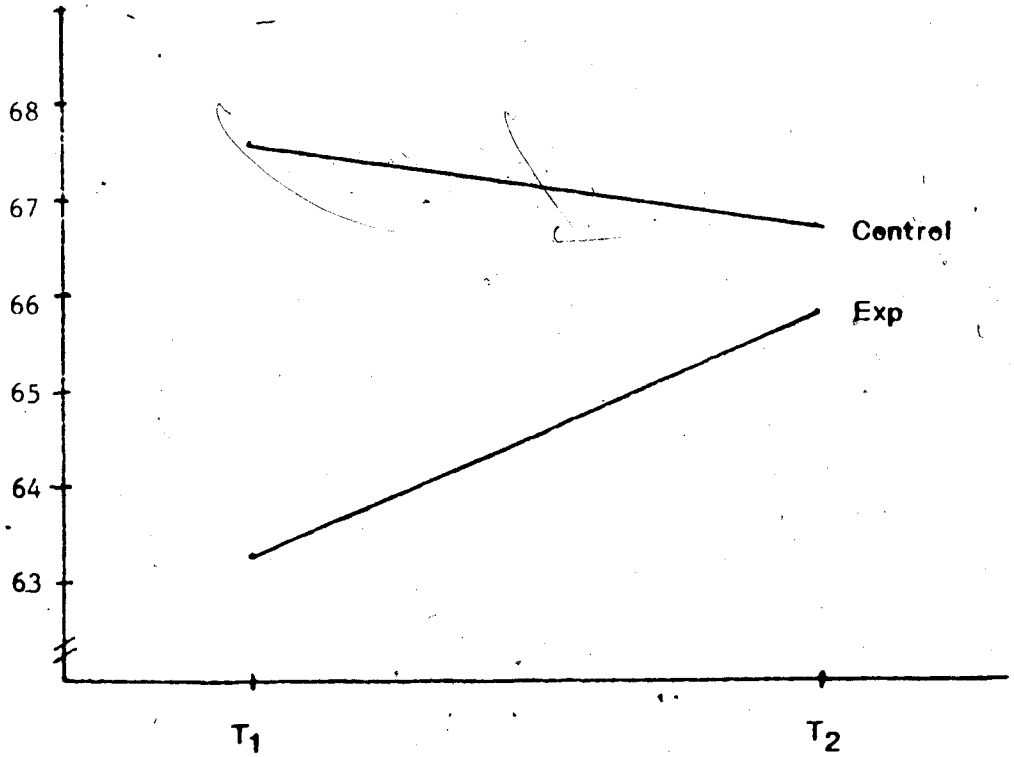

Figure 3: Pre and post-test group means for physical self

IX. Discussion

The fact that there was no significant pre to post treatment increase in the experimentals' Cybex scores, would normally indicate that the strength-training program had not been effective. However, the subsequent strength analysis (final training resistances compared to initial repetition maximums) strongly contradict these findings. There are several other factors which argue in favour of a strength increase and explain why the Cybex was insensitive to these improvements.

First, with respect to the Cybex data, it should be noted that the control group experienced a significant decrease in knee extension strength ($p<.05$), while the experimentals demonstrated a trend towards improvement. That a relatively young population, already sedentary for at least a period of six months previous to the study, should become significantly weaker in the period of eleven weeks is highly unusual. More likely, is the fact that the unavoidable differences in the post-test procedures (i.e., a different coordinator, the breakdown of the Cybex apparatus necessitating that testing be carried out over two sessions, and the absence of the author for the second session) may have interacted to create a setting which detracted from the validity of the post-test results. As was mentioned in the limitations, the degree of motivation an individual possesses will greatly affect the strength output. As the author was instrumental in motivating the subjects, his unavailability for the second part of the post-tests may have been moot. Also, a different tester is likely to have slightly different placement of the Cybex apparatus which can cause changes in leverage. Thus, this could detract from the torque generation capacity of the subjects. Finally, it is possible that the calibration of the machine was inexact. The individual coordinating the post-tests was not as experienced as the initial tester.

Another salient factor is the disparity between the testing instrument (Cybex) and the training apparatus (Nautilus). As was mentioned in the methodology, the Cybex is a truly isokinetic device which provides constant resistance exactly matching the torque curve of the joint being masured. Nautilus, however, is semi-accommodating rather than isokinetic. It uses a cam system which is designed to vary resistance in a manner which approximates the torque curve for an "average" male. Thus, by its very nature, it does not take into account individual differences which cause torque curves to vary. Because

all subjects were female, this problem was probably compounded.

These differences become relevant when one considers how strength was measured. Strength was defined as the peak torque production in a particular joint action performed at a velocity of 60° per second. The Cybex identified this point specific to a certain joint angle. Due to the lack of precision of the Nautilus equipment, it is possible that the resistance provided at the peak torque angle was not sufficient to present a training stimulus. Thus, while other areas in the range of motion may have been receiving adequate training stimuli and consequently increasing their torque generation capacity, these changes would not necessarily be reflected on Cybex scores because only peak torque was being measured. Regardless of relative increases throughout the range of motion, the joint angle productive of peak torque would in all likelihood be unchanged. In this way, the Cybex would be insensitive to tissue dynamics resulting from the training program.

Similarly, if the Nautilus equipment was [illegible] inexact that an increased workload still did not provide an adequate training stimulus to the angle of maximal torque generation, subjects could move more resistance without demonstrating increased Cybex scores. This would not deny, however, that strength relative to certain joint angles was increasing.

Another variable to be considered is the neurological component of strength. As the subjects came more accustomed to the Nautilus equipment, their muscles learned to fire in a synchronous manner which enhanced force production. However, because the subjects did not have the same opportunity to practise on the Cybex, it is possible that this neurological component was not completely evident in the Cybex testing.

In light of the information presented, it is probably correct to assume that the experimental treatment was in fact successful in achieving significant strength gains. The lack of support evidenced in the Cybex results most likely reflects instrumentation, procedural and definitional problems.

