THE EFFECT OF A PHYSICAL CONDITIONING PROGRAM
ON PHYSICAL FITNESS AND HEALTH LOCUS
OF CONTROL AMONG ADOLESCENT
SUBSTANCE ABUSERS

DISSERTATION

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

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DOCTOR OF PHILOSOPHY

By

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The purpose of this investigation focused on determining the effects of a physical conditioning program on physical fitness and health attitudes on inpatient adolescent male substance abusers during and following participation in a six week fitness program. The fitness measures chosen for this study were the 1 1/2 mile run, skinfold, sit-and-reach, and grip strength. The first four of these measures make up the AAHPERD test battery (AAHPERD, 1980). The Health Attribution Test (Lawlis and Lawlis, 1980) was administered to determine health locus of control.

Forty-four inpatient male subjects were randomly selected from the Vernon Center for adolescent drug abuse treatment. Subjects selected were within the age range of 13 to 18 years and were randomly assigned to one of two groups of twenty-two subjects. Group I, the experimental, and Group II, the control, received pre-test measures prior to the initiation of thirty training sessions for Group I. The training sessions included cardiovascular, strength, and flexibility activities. Experimental and control groups received all
currently prescribed treatment offered by the Vernon State Center.

A two-factor mixed design with repeated measures on one factor was employed for analysis of data. The five fitness measures were analyzed through the use of a 2 X 4 factorial analysis of variance and the health attitude measures with a 2 X 3 factorial analysis of variance.

Conclusion of the study indicated that a fitness program of as short as four weeks can produce significant changes on measures of physical fitness for adolescents whose initial performance was below normal on selected measures of health related fitness. Fitness training was recommended as an integral part of a drug treatment program for adolescent substance abusers for improving specific levels of physical fitness and selected attitudes toward health.
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CHAPTER I

INTRODUCTION

The ever increasing body of knowledge, concerning one of society's oldest and greatest enigmas, affords an opportunity for a preventative approach to the reduction of alcohol and other drug related problems. Recent efforts at developing an optimal, humane treatment model for the alcoholic have substantially advanced societal concepts of alcohol abuse from the early "temperance" movement in the mid-1800's (Rubin, 1979). Contemporary trends and pragmatic methods have improved the outlook for the adult alcoholic while demographic data explicitly identify a noticeable increase in drug related problems for the adolescent population of the United States (Carlin, Stauss, Grant, & Adams, 1980; Alterman & McLellan, 1981; O'Conner, 1977; and Wechsler & McFadden, 1979). These concommitant problems of adolescent drug abuse have greatly increased the urgent need for scientific investigation relative to determining a comprehensive approach at resolving a complex social problem.

In relation to the world community, the United States per capita consumption of alcohol in numbers of problem drinkers is extraordinarily high (Martin, 1976). A national survey was conducted by Donavan and Jessor (1978) of 15,000
randomly sampled seventh through twelfth grade adolescent youths. Self-administered questionnaires were analyzed for purposes of identifying problem drinkers. Problem drinking was viewed as an indicator of a more general behavioral syndrome which included a proneness for other drug misuse as well as pre-delinquent activities.

Gideon (1976) estimated 10 million adults and 3.3 million teenagers are identified as problem drinkers in the United States. He projected that each of these individuals would impact a minimum of four other persons. Approximately 50 million Americans are adversely affected by alcohol. In 1975, more than 95,000 deaths were either directly or indirectly attributed to excessive alcohol consumption (Noble, 1978).

Certain basic realities must preface a discussion of alcohol and drug related problems. A highly technological society has enhanced the quality of life, fostered acceptance of social drinking and significantly escalated the prevalence of human affective problems. Chronic excessive use of a myriad of drugs for self-medication, while toxic to the system, continues an upward trend according to Noble (1978).

The substance abuser frequently suffers from degenerative conditions, liver damage, malnutrition, hypertension, diabetes, neurological disorders, and muscular atrophy directly attributable to drug abuse. This individual manifests a higher incidence of disorders and negative
consequences attributed to a sedentary lifestyle including obesity, hyperlipemia, and the onset of coronary artery disease in early adulthood (Gettman, 1980; Cooper, 1980).

Numerous studies have exemplified the positive impact of exercise in improving the health of individuals not known to be substance abusers (Pollock, 1973; Pollock, Miller, Janeway, Linnerud, Robertson, & Valentino, 1971; Saltin, Blomquist, Mitchell, Johnson, Wildenthal, & Chapman, 1968; Cooper, 1977; Amsterdam, Wilmore, & DeMaria, 1977). Current drug treatment programs seldom include a component of exercise (Freeman, 1980; Pursch, 1980). Freeman theorized rehabilitative programs with no physical conditioning or physical rehabilitation evidence high recidivism rates. The imperative need for developing and maintaining a physically healthy individual from the earliest stage of drug recovery constitutes a documented necessity. Improved physical conditioning facilitated through an individualized exercise program may substantially enhance the rehabilitation prognosis for the individual thus strengthening the effects of other recovery techniques. Sound rehabilitation programs foster successful aftercare programs which sustain the recovering drug abuser for a longer time (Freeman, 1980).

Problem

A paucity of specific directive information relative to establishing effective physical conditioning and physical
rehabilitation programs for the adolescent inpatient substance abuser currently exists. This study examines physical and attitudinal effects of a specific individually formulated and prescribed physical fitness program for subjects identified as adolescent inpatient substance abusers.

Purpose

The primary purpose of this study focused on determining the effects of a physical conditioning program on physical fitness among inpatient adolescent male substance abusers following participation in a six week fitness program. Data analysis quantified the effects of a specific physical fitness program on five measures of physical fitness.

The secondary purpose of the study was to determine the specific effects of a six week fitness program on the attitudes of inpatient adolescent male substance abusers with regard to personal health habit attitudes, health locus of control, as measured by the Health Attributes Test (HAT). Pre and post-treatment analysis measures discerned significant attitudinal variance affected by participation in the six week fitness program.
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

While the definition of drug and alcohol misuse (alcoholism, substance abuse, drug abuse, etc.) are as numerous as the books and articles devoted to the subject, authorities agree drug usage becomes misusage when it impairs the physical, mental, or social functioning of the drug user. This misuse may be of an infrequent occurrence, chronic nature, or in combination at different intervals of an individual's life. The drug of choice varies from the use of one to several different drugs used concurrently. Desired effects range from therapeutic to suicidal. The misuser may be the medical professional or any individual representing a multiplicity of variance in age, ethnic background, and social status (Kandel, Adler, & Sudit, 1981; Jacobs & Gottenborg, 1981; Sowder & Burt, 1980; and Backman, Johnston, & O'Malley, 1981). The major contingencies in selecting from various drug choices for purposes of abuse are availability, legality, and specific clinical effect for altering behavior (Noble, 1978).

The approach for a review of the literature is to initially review drug abuse from a traditional disease-
oriented viewpoint. The underlying basis and assessment subdivisions will primarily investigate the effects of various drugs on the individual, specifically similarities and differences, and diagnosis of drug-related behavior. The final sections of the review of literature will assume a more contemporary approach through a presentation of current preventive treatment methods.

Underlying Basis

Problems Specific to Alcohol

During the past century, society has evolved through days of prohibition when "temperance" was primarily viewed as a moral decision challenged by individuals who elected to indulge in alcoholic beverages resulting in their concomitant guilt and societal chastisement. Rehabilitation of the alcohol abuser during this era was highly frowned upon by the existing temperance groups (Rubin, 1979). Since the early days of the century, numerous myths have been identified (Girdano & Girdano, 1973; Gideon, 1976) and a more humanistic approach to alcohol-related problems is now widely espoused (McDonald, 1976; Orford, 1978; Steiner, 1971).

Pragmatic and humanistic attitudinal approaches of this era have facilitated the provision of treatment and assistance for the problem drinker without chastisement, moral judgement, or guilt for those receiving services. The
opportunity for friendship, solace, and direction afforded by Alcoholics Anonymous provided the single most stabilizing factor throughout the development of society's present acceptance of the problem drinker (Glasser, 1976).

Reviewing knowledge within the framework of current attitudes relating to the problem drinker mandates discussion of treatment recommendations that represent an enlightened, contemporary approach to solving human problems. A framework reflecting an enlightened, contemporary approach is exemplified in the guidelines recommended by the Third Special Report to the U.S. Congress on Alcohol and Health (Noble, 1978). Noble points out that the initial step in preventive programming is focused on determining what problems need to be prevented in order "to reduce the negative consequences of drinking" (p. 93). The following five general areas of problems were suggested and will be utilized for the purpose of this study:

"chronic illness or disability resulting from prolonged excessive drinking;

acute health problems related to a specific drinking bout;

injuries, death, and property loss caused by accidents and crimes related to drinking;

failure of the chronic excessive drinker to fulfill his or her role in the family or on the job; and

mental problems, such as depression and anxiety, related to drinking" (Noble, 1978, p. 93).
Chronic illness or disability.—In animal studies of the fetus as well as the parents, radioactive ethanol was found to be present in almost all tissues of the body (Fabre, 1976). This type of research has indicated a more pervasive medical problem than was originally believed. The most far-reaching, deleterious effects seem to be related singly to a depressant effect or in combination with cell damage of the central nervous, cardiovascular, and metabolic systems.

Since cell damage to the central nervous system (CNS) produces effects in cognitive, motor, auditory, speech, limbic (mood), pituitary, and vital control centers of the brain, concomitant changes are evidenced in other systems within the body. Chronic effects are most noticeably negative in the areas of sleep disturbances, loss of memory, tremors, seizures, general encephalopathy, auditory hallucination, and ataxia from cerebellar degeneration (Sharma, 1976; Charalampous, 1976; Hill & Reyes, 1978).

Grant, Adams, and Reed (1979) note that no definitive "dose effect" relationship exists between alcohol and cognitive decline. Other research studies suggest, however, that it takes up to two months to ascertain if this decline is reversible after abstention (Grant, Mohns, Miller, & Reitan, 1976; Carlen, Wortzman, Holgate, Wilkinson, & Rankin, 1978; Hill, Mikhael, Carlen, Wilkinson, Wortzman, & Holgate, 1979; "Alcohol Brain Damage," 1979) or permanent (Grant, Mohns, Miller, & Reitan, 1976; Grant, Adams, Carlin, Rennick, Judd,
Schooff, 1978; Grant, Adams, Carlin, Rennick, Judd, Schooff, & Reed, 1978). The adverse, synergistic interaction with other prescribed and non-prescribed depressant drugs compound the problem of alcohol-induced damage (Labianca, 1978; "Liquor May be Quicker," 1979).

Marsden (1976) views nerve damage, as observed in acute neuropathy as the most problematic issue. He points out that approximately 10 percent of all chronic alcoholics have peripheral neuropathy as well as many behavioral and physiological problems.

Neurological disorders that can be either primarily or secondarily attributed to misuse of alcohol include alcohol chronic brain syndrome, Wernicke's syndrome, Korsakoff's psychosis, alcoholic pellagra, and cerebellar degeneration (Smith, 1977). Research oriented controversy concerning the exact relationship of alcohol and neurological diseases coincides with a general consensus that many of the problems are caused by alcohol-induced malnutrition.

Alcoholic cardiomyopathy may occur as a direct effect of alcohol or indirectly in combination with malnutrition. This disorder at one time was attributed to a thiamine deficiency and termed beriberi. Burch and Giles (1971) surmised that this misunderstanding probably did more than any other event to delay recognition of the role of alcohol as a cardiac toxic agent.
In a study conducted by Pader (1973), 100 nutritionally sound patients, varying in age from 28 to 64 years, with a history of excessive alcoholic intake, were given a complete physical examination consisting of urinalysis, blood analysis, chest x-ray, and a resting electrocardiogram (ECG). Clinical heart disease was found in 3 patients and heart rhythm disturbances in 23. Cooper (1977, 1980) and Kugler (1978) concurred with Pader reiterating the high risk and implicit danger of coronary heart disease from excessive use of alcohol.

Two studies of heart disease in chronic male alcoholics (Frederiksen & Hed, 1958; Pader, 1973) noted many cardiac abnormalities diagnosed during the administration of a resting electrocardiogram (ECG). Frederiksen and Hed observed 66 normal ECG readings from the recordings of the 121 alcoholics ranging in age from 20 to 40 years. These researchers projected the predominant cause of the cardiac abnormalities was probably cardiac lesions related to either Vitamin B₁ or protein deficiencies. Pader's study focused on 100 male chronic alcoholics, varying in age from 28 to 64 years, finding cardiac abnormalities in 23 of the subjects. He classified his subjects as being well-nourished and suggested the probable cause was related to toxic changes in the heart muscle due to the negative effects of alcohol on the contractile properties of the myocardium.
Dupuis et al. (1978) studied 50 children under 4 years of age born to alcoholic mothers, each exhibiting symptoms of heart defects. The authors suggest environmental factors were probably linked very closely to genetic factors in determining fetal alcohol syndrome (FAS) and accompanying cardiac myopathies.

Burch and Giles (1978) explored the association of hypomagnesemia and decreased potassium in skeletal muscle with cardiomyopathy. Their study noted numerous alcohol-related causes of magnesium depletion. Increased urinary excretion of magnesium, vomiting, diarrhea, and cirrhosis of the liver were medical conditions noted as causal factors. Administration of magnesium reversed a significant number of ECG abnormalities.

Lieber (1976) authored an extensive and scholarly discussion on the metabolism of alcohol. He emphasized over consumption of alcohol as a primary cause of malnutrition, frequently resulting in cirrhosis of the liver and possibly death. Alcohol and its chemical properties disturb liver metabolism and damage the liver cells. Three basic stages of metabolism occur following minimal or safe levels of alcohol consumption. Initially, the breakdown of alcohol (ethanol) to acetaldehyde and hydrogen proceeds next to the oxidation of acetaldehyde into acetic acid. Acetic acid is then broken down to carbon dioxide and water. During periods of excessive alcohol intake, the metabolic processes are
disrupted and an abundance of hydrogen and acetaldehyde is produced. The convergent affects of these processes contribute to noninfectious hepatitis. Hepatitis culminates in possible cirrhosis, hepatic coma, excess back up of fluids in the abdominal cavity, and ruptured veins within the liver area (Lieber, 1976; Smuckler, 1975; Prud'homme, 1980).

The difficulty in identifying the effects of alcohol toxicity and alcohol-related or unrelated malnutrition was exemplified in a study by Roe (1979). Normal testosterone metabolism was noted as being adversely affected by a decrease in male hormones and subsequent visible feminization (Rubin, Lieber, Altman, Gordon, & Southren, 1976). Stankushef & Razboynikova (1975) in a comparable study of 87 alcoholic women and 80 alcoholic men found masculine traits in the character as distinctive personality peculiarities of alcoholic women. Whether the traits preceeded or were a consequence of alcoholism was not determined. Additionally, in a recent study of 97 heavy drinkers (Nicholson & Paton, 1979), with no known history of diabetes, liver biopsy and glucose tolerance tests were administered. Results of the tests indicated that over half of the subjects had abnormal glucose tolerance and approximately a quarter had a diabetic response. Chronic pancreatitis was another disorder directly and indirectly related to excessive alcohol consumption (Kissin, 1979; Charalampous, 1976).
Fetal alcohol syndrome (FAS) is a disorder affecting the fetus and may be the most damaging medical problem directly attributed to alcohol abuse by the mother. In a study conducted at the University of Washington (Roe, 1979), one-third of all infants born to women who were chronic alcoholics exhibited FAS and approximately one-half suffered from various degrees of mental deficiency. Features of FAS include increased incidence of prenatal mortality, growth retardation, malformations, cardiac defects, and brain abnormalities (Streissguth, 1977; Robinson, 1977; Roe, 1979; Brown, Goulding, & Fabro, 1979; Witti, 1978; Colen, 1975).

Fetal alcohol syndrome is the third leading cause of birth defects and the only preventable of the three (Noble, 1978). The educational community must respond to the distinct inference that minimal brain dysfunction (MBD), a disorder which affects between 5-10 percent of school age children, may be a subtle variance of FAS (Noble, 1978).

Age, sex, race, religion, nationality, and educational background must be eliminated in discussing a preponderance for alcoholism. Numerous studies have attempted to isolate factors which initiate, promote, and maintain problem drinking.

Cartwright & Shaw (1978) and Youcha (1978) state that increased production and availability of alcohol elevate the number of problem drinkers. Other authors explored the relationship of alcoholism in fraternal and identical twins
(Noble, 1978), and parenting patterns of both biological and adoptive parents (Hays, 1976; Bohman, 1977). Subsequent studies focused on the correlation between patterns of college and high school student histories of drinking (Wechsler & McFadden, 1979). Specific related attributes of adolescents include student status, truancy, poor scholastic achievement, little or no church participation, inadequate parental control, use of illegal drugs, and employment as associated with substance abuse (Donovan & Jessor, 1978; Schlegel & Sanborn, 1979; Hayes, 1976; O'Conner, 1977; Wechsler & McFadden, 1979; Martin, 1976).

Wechsler and McFadden (1979) surveyed 7,000 randomly-selected, New England college students over five states. Men were noted as drinking more frequently than women, with beer as the beverage of choice. Less than 2 percent of either sex worried about their drinking. Fifty percent of Asian-Americans are abstainers, light or infrequent drinkers as compared to 33 percent blacks and 18 percent whites. Fewer Protestants and Catholics drink alcoholic beverages than Jews but tend to be heavier drinkers. More drink among the upper social class than middle and lower class, but fewer are problem drinkers.

Chronic use of alcohol evidences a correlation with the incidence of cancer (Noble, 1978; Gideon, 1976; Charalampous, 1976; Keller, 1977). In a recent study, these authors chose to explore the effects of pure ethanol on the development of
mammary adenocarcinoma in mice. The study indicated a higher incidence of breast cancer in the ethanol-fed group than in the control group (Schrauzer, McGinness, Ishmael, & Bell, 1979).

**Acute health problems.**—Cross-tolerance of alcohol with other drugs constitutes a critical state necessitating progressively larger doses of each to reach the desired effect. As a result, an estimated 47,000 persons are treated in hospital emergency rooms annually for drug toxicity, with 2,400 observed fatalities ("Liquor May be Quicker," 1979; Rockaway, 1976).

Contemporary authors researching the progressive effects of alcohol, as consumption of alcohol increases, have concentrated their endeavors on behavioral changes (Kissin, 1970; "Alcohol, Some Questions," 1979; Sharma, 1976). Initially, alcohol affects the higher centers of the cortex impairing learned behavior. The individual first exhibits uninhibited behavior. Alcohol progressively works toward lower centers in the brain stem causing temporary impairment of memory, judgment, muscle coordination and balance. Excessive consumption severely impairs judgment and sensory functions, may depress heart and respiratory centers possibly resulting in coma and death. On each of these differing levels, observation of the consequences of alcohol on the non-problem drinker and the alcoholic may encompass quarrels,
drownings, and an increase in heart rate with possible heart attacks. Noble (1978) refers to the latter problem as "holiday heart syndrome" (p. xiii). Khetarpal and Volicer (1979) state the incidence of high blood pressure among alcoholics, while not directly related to alcohol, may accompany nutritional deficiency, particularly pyridoxine deficiency, and obesity found in conjunction with alcohol intake.

In a study conducted on six adult male non-problem drinkers (Squires, Chu, & Starr, 1978), auditory brainstem potentials were recorded after each had reached a level of moderate intoxication as indicated by slight slurring of speech, dizziness, slight ataxia, and joviality. The results demonstrated that alcohol produces a depressant effect on the primary auditory pathway as well as other brainstem structures since "signs of brainstem dysfunction such as dizziness, unsteady gait and nystagmus are prominent in both acute and chronic alcohol intoxication" (p. 175). In a similar study of the effects of ethanol on cats (Sutko & Weinberger, 1979), the authors discovered specific structures of the brainstem were affected as quickly as the cortex.

Two studies (Valeriote, Tong, & Durding, 1979; Linnoila, Erwin, Cleveland, Logue, & Gentry, 1978) supported the finding that alcohol has more effect on the non-dominant side of the brain. Minor sex-related differences were observed on psychomotor performance.
Injuries, death, and property loss.—As an indirect cause, alcohol accounts for one-third of motor vehicle injuries and one-half of all motor vehicle fatalities. Of drivers arrested for driving while intoxicated (DWI), 37 percent were identified as alcoholic and 48 percent had serious drinking problems (Noble, 1978). Noble further relates startling statistics of accidents, deaths, and crimes related to alcoholism as follows: 47 percent of industrial injuries and 40 percent of fatal industrial accidents; 44 percent of noncommercial pilots who were involved in crashes; 69 percent of drownings; 83 percent of fire fatalities and 62 percent of all burns; 70 percent of fatal falls and 63 percent of injuries from falls; 72 percent of robbery; 50 percent of sex offenders; 72 percent of assault offenders; 86 percent of homicide offenders and 40-60 percent of the victims; 64 percent of suicide attempts; 33 percent of successful suicides; and 65 percent of child abuse cases. The innocent bystander may fall victim to quarrels and other social atrocities.

Role in family and job.—In Keller's survey (1977), of 14,000 students grades seventh through twelfth, 92 percent of high schoolers had been introduced to alcohol or other drugs. As early as the seventh grade, 63 percent of boys and 54 percent of girls have experimented with drugs. O'Connor (1977) reported the first drink was usually beer and
was consumed in the home. Reasons given for the first drink were "curiosity about drinking," "holiday or special occasion," or "being offered a drink by their families" (p. 280). While original rationale may be very normal for the adolescent and even expected as a part of the adolescent's attempt at identification with adulthood (Rockaway, 1976), Wechsler and McFadden (1979) stated that among 7,000 college students questioned in New England, the single most important indicator of heavy drinking during college was introduction to drinking at an early age.

Jacob, Favorini, Meisel, and Anderson (1978) reviewed 16 studies relating to children of alcoholic parents and concluded that children of alcoholic parents exhibit significant difficulties in psychological, social, and family functioning. Hecht (1977), emphasizing the plight of children in a problem-drinking environment, states that "in the alcoholic family with its skewed communications and roles, the child has to make sense of what is often an irrational situation" (p. 197).

Numerous professionals in the field of alcoholism concur in stating the problem drinker can be either the result or cause, or alternately both, of a complex set of problems within the family unit (Pursch, 1980; Jacob, Favorini, Meisel, & Anderson, 1978; Steiner, 1971; Youcha, 1978; McCurdy, 1976). Glasser (1976) philosophically states this breakdown in the family unit can be attributed to an
inability of members of the unit to obtain "love and worth." The lack of support in providing basic needs, the resultant disruption that the problem drinker causes in the family unit, and the cultural attitudes that reflect our current stressful, mobile, competitive society have been researched extensively (Freemesser, 1976; Noble, 1978; Jacob et al., 1978; Martin, 1976).

Contrary to myth, the alcoholic is usually not a "skid-row," non-attached individual. This individual is a member of a once functional family unit that has evolved as a non-functional or partially functional unit in critical areas of financial, occupational, mental, and physical aspects. Pursch (1980) expressed this whole-family problem concept by the term "co-alcoholic" and acknowledges that the underlying causes can be the result of any or all of the members of the family unit and all members need help.

Mental problems.—Anxiety and depression are accepted as causal factors of drug abuse, as well as maintenance factors (Dengerink & Fagan, 1978; Coleman, 1973; Toombs, 1976). Exploratory studies have demonstrated that depression and anxiety, substantial impact factors in the abuser's life, are compounded by the drug problem.

Dengerink and Fagan (1978) conducted an analog study with 30 undergraduate men at Washington State University. The subjects were divided into three groups. One group
received high-dose alcohol, the second group, low-dose alcohol; and a third, a placebo. The subjects were to report their level of intoxication on a scale. Subjects rated their level of anxiety following a preliminary shock. The study concluded:

... alcohol consumption results in sustained high levels of anxiety (self-report), has no effect on a behavioral measure of anxiety (the choice of immediate vs delayed shock), increases levels of emotional arousal (heart rate), and increases responsiveness (skin conductance level and response) to aversive stimulation. (p. 535)

Other feelings or mental problems that perpetuate the problem of drug abuse are, hostility, feelings of helplessness, low self-esteem, poor impulse control, sexual dysfunction, frequent errors in judgment, inability to express pain, shame, anomie, unresolved dependency, and role confusion (Toombs, 1976; McDonald, 1976).

**Other Depressants**

The development of a true addiction, which must include the development of physical dependence and tolerance, constitutes the major risk of all CNS depressants including alcohol. Recognizing that both CNS stimulants and depressants may cause psychological dependence, or habituation, stimulants rarely develop into a "true" addiction. Although the actual mechanism for producing physical dependence is not well defined, cells of the human body become dependent on a drug as evidenced by withdrawal symptoms or abstinence
syndrome, appearing when the drug is abruptly removed. Withdrawal symptoms generally include irritability, emotional depression, extreme nervousness, abdominal pain, nausea, delerium tremens, and convulsions (Jones, Shainberg, & Byer, 1973).

Withdrawal symptoms vary from mild to severe and are relatively high in incidence of death when delerium tremens (DT's) and convulsions occur. Jones, Shainberg, and Byer (1973) identify the critical danger of withdrawal from depressants as one of the prime reasons this type of drug exhibits a more severe potential hazard profile than do stimulants. The inherent danger of drug tolerance is greater in CNS depressants than CNS stimulants. Tolerance to a drug is evidenced as the user takes larger doses to maintain the desired effect. Tolerance is a phenomena observed when the body adapts to various drug levels producing an extreme danger as larger doses approximate a lethal dose. Increased self-dosage may culminate in accidental suicide.

Barbiturates are sleep-producing drugs that have many similarities to alcohol in therapeutic dosages. The primary impact derived from sedatives depresses the cells of the reticular activating system (RAS) which induces sleep. The implicit health dangers include addiction, withdrawal symptoms, and accidental suicides. Polydrug usage involving sedatives in combination with alcohol or other drugs creates a dangerous physiological condition. Recent studies relating
to polydrug usage indicate this type of drug abuse frequently simulates psychiatric illnesses (Grant et al., 1978). Carlin's research exploring dangerous combinations identified alcohol, opiates, and depressants (1980). Grant and Judd (1976) concluded neuropsychological impairments as measured by an EEG were common among individuals with a history of combined drug misuse. Medical supervision was established as a critical factor in successful treatment of sedative misuse.

Tranquilizers were discovered as a replacement for what was thought to be the more dangerous sedatives. When contrasted with sedatives, tranquilizers are safer, but misuse or large dosages can still lead to addiction. Long-term effects may include drowsiness, blurring of vision, skin rash, tremors, and occasionally, jaundice (Calhoun, 1977).

Marijuana has not been established as an addictive drug. Physical dependence and tolerance therefore may not be a problem. Psychological dependence was suggested as a moderate problem by Calhoun (1977). Short-term effects produce slowed reaction time, decreased steadiness of hand and body, distorted visual and time perception, lowered intelligence test scores, and sleepiness (Girdano and Girdano, 1973). Physiological symptoms regularly attributed to marijuana are reddened eyes and a temporarily increased heart beat. Presently, while it seems evident that marijuana does not have the inherent dangers of other depressants, the
harmful aspects continue to be the topic of concentrated research.

The therapeutic usage of narcotics is for severe pain and diarrhea. Misuse evolves as the individual searches for a euphoric state. Narcotics have the identical dangers of alcohol and sedatives as a tolerance and physical dependence can develop. Approximately 90 percent of all narcotic addicts are addicted to heroin. The physiological symptoms on the CNS are virtually identical to alcohol and barbiturates. Since the addict often injects narcotics directly into the circulatory system, there is an increased potential for overdose. Long-term addicts, as the victims of nutritional deficiencies, are usually emaciated and suffer from constipation (Calhoun, 1977).

**CNS Stimulants**

Stimulants frequently used include amphetamines, cocaine, nicotine, and caffeine. The most dangerous in this group of drugs are the amphetamines. While stimulants do not produce a physical dependence, there is a high incidence of developing tolerance and a psychological dependence (Calhoun, 1977). Overstimulation of the CNS for prolonged period of time results in restlessness, irritability, weight loss, and at times toxic psychosis. The major dangers arising from misuse of stimulants are hepatitis which accompanies unsterile injection, liver and brain damage associated with
toxic amounts, and increases in abnormal heart arrhythmias and blood pressure (Jones, Shainberg, & Byer, 1973). When stimulants are used in conjunction with alcohol, the combined effect may produce either antagonistic or synergistic action depending on whether alcohol is releasing inhibitions or exerting a depressant effect (Department of Health, Education and Welfare, 1979).