With reference to psychological measures, the null hypothesis was accepted on all dependant variables with the exception of trait anxiety and physical self. Despite the fact that the experimental group evidenced improvement in both these domains, the lack of a placebo treatment makes it difficult to assess the causality of the results. The

design does not guarantee that resistance-training in itself, is a more powerful strategy than any other activity which is carried out in a group setting. Social factors and the experiential qualities associated with entering into a new activity compete with resistance-training as explanations for the improvements. Also, self-selection effects may be present which may have pre-disposed the sample to change in certain ways.

The subjective data do provide evidence which suggests that the strenuous nature of the resistance-training program, in concert with both its distractive qualities and the positive social environment, interacted in a manner as to effect improvements in trait anxiety. Several subjects stated that they regarded working-out as a relaxing break, totally foreign from the stresses of school and work. Others reported the strenuous exercises provided a cathartic release from their day's frustrations. The expenditure of energy served to fatigue and relax the individuals. Almost all subjects expressed enjoyment of social environment. It could well be that the comfortable, enjoyable atmosphere in itself enhanced tension reduction. By adhering to the treatment for the duration of the study, it is quite possible that the transitory anxiety-reducing qualities of the program began to exert an effect on the more stable trait characteristics. As well, the subjects' improved self-image (physical self) may have alleviated anxieties about their appearance. This too could have been moot in decreasing the propensity for anxiety.

It should be noted that no significant change in transitory anxiety was found although many subjects believed that the treatment was instrumental in improving this condition. One even went as far as to state that she was able to rid herself of "stress headaches" by working-out. The A-state findings are better understood in light of procedural errors incurred in the measurement of the variable. By having subjects complete the A-state component of the STAI at the same time as the other psychologic inventories, the author was actually measuring the extent to which transitory anxiety was evoked by the testing environment rather than any effects which might occur due to the treatment. What would have been appropriate was to have assessed subjects both before and after several workouts. At the same time, to enhance validity, the controls could have been given a placebo treatment. Due to the inadequacy of the actual methods employed, A-state results should not be given serious consideration.

However, despite the qualifications, the treatment did produce a reduction in trait anxiety. This is an important finding if only because it has not been previously reported to be associated with anaerobic training. With weight-training currently enjoying prominence as an extremely popular exercise activity for women, the contention that there are inherent psychological benefits presents relevant therapeutic applications. Research should be conducted to determine the salience of social factors involved as well as deliniating optimal training prescriptions for anxiety reduction.

The improvement in physical self is probably directly related to body changes resulting from resistance-training. This construct is less likely to be affected by the social environment or distractive qualities of the treatment. Although the effect was significant, the subjective data indicate that it could have been more powerful if the program had been altered to meet the specific needs of the individuals. Many of the subjects expressed that they had joined the program with the intention of losing weight and toning-up. To this end, a treatment which emphasized increased repetitions at lower intensities would have been more effective. As well, an aerobic component would have further enhanced the attainment of these goals. While the treatment did help to improve tone, muscular definition was not as evident because caloric expenditure was not optimal. Thus, from a visual perspective, changes were not as dramatic as they could have been. This finding is substantiated by remarks made by many of the subjects which indicated that while they believe their appearance to be somewhat enhanced, they still felt there was room for improvement. Individuals who, at the outset, were quite lean in appearance, better appreciated the program as they felt they had increased in size. It should be remembered, however, that this was not a standard physiologic response for all subjects. The trade-off between increased muscular size and decreased body fat served to reduce size for more endomorphic individuals while increasing dimensions for mesomorphic and ectomorphic types.

Increased strength was an important variable for nine subjects. They indicated that increased strength was valued because it helped them in either job or sports-related performances, made them feel less vulnerable to physical attack, lessened their dependence on men, or simply because they wanted an enhanced overall level of fitness. Still, strength per se was not as instrumental as the visual perspective when

evolving one's body image. Although attitudes appear to be changing, it seems fair to say that strength may be a more important variable to the self-image of males than females. Physical educators should take into consideration an individual's ideal body image when prescribing exercise programs.

Other areas of self-concept did not evidence significant changes, although the experimentals did demonstrate trends towards significant improvements on most variables. It is possible that with a larger number of subjects and a longer time frame, these variables could have been enhanced as well. Several subjects indicated that adherence to the exercise program had instilled in them a measure of self-discipline which translated into other areas of their lives. Also, several subjects said their level of self-esteem had increased because of the program. Almost all subjects stated that significant others were very supportive of their participation in the study. These facts suggest that the treatment had the potential to enhance other areas of self-concept as well. A more exhaustive study could verify the global nature of resistance-training on various constructs.

With respect to assertiveness, the results are more conclusive. The treatment did not appear in any way to increase assertive behaviour. Although the author had postulated that increased strength and improved body-image could lead to increased self-confidence providing the building blocks for more assertive behaviour, this was not the case. It could be that more time was needed to entrench improvements in self-confidence, but more likely is that assertive behaviour is a learned action that requires direct instruction as to the techniques, as well as frequent practice. An indirect approach such as resistance training is probably not in itself adequate.

In conclusion, the results from this study are encouraging. Although the design does not allow one to infer direct causality, participation in a group resistance-training program was associated with decreased anxiety and an enhanced body image for sedentary females. Thus for many anxious, out of shape women, unhappy with the way they look, resistance-training may be the vehicle to an improved body and state of mind.

X. Conclusions

1. When strength is defined as the maximal amount of resistance which can be moved through a range of motion by a specific joint action, the treatment was highly successful in increasing strength.
2. When investigating strength development, the testing instrument and the training apparatus should either be the same or very similar in design.
3. Resistance training is associated with decreases in trait anxiety and improvements in physical self-concept in sedentary females.
4. Resistance training is not associated with increased assertiveness in sedentary females. More direct methods, such as assertiveness training courses, are probably needed to effect positive adaptations.
5. Resistance training may lead to significant improvements in most areas of self-concept for sedentary females. However, a larger sample and a longer training period than was employed in this study is needed to verify this.
6. Based on subjective data, it appears self-concept can best be enhanced by tailoring exercise programs to meet the specific objectives of the individual. For most sedentary females, however, a program which emphasizes body fat reduction and muscular definition would be superior to a strength development routine.
7. Strength, per se, while somewhat relevant, is not as instrumental as visual appearance for most sedentary females with respect to body image.
8. The distrative properties of resistance training in concert with the cathartic release it provides and the increased body image that results are important variables in anxiety reduction.
9. The social component of resistance training is a salient factor in the overall enjoyment of the activity. This probably enhances exercise adherence. Further research should be carried out to determine to what extent a positive social atmosphere contributes to psychological enhancement associated with resistance training.