LSD (lysergic acid diethylamide) is a synthetic drug also known as an hallucinogen. Its original purposes were to increase creativity and combat mental illness. The chief dangers to the misuser are adverse psychological phenomena causing impairment in judgment and in some cases depression leading to suicide (Eddy, Halbach, Isbell, & Seegers, 1970). While there is no evidence of physical dependence, a tolerance is developed which can lead to overdose. Research indicates that LSD exerts an antagonistic action on the neurohormone serotonin, which may be responsible for an inhibiting effect on the brain and brain stem (Girdano & Girdano, 1973).

Anti-depressants act by blocking a metabolic route, monoamine, allowing nerve cells to react for prolonged periods of time and thus increasing the stimulating effects. The overall effect is mood elevation, while a potential problem is a masking effect obscuring problems causing depression. Anti-depressants are capable of re-energizing the person, while the problems of conflict are unresolved and in acute depressive states the probability of suicide remains, even
though the drug state would seem to indicate a happy energetic person (Jones et al., 1973).

Numerous chemicals possessing no known therapeutic effect are used to get "high." Misuse of glue, gasoline, solvents, nonprescription sedatives, and an ever increasing variety of household chemicals poses potentials for extensive damage to the CNS, liver, kidney, and other body organs. Research delineating specific information in this area of drug abuse presents obvious complexities to the serious scientist (Girdano & Girdano, 1973).

Assessment

Diagnostic and evaluation techniques used to determine the extent and origin of a drug problem mandate thorough tests in each of the areas of physiological, clinical, and behavioral analysis. Development of drug tolerance may be ascertained specifically through blood analysis isolating the presence of certain drugs coupled with a profile of daily usage. The physiological determinations required include physical dependence which would be reflected by withdrawal symptoms. Withdrawal symptoms include gross tremor, hallucinations, seizures, and delirium tremens. Blackouts are a strong indicator of alcoholism.

Khavari, Farber, and Douglass (1979) state an important determinant of clinical problems is usually dosage level of the specific misused drug. Blood or urine measures (Connell,
1977) may determine dosage in combination with interview questionnaires. Evenson, Holland, and Cho (1979) reported results from 6,000 alcoholics on a self-administered twenty-item test aimed at measuring the severity of alcoholism. Their assessment indicated considerable overlap with the assessment scales adopted by the National Council on Alcoholism (Mendelson & Mello, 1979). In his longitudinal, descriptive research, Marlatt (1976) continues delineation of much needed improvements based on the development of an alcohol and drug abuse profile which will assist the physician in determining daily dosages and drugs abused.

Another determinant specified by Khavari et al., (1979) of clinical problems are health problems or illnesses frequently associated with particular drugs. Those frequently encountered are hepatitis, cardiac myopathy, liver damage, disease of the central nervous system, and kidney damage.

The NCA Scale, Marlatt Scales, and the scale proposed by Heineman and Estes (1977), all address the importance of assessing "behavioral" components of drug misuse. The primary determinant in the behavioral area is the degree of loss in control over the misused drug. An indication of loss of control would be evidenced if the substance abuser continues to use a drug at the risk of losing health, family, job, and freedom despite knowledge of these consequences (Pursch, 1980). Personality disorders related to drug misuse
have been shown to differ between sexes (Stankushev & Razboynikova, 1975) and often masks psychotic behavior (Grant & Judd, 1976).

Treatment Stratagem

The scope of this study centered on the adolescent substance abuser. A theoretical approach to treatment was one of prevention of problem behaviors which precipitate or result from the misuse of drugs. The first three sections of literary review address the prevalence of a myriad of drug-related problems and the diagnosis and assessment of these problems. This section will concentrate on attitudes, health habits, and environments conducive to prevention of problem behavior in the adolescent substance abuser.

Positive Health Attitudes

Unhealthy behaviors or life styles are responsible for an excess of one-half of deaths among the American population. Stroke, heart disease, emphysema, cirrhosis of the liver, diabetes, and accidents are included in the ten major causes of death and can be linked directly or indirectly to lack of exercise and the individual's eating, drinking, and smoking behaviors (Lawlis & Lawlis, 1980).

The attitude and extent to which the individual establishes positive health habits can significantly impact quality of life. While pathological conditions may be clinically ameliorated or attenuated through the guidance
and programming of a health professional, the individual's active participation in a programmed regimen of activity and acceptance of responsibility for self-health can substantially increase a positive prognosis (Glasser, 1976).

Glasser (1976) emphasizes that "we choose our own misery in life" and suggests that through more appropriate life choices all individuals could operate from a position of strength rather than one of weakness in creating optimal conditions for personal growth. Chamberlain (1978) concurred emphasizing the active participation and accountability of the individual for his own physical and mental health through the systematic elimination of what he terms self-defeating behaviors. Studies relating to health locus of control indicate the attitudes and beliefs of the individual are predictive of health behavior and the extent of medical facilities usage (Flynn, 1980; Vierke, 1980; Radius, Dillman, Becker, Rosenstock, & Horvath, 1980). Numerous studies have explored how attitude toward self can affect mental health both positively and negatively (Mowatt, 1978; McClenn, 1976; Ryan, 1978).

Contemporary approaches to change health behavior include rational-emotive therapy (Harris, 1976; Ellis, 1976), using physical fitness programs as a behavioral-shaping approach (Coates, Jeffrey, & Slinkard, 1981; Folkins & Sime, 1981; Keefe & Blumenthal, 1980), wilderness counseling (Dowd, 1977), behavior management programs (Marlatt & Morques,
Physical Fitness

The exercise boom, concludes Cooper (1977), constitutes the single most positive habit that has impacted the health of the United States in recent years. Much of the research that has assisted in developing the principles, safety guidelines, methods, and rationale behind the present body of knowledge relating to physical fitness has culminated in the position statements and guidelines developed by the American College of Sports Medicine (1975, 1978). The adult has received increasing attention by investigators interested in determining the physiological effects of health-related fitness on this population (Gettman, Ayres, Pollack, Durstine, & Grantham, 1979; Gettman, Ayres, Pollack, & Jackson, 1978; Katch, McArdle, Czula, & Pechar).

Recent studies relating to the adolescent population have included exhaustive research comparing the effects of exercise programs on self-concept (Culhane, 1979; Hileyer, 1979; Jones, 1978; Luebke, 1977; Petracek, 1977; Sebold, 1977; Shadow, 1979). Folkins and Sime (1981) cautioned that while many investigators have studied physical fitness as it affects psychological health, only about fifteen percent of the studies qualified as true experimental designs. Findings
and research conclusions have primarily focused on nonclinical populations.

The use of physical fitness for the treatment of clinical populations has been primarily experimental (Lund, 1980; Magistris, 1980; Pollock, 1974). Fineberg, Sowards, and Kettlewell (1980) emphasize the increasing need for inpatient care for the adolescent. They reviewed findings of the past forty years relating to treatment strategy, length of stay, and aftercare. Individual, group, and family therapy form a multidimensional basis for treatment. While physical fitness has been shown to have positive effects on psychological health of the adolescent in the community, no mention was made of this aspect in recommendations for therapeutic treatment of the inpatient adolescent.

**Environments**

The current 1980 North Central Texas Council of Governments regional list of alcoholism and drug abuse treatment centers identifies 125 agencies of various types and services for Tarrant and Dallas Counties. Service delivery systems range from telephone crisis assistance and education to intensive hospital care, including treatment settings in halfway houses, businesses, churches, public and private schools, and community facilities. Agencies involved include volunteer, community, minority, corporate, religious, educational including universities, federal correctional, and
private health. A continued emphasis on drug treatment services for the public schools are indicative of the rapidly expanding drug problems among adolescents (Hallihan & Kaufman, 1978; Smith & Payne, 1980; Stephenson, 1975; Swinson, 1978; Wong, 1979).

Private and group counseling are generally provided within the offices and under the direct supervision of psychiatrists, psychologists, and other drug counseling professionals. Numerous behavioral therapy training programs have been established to assist counselors (Chamberlain, 1978; de Jong & Henrich, 1980; Hutton, 1976; Jansma, 1980).

Physical fitness facilities and sport settings, as treatment environments, are the focus of numerous impact studies (Carmach & Martens, 1979; Dulberg & Bennett, 1980; Gary & Guthrie, 1972; Glasser, 1976). Their findings emphasize the significance of the activity and the environment as potentially positive contributory elements in behavioral treatment and management.

Fielding (1979) stresses the importance of prevention as being the front line environment for the treatment of drug misuse. He views the basis for treatment as requiring well-population clinics for all ages beginning with the pregnant woman and fetus through old age. An outline of programs by age group would be essential in implementing this concept and approach.
Summary

Research studies establish physical health of the recovering alcoholic as below normal and below that of the general population (Israel, 1979; Kolb, Gunderson & Bucky, 1976). Years of alcohol abuse place the problem drinker at extreme risk for disorders not attributed to drinking but directly related to lifestyle. Anecdotal evidence suggests that an improvement in physical health may serve to enhance the chances of recovery from alcoholism ("Brain Cells Born," 1978; Carlen, Wottzman, Holgate, Wilkinson, & Rankin, 1978; Prud'homme, 1980; Zeiner, 1980). Research indicates that the drug-misuser, regardless of the drug(s) of choice, can significantly improve the degree of recovery or rehabilitation through a multi-modal approach. Treatment programs combining early assessment and diagnosis (Davis, 1977; Deiker & Chambers, 1978; Evenson et al., 1979; Grant & Judd, 1976; Khavari et al., 1979; Pokorny, 1976); individual and group counseling (Baer, 1976; Bell, 1976; Heilbrun et al., 1979; Herranen, 1976; Hutton, 1976; Steiner, 1971); nutritional therapy (Null & Null, 1976; Sardesai & Provido, 1978; Williams, 1971); prescriptive exercise (McKelvy et al., 1980; Payne, 1979; Pollock, 1974); vocational rehabilitation (Helper, 1976; Klein, 1976); leisure education (Freeman, 1980; Glasser, 1976; Shaw, 1980); relaxation techniques (Lenigan, 1977); medical care (Kwentus & Major, 1979; "Lithium Treatment," 1978; Soterakis & Iber, 1975); and family therapy
(Hecht, 1977; Jacob et al., 1978; Pursch, 1976; Rockaway, 1976) constitute a sound multi-modal approach.
CHAPTER III

PROCEDURES

Research Methodology

This study determined the significant effects of a six-week physical fitness program on selected fitness and health locus of control variables for an experimental group of adolescent inpatient substance abusers. A repeated measures experimental control group design was selected for this study. Experimental and control groups were measured before during, and after the experimental group received a six-week physical fitness treatment program. Five tests of physical fitness were combined with three measures indicating health locus of control. The five tests of physical fitness were, distance run, body composition, sit and reach, sit-ups, and grip strength. The three attitudinal measures were, internal, powerful others, and chance.

Subjects

Male subjects were randomly selected from the Vernon Center for inpatient drug abuse treatment. The average population was approximately 125 male and female adolescents between the ages of 13 and 21. For the purposes of this study, the adolescent age range of 13-18 years comprised the sample pool.
Facility program admission eligibility criteria for applicants included, age requirement of 13-21 years; known to abuse dangerous drugs, controlled substances, alcohol, or inhalants; client required specialized inpatient drug or alcohol treatment program; client selected to obtain treatment as a voluntary condition of probation or had been adjudged as addicted to narcotics and in need of hospitalization and treatment; and had exhausted all community treatment resources for drug abuse, alcoholism, and related problems. The average stay of each client was between three and six months.

Subjects for this study were selected from the male population who had been in the program for five months or less and whose program plans indicated at least an additional six weeks of treatment at the drug center. Forty-four male subjects were randomly selected and assigned to one of two groups of twenty-two subjects. Each was assigned to an experimental or control group through a stratified proportional sampling design employing age and length of stay for purposes of matching subjects within the two groups (Appendices, page 102). The confidentiality and safety of the subjects during all aspects of the research study were of utmost concern of the investigator. During the orientation session the methods used to protect the subjects in these two areas were discussed and this presentation was given to
the participants. A copy of the informed consent can be found in the Appendices, page 103.

Treatment Procedures

Group I, the experimental, and Group II, the control, received pre-test measures prior to the initiation of thirty fitness training sessions for Group I. The fitness training sessions constituted the independent variable under investigation. Measures on each of the five dependent variables assessing fitness were also taken at two, four, and six weeks. The three dependent variables measuring health locus of control were taken four and six weeks following the initial pre-test. Each subject within Group I participated in a minimum of 70 percent of the training sessions for any comparison period in order to be included in this portion of the study (see Appendices, page 108). Experimental and control groups received all currently prescribed treatment offered by the Vernon State Center.

Subjects in experimental Group I participated in 5-minute daily stretching exercises combined with three 40-minute sessions of cardiovascular activities, and two 40-minute sessions of strength training per week. All 45-minute experimental sessions were supervised by this investigator with the assistance of a recreation leader at Vernon Center and included individualized instructional analysis and directives. The fitness program is described in more detail, including forms used during instruction, in the Appendices,
A schedule of research activities encompassing planning, orientation, and implementation can be found in the Appendices, page 115.

Instrumentation

Fitness Measures

In 1957 the American Alliance for Health, Physical Education, Recreation, and Dance published a test battery designed to evaluate the physical performance of boys and girls, grades 5-12, in United States public schools. Approximately 20 million children were tested with the AAHPERD Youth Fitness Test in 1979.

A 1977 task force assigned to revise the AAHPERD instrument employed specific criterion for physical fitness in refining the original test items for a projected 1980 revision. The first criterion stated physical fitness should measure the full range from the severely limited dysfunction to high levels of functional capacity. The second criterion of physical fitness emphasized fitness should measure capacities that can be improved with appropriate physical activity. The third criterion stated physical fitness should accurately reflect an individual's physical status as well as changes in functional capacity by corresponding test scores and changes in these scores (AAHPERD, 1980).

The product of the AAHPERD Task Force on Youth Fitness specified the selection of four measures intended to assess
the status of these three criterion components of physical fitness. The three component measurements constitute a profile of cardiorespiratory function, body composition, and musculoskeletal function.

The refined AAHPERD test battery delineated in the 1980 AAHPERD Test Manual was utilized in measuring aspects of physical fitness for subjects in this study. Cardiorespiratory function was measured as a distance run mediated on the contingent variance in age. Body composition was measured as the numerically summed triceps and subscapular skinfolds. Musculoskeletal function in the abdominal, low back, and hamstring areas was assessed through the number of sit-ups within one minute in addition to a sit-and-reach score measured in inches. A measure of upper body strength, grip strength, was added to the AAHPERD Youth Fitness Test. Appropriate administrative procedures for the five-item test battery are in the AAHPERD Test Manual.

**Locus of Control Measures**

The Health Attribution Test was selected for this study to provide an indicator of health locus of control. This test consists of twenty-two items that provide three-factor scores relating to locus of control: internal, chance, and powerful others. Lawlis and Lawlis (1980), the developers of this research instrument, described these three factors as follows: internal sources, "I'm in charge of my health";
external sources, "Powerful others are in charge," or "Chance or fate is in control." The format of the test questionnaire is a six-point Likert scale from strongly disagree to strongly agree. Subject response on each item is scored from -3 to +3. Each of the three factors has a scale of eight items. There are two items overlapped for two scales, allowing for twenty-two actual questions instead of twenty-four. A copy of the questionnaire is included in the Appendices, page 116. The Health Attributes Test Manual was followed for all administrative and scoring procedures. (See Appendices, page 121.)

Reliability and Validity

Reliability and validity of all instruments used except the hand-grip measure is discussed in the AAHPERD and Health Attributes Test Manuals. This information, including related information on the hand-grip measure can be found in the Appendices, page 119.

Definition of Terms

The following terms have restricted meaning and are thus defined for this study:

1. Addiction: a state resulting from regular use of drugs (especially depressants) which create physical dependence.

2. Alcoholism: a chronic disease manifested by repeated implicative drinking so as to cause injury to the drinker's health or to his social or economic functioning.
3. Blackout: a chemically induced period of amnesia. (Blackout is not to be confused with passing out or drinking to the point of losing consciousness.)

4. Drinking Behavior: individual profile of the drinking habits of an alcoholic that would include such factors as reasons for drinking, time of day, type of drink, and amount.

5. Drug: any substance which, when taken into the body, alters the structure or function of the organism.


7. Drug Dependence, PHYSICAL: development of a cellular demand for a specific drug characterized by withdrawal symptoms after drug is taken away from user.

8. Drug Dependence, PSYCHOLOGICAL: a strong desire or compulsion to continue use of a psychoactive drug, a craving for repetition of the pleasurable, euphoric effects of the substance.

9. Drug High: the state of reaching the desired effect by the drug user.

10. Drug Misuse: the taking of a drug for the purpose of fulfilling a need that the drug cannot pharmacologically fulfill.

11. Drug Tolerance: diminished cellular response to repeated exposure to a drug requiring increased amounts of a drug to produce the same effects.

13. Health: a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (World Health Organization).

14. Health Locus of Control: for this study, expectancies about physical health in relation to three dimensions, internal, external-powerful others, and external-chance. An internal locus of control would indicate a more self-directed regard to health than the external dimensions.


16. Medicine: a kind of drug that is taken into the body to prevent or cure a disease or a disabling condition.

17. Preventive Medicine: care which has the aim of preventing disease or its consequences. It includes health care programs aimed at warding off illnesses, early detection of disease, and inhibiting further deterioration of the body. Preventive medicine is also concerned with general preventive measures aimed at improving the healthfulness of our environment and our relations with it through such things as avoidance of hazardous substances, modified diet, family planning, and the promotion of health through altering behavior, especially by health education.
18. Sedative: chemical substance having a calming or depressant effect on the central nervous system.

19. Wellness Clinic: a clinic designed to promote good health prior to sickness, a preventive medicine approach to health care.

Delimitations

Caution should be exercised in generalizing results of this study to adolescent populations in the public school or outpatient treatment programs. Inpatient subjects in this study had a controlled regimen including sleep, diet, and programmed recreational activity, as well as an absence of the availability of drugs of misuse. Programmed recreational activities are seldom included in drug treatment programs; consequently, control subjects for this study were not a generalized representative control for all drug treatment programs.

Constraints of limited population parameters and availability of fitness therapists for this study imposed a limitation on design. Possible sources of error variance may include practice effects, experimenter bias, and selection bias.

The female population of Vernon Center constitutes 10 percent of the total population in relation to males. This study was restricted to a male population for purposes of adequate sample size. Caution must be advised when
generalizing results for sex and age groups differing from the population chosen for this study.

Experimental Hypotheses

Ho₁. There will be no significant difference between means of experimental Group I and control Group II after six weeks of fitness training on any one of the following dependent measures:

a. one and one-half mile run in seconds

b. sum of triceps and subscapular skinfolds in millimeters

c. number of sit-ups for sixty seconds

d. linear measurement of sit-and-reach in inches

e. dominant hand grip strength in kilograms

f. sten score for "internal" locus of control

g. sten score for "powerful others" locus of control

h. sten score for "chance" locus of control

Ho₂. There will be no significant difference between Pre-Test and Trial means of experimental Group I and control Group II for the six week treatment period on any one of the following dependent measures:

a. one and one-half mile run in seconds

b. sum of triceps and subscapular skinfolds in millimeters

c. number of sit-ups for sixty seconds

d. linear measurement of sit-and-reach in inches
44

e. dominant hand grip strength in kilograms
f. sten score for "internal" locus of control
g. sten score for "powerful others" locus of control
h. sten score for "chance" locus of control

H03. There will be no significant interaction between the treatment effect and trials over any one of the following dependent measures:

a. one and one-half mile run in seconds
b. sum of triceps and subscapular skinfolds in millimeters
c. number of sit-ups for sixty seconds
d. linear measurement of sit-and-reach in inches
e. dominant hand grip strength in kilograms
f. sten score for "internal" locus of control
g. sten score for "powerful others" locus of control
h. sten score for "chance" locus of control

Analysis of Data

A two-factor mixed design with repeated measures on one factor was employed for the five health related dependent measures and a 2 x 3 factorial analysis of variance for the three health locus of control dependent measures. Statistical procedures were selected for their inherent robustness in identifying the following: (1) significant treatment; (2) significant trial effects; and (3) significant interactions between treatment and trails. When a trial main
effect was significant, Newman-Keuls' multiple range test was administered for determining significant differences between trials.

A stratified random sampling technique (see Appendices, page 102), to insure the assumption of normal distribution and homogeneity of variance required of F statistics, was employed.

For purposes of this study an alpha level of .05 was accepted in determining significance. Data with an alpha level ranging between .054 and .10 is discussed. Kirk's (1968, p. 109) power analysis was formulated in determining the appropriate number of subjects for the proposed study. The formula utilized in generating the $\phi$ was:

$$
\phi = \sqrt{\frac{\sum j^2 \cdot k}{\sum j \cdot \sigma^2 \cdot n}} = \sqrt{\frac{C \cdot \sigma^2}{n}} = \sqrt{\frac{C^2 \cdot \sigma^2}{n}}.
$$

For the purposes of this analysis, an alpha level of .05, $1-\beta$ level of .80, were chosen. The "C" term in Kirk's formula represents a number other than zero that represents the expected difference in standard deviation units. One was chosen to represent this difference. The $\phi$ generated for twenty subjects was 2.24. Table D.14 of Kirk's text (p. 540) revealed a power of .85. This value exceeds the initially established criterion of .80. Twenty-two subjects per group was accepted as an appropriate sample size knowing that there would be a distinct possibility of subject attrition. Six subjects in each group were dropped from the study (see
Appendix, page 122) for a final group size of sixteen in each of the experimental and control groups. The $\phi$ generated for sixteen subjects per group is 2.05, revealing a power of .81, exceeding the established criterion of .80.
CHAPTER IV

FINDINGS AND INTERPRETATIONS

Introduction

Subdivisions within the two major parts of this chapter will be the eight dependent measures. Initial anthropometric and vital measure means and standard deviations for the experimental and control groups can be found in Table on page 123 of the Appendices. Means, standard errors of the means, standard deviations, and levels of significance for the experimental and control groups on the five health related fitness variables over the pre-test and three trials are included in Table XI on page 124 of the Appendices with the same descriptive measures for the three health attitude variables in Table XII on page 125 of the Appendices.

Findings

Three major experimental hypotheses will be statistically examined for eight dependent measures. The eight dependent measures are (a) 1 1/2 mile run, (b) sum of triceps and subscapular skinfolds, (c) sit-ups, (d) sit-and-reach, (e) grip strength, (f) internal locus of control, (g) powerful others locus of control, and (h) chance locus of
of control. The independent or treatment variable is a six-weeks fitness program. The main effects are treatment (fitness program) and trials (time). On all statistical analysis, an alpha level of .05 for significance was used for the level of rejection or acceptance of the null hypothesis.

**1 1/2 Mile Run**

\[ H_0^1(a) \] There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by the 1 1/2 mile run.

The analysis of variance data for the 1 1/2 mile run is presented in Table I.

**TABLE I**

**SUMMARY OF ANALYSIS OF VARIANCE FOR 1 1/2 MILE DISTANCE RUN**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>1004830.32</td>
<td>15.17***</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>66233.24</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>3</td>
<td>10997.65</td>
<td>1</td>
</tr>
<tr>
<td>Treatment x Trials</td>
<td>3</td>
<td>50656.03</td>
<td>3.95**</td>
</tr>
<tr>
<td>Error (b)</td>
<td>90</td>
<td>12829.59</td>
<td></td>
</tr>
</tbody>
</table>

**p < .01**

**p < .001**

The observed F ratio of 15.17 found in Table I for the main effect of treatment as measured by the 1 1/2 mile run
was significant at $p \leq .001$ level. The observed $F$ demonstrates a statistically significant difference between experimental Group I and control Group II as determined by the 1 1/2 mile run. Variances are due to factors other than naturally occurring variance. The null hypothesis $H_{01}$ is rejected.

$H_{02}$: There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by the 1 1/2 mile run.

The observed $F$ ratio of 4.1 found in Table I for the main effect of trials as measured by the 1 1/2 mile run was not significant at the .05 level. Any variances between experimental Group I and control Group II could not be explained other than occurring by chance. The null hypothesis $H_{02}$ is accepted.

$H_{03}$: There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by the 1 1/2 mile run.

The observed $F$ ratio of 3.95 found in Table I for the interaction effect of treatment by trials as measured by the 1 1/2 mile run is significant at the $p \leq .01$ level. Analysis of variance indicates a significant interaction between treatment and trials due to conditions other than naturally occurring variance. The null hypothesis $H_{03}$ is rejected. Figure 1 provides a two-dimensional representation of treatment by trials interaction of the 1 1/2 mile run.
Fig. 1--Comparison of mean scores with corresponding standard error of the mean for 1 1/2 mile distance run over trials for experimental and control groups.
A divergent trend for experimental and control groups as measured by the 1 1/2 mile run during the first four weeks of the fitness training is evidenced.

**Skinfolds**

$H_{01}(b)$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by the sum of tricep and subscapular skinfolds.

The data for the sum of skinfolds is presented in Table II.

**TABLE II**

SUMMARY OF ANALYSIS OF VARIANCE FOR SUM OF SKINFOLD

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>290.41</td>
<td>1.78</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>163.42</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>3</td>
<td>10.59</td>
<td>3.40*</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>3</td>
<td>3.41</td>
<td>1.10</td>
</tr>
<tr>
<td>Error (b)</td>
<td>90</td>
<td>3.11</td>
<td></td>
</tr>
</tbody>
</table>

*p ≤ .05

An observed $F$ ratio of 1.78 presented in Table II for the main effect of treatment as measured by the sum of skinfolds was not significant at the $p ≤ .05$. Any variance between Group I and Group II may be attributed to chance occurrence. The null hypothesis $H_{01}(b)$ is retained.
Ho_2(b). There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by the sum of skinfolds.

The observed F ratio of 3.40 presented in Table II for the main effect of trials as measured by the sum of skinfolds is significant at the p < .05 level. A demonstrated statistically significant difference between Group I and Group II over trials exists. Variances are due to factors other than naturally occurring variance. The null hypothesis Ho_2(b) is rejected.

The four trial means for Group I and Group II include means for the pre-test condition. The analysis of variance for repeated measures has indicated a significant difference exists between a minimum of two means of a possible combination of six pairings of group means over trials. Neuman-Keuls' test was selected for identifying pairings with a significant difference. Table III contains the results of the Neuman-Keuls' multiple comparison test for the main effects of trials.

The single significant difference observed through the Neuman-Keuls' multiple comparison test is between the Trial 1 and Trial 2 means. The observed difference identifies statistically significant variance for trial effects presented in the Table II analysis of variance between the second (T1) and fourth (T2) week. This treatment period was significantly
TABLE III
RESULTS OF NEUMANN-KEULS' MULTIPLE COMPARISON TEST FOR THE MAIN EFFECT OF TRIALS FOR FOUR SEPARATE VARIABLES

<table>
<thead>
<tr>
<th>Treatment Time in Weeks</th>
<th>Trials Compared</th>
<th>Mean Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Skinfold</td>
</tr>
<tr>
<td>6</td>
<td>T&lt;sub&gt;3&lt;/sub&gt; - Pre-Test</td>
<td>1.06</td>
</tr>
<tr>
<td>4</td>
<td>T&lt;sub&gt;3&lt;/sub&gt; - T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>.98</td>
</tr>
<tr>
<td>2</td>
<td>T&lt;sub&gt;3&lt;/sub&gt; - T&lt;sub&gt;2&lt;/sub&gt;</td>
<td>.05</td>
</tr>
<tr>
<td>2</td>
<td>T&lt;sub&gt;2&lt;/sub&gt; - Pre-Test</td>
<td>1.01</td>
</tr>
<tr>
<td>2</td>
<td>T&lt;sub&gt;2&lt;/sub&gt; - T&lt;sub&gt;1&lt;/sub&gt;</td>
<td>.87*</td>
</tr>
<tr>
<td>2</td>
<td>T&lt;sub&gt;1&lt;/sub&gt; - Pre-Test</td>
<td>.87</td>
</tr>
</tbody>
</table>

*Note: If mean differences exceed the Neumann-Keuls' range product, the means are significantly different. The range product represents a significance level of p ≤ .05.

different for Group I and II as measured by sum of the skinfolds.