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Appendices

Appendix A Experimental Conditions and Consent Form

Experimental Conditions of the Study

1. Subjects will agree to be randomly assigned to either a control group or a weight-training group.
2. Subjects assigned to the weight-training group will attend a minimum of 90% of the training sessions (26 out of 29).
3. All subjects will agree to not become involved in regular (2-3x/wk.) vigorous physical activity (aerobics, jogging, cross-country skiing, weight-training, swimming, sports, etc.) during the duration of the study. Intermittent exercise of a recreational nature is acceptable.
4. All subjects will agree to have their quadricep and pectoral strength tested on cybex equipment and to complete various forms and self-report inventories.
5. All experimental subjects will agree to participate in a short (10 min.) debriefing session following the study.
6. All control subjects will complete and return 3 physical activity questionnaire forms sent to them at regular intervals during the study.

Consent Form

I, _____ , having read the above conditions of the study, and being fully aware of their implications, consent to abide by these conditions to the best of my ability. In the event of any injury to my person resulting from participation in the study, I release Roy Howse, other experimental staff and the University of Alberta from any liability in the matter.

Signature _____

Date _____

Appendix B Weight-Training Subject Information Form

Name: _____ Home phone: _____

Age: _____ Marital Status: _____ (work): _____

Occupation: _____ University Department: _____

Address: _____ Postal Code: _____

Experimental number assigned: _____

1. Have you previously trained regularly (2-3x/wk), for a period of at least 1 month with weight-training apparatus? Yes ____ No ____

   If yes: When was your most recent experience? _____ (years)

   For how long? _____ (# of weeks or months)

   Times per week? _____ (average)

   Duration of each session? _____ (average)

2. Have you participated in regular (2-3x/wk, for a period of at least 1 month) vigorous exercise since Jan. 1, 1985 (ie.: aerobics, jogging, cycling, cross-country skiing, skating, swimming, etc.)?

   If yes: Which activity(s)? _____

   When? _____ (months)

   Times per week? _____ (average)

3. Are you presently taking oral contraceptives? Yes ____ No ____

   If yes: what is the brand name? _____

   If no: would you be agreeable to a small blood sample (1 teaspoon) being taken at the beginning and the end of the program? Yes ____ No ____

4. Are you presently taking or planning to take psychological counseling?

   Yes ____ No ____

Signature _____

Appendix C Psychologic Pre-test Procedure

1. Assign experimental numbers and check attendance as subjects arrive.
2. Circulate Experimental Conditions, Consent Form, PAR-Q, Weight-training Information Form, and Moos MDQ. Explain each form and have the subjects fill them in sequentially.
3. After the subjects have finished all the forms, have them return the completed forms and remain seated until all others have finished.
4. Circulate TSCS and optical scanner sheets. Explain the instructions and have subjects complete the inventory, return it, and remain seated.
5. Follow the same procedure as in Step 4 for the STAI and the Assertion Inventory respectively.
6. Inform subjects of test times for the strength assessment.
7. Take all subjects to the Research and Training Centre for the Physically Disabled to insure they know its location.

Appendix D Strength Assessment Protocol

1. Subjects will arrive in pre-designated groups of 10 at hourly intervals commencing at 5:30 PM.
2. The coordinator will briefly explain how the Cybex operates and provide a demonstration of the required movements.
3. Subjects will be systematically tested on right knee extension.
   a. The assisitant will adjust the apparatus to the proper fit for the subjects.
      i) Subjects will assume a seated position.
      ii) The right tibial-femoral joint will be aligned with the axis of rotation of the cybex at mid-joint. If necessary, pads will be placed behind the subjects back to insure proper positioning.
      iii) A waist restraint and a leg harness, positioned just superior to the medial malleolus of the right tibia, will be secured.
   b. Subjects will grip handles on the sides of the seat.
   c. Velocity will be set at 60°/second.
   d. Subjects will perform 3 warm-up repetitions at low intensity, from 90° of flexion to full extension of the knee.
   e. Subjects will perform 4 similar maximal contractions. The highest torque output will be recorded as the subjects' strength value.
4. Subjects will then be sequentially tested right horizontal shoulder flexion in the same order as the previous test:
   a. The assistant will adjust the apparatus to the proper fit for the subjects.
      i) Subjects will assume a supine position on their backs.
      ii) Subjects will be secured to the bench by means of a belt positioned over the inferior portion of the thoracic cage.
      iii) The Cybex attachment will be adjusted so that the handle will rest between the middle and distal phalangeal joints of the right hand with the elbow fully extended and the shoulder at 180° of horizontal extension. The axis of rotation of the Cybex will be aligned with the superior mid-point of the right gleno-humoral joint.
   b. The subjects will grip the left side handle of the Cybex bench with their left

hands.

c. Velocity will be set at 60° / second.

d. Subjects will perform 3 warm-up repetitions at low intensity, starting at 180° horizontal shoulder flexion and ending at approximately 110° of transverse flexion.

e. Subjects will perform 4 similar maximal contractions. The highest torque output will be recorded as the subjects' strength value.

Appendix E. Adjunct to the Moos Menstrual Distress Questionnaire

Are you presently affected by any of the Menstrual Distress Symptoms listed previously?

Yes _____ No _____

If yes: list the symptom(s) and indicate the severity (1-5)

_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____
_____	____	_____	____

Do you believe the symptoms affected the way in which you responded to the self-report inventories previously completed?

Yes _____ No _____

If yes: please explain in what way.

_____

_____

_____

_____

Appendix F Experimental Treatment

(a) Group Warm-up.