H<sub>03</sub>(b). There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by the sum of skinfold.

The observed F ratio of 1.10 presented in Table II for the interaction effect of treatment by trials as measured by the sum of skinfolds was not significant at the .05 level. Any variance in the trend of group means over trials could not be explained other than as naturally occurring variance.
Figure 2 provides a graphic representation of group means over trials.

While graphic differences between group means for sum of skinfold are not parallel and demonstrate variance, the observed variances are not statistically significant. The null hypothesis $H_0^3(b)$ is accepted.

**Sit-Ups**

$H_0^1(c)$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by the number of sit ups performed in sixty seconds.

The analysis of variance summary for this data is presented in Table IV.

**TABLE IV**

**SUMMARY OF ANALYSIS OF VARIANCE FOR SIT-UPS**

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>2227.78</td>
<td>15.98***</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>139.44</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>3</td>
<td>1583.40</td>
<td>52.43***</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>3</td>
<td>345.30</td>
<td>11.43***</td>
</tr>
<tr>
<td>Error (b)</td>
<td>90</td>
<td>30.20</td>
<td></td>
</tr>
</tbody>
</table>

***$p \leq .001$

The observed F ratio of 15.98 evidenced in Table IV for the main effect of treatment as measured by sit-ups is
Fig. 2—Comparison of mean scores with corresponding standard errors of the mean for sum of tricep and subscapular skinfolds over trials for experimental and control groups.
significant at the $p \leq .001$ level. The statistically significant variance found between Groups I and II indicates a treatment variance greater than natural variability. The null hypothesis $H_{01}(c)$ is rejected.

$H_{02}(c)$. There will be no significant variance between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by the cumulative number of sit-ups performed over a sixty second time period.

The observed F ratio of 15.98 presented in Table IV for the main effect of trials as measured by sit-ups was significant at the $p \leq .001$ level. Statistically significant variances observed were not due to chance variance. The null hypothesis $H_{02}(c)$ is rejected. Neuman-Keuls' multiple range test presented in Table III indicates at the .04 level of significance a trial effect difference between five of the possible six combinations of trial means for sit-ups. Significant differences between trials were found from pre-test to two weeks, pre-test to four weeks, and pre-test to six weeks. Significant differences were demonstrated between two weeks and four weeks, as well as between two weeks and six weeks. The single nonsignificant period of time was between fourth and sixth week comparisons.

$H_{03}(c)$. There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by sit-ups.
The observed F ratio of 1.43 presented in Table IV for the interaction effect of treatment by trials as measured by sit-ups was significant at the $p \leq .001$ level. A statistically significant interaction due to factors other than naturally occurring variance is observed. The null hypothesis $H_{03}(c)$ is rejected. Figure 3 provides a graphic representation of the significant interaction between treatment and trials for sit-ups. Observation of means over trials for sit-ups represents a significant nonparallel pattern of change between Group I and Group II.

**Sit-and-Reach**

$H_{01}(d)$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by the sit-and-reach test of flexibility.

The analysis of variance summary data are presented in Table V.

The observed F ratio of 4.61 found in Table V for the main effect of treatment as measured by sit-and-reach was significant at the $p \leq .05$ level. The statistically significant variance found between Groups I and II indicate a treatment difference not occurring as natural variance. The null hypothesis $H_{01}(d)$ is rejected.

$H_{02}(d)$. There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by sit-and-reach.
Fig. 3—Comparison of mean scores with corresponding standard errors of the mean of sit-ups in 60 seconds over trials for experimental and control groups.
TABLE V

SUMMARY OF ANALYSIS OF VARIANCE
FOR SIT-AND-REACH

<table>
<thead>
<tr>
<th>Source</th>
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<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>1262.58</td>
<td>4.61*</td>
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<tr>
<td>Error (a)</td>
<td>30</td>
<td>273.97</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>3</td>
<td>422.35</td>
<td>39.67***</td>
</tr>
<tr>
<td>Treatment x Trials</td>
<td>3</td>
<td>30.26</td>
<td></td>
</tr>
<tr>
<td>Error (b)</td>
<td>90</td>
<td>10.65</td>
<td>2.84*</td>
</tr>
</tbody>
</table>

*p ≤ .05
***p ≤ .001

The observed F ratio of 39.67 found in Table V was significant at the p ≤ .001 level. Statistically significant observed differences do not occur as natural variance. The null hypothesis $H_0^2 (d)$ is rejected. Neuman-Keuls' multiple range test in Table III indicates a significant trial effect difference at the $p ≤ .05$ level between five of the possible six combinations of trial means for sit-and-reach. Significant differences were observed between pre-test and four weeks, as well as pre-test and six weeks. Significant differences were also noted between two weeks and four weeks, two weeks and six weeks, as well as between four weeks and six weeks. The single non-significant comparison was between pre-test and two weeks.
Ho\textsubscript{3}(d). There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by sit-and-reach.

The observed F ratio of 2.84 presented in Table V for the interaction effect of treatment by trials as measured by sit-and-reach was significant at the p \textless 0.05 level. A significant interaction effect due to factors other than naturally occurring variance was observed. The null hypothesis Ho\textsubscript{3}(d) is rejected. A graphic explanation of the significant interaction of treatment by trials for sit-and-reach is presented in Figure 4. Groups I and II demonstrate consistent trend differences over repeated measures and are significantly divergent between pre-test and two weeks.

Grip Strength

Ho\textsubscript{1}(e). There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by grip strength.

Analysis of variance summary for grip strength data is found in Table VI.

The observed F ratio of < 1 found in Table VI for the main effect of treatment as measured by grip strength was not significant at the p \textless 0.05 level. Any mean differences between Group I and Group II on measures of grip strength occur as natural variance. The null hypothesis Ho\textsubscript{1}(e) is accepted.
Fig. 4 — Comparison of mean scores with corresponding standard errors of the mean of sit-and-reach over trials for experimental and control groups.
TABLE VI

SUMMARY OF ANALYSIS OF VARIANCE
FOR GRIP STRENGTH

<table>
<thead>
<tr>
<th>Source</th>
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<td>Treatments</td>
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<td>63.99</td>
<td>&lt;1</td>
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<tr>
<td>Error (a)</td>
<td>30</td>
<td>240.79</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>3</td>
<td>78.64</td>
<td>14.64***</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>3</td>
<td>12.80</td>
<td>2.38</td>
</tr>
<tr>
<td>Error (b)</td>
<td>90</td>
<td>5.37</td>
<td></td>
</tr>
</tbody>
</table>

***p ≤ .001

$H_0^2(e)$. There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by grip strength.

The observed F ratio of 14.64 presented in Table VI for the main effect of trials as measured by grip strength was significant at the p ≤ .001 level. Statistically significant differences found in the trial effects of grip strength are due to conditions other than naturally occurring variance. The null hypothesis $H_0^2(e)$ is rejected. Neuman-Keuls' multiple range test presented in Table III indicates that the sources of trial effect differences are between four of the six possible comparisons of trial effect means for grip strength. Significant differences at the p ≤ .05 level were identified between pre-test and four weeks, as well as pre-test and six weeks. Significant differences
were observed between two weeks and four weeks, as well as two weeks and six weeks. No significant differences were found between the trial means for pre-test and two weeks and between four weeks and six weeks.

$H_{03(e)}$. There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by grip strength.

The observed $F$ ratio of 2.38 presented in Table VI for the interaction effect of treatment by trials as measured by grip strength with an observed alpha of .07 was not significant at the $p \leq .05$ level. The null hypothesis $H_{03(e)}$ is accepted. While differences could not be explained other than by chance occurrence at the $p \leq .05$ level, interaction differences represent data critical to analysis interpretations. (See Table XI in the Appendices, page 124.) The differences between treatment and trial means can be observed in Figure 5. While the observed alpha for differences does not coincide with acceptable levels established for purposes of this study, the trends for treatment by trial means were notably deviant and nonparallel for these sample means.

Internal

$H_{01(f)}$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by internal locus of control.
Fig. 5--Comparison of mean scores with corresponding standard errors of the mean of dominant hand grip strength over trials for experimental and control groups.
The analysis of variance summary for internal locus of control is presented in Table VII.

### TABLE VII

**SUMMARY OF ANALYSIS OF VARIANCE FOR INTERNAL LOCUS OF CONTROL**

<table>
<thead>
<tr>
<th>Source</th>
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</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>2.67</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>8.92</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>2</td>
<td>2.57</td>
<td>1.31*</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>2</td>
<td>6.01</td>
<td>3.07*</td>
</tr>
<tr>
<td>Error (b)</td>
<td>60</td>
<td>1.96</td>
<td></td>
</tr>
</tbody>
</table>

*p ≤ .05

The observed F ratio of <1 presented in Table VII for the main effect of treatment as measured by internal locus of control was not significant at the p ≤ .05 level. Differences in the mean scores between Group I and Group II would be a function of naturally occurring variance. The null hypothesis $H_{01}(f)$ is accepted.

$H_{02}(f)$. There will be no significant differences between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by internal locus of control.

The observed F ratio of 1.31 presented in Table VII for the main effect of trials as measured by internal locus of control was not significant at the p ≤ .05 level. Variances
between Group I and Group II are observed as naturally occurring variance. The null hypothesis $H_{o_2}(f)$ is accepted.

$H_{o_3}(f)$. There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by internal locus of control.

The observed $F$ ratio of 3.07 found in Table VII for the interaction effect of treatment by trials as measured by internal locus of control was significant at the $p < .05$ level. This indicates a statistically significant interaction between treatment and trial means due to factors other than chance or natural variance. The null hypothesis $H_{o_3}(f)$ is rejected. Figure 6 provides a graphic presentation of the interaction of treatment by trials as measured by internal locus of control. The divergent trend of Group I and Group II is evident from pre-test to the fourth week measures.

**Powerful Others**

$H_{o_1}(g)$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by powerful others locus of control.

The analysis of variance summary of the data for powerful others is presented in Table VIII.

An observed $F$ ratio of $<1$ presented in Table VIII for the main effect of treatment as measured by powerful others locus of control was not significant at the $p < .05$. 
Fig. 6—Comparison of mean sten scores with corresponding standard errors of the mean for internal health locus of control over trials for experimental and control groups.
TABLE VIII
SUMMARY OF ANALYSIS OF VARIANCE FOR POWERFUL OTHERS LOCUS OF CONTROL

<table>
<thead>
<tr>
<th>Source</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Treatments</td>
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<td>1.50</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>15.54</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>2</td>
<td>6.13</td>
<td>2.77</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>2</td>
<td>.50</td>
<td>41</td>
</tr>
<tr>
<td>Error (b)</td>
<td>60</td>
<td>2.21</td>
<td></td>
</tr>
</tbody>
</table>

Variance between the means of Group I and Group II may be attributed to chance occurrence. The null hypothesis $H_{01}(g)$ is retained.

$H_{02}(g)$. There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by powerful others locus of control.

An observed $F$ of 2.77 presented in Table VIII for the main effects was not significant at the $p \leq .05$ level. The observed alpha for trial effects was .07 indicating a notable difference critical to analysis of interpretations. The null hypothesis $H_{02}(g)$ is retained.

$H_{03}(g)$. There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by powerful others locus of control.

An observed $F$ ratio of $<1$ presented in Table VIII was not significant at the $p \leq .05$ level. Variance in the trend
of group means over trials was evidence of naturally occurring variance. Figure 7 provides a graphic presentation of group means over trials. While graphic differences between group means for powerful others are not parallel and demonstrate variance in trend, the observed variances are not statistically significant. The null hypothesis $H_0_3(g)$ is retained.

**Chance**

$H_0_1(h)$. There will be no significant difference between the means of experimental Group I and control Group II due to treatment effects after six weeks of fitness training as measured by chance locus of control.

The analysis of variance summary of the data for chance is presented in Table IX.

**TABLE IX**

**SUMMARY OF ANALYSIS OF VARIANCE FOR CHANCE LOCUS OF CONTROL**

<table>
<thead>
<tr>
<th>Source</th>
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</thead>
<tbody>
<tr>
<td>Treatments</td>
<td>1</td>
<td>10.67</td>
<td>1.42</td>
</tr>
<tr>
<td>Error (a)</td>
<td>30</td>
<td>7.53</td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>2</td>
<td>6.32</td>
<td>2.67</td>
</tr>
<tr>
<td>Treatments x Trials</td>
<td>2</td>
<td>1.26</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Error (b)</td>
<td>60</td>
<td>2.37</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 7--Comparison of mean sten scores with corresponding standard errors of the mean for powerful other health locus of control for experimental and control groups.
An observed F ratio of 1.42 presented in Table IX for the main effect of treatment as measured by chance locus of control was not significant at the $p \leq .05$ level. Variance between the means of Group I and Group II may be attributed to naturally occurring variance. The null hypothesis $H_{01}(h)$ is retained.

$H_{02}(h)$. There will be no significant difference between the means of experimental Group I and control Group II due to trial effects during six weeks of fitness training as measured by chance locus of control.

An observed F of 2.67 presented in Table IX for the main effects was not significant at the $p \leq .05$ level. Trial effects were significant at the .08 level indicating a notable difference over trials and data critical to analysis of interpretations. The null hypothesis $H_{02}(h)$ is retained.

$H_{03}(h)$. There will be no significant interaction between the main effects of treatment and trials between experimental Group I and control Group II after six weeks of fitness training as measured by chance locus of control.

An observed F ratio of $<1$ presented in Table IX was not significant at the $p \leq .05$ level. Any differences in the trend of group means over trials could not be explained other than as naturally occurring variance. Figure 8 provides a two dimensional presentation of group means over trials. The graphic presentation would seem to agree with the obtained nonsignificant F ratio. The null hypothesis $H_{03}(h)$ is retained.
Fig. 8—Comparison of mean sten scores with corresponding standard errors of the mean for chance locus of control over trials for experimental and control groups.
Interpretation

An interpretive foundation for initiating a discussion of the research data will be established through an examination of two pertinent questions related to the status of the experimental and control groups prior to treatment:

1. Did the experimental and control groups differ on any of the eight dependent measures at pre-test?

2. Did either group differ from the accepted norm on any of the eight dependent measures?

Within the context of the answers for these two questions meaningful comparisons will be evaluated between the experimental and control groups facilitating a comprehensive understanding of the effects of a physical fitness program on repeated measures of fitness and health attitudes.