All subjects will perform some light calisthenics (i.e. arm circles, stepping with knees up etc.) to increase body temperature and blood flow to the working muscles. This will be followed by static stretching of the major muscle groups. The warm-up will last approximately 8 minutes.

(b) Strength Training Exercises (Nautilus Equipment).

1. Hip Extension.
2. Horizontal Shoulder Flexion.
3. Hip Abduction.
4. Hip Abduction.
5. Shoulder Flexion (Lat Pull Down).
6. Knee Extension.
7. Knee Flexion.
8. Elbow Flexion.
9. Elbow Extension.
10. Abdominal Exercise (various types depending on ability done to the point of fatigue).

- the subjects may start any exercise and work sequentially through them without working the same muscle group consecutively.
- subjects will work in pairs.

(c) Training Variables

Week 1:	1 set	upper 8-10 reps lower 12-15 reps	50% RM	
2:	1 set	same	70% RM	
3:	2 sets	same	70% RM	2-3 min RI
4:	2 sets	same	70% RM	2-3 min RI
5:	2 sets	same	75% RM	2-3 min RI
6 - 10:	2 sets	upper 6-8 reps lower 10-12 reps	80% RM	2-3 min RI

- RM will be determined prior to the treatment and will serve only as a rough guideline as to intensity. The main criterion will be reaching fatigue or failure between the suggested number of reps.
- the exercises will be performed in the following manner: the subject will count one-one thousand, two-one thousand on the concentric phase, hold for 1 second at the completion of the concentric contraction, then perform a 4 second count on the eccentric phase.

Abbreviations.

RM	-	repetition maximum
reps	-	repetitions
RI	-	rest interval
upper	-	upper body exercises
lower	-	lower body exercises

Appendix G Moos MDQ Results

Subject Exp #	Total Column A	Total Column B	Total Column C
01	9	6	6
02	20	10	8
03	19	14	6
04	41	11	7
05	38	71	11
06	25	13	5
07	14	15	10
08	15	5	6
09	17	5	6
10	9	13	0
11	40	47	20
12	9	9	5
13	16	13	11
14	25	17	0
15	6	41	7
16	18	17	12
17	6	6	5
18	13	10	5
19	6	10	4
20	65	63	21
21	49	58	37
22	29	20	7
23	24	13	8
24	37	35	25
25	17	5	5
26	68	17	0
27	34	25	7
28	31	42	19
29	30	64	14
30	22	14	10
31	14	5	13
32	28	26	22
33	19	9	5
34	18	25	6
35	11	67	10
36	93	61	35
37	74	101	10
38	24	24	13

Appendix H . List of Abbreviations

1. Rt. Knee Ext	Right knee extension
2. Rt. Horiz. Sh. Fl	Right horizontal shoulder flexion
3. A-state	State anxiety
4. A-trait	Trait anxiety
5. AADD	Assertiveness: degree of discomfort
6. ASRP	Assertiveness: response probability
7. ASDIF	Assertiveness difference between AADD & ASRF
8. TP	Total positive (global self-concept)
9. Iden	Identity (re: self-concept)
10. Ssat	Self satisfaction (re: self-concept)
11. Beh	Behaviour (re: self-concept)
12. Phsf	Physical self
13. Mesf	Moral-ethical self
14. Pesf	Personal self
15. Fasf	Family self
16. Sosf	Social self
17. Scr	Self criticism

Appendix I Summary Tables of F-Ratios for Variables That Did Not Reach Significance

SUMMARY TABLE OF F-RATIOS FOR RIGHT HORIZONTAL SHOULDER FLEXION

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	984.77	984.77	13.41	1.0	25.0	0.0012
CASES(GRP)	1835.56	73.42				
GRAND MEAN	39660.78	39660.77	2462.68	1.0	25.0	0.0
TIME	27.20	27.20	1.69	1.0	25.0	0.2056
GRP TIME	24.53	24.53	1.52	1.0	25.0	0.2286
TIME CASES(GRP)	402.62	16.10				

SUMMARY TABLE OF F-RATIOS FOR A-STATE

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	29.72	29.72	0.24	1.0	28.0	0.6312
CASES(GRP)	3532.96	126.18				
GRAND MEAN	66358.52	66358.52	932.30	1.0	28.0	0.0
TIME	220.12	220.12	3.09	1.0	28.0	0.0896
GRP TIME	249.72	249.72	3.51	1.0	28.0	0.0715
TIME CASES(GRP)	1992.96	71.18				

SUMMARY TABLE OF F-RATIOS FOR ASSERTIVENESS: DEGREE OF DIFFICULTY

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	130.04	130.04	0.16	1.0	28.0	0.6911
CASES(GRP)	22585.65	806.63				
GRAND MEAN	584048.08	584048.08	6635.64	1.0	28.0	0.0
TIME	0.01	0.01	0.0	1.0	28.0	0.9898
GRP TIME	61.61	61.61	0.70	1.0	28.0	0.4099
TIME CASES(GRP)	2464.47	88.02				

SUMMARY TABLE OF F-RATIOS FOR ASSERTIVENESS: RESPONSE PROBABILITY

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	93.73	93.73	0.30	1.0	28.0	0.5862
CASES(GRP)	8653.23	309.04				
GRAND MEAN	627961.44	627961.44	8077.19	1.0	27.0	0.0
TIME	217.24	217.24	2.79	1.0	27.0	0.1062
GRP TIME	5.32	5.32	0.07	1.0	27.0	0.7956
TIME CASES(GRP)	2099.12	77.75				

SUMMARY TABLE OF F-RATIOS FOR ASSERTIVENESS: DEGREE OF DIFFERENCE

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	1.06	1.06	0.0	1.0	28.0	0.9578
CASES(GRP)	10380.04	370.72				
GRAND MEAN	1569.50	1569.50	8.06	1.0	27.0	0.0085
TIME	730.03	730.03	3.75	1.0	27.0	0.0633
GRP TIME	96.14	96.14	0.49	1.0	27.0	0.4882
TIME CASES(GRP)	5254.85	194.62				