Baseline

A simple analysis of variance technique was applied to the pre-test data on each of the eight dependent measures. The results of analysis indicated no difference between experimental Group I and control Group II on any of the eight dependent measures at pre-test. The $p < .05$ level was selected in determining if any significant differences existed. The study design assumed the two groups were samples from the same population on each of the eight dependent measures at the beginning of the treatment period. The age accepted for all normative data was sixteen years
as the grand mean for the thirty-two subjects at baseline was 15.8 years. A comparison of each of the eight dependent measures to normative data is presented in Figure 9.

The first four measures; 1 1/2 mile run, sum of skinfolds, sit-ups, and sit-and-reach are compared to percentile norms found in "Lifetime Health Related Physical Fitness Test Manual," (AAHPERD, 1980). The grip strength is not included in the AAHPERD manual. Percentile norms for grip strength were obtained from the results of a community study of more than 6,000 males and females, ages 10-69, in Tecumseh, Michigan (Montoye & Lamphier, 1977). In the Tecumseh study, grip strength was summed for both hands. A corresponding comparison was established as the group means for dominant grip strength in this study were compared to one half the summed score for the Tecumseh study. The resultant mean scores for the Vernon study consequently are slightly higher for both groups when compared with the method of both arms measured and summed.

The three health attitude measures are compared to a sten score range developed from normative data by Lawlis and Lawlis (1980). Statistically, assuming a sten score as comparable to percentile scores, the percentile scale was used for these three measures. By combining the three sources of norms, all eight variables are viewed in the same figure. An accommodation for the mean difference between the percentile.
**Fig. 9** Comparison of pre-test means of eight dependent measures to normative data.

Sources: AAHPERD, 1980 - $\frac{1}{2}$, SK, SU, SR  
Montoye and Lamphiear, 1977 - GR  
Lawlis and Lawlis, 1980 - I, PO, CN
and sten measures is reflected in Figure 9. The percentile mean is 50 percent while the sten score mean is slightly higher at 5.5.

Observation of Figure 9 reveals both the experimental and control groups are considerably lower than their age group norms on measures of health-related fitness. Scores for the two groups ranged from the eighth to the thirty-eighth percentile. The lowest single scores observed for the experimental and control groups were on the 1 1/2 mile run indicating very poor levels of cardiovascular conditioning for both groups.

The highest fitness levels at pre-test were in the skin-fold and sit-up measures. Using the percent body fat tables from Allsen, Harrison, and Vance (1978, p. 151) the experimental group mean for percent body fat was 11.7 and the control group mean 13.0. The overall mean was 12.6 percent. Percent body fat reflects a ratio of body fat to muscle and bone. Using the percent body fat rating scale (p. 156), all three means are in the lean category of body fat.

The subjects in this study also differ from the norm in that a male population was selected. Accepted findings on measures of fitness of females compared to males would indicate nonsignificant differences in response to exercise if equated for size.

Lawlis and Lawlis (1980) present the premise of health attitude as encompassing the two dimensions of health locus
of control as internal and external. These authors break external into powerful others and chance. Lawlis and Lawlis further state,

The distinctions between the single internal factor and dual external factors may well be related to issues of control combined with prediction over events (as in internal dimension), or prediction of events only (as conceivably in instances when happenstances are attributed to Powerful Others), or when neither prediction or control is perceived as possible (as when Chance or Fate are believed to be in control) (pp. 7-8).

The Lawlis and Lawlis research stresses the applicability of "the theoretical premise of health behaviors as being related to the beliefs regarding attribution or control" (p. 12). Data presented in Figure 9 indicates both the experimental and control groups were above the mean in all three health attitude measures. Lawlis and Lawlis (1980) have projected an above the mean "internal" score would predict an 80 percent chance of success for burn victims in a rehabilitation program, while high "powerful others" scores predict a lesser 60 percent chance. Contrarily, high "chance" scores represented almost 0 percent recovery. An attitudinal profile for burn victims compared to drug abusers by nature of the condition will differ somewhat, although the test purports to measure attitude affecting rehabilitation potential. The rationale applied to rehabilitation potential behind the Health Attributes Test would indicate higher "internal" compared to lower "external" profiles in both
"powerful others" and especially "chance" predict a more positive prognosis for effective rehabilitative treatment.

Fitness

In three of the five health related fitness measures both main effect and interaction were significant. These significant measures were 1 1/2 mile run, sit-ups, and sit-and-reach. The AAHPERD Health Related Fitness Manual (1980) test battery recommends these three measures combined with the sum of skinfold as an appropriate test for measuring health related fitness. A comparison of sum of skinfold to normative data over trials is presented in Appendices, page 128.

One possible rationale for a nonsignificant main effect of skinfold was the relative leanness of both experimental and control groups at pre-test as compared to tables in Allsen, Harrison, and Vance (1978). A second possible impacting factor was the consistent and effective caloric and nutritionally controlled diet both inpatient groups received as a regimen of interdisciplinary treatment. The total amount of calories available to each subject was the same even though the experimental group probably expended considerably more calories each week in the formal fitness program.

Grip strength, a measure not included in the AAHPERD test battery, did not indicate an overall significant strength difference. In contrast, exceedingly significant trial effects on grip strength were observed between the
higher gains of experimental and those of control on second and fourth and second and sixth weeks of the training program. Grip strength compared to normative data over trials can be found in Figure 10. A disordinal interaction was observed as presented in the graphic display (see Figure 5) of grip strength $p < .075$. The interaction did not reach the accepted level of significance and differences could not be attributed to a training effect.

A possible reason for nonsignificant grip strength findings between pre-test and trial one could be the length of time needed to learn the circuit strength training component, agreeing with Gettman et al. (1978). A second possible confounding variable was the control group's frequent usage of equipment in the weight room during unstructured recreational activities. Of all activities and equipment available for the Vernon Center clients, the weight room with resistive exercise equipment was the observed leisure selection preference for the control group. While controls were observed frequenting this area daily, muscular strength, rather than muscular endurance, appeared to be their objective as demonstrated in their voiced interest in how much they could lift at one time as opposed to how many repetitions could be performed. This rationale was supported in this study by a significant main effect for sit-ups purported to measure muscular endurance and a nonsignificant main effect of grip strength measuring muscular strength.
Fig. 10—A comparison of experimental and control group means to age-adjusted norms for dominant hand grip strength (kg) over trials. Source: Percentile norms from Henry J. Montoye and Donald E. Lamphiear, "Grip and Arm Strength in Males and Females, Age 10-69," The Research Quarterly, 48(1), 109-120.
A marked significant interaction of treatment over trials for the 1 1/2 mile distance run (see Figure 1) profiles an area of serious concern for health professionals treating the inpatient substance abuser. Both control and experimental subjects rank very low in cardiovascular efficiency when compared to normative data. Alarmingly, control subjects not receiving a fitness program actually exhibited losses on this critically important measure of fitness (see Figure 11).

Pader (1973) using a resting EKG, blood tests, general physical, and a health questionnaire identified sixteen abnormal heart conditions out of 100 middle aged male alcoholics not suffering from malnutrition. In a comparable nonalcoholic age group only one person out of 100 was discovered to have a cardiac abnormality. Research studies have repeatedly demonstrated (Cooper, 1978) a stress ECG as much more sensitive in identifying cardiac difficulties. This established diagnostic premise would indicate that Pader's identification of myopathies in the alcoholic while seemingly high, are still very conservative.

The inpatient drug abuser entering a treatment program at a dangerously low level of cardiovascular functioning can ill afford a worsening profile promoted by further involvement in deleterious activities. Potentially, numerous variables could be identified as affecting observed decline in cardiovascular fitness exhibited by the control group.
Fig. 11--A comparison of experimental and control group means to age-adjusted norms for 1 1/2 mile distance run (min:sec) over trials. Source: AAHPERD, Lifetime health related physical fitness manual, Reston, Va., 1980.
Increased usage or the initiation of use of nicotine and/or caffeine at the time of entrance into the drug treatment program could constitute a negative variable impacting cardiovascular statistical data of this study when control for these drugs could not be affected.

Adolescent drug abusers whose main drugs of choice during abusive action had been "uppers" in pill form experienced an increase in central nervous system activity. Hospital treatment activity level, devoid of "uppers" may have the effect of decreasing the activity level. Activity levels have also been subject to decrease because of incarceration and enforced educational training as opposed to the "freedom of the streets" prior to entering treatment.

In the two measures of flexibility, sit-and-reach, and muscular strength and endurance, sit-ups, improvements of the experimental compared to the control group became increasingly greater over trials. In Figure 3 it can be observed that the experimental group improved in a linear fashion until the fourth week at which time the gains took on a curvilinear pattern. As is presented in Figure 12, the experimental group had exceeded the ninetieth percentile for their age group by week four, which would indicate a probable curvilinear change after attaining such a high level of strength. The sit-and-reach scores increased in a linear pattern through all trials reaching the seventy-fifth percentile by the sixth week as can be seen in Figure 13.
Fig. 12--A comparison of experimental and control group means to age-adjusted norms for sit-ups (in 60 sec.) over trials. Source: Percentile norms from AAHPERD, Lifetime health related physical fitness manual, Reston, Va., 1980.
Fig. 13—A comparison of experimental and control group means to age-adjusted norms for sit-and-reach (cm) over trials. Source: AAHPERD, Lifetime health related physical fitness manual, Reston, Va., 1980.
Fitness gains are expected after participation in a conditioning program; however, the length of time necessary for these changes are highly important in determining the relative use of conditioning in a two to six week drug treatment program. It can be observed that a structured fitness program enabled the experimental group to surpass the fiftieth percentile on measures of muscular strength and endurance by the second week of training (see Figure 12) and on measures of cardiovascular efficiency (see Figure 11) by the fourth week.

Significant fitness gains in this study support the findings of other studies having similar training regimens but not with identified drug abusers (Gettman et al., 1978; Gettman et al., 1979; Pollock et al., 1971). The shortest length of treatment time for these studies was twenty weeks compared to six weeks for the subjects for this research. Significant differences were noted in this study as early as two weeks for sit-ups and at four weeks for all five measures of health related fitness.

Reports of reviewed fitness studies targeting substance abuse populations (Gary & Guthrie, 1972; McKelvy, Stein, & Bertini, 1979; Pierkowski & Axtell, 1976) reported improved cardiovascular fitness as measured by pulse recovery tests. While the treatment programs were for only three to four weeks in these three studies, it is recognized that pulse rate recovery is not an accurate predictor or a reliable
measure of cardiovascular fitness as compared to the data reflecting distance run (AAHPERD, 1980; Cooper, 1978).

**Attitudes**

The relationship of health beliefs and attitudes to noncongruent health behavior of adolescent drug abusers represents an area of great interest to health professionals (Glasser, 1976; Lawlis & Lawlis, 1980; Radius et al., 1980). Dependence on experts (Love, Morphis, & Page, 1981) or powerful others (Lawlis & Lawlis, 1980) for good health, or fatalistically accepting health as being a chance occurrence (Flynn, 1980; Lawlis & Lawlis, 1980) have been identified as indicating poor prognosis for the development of positive health habits. The significant disordinal interaction $p < .05$ of a six week physical fitness treatment program over trials on measures of internal locus of control presented in Figure 6 indicate that during the first four weeks of a fitness program the experimental group exhibited a feeling of more control over their health, while the non-exercising control group felt less in control, strongly supportive of studies by Collingwood (1972) and Hilyer and Mitchell (1979). The experimental group continued on a linear path the remainder of the six week study while the control group failed to regain their pre-test level of internal control. Comparison of internal to normative data is presented in Figure 14. The development of a more independent
Fig. 14--A comparison of experimental and control group means to normative data for internal locus of control. Source: Normative data from J. Lawlis and G. F. Lawlis, Health Attribution Test, Dallas, Texas, 1980.
controlling health attitude can be attributed to the participation in a daily health related conditioning program by adolescent inpatient drug abusers. Other studies support the significant attitudinal effects that can be derived from a structured fitness program (Griest et al., 1979; Pursch, 1976). Significant data of this experimental controlled participant study are in contrast with the questionnaire only attitudinal projections of Shadow's study. Comparison of experimental and control group means to narrative data for the "powerful others" and "chance" variables are presented in Figures 15 and 16 on pages 126 and 127 of the Appendices.

Many drug treatment centers have recognized the importance of developing a physical health base as an integral part of successful therapy (Freeman, 1980; Pursch, 1980; Shaw, 1980). The positive results gained from treatment centers incorporating a sound conditioning program have and will generate much interest in the study of physical fitness and its effect on positive health behavior.

Recent studies relating to the ameliorative effects of running on depression (Greist, Eischens, Klein, & Faris, 1979; Greist, Klein, Eischens, Faris, Gurman, & Morgan, 1979) indicate that running may be as effective as psychiatric counseling in alleviating slight depression, and it is more cost effective. Many studies have indicated the effectiveness of physical fitness training for changing self-concept
Health attitudes have been identified as being the crucial factor in prognosing recovery to optimal health for persons exhibiting varied health problems (Flynn, 1980; Glasser, 1976; Lawlis & Lawlis, 1980; Radius et al., 1980). The improvement in health attitudes with corresponding improvements in health related fitness of the subjects in this study support the findings of related research. Strong statistical evidence of this study specifically delineates directive information and procedures which significantly improve physical conditioning and selected measures of health attitude for subjects selected in this study.
CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

Summary

An astounding increase in the misuse of drugs by adolescents during the past decade has culminated in a myriad of problems in our culture. Before society could comfortably accept and completely adjust to the premise of an adult alcoholic as an individual having a treatable disease, our schools, hospitals, correctional facilities, and drug treatment centers were flooded by early adolescent poly drug abusers. Causal factors, as a primary or original source of problems related to substance abuse by adolescents, are compounded by the severe mental and physical detrimental effects produced by regular drug abuse.

These confounding factors inhibit any efforts for a successful multimodal program paradigm. Treatment programs are negatively impacted when operant procedures address a singular dimension of therapy, physical, emotional, or spiritual. Rehabilitative processes inherently mandate physical reconditioning, the missing yet critical component or factor in the majority of treatment programs.
The primary purpose of this study focused on determining the effects of physical fitness on sixteen inpatient adolescent male substance abusers following their participation in a six week fitness program. The data analysis quantified the effects of a special physical fitness program on five measures of physical fitness: 1 1/2 mile distance run, skinfold, sit-ups, sit-and-reach, and grip strength.