SUMMARY TABLE OF F-RATIOS FOR TOTAL POSITIVE

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	81.41	81.41	0.08	1.0	28.0	0.7740
CASES(GRP)	27104.33	968.01				
GRAND MEAN	.725428D7	.725428D7	37226.02	1.0	28.0	0.0
TIME	403.94	403.94	2.07	1.0	28.0	0.1610
GRP TIME	371.34	371.34	1.91	1.0	28.0	0.1784
TIME CASES(GRP)	5456.40	194.87				

SUMMARY TABLE OF F-RATIOS FOR IDENTITY

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	9.32	9.32	0.09	1.0	28.0	0.7615
CASES(GRP)	2779.83	99.28				
GRAND MEAN	938172.99	938172.95	30979.87	1.0	28.0	0.0
TIME	39.22	39.22	1.30	1.0	28.0	0.2648
GRP TIME	0.55	0.55	0.02	1.0	28.0	0.8937
TIME CASES(GRP)	847.93	30.28				

SUMMARY TABLE OF F-RATIO FOR SELF SATISFACTION

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	39.65	39.65	0.19	1.0	28.0	0.6655
CASES(GRP)	5814.68	207.67				
GRAND MEAN	719111.37	719111.33	14891.21	1.0	28.0	0.0
TIME	194.79	194.79	4.03	1.0	28.0	0.0543
GRP TIME	49.79	49.79	1.03	1.0	28.0	0.3186
TIME CASES(GRP)	1352.15	48.29				

SUMMARY TABLE OF F-RATIOS FOR BEHAVIOUR

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	74.70	74.70	0.60	1.0	28.0	0.4445
CASES(GRP)	3476.65	124.17				
GRAND MEAN	762403.55	762403.52	30255.15	1.0	28.0	0.0
TIME	77.11	77.11	3.06	1.0	28.0	0.0912
GRP TIME	87.11	87.11	3.46	1.0	28.0	0.0735
TIME CASES(GRP)	705.58	25.20				

SUMMARY TABLE OF F-RATIOS FOR MORAL ETHICAL SELF

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	19.66	19.66	0.31	1.0	28.0	0.5835
CASES(GRP)	1788.83	63.89				
GRAND MEAN	306612.34	306612.33	20617.68	1.0	28.0	0.0
TIME	6.09	6.09	0.41	1.0	28.0	0.5276
GRP TIME	12.75	12.75	0.86	1.0	28.0	0.3623
TIME CASES(GRP)	416.40	14.87				

SUMMARY TABLE OF F-RATIOS FOR PERSONAL SELF

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	1.07	1.07	0.02	1.0	28.0	0.8991
CASES(GRP)	1833.93	65.50				
GRAND MEAN	280210.69	280210.70	17681.61	1.0	28.0	0.0
TIME	122.67	122.67	7.74	1.0	28.0	0.0096
GRP TIME	15.20	15.20	0.96	1.0	28.0	0.3358
TIME CASES(GRP)	443.73	15.85				

SUMMARY TABLE OF F-RATIOS FOR FAMILY SELF

PART OF MODEL	SSH	MSE	F-RATIO	DFH	DFE	PROB
GRP	108.94	111.84	0.97	1.0	28.0	0.33
CASES(GRP)	3131.40					
GRAND MEAN	303183.02	13.89	21832.71	1.0	28.0	0.0
TIME	0.11	13.89	0.01	1.0	28.0	0.9305
GRP TIME	7.91	13.89	0.57	1.0	28.0	0.4568
TIME CASES(GRP)	388.83					

SUMMARY TABLE OF F-RATIOS FOR SOCIAL SELF

PART OF MODEL	SSH	MSH	F-RATIO	DFH	DFE	PROB
GRP	9.54	9.54	0.23	1.0	28.0	0.6389
CASES(GRP)	1186.15	42.36				
GRAND MEAN	303297.02	303297.02	22551.41	1.0	28.0	0.0
TIME	7.91	7.91	0.59	1.0	28.0	0.4496
GRP TIME	5.11	5.11	0.38	1.0	28.0	0.5427
TIME CASES(GRP)	376.58	13.45				

Appendix J Post Hoc Analysis of Significant Interactions

Post Hoc Analysis of Right Knee Extension

POST HOC ANALYSIS: 1

ANALYSIS: 1 FACTORS: GRP TIME
PARTITION: 1 LEVELS: experime PRE
PARTITION: 2 LEVELS: control PRE

EFFECT: 1 (16.00) 4.80
EFFECT: 2 (13.00) -4.72

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
CYL 1	649.93	425.29	1.53	1	27	0.2270

POST HOC ANALYSIS: 2

ANALYSIS: 2 FACTORS: GRP TIME
PARTITION: 3 LEVELS: experime PRE
PARTITION: 4 LEVELS: experime POST

EFFECT: 1 (16.00) 4.80
EFFECT: 2 (16.00) 8.50

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
CYL1	109.52	48.52	2.26	1	27	0.1446

POST HOC ANALYSIS: 3

ANALYSIS: 3 FACTORS: GRP TIME
PARTITION: 5 LEVELS: control PRE
PARTITION: 6 LEVELS: control POST

EFFECT: 1 (13.00) -4.72
EFFECT: 2 (13.00) -11.65

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
CYL 1	312.58	48.52	6.44	1	27	0.0172

POST HOC ANALYSIS: 4

ANALYSIS: 4 FACTORS: GRP TIME
PARTITION: 7 LEVELS: experime POST
PARTITION: 8 LEVELS: control POST

EFFECT: 1 (16.00) 8.50
EFFECT: 2 (13.00) -11.65

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
CYL 1	2913.27	425.29	6.85	1	27	0.0143

Post Hoc Analysis of A-Trait

POST HOC ANALYSIS: 1

ANALYSIS: 1 FACTORS: GRP TIME
PARTITION: 1 LEVELS: experime PRE
PARTITION: 2 LEVELS: control PRE

EFFECT: 1 (16.00) 1.83
EFFECT: 2 (14.00) -0.34

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
ATR1	35.15	105.11	0.33	1	28	0.5677

POST HOC ANALYSIS: 2

ANALYSIS: 2 FACTORS: GRP TIME
PARTITION: 3 LEVELS: experime PRE
PARTITION: 4 LEVELS: experime POST

EFFECT: 1 (16.00) 1.83
EFFECT: 2 (16.00) -1.26

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
ATR1	76.07	6.85	11.11	1	28	0.0024

POST HOC ANALYSIS: 3

ANALYSIS: 3 FACTORS: GRP TIME
PARTITION: 5 LEVELS: control PRE
PARTITION: 6 LEVELS: control POST

EFFECT: 1 (14.00) -0.34
EFFECT: 2 (14.00) -0.31

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
ATR1	0.01	6.85	0.00	1	28	0.9741

POST HOC ANALYSIS: 4

ANALYSIS: 4 FACTORS: GRP TIME
PARTITION: 7 LEVELS: experime POST
PARTITION: 8 LEVELS: control POST

EFFECT: 1 (16.00) -1.26
EFFECT: 2 (14.00) -0.31

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
ATR1	6.69	105.11	0.06	1	28	0.8027

Post Hoc Analysis of Physical Self

POST HOC ANALYSIS: 1

ANALYSIS: 1 FACTORS: GRP TIME
EFFECT: 1 LEVELS: experime PRE
EFFECT: 2 LEVELS: control PRE

EFFECT: 1 (16.00) -2.44
EFFECT: 2 (14.00) 1.88

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
PHSF1	139.44	85.03	1.64	1	28	0.2109

POST HOC ANALYSIS: 2

ANALYSIS: 2 FACTORS: GRP TIME
EFFECT: 3 LEVELS: experime PRE
EFFECT: 4 LEVELS: experime POST

EFFECT: 1 (16.00) -2.44
EFFECT: 2 (16.00) 0.01

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
PHSF1	47.96	7.89	6.08	1	28	0.0200

POST HOC ANALYSIS: 3

ANALYSIS:	3	FACTORS:	GRP	TIME
EFFECT:	5	LEVELS:	control	PRE
EFFECT:	6	LEVELS:	control	POST

EFFECT: 1 (14.00) 1.88
EFFECT: 2 (14.00) 0.91

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: TIME CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
PHSF1	6.60	7.89	0.84	1	28	0.3680

POST HOC ANALYSIS: 4

ANALYSIS:	4	FACTORS:	GRP	TIME
EFFECT:	7	LEVELS:	experime	POST
EFFECT:	8	LEVELS:	control	POST

EFFECT: 1 (16.00) 0.01
EFFECT: 2 (14.00) 0.91

POST HOC HYPOTHESIS TERM: GRP TIME

POST HOC ERROR TERM: CASES(GRP)

UNIVARIATE F RATIOS

VARIABLE	M.S. HYP	M.S. ERR	F-RATIO	DF1	DF2	PROB
PHSF1	6.07	85.03	0.07	1	28	0.7913

Knee Extension

HYPOTHESIS PART OF MODEL GRP

ERROR PART OF MODEL CASES(GRP)

GRP		experime	control
FREQ		16.0	13.0
CYL1	VARIANCE	248.183	168.228

VARIABLE CYL1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST	0.596	13	2.000	1.000
BARTLETT-BOX TEST	0.476	1	2115.885	0.490
HARTLEY TEST	1.475			

HYPOTHESIS PART OF MODEL GRP*TIME

ERROR PART OF MODEL TIME*CASES(GRP)

GRP		experime		control	
TIME		PRE	POST	PRE	POST
FREQ		16.0	16.0	13.0	13.0
CYL1	VARIANCE	30.183	30.183	16.856	16.856

VARIABLE CYL1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST	0.321	13	4.000	1.000
BARTLETT-BOX TEST	0.706	3	5111.586	0.548
HARTLEY TEST	1.791			

A-trait

HYPOTHESIS PART OF MODEL: GRP

ERROR PART OF MODEL: CASES(GRP)

GRP		experime	control
FREQ.		16.0	14.0
ATR1	VARIANCE	60.966	42.853

VARIABLE: ATR1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST:	0.587	14	2.000	1.000
BARTLETT-BOX TEST:	0.412	1	2320.166	0.521
HARTLEY TEST:	1.423			

HYPOTHESIS PART OF MODEL: GRP*TIME

ERROR PART OF MODEL: TIME*CASES(GRP)

GRP		experime		control	
TIME		PRE	POST	PRE	POST
FREQ.		16.0	16.0	14.0	14.0
ATR1	VARIANCE	3.241	3.241	3.633	3.633

VARIABLE: ATR1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST:	0.264	14	4.000	1.000
BARTLETT-BOX TEST	0.030	3	5583.551	0.993
HARTLEY TEST:	1.121			

HYPOTHESIS PART OF MODEL: GRP

ERROR PART OF MODEL: CASES(GRP)

GRP		experime	control
FREQ.		16.0	14.0
PHSF1	VARIANCE	62.216	19.786

VARIABLE: PHSF1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST:	0.759	14	2.000	1.000
BARTLETT-BOX TEST:	4.092	1	2320.166	0.043
HARTLEY TEST	3.144			

HYPOTHESIS PART OF MODEL: GRP*TIME

ERROR PART OF MODEL: TIME*CASES(GRP)

GRP		experime		control	
TIME		PRE	POST	PRE	POST
FREQ.		16.0	16.0	14.0	14.0
PHSF1	VARIANCE	5.099	5.099	2.616	2.610

VARIABLE: PHSF1

TEST	RATIO	DFH	DFE	PROBABILITY
COCHRAN TEST:	0.331	14	4.000	1.000
BARTLETT-BOX TEST:	0.977	3	5583.551	0.402
HARTLEY TEST:	1.954			

Appendix L Sample Subject Interviews

A. Interviewer (I): We'll just start off by getting you to give me some of your impressions about the program, positive, negative, what it meant to you.

Subject (S): It was a good program. I liked the strength-training, the weight-lifting part. What I didn't like was not any aerobics. I know my body type and for me to improve my body, I need activities that burn more fat. Otherwise, it was a good program. I enjoyed it.

I: What kind of things did you get out of it? You mentioned that you ... fat-burning that you wanted. Was there any ... did get that you ...