The secondary purpose of the study determined the effects of a specific six week fitness program on the health attitudes of sixteen inpatient adolescent male substance abusers with regard to personal health habit attitudes as measured by the Health Attributes Test (HAT). Pre- and post-treatment analysis discerned significant attitudinal variance produced by participation in the four week fitness program.

A repeated measures experimental group design was selected for identifying significant effects of a six week conditioning program as determined by five fitness and three health attitude measures on adolescent inpatient male substance abusers. Forty-four subjects were randomly selected and assigned to either an experimental or control group. Baseline measures were obtained from both groups. The experimental group subsequently participated in thirty sessions of fitness classes including eighteen sessions of walk/jogging, twelve sessions of resistive exercises, and thirty sessions of isometric stretching.
Analysis of variance for repeated measures was employed in identifying significant main effects of treatment and trials and in determining significant interaction effects of treatment over trials. An alpha level of $p < .05$ was selected to determine significance. Neuman-Keuls' multiple range test was selected for analyzing between trial differences. Graphic representations of all significant and nonsignificant interactions were provided in eight two dimensional figures.

Significant main effects of treatment were observed for three of the five dependent measures of fitness. The significant dependent variables were the one and one half mile run, $p < .001$; sit-ups, $p < .0001$; and sit-and-reach, $p < .05$.

Significant trial effects were observed in four of the five fitness measures. These significant dependent variables were skinfolds, $p < .05$; sit-ups, $p < .0001$; sit-and-reach, $< .0001$; and grip strength, $p < .0001$.

Significant interactions effects of treatment over trials were attained for three fitness measures and one attitude measure. These significant dependent variables are one and one-half mile run, $p < .01$; sit-ups, $p < .0001$; sit-and-reach, $p < .05$; and internal health locus of control, $p < .05$.

A six week fitness program including jogging, resistive exercises, and stretching produced strongly significant overall effects on selected measures of cardiovascular
efficiency, muscular strength and endurance, flexibility, and health attitudes for male inpatient substance abusers.

Conclusions

A major conclusion of this six weeks treatment study indicates a significant gain in physical fitness within four weeks of conditioning program for adolescent substance abusers. While research supports the need for longer training periods for significant gains in the normal population, adolescent substance abusers, functionally subnormal in physical fitness, evidence significant gains over shorter periods of time. Physical conditioning programs are appropriately productive for inclusion in a four week drug treatment program. Further findings of this investigation support the following specific conclusions for male adolescent substance abusers:

1. A fitness program including a walking/jogging component significantly increases cardiovascular efficiency.

2. The absence of a structured, consistent physical fitness program promoted the observation of significant and substantive losses in cardiovascular efficiency during inpatient drug treatment. The statistical data observed among adolescents participating in generalized activities and random physical activity of choice, but not included in programmed physical fitness therapy, demonstrated a negative health variance indicative of a significant deleterious decline in vascular fitness.
3. The experimental physical fitness therapy program of this study, while evidencing an overall decline, effected no significant loss of body fat in ratio to muscle. Adolescent subjects of this research exhibit profiles of severe poly drug abuse which intrinsically decreases the ratio of fat to muscle as observed in the overall pre-test mean 12.6 percent for experimental and control groups. Experimental and control subjects were a generalized representative sampling of lean adolescent males.

4. Significant decreases in body fat evidenced between the second and fourth weeks of physical fitness therapy are due to conditioning effects.

5. A physical fitness therapy program which includes a circuit strength training component significantly increases abdominal strength and endurance.

6. Abdominal strength and endurance will evidence exceedingly significant and impressive improvement as early as the second week of fitness training.

7. Adolescent substance abusers participating in a formal fitness program and those receiving only informal physical activity within a drug treatment program gain in abdominal strength and endurance. The exceedingly significant rate of strength change is consistent and progressively greater for those in a formal physical fitness therapy program.
8. Physical fitness therapy programs which include an isometric stretching component will effect significant increases and improvement in measures of lower back and hamstring flexibility.

9. Exceedingly significant gains in lower back and hamstring flexibility are evidenced between the second and fourth weeks as well as the fourth and sixth weeks of physical fitness therapy.

10. The physical fitness therapy program and the general informal physical activity produce a degree of improvement and increment in flexibility. The trend for adolescents receiving a structured formal physical fitness therapy program reflect statistically significant increases which occur at an accelerated rate.

11. A physical fitness therapy program for adolescent substance abusers which includes a circuit strength training component will not significantly increase overall grip strength.

12. Exceedingly significant gains in grip strength between the second and fourth weeks of physical fitness therapy would be attributed to effects of conditioning.

13. The absence of physical fitness therapy results in significant substantive losses in self-reliance in relation to health attitude.
14. Adolescents sampled in this study evidenced less reliance on others for controlling health. Improvement was nonsignificant and could not be attributed to physical fitness therapy alone although overall improvement appeared slightly higher for those following a structured exercise program.

15. Reliance on chance for the control of health was not significantly affected by inclusion in the physical fitness therapy under the time conditions employed in this study.

Recommendations

The findings and conclusions indicate the following recommendations for treatment and further study of the inpatient adolescent substance abuser:

1. It is recommended that a health-related physical fitness therapy program be an integral part of interdisciplinary treatment for the inpatient adolescent substance abuser operant under the following policy or guidelines:

   a. immediate and appropriate diagnosis and documentation of physical health needs with the AAHPERD Health Related Fitness Instrument or comparable tests when medical clearance is obtained;

   b. information gained from diagnosis should be utilized by an interdisciplinary treatment team in
determining short and long term goals and establishing strategies for treatment;

   c. a physical fitness therapist recognized as a member of the interdisciplinary team and assuming responsibility for insuring all appropriate strategies are followed in assisting each client in the attainment of health fitness goals;

   d. basic operational budgeting will include funding allocations for necessary staff, equipment, and facilities required in conducting an appropriate program of physical conditioning and rehabilitation;

   e. health professionals for purposes of monitoring diagnostic and treatment phases of the physical fitness conditioning program;

   f. fitness guidelines established by the American College of Sports Medicine be followed relating to frequency, intensity, duration, starting levels, and appropriate activities for improving cardiovascular efficiency, flexibility, muscular strength and endurance, and body composition;

   g. adequate observational protocol and review for assessing, reviewing, and documenting progress of clients;

   h. aggregate administrative support for the total inpatient and outpatient physical fitness therapy conditioning program.
2. It is recommended that appropriate after-care protocol be developed to assure that clients can maximize benefits of conditioning after community return.

3. Pre-service and in-service programs should be provided for all health professionals, including appropriate preparation in health related fitness commensurate with their specific needs as a member or future member of the treatment team for the "at risk" adolescent.

4. It is recommended that an assessment of health beliefs and attitudes be a part of the entrance and exit information obtained from adolescent substance abusers receiving treatment, for purposes of determining psychological attitudinal status of the client in assuming a responsible role for good health.

5. A follow-up longitudinal study should be conducted for purposes of acquiring data in determining the effects of physical fitness therapy on recidivism for the adolescent completing or exiting an inpatient drug treatment program.

6. A study of the effects of physical fitness therapy on health attitudes should be conducted over a treatment period exceeding six weeks.

7. A minimal four-to six-week study should be made of the effects of physical fitness therapy in reducing recreational sports injuries of adolescent inpatient drug abusers.
8. A study should be made of the frequency of use for replacement or substitute drugs including nicotine, caffeine, and prescribed medication on the health related fitness of the adolescent therapeutically withheld from selected drugs of misuse during inpatient status.

9. A comparative study should be made of the effects of changing activity levels on the health related fitness of the adolescent drug abuser contrasting (a) pretreatment activity levels, (b) treatment activity levels not including a structured physical fitness activity, and (c) treatment activity levels including structured fitness levels.

10. A study of the effects of physical fitness conditioning on body composition of overfat inpatient adolescent drug abusers should be initiated.

11. A study of the health beliefs and attitudes of health personnel providing treatment to adolescent drug abusers should be made.

12. A documentary study should be made of the health related age and sex adjusted physical fitness levels of health professionals, therapists, and all other personnel currently providing treatment to inpatient adolescent drug abusers.

Recommendations of this study are not inclusive of all needs and possible strategems. Their pertinence and impact are generated by the selected purposes and focus of this study.
APPENDICES
SAMPLING PROCEDURES

SUBJECT POOL

Consenting physically capable males 13-18 years of age at the Vernon Center with at least six more weeks of treatment remaining.
Approximately 100

First stratification is grouped by length of stay.
Second stratification is grouped by length of stay and age.
Proportionate randomized selection of subjects to either the control or experimental group.
INFORMED CONSENT

The Effect of a Physical Conditioning Program on Physical Fitness and Health Locus of Control Among Adolescent Substance Abusers

You are being asked to participate in a six-week study of physical health and drug abuse being conducted at the Vernon Center in Vernon, Texas by the Vernon Center and Guy M. Owen, a Doctoral Candidate at North Texas State University in Denton, Texas. This description will explain the project, what will be done, and why.

The project will include these parts: a paper and pencil part and a physical testing part, with an activity evaluation part also. In the paper and pencil part, you will be asked to answer a series of questions on several forms which will take approximately one hour to complete. The questions have to do with general identifying information, your history, and your attitudes about health. Later in your stay here, you will be asked again to fill out some of the forms so that we can see what changes, if any, may occur. You have been cleared for physical testing by your medical doctor at Vernon Center after a review of your initial physical examination.

In the physical testing part, you will be asked to have a series of tests which will take approximately one hour to complete. The tests you will receive include standard fitness measures to assess your over-all fitness. These tests will...
include a body composition evaluation to determine the amount of body fat at selected sites, a grip strength test to estimate upper body fitness, a 1.5-mile run to estimate your state of cardiovascular fitness, abdominal strength estimation by the number of sit-ups you can perform in one minute, and a sit-and-reach measure of flexibility. The distance run consists of jogging or walking on a quarter-mile track for six laps. You are encouraged to cover the distance in the fastest time possible for a true estimation of your fitness. Please wear a pair of tennis shoes and shorts. All of the physical tests will be given by trained and qualified personnel.

The activity evaluation part will include a program of activity as part of your participation at the Vernon Center. While the exact activities may vary, all will be based on an individual activity prescription, which will be discussed with you, using the results of the physical testing. The state of your fitness will be reevaluated at two weeks, four weeks, and six weeks after the initial evaluation.

Data collected will be used to help understand people's drug patterns so that we can more efficiently plan treatment, and to evaluate response to a fitness program at Vernon Center. Our hope is that we will be able to use this information to make our program more effective in the future.

The information from the paper and pencil part will not be used in planning your rehabilitation, since the purpose of it is to monitor your response to the overall program.
The physical testing and activity programs will be used as part of your participation at Vernon Center. All of the information will be kept confidential. This means the information will be coded into a computer and no one else will know how you answered. While it will be necessary to keep track of your name at first to make sure that the forms and physical results are put together, this information will be locked in a file. As soon as the study is complete, your name will be removed so that you cannot be identified.

If you wish, you may request individual, confidential feedback upon the successful completion of your program. You will also be entitled to a complete explanation or "debriefing" just in case anything occurred that you did not understand.

While we are asking you to help us for the purpose of benefiting future participants at Vernon Center with improved treatment, you will also benefit personally by having a better knowledge of your physical condition and the actions you can take to improve your health, if any. You will also benefit by having your physical condition closely monitored throughout the program.

As with any medical procedure, there is an element of risk. There is no physical risk involved in the paper and pencil part of the project, and we believe there is minimal psychological risk. We also believe there is a low risk involved in the physical procedures. The risks involved in the
physical tests are the same as the risks of engaging in physical exercise on your own. There exists the possibility of certain changes occurring during the fitness tests. They include abnormal blood pressure, fainting, disorders of heartbeat, and very rare instances of heart attack. Every effort will be made to minimize them by the preliminary examination and by observations during testing. Emergency equipment and trained personnel are available to deal with unusual situations which may arise. While you will have some fatigue in the distance run and the activity program, the risk level is considered minimal in comparison to the anticipated gains of the program.

You may at any time withdraw your consent to participate in this project. You are also free to consult any member of the Vernon Center Human Assurance Committee or Consent Committee. We appreciate your efforts in helping us to understand alcoholism and drug addiction better.

Obtain the following certification as appropriate:

A. Certification of Person Explaining Proposal

I have explained the above items to (Name of Person(s) and believe that (he/she/they) understands each of the items.

(Investigator's Signature) Date

We were present at the explanation of the above items to (Name of Person(s) giving consent) and we believe that
understands each of the above items.

(he/she/they)

Witness ___________________________ Date ___________________________

Witness ___________________________ Date ___________________________

B. Certificate of Person Giving Consent

I understand each of the above items relating to the participation of __________________________ in the research of __________________________ under the care of __________________________, and I hereby consent to participation in the research project.

(Investigator)

(my/his/her)

(Signature of Person Giving Consent) Date ___________________________

(Relation to Patient—Patient, Parent or Guardian)

C. Certificate of Assent by Proposed Subject

(If the above consent is given by a person other than the patient and the assent of the patient is also required, the following certification should also be completed for signature by the patient.)

I understand each of the above items relating to the participation of __________________________ in the research of __________________________ under the care of __________________________, and I hereby agree to my participation in the research project.

(Signature of Patient) Date ___________________________
EXPERIMENTAL DESIGN AND STATISTICAL ASSESSMENT*

TRIALS (4)

**A two-way analysis of variance with repeated measures was employed. The analysis evaluated treatment and trial differences between Groups as well as any interaction effects of treatment x trials.