S: Actually, I enjoyed doing a lot of extra ... for socialization. I met a lot of neat girls through it . . . It got me doing ... I probably did well in school because of this.

I: ... you expand on that a little bit?

S: It got me more disciplined. I was more disciplined in going to the classes than I was in studying for some courses . . . I think it helped.

I: As far as your body goes, have you noticed any change ... all?

S: Before I started university, I was quite muscular . . . I'm getting back to my muscular strength that I was. I noticed a decrease in area. I think what a good idea would have been was to measure us . . . rather than build in volume, I toned down.

I: How did you notice that? What landmarks did you use?

S: Basically watching my body and the way certain clothes fit.

I: OK. Mirror and clothes tricks. Whereabouts did you notice the toning happening?

S: I really lost in my arms, my upper-legs and not so much in my hips, but it was in my buttocks, upper legs, and arms.

I: Good, good. Has there been any reaction because you were in a strength-training program from some of your "important others," whether it be family, friends, boyfriends, whatever?

S: Actually, everyone was <u>very</u> supportive about it . . . I'd get hints like let's see your arms, flex your arms, you know . . . everybody was supportive when I told them about it, they thought it was a good idea.

I: OK. How would it have been if you hadn't got much support . . . would that have

affected your enthusiasm?

S: Um, I don't think so. That's a "what-if" question. It's hard to say. Perhaps, it would have affected my attitude, but I'd still have gone. It would have biased my outlook towards the program, but I still would have gone.

I: OK, good. How about in terms of tension. Have you noticed any change one way or another? When I'm referring to tension, I'm talking about stress, anxiety, that type of stuff.

S: I think I'm mentally conditioning my body to relax more.

I: Unhuh. Do you see this as an outgrowth of weight-training or is this something you're doing on your own?

S: It's cumulative. I think it's weight-training and my outlook, my own personal readings and you know, that type of thing.

I: Has there been any changes one way or the other with that? Has it improved or decreased?

S: It's improved. I think I'm more relaxed around people. Like, in stressful situations I'm more relaxed, at ease.

I: OK. Am I reading you right? Is weight-training part of a holistic approach to it, is weight-training an integral part of it?

S: Yeah, everything helps.

J: How about your own apppreciation of your body . . . if you were going to rate your body on an acceptance level before and after, how would you rate it?

S: Oh, um . . . . Before I would have rated it unsatisfactory, lots of room for improvement. Now, I've seen that I can improve and there is still much room for improvement . . . I would say I accept my body quite a bit more. I might be less bashful about myself, able to take my mind off of worrying about how I look to others. Just be myself, know that I'm comfortable where I am and I know I can improve.

I: So do you feel more attractive now?

S: Um, attractive? Not necessarily, I would say it's psychological. Because a lot of people look at me and don't see a lot of changes, but I know the changes.

I: And that's important to you?

S: Yes.

I: OK . . . . How about in certain interpersonal situations . . . . You remember that last inventory we did on Monday was dealing with assertive behaviour, being able to give somebody a compliment, being able to stand up for your rights when you feel you shou[illegible]ave you noticed any qualitative changes, either positively or negatively, in the last three months?

S: Positively or anything. It's hard to say because university is a growing time. I've noticed ever since I started university, I've been constantly changing a little bit at a time. So it's hard to say whether or not the weight-training program was a big change or whether or not it was because I'm doing better at school than I have been before. So may be an increase in self-confidence about myself. It's really hard to take it apart but I'd say it helped.

I: OK, could you just list in terms of priorities, what you felt was the most important things you got from th[illegible]ogram and, if there's a flip-side to that, things that you didn't get? Just reverse it, if you know what I mean. Take time to think.

S: Overall, I think the greatest benefits was attitude. Looking at oneself and saying, "I can do this. I can improve myself," and that overflows into your self-image. It boosts your self-image. Everything's inter-related. It's hard to put a rating on it. I'd say overall it's an attitude change. The attitude change leads to a better self-image . . . I'd say number two, an increase in my self-image. I would say performance increased, number three, in all areas.

I: The strength part?

S: Yeah . . . just the actual working-out and knowing that I'm doing something to benefit myself, rather than just doing all the intellectual stuff at school. I'm actually doing something that I can see and it's going to live with me . . . . Number five would be meeting all the neat people that I did . . .

I: OK. That's interesting. No[illegible]mentioned that you would have liked an aerobic component. Was there any other things lacking that you would have liked to have got?

S: It's hard to say. My overall concern was not getting that aerobics activity . . . . I really can't think of anything else.

I: OK. . . . How has your sleep been? Has it been affected at all?

S: My sleep . . . . I found that I sleep much better. Come evening, I've found my body is more relaxed. And since the weight-training was in the evening, I came home, relaxed, watched T.V., and went to bed . . . I slept well, I would say.

I: OK. Are you a type of person who will get depressed from time to time and feel blue?

S: Oh yeah.

I: Did you notice any changes at all?

S: Actually, it decreased those moods. It increased my own self-image, my attitude. I'd sort of snap myself out of it. I'd go to weight-lifting sometimes and I'd be depressed. It would help to change that mood.

I: OK. That's good, that's interesting. I think we'll terminate this right now.

B. Interviewer (I): Maybe we can just start off by getting a few impressions of how you felt about the program. What it meant to you, either positively or negatively.

S: I enjoyed going to the sessions, sort of got the stress out. You know what I mean? But after awhile, going into an exercise program the motivation sort of tapers off. But overall, it was nice to meet people there and do that type of thing.

I: When you mentioned that you got the stress off for the day, can you expand on that?

S: I'm not sure, I could say it's from this, but even during the exams everything went really smoothly. Usually, I'm really stressful.

I: And you feel it was related to the weight-training?

S: Yes, I think so. I think I really felt the difference.

I: OK, good. You mentioned the motivation started to sag as you got further into it. When your motivation was down, were you still able to get a positive effect from the stress reduction. Were you still getting that or did that taper off too?

S: Like, I think that, in most cases, once I was there it was OK. It was just getting there. My classes ended quite early and to get there for 5:30 I'd have to wait around for so long. It would have been so much easier just to go home. That was the only thing. Once I was there, I don't think it really . . . my motivation wasn't a problem.

I: As far as the physical changes that have happenend, how has that made you feel about yourself?

S: To me, I found that my biceps and just my pectoralis majors changed a lot. Everything else, I haven't really noticed too much. I think, maybe, if I had dieted as well, I would have felt a lot better . . .

I: What about the increase in strength. Does that hold any significance for you?

S: Not in everyday life, no.

I: OK. You mentioned you enjoyed the social aspect of it. Could you expand a little bit more on what you meant by that?

S: Just meeting people, like . . . you're with your partner and in that way you got to know her better. And, I think it really helped a lot . . . doing those exercises, being friends with everybody else.

I: Is that from a motivational perspective?

S: Yeah, I think so. Like, when I was by myself, when my partner didn't show up it was easier to just go fast and not really . . . but when you have a partner there, it's a lot more motivating.

I: Umhum. Has there been any reaction by your friends and family to your participation in the program?

S: Oh, I think everybody has been really positive about it. Take my dad, he weight-trains and he's really happy. My friends gave me a lot of positive reinforcement.

I: Has that changed the context of your relationships to any degree at all?

S: No, not really.

I: How about your sleeping patterns? Has anything changed in that regard? Or, how have they been anyway?

S: Oh, I think I fall asleep really easily. Now I get home rally late. I g[redacted]bout 8 - 8:30 and I do some homework and I fall asleep really quite easily. W[redacted]efore, I don't think I did. I didn't have very good sleep patterns.

I: OK. Are you the type of person who gets depresed every so often about things and starts feeling blue?

S: Sometimes, yeah.

I: How's your depression been in the last three months? Have you had very many bouts? What's it been like as opposed to before that?

S: I think it was about the same actually.

I: OK. One of the questionnaires we did the other day dealt with assertive behaviour and they mentioned a variety of different contexts of assertive behaviour. One might be standing up for your rights when somebody's pushing you around or taking advantage of you. An[redacted] type might be being able to express your emotions to someone, being ab[redacted] to compliment someone, that sort of thing. Not being guarded in that way. Assertive behaviour is sometimes incorrectly identified as aggressive behaviour, which it isn't. Just bearing that in mind, how do you classify yourself in terms of what type of behaviour?

S: For - like, say emotions - I will tell my emotions but I find it . . . like to the person I'm angry with, I will tell them but I'll feel really uncomfortable about doing it. I

don't feel bad because I feel I've been hurt myself. But things like being pushed around, I think maybe I let myself be pushed around a little bit too much. And what was the other case?

I: Basically, being able to compliment someone. Being able to express those types of emotions to people.

S: I don't think I'm afraid to compliment somebody.

I: Umhum, OK. Are you afraid to put your own feelings out on a limb? For example, asking somebody to go out on a date or a meeting, where the chance of rejection might enter into things. How do you cope with those sort of things?

S: I think I would feel quite uncomfortable about asking for a date. I don't think I would. I don't think I'd risk it.

I: Or a situation where you might express an opinion which was contrary to what other people were saying. How would you feel about that?

S: It would depend on who I was with. I would probably be able to if I felt comfortable with them. But if I thought it might hurt their feelings, I might not.

I: Knowing now what is meant by assertive behaviour, have you noticed any kind of qualitative changes, one way or the other, since the beginning of the study?

S: Maybe just realizing it more. I don't think I've really changed my behaviour, but at least I realize that maybe I should say something in certain situations.

I: Why do you think you've started realizing that?

S: I think, you know, thinking about the survey--the questions that were asked. There was many cases during the year where I'd think back to the survey and compare my actions or my thoughts to it.

I: OK, just switching gears here . . . how do you feel about your body? On a scale of 1-10, how did you feel about yourself before starting the program and how do you feel after completing it?

S: I'd say before going in maybe about a six, and coming out of there maybe just a seven. I think I should have dieted a little. Then maybe I would have felt a lot more . . .

I: OK. You've mentioned there was some little enhancement about how you feel about your body, in what particular area did you feel you had improved?

S: In my arms and my pectoralis major.

I: Is that from a visual perspective or a functional one, as far as being strong?

S: It wasn't a functional one. I think it was just mostly I'll feel it or look in the mirror. But I haven't used any real strength in everyday life.

I: So, would it be fair to say for you to make real noticeable changes about how you feel about yourself physically, it would be to lose some weight and to tone up, as opposed to gaining strength?

S: Yeah.

I: So strength isn't high on your list of priorities?

S: No.

I: I'm not putting words into your mouth?

S: No.

I: OK. How have you got along socially lately? Has there been any changes in the last three months in terms of meeting people and going to parties, etc.? Are you more comfortable, less comfortable . . .

S: I don't think there is any difference in that.

I: What about from an ethical perspective? Do you feel you're a better person now, a worse person . . .

S: I think I feel a little bit better about myself.

I: Do you know why?

S: Maybe from getting balance, both doing work and getting exercise, plus a social life. It feels a little more rounded than before.

I: Good. Some people have mentioned that one of the things that they got out of the program was a sense of self-discipline. Is that valid for you?

S: I don't feel that it took a great amount of discipline, so I don't think I really found it rewarding.

I: OK, that's quite interesting. Is there anything else you'd like to add with respect to the program that we haven't touched on so far.

S: No, I don't think so.

I: OK, good enough. That's the end of the interview.

Appendix M Subjective Data

a. Variable	Subjects Expressing Improvement	Subjects Expressing Deterioration	Subjects Expressing No Change
1. Anxiety	16	-	
2. Assertion	7	-	9
3. Self-image			
Visual	11	1	3
Functional	9	-	-
Both	4	-	-
4. Depression	3	-	8
5. Self-esteem	7	-	-
6. Self-discipline	5	-	1
7. Sleep	7	-	2
8. Energy	5	-	-

b. Variable	Valued It	Didn't Value It	Didn't Mention It
Social Environment	11	1	4

c. Variable	Positive Support	Negative Support	Couldn't Say
Group Support	14	1	1