**Trial 1 only included fitness measures; all other trials as well as the pre-test included all eight dependent measures.
Fitness Training Sessions

1. Fitness program components:
   a. Cardiovascular - Walking/Jogging (WJ)
   b. Muscular Strength and Endurance - Circuit Strength Training (CST) consisting of 14 strength stations
   c. Flexibility - Isometric Stretching Exercises (ISE) consisting of 10 exercises
   d. Health Fitness Instruction and Education (FIE)

2. Fitness principles for training sessions:
   a. Mode
   b. Intensity
   d. Frequency
   e. Duration
   - WJ
     60-90% Max.
     Heart Rate
     3 x per week
     15-40 minutes
   - CST
     50% IRM
     2 x per week
     20-30 minutes
   - ISE
     60-80% Max.
     Daily
     5-10 minutes

3. Approximate assignment of total training session time in minutes by activity:

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<th>Activity</th>
<th>Avg. Time per Session</th>
<th>Total Sessions</th>
<th>Total Time</th>
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</thead>
<tbody>
<tr>
<td>a. WJ</td>
<td>25</td>
<td>18</td>
<td>450</td>
</tr>
<tr>
<td>b. CST</td>
<td>20</td>
<td>12</td>
<td>240</td>
</tr>
<tr>
<td>c. ISE</td>
<td>5</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>d. FIE</td>
<td>12</td>
<td>30</td>
<td>360</td>
</tr>
<tr>
<td>e. Class Org.</td>
<td>5</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>f. Wm. up/Cool Dn. (Time figured within exercise components)</td>
<td></td>
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<td>Total 1350</td>
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</table>

4. Other physical activity:

   Both experimental and control subjects had the choice of instructional recreation activities during their free time. During the six-week treatment period the recreational activities offered were swimming, weight lifting, intramural basketball competition, dancing, and badminton. Choices that seemed most popular were weight training and basketball.

5. Description of circuit training:

   1 RM represents the maximum amount that can be lifted in one repetition. During the circuit training session the subjects began at 50% 1 RM and completed as many repetitions as possible during a 20-25 second period for each lift. There were 14 stations and by the fourth week subjects were completing two sets of the fourteen
stations for a total of 28 stations at 20-25 seconds each.

6. Exercises chosen for fitness components:

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<tr>
<td>Walking</td>
<td>Jogging</td>
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<tr>
<td>WJ</td>
<td>Interval Training</td>
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<tr>
<td>CST</td>
<td>Shoulder Press</td>
<td>Bench Press</td>
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<td></td>
<td>Upright Rowing</td>
<td>Leg Press</td>
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<tr>
<td></td>
<td>Bar Dip</td>
<td>Lat. Pull Down</td>
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<td></td>
<td>Arm Curl</td>
<td>Back Arm Pull Down</td>
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<td></td>
<td>Chin Up</td>
<td>Bench Step</td>
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<td></td>
<td>Sitting Toe Touch</td>
<td>Lying Knee-Pull</td>
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<tr>
<td></td>
<td>Indian Curl</td>
<td>Pelvic Stretch</td>
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<tr>
<td></td>
<td>Knee Chest Curl</td>
<td>Pectoral Stretch</td>
</tr>
<tr>
<td></td>
<td>Sitting Twist</td>
<td>Heel Cord Stretch</td>
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# PHYSICAL PERFORMANCE EVALUATION

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<tr>
<td>Chest Circumference</td>
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# Strength and Flexibility Program Progress

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<th>Individual Plan</th>
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<th>3</th>
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**APPROVAL CLASSIFICATION**

A. No restrictions
B. Restrictions as noted by Physician
C. Presence of Physician required unless otherwise noted by Physician
## SCHEDULE OF RESEARCH ACTIVITIES

<table>
<thead>
<tr>
<th>Research Day</th>
<th>Activities</th>
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</table>
| 1-4          | 1. Review project with Vernon Center Administrative Staff  
               2. Prepare all test folders for selected subjects  
               3. Insure that all equipment and facilities are prepared for testing |
| 5-7          | 1. Orientation of Vernon Center Staff to project  
               2. Selection of eligible subject pool  
               3. Orientation of selected subjects |
| 8-11         | 1. Complete general information form for all subjects  
               2. Stratified random sampling of subjects for placement into Experimental Group I and Control Group II  
               3. Complete all pre-test measures on all subjects  
               4. Write fitness prescriptions for experimental group  
               5. Randomly divide Group I into two classes of approximately ten subjects for instruction during treatment phase  
               6. Insure that equipment and facilities are ready for fitness classes |
| 12-51        | 1. During this period, Group I will receive a minimum of twenty sessions and no more than thirty. This group will also continue to receive the full treatment program presently offered by Vernon Center  
               2. Group II will continue to receive the current full treatment program offered by the Vernon Center  
               3. Conduct appropriate measures at two weeks and four weeks |
| 52-54        | 1. All subjects will complete all final measures  
               2. Final meeting with all subjects and participants |
| 55-60        | 1. Results and recommendations will be given the Vernon Center in the form of staff training sessions |
# Health Attribution Test

<table>
<thead>
<tr>
<th>Name:</th>
<th>I</th>
<th>P</th>
<th>C</th>
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<tbody>
<tr>
<td>Date:</td>
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<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Disagree strongly</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Agree somewhat</th>
<th>Strongly agree</th>
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</thead>
<tbody>
<tr>
<td>1. I can usually keep myself healthy by paying close attention to what I eat.</td>
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<td>2. When I get sick or hurt it is usually God's way of punishing me for my sins.</td>
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<td>3. If I don't catch a cold or flu or have an accident once a year it is because I am very lucky.</td>
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<td>4. If I were extremely sick, I might go to a faith healer.</td>
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<td>5. Most diseases or accidents can happen to anybody at any time.</td>
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<td>6. Thinking positive thoughts can help me get well and stay well.</td>
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<td>7. If I keep my body in shape through exercise, I can ward off much sickness.</td>
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<td>8. If I breathe in cold germs, I'll almost always catch a cold.</td>
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</table>
9. If I could just understand how my body functioned, I could figure out how to get well and stay healthy.

10. I will still get sick or hurt if that is what is supposed to happen even if I set my mind to stay healthy.

11. Everyone should be responsible for their own health and not push the responsibility off on a doctor.

12. Sickness or accidents are a lesson in life and carry a message

13. I believe little children can learn to be healthy if they are exposed to proper teachings

14. Other countries who are our enemies are probably responsible for the high rate of disease here.

15. No matter what I do I will get sick or hurt sooner or later.

16. It always amazes me that people think they can control whether they’ll get sick or hurt or not.

17. Only medical doctors know how to treat illnesses.
<p>| | |</p>
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<tbody>
<tr>
<td>18.</td>
<td>Diet and nutrition have very little to do with health, people will get sick no matter what they do</td>
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<tr>
<td>19.</td>
<td>All the talk about nutrition and exercise is foolish; some people are just basically healthy and others aren't.</td>
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<tr>
<td>20.</td>
<td>Some people just seem to be accident prone.</td>
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<tr>
<td>21.</td>
<td>I can usually tell when I am about to get sick, and with some care on my part I can avoid it.</td>
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<tr>
<td>22.</td>
<td>My life is chiefly controlled by powerful others.</td>
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</tbody>
</table>
Distance Run. The 1 1/2-mile run was described by Cooper (1978) as correlating well with one’s maximum oxygen consumption (p. 282). Both Cooper and the AAHPERD Task Force (AAHPERD, 1980) have indicated their confidence in the 1 1/2-mile test as a reliable and valid test of cardiovascular efficiency.

Body Composition. The sum of subscapular and tricep skinfolds will be measured using a Harpenden (Quinton Instrument Company, Seattle, Washington) skinfold caliper. These skinfold calipers include accurate calibration capability and a constant pressure of 10 gm/mm² throughout the range of skinfold thickness. This caliper is one of two recommended in the AAHPERD Test Manual. The correlations (i.e., validity coefficients) between skinfolds and the accepted and valid hydrostatic weighing method have consistently ranged from 0.70 to 0.90 in both children and adult. The test-retest reliability of skinfold fat measures has exceeded .95 in experienced testers (AAHPERD, 1980). This investigator obtained test-retest reliabilities of .99 on both tricep and subscapular skinfold measures.

Modified Sit-ups. The validity of the sit-up has been logically determined. Scientific studies have shown that the abdominal muscles are being utilized during the execution
of the test. The test-retest reliability coefficients have ranged from 0.68 to 0.94 (AAHPERD, 1980).

**Sit and Reach.** The sit and reach test has been validated against several other types of flexibility tests. The coefficients have ranged between 0.80 and 0.90. The measure has a logical validity in that one must have good extensibility in the low back, hip, and posterior thigh in order to achieve a good score on the test item. Reliability coefficients for the sit and reach test have been high, ranging above 0.70 (AAHPERD, 1980).

**Grip Strength.** Arm and grip strength measures have been correlated with other measures of upper body strength and have been found to be a valid measure of arm strength. One of the largest studies employing this method of assessment was conducted by Montoye and Lamphier (1977). Six-thousand subjects both male and female between the ages of ten and sixty-nine in the city of Tecumseh, Michigan was given arm and grip strength tests. In this study, the Harpenden hand dynamometer will be used to assess grip strength in kilograms of the dominant hand. Each subject will be allowed three trials with the largest score being accepted as the final score. During the assessment, the subject will be asked to squeeze as hard as possible keeping the hand and arm down and away from the body. The hand dynamometer will be appropriately adjusted to the hand of the
Health Attitude Test (HAT). In a study conducted by Flynn (1979) 195 subjects including 93 undergraduate students, 50 non-patient adults, 25 hospital inpatients, and 27 medical outpatients, it was found that concurrent correlations between the HAT test and the Levinson Locus of Control test were significant. Lawlis and Lawlis (1980) indicated this represented acceptable concurrent validity. Test-retest reliability was determined using twenty-four subjects that were tested at an interval of one to three days. The resultant coefficients for the three health attitude measures of Internal, Powerful Other, and Chance ranged from 0.75 to 0.85. In order to estimate the consistency in the test items, a split-half reliability analysis was computed with the 161 subjects in the original study (Flynn, 1979). The resultant coefficients for the three measures ranged from 0.75 to 0.92.

Lawlis and Lawlis (1980) recommended a transformation of raw scores into "sten scores" for ease in interpretation of results. Their suggestion was heeded and scores were transformed. The sten score, a version of standard scores, is based on a division of the normal distribution curve into a range of from 1 to 10. The mean of the sten scores is 5.5 and the standard deviation is 2.
### Subject Attrition Information

<table>
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<th>Group*</th>
<th>Subject No.</th>
<th>Reason for Attrition</th>
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<td>1</td>
<td>05</td>
<td>Asked to leave facility because of poor program progress</td>
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<td>1</td>
<td>06</td>
<td>Did not return from furlough</td>
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<td>1</td>
<td>15</td>
<td>Refused to participate after pre-test</td>
</tr>
<tr>
<td>1</td>
<td>17</td>
<td>Refused to participate after pre-test</td>
</tr>
<tr>
<td>1</td>
<td>19</td>
<td>Graduated from treatment center</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>Graduated from treatment center</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>Asked to leave facility because of poor program progress</td>
</tr>
<tr>
<td>2</td>
<td>33</td>
<td>Asked to leave facility because of drug usage</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>Graduated from treatment center</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>Asked to leave facility because of drug usage</td>
</tr>
<tr>
<td>2</td>
<td>43</td>
<td>Asked to leave facility because of poor program progress</td>
</tr>
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</table>

*Experimental Group = 1  
Control Group = 2
<table>
<thead>
<tr>
<th>Anthropometric And Vital Measures</th>
<th>Experimental Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Height (in.)</td>
<td>66.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Weight (lbs.)</td>
<td>133.3</td>
<td>20.3</td>
</tr>
<tr>
<td>Resting Pulse Rate (BPM)</td>
<td>67.1</td>
<td>10.5</td>
</tr>
<tr>
<td>Systolic BP (mm)</td>
<td>97.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Diastolic BP (mm)</td>
<td>63.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Variable</td>
<td>Group No.</td>
<td>Pretest</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>1 1/2 mi. Distance Run (sec)</td>
<td>I</td>
<td>756.1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>833.4</td>
</tr>
<tr>
<td>Sum of Tricep and Sub-Scapular</td>
<td>I</td>
<td>16.9</td>
</tr>
<tr>
<td>Skinfold (mm)</td>
<td>II</td>
<td>19.1</td>
</tr>
<tr>
<td>Sit-ups in 60 Sec.</td>
<td>I</td>
<td>41.1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>40.3</td>
</tr>
<tr>
<td>Dominant Hand Grip Strength (Kg)</td>
<td>I</td>
<td>36.1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>38.2</td>
</tr>
<tr>
<td>Sit-and-Reach (Cm)</td>
<td>I</td>
<td>26.1</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>22.6</td>
</tr>
</tbody>
</table>

Group No. I, Experimental; Group No. II, Control

* P ≤ .05
** P ≤ .01
*** P ≤ .001
TABLE XII

DESCRIPTIVE STATISTICS FOR THREE HEALTH ATTITUDE MEASURES 
OVER PRE-TEST AND TRIALS 2 AND 3 INCLUDING 
LEVELS OF SIGNIFICANCE

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group*</th>
<th>Pretest M</th>
<th>SeM</th>
<th>SD</th>
<th>Trial 2 M</th>
<th>SeM</th>
<th>SD</th>
<th>Trial 3 M</th>
<th>SeM</th>
<th>SD</th>
<th>Between</th>
<th>Within</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal (Sten Scores)</td>
<td>I</td>
<td>6.0</td>
<td>.4</td>
<td>1.7</td>
<td>6.5</td>
<td>.5</td>
<td>2.1</td>
<td>6.8</td>
<td>.5</td>
<td>1.9</td>
<td>.589</td>
<td>.276</td>
<td>.054**</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>6.6</td>
<td>.5</td>
<td>2.1</td>
<td>5.4</td>
<td>.5</td>
<td>2.1</td>
<td>6.3</td>
<td>.6</td>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powerful Others (Sten Scores)</td>
<td>I</td>
<td>7.7</td>
<td>.7</td>
<td>2.7</td>
<td>6.8</td>
<td>.7</td>
<td>2.7</td>
<td>6.8</td>
<td>.8</td>
<td>3.0</td>
<td>.758</td>
<td>.071</td>
<td>.798</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>7.2</td>
<td>.6</td>
<td>2.5</td>
<td>6.8</td>
<td>.5</td>
<td>2.1</td>
<td>6.5</td>
<td>.6</td>
<td>2.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chance (Sten Scores)</td>
<td>I</td>
<td>6.1</td>
<td>.5</td>
<td>2.1</td>
<td>5.3</td>
<td>.5</td>
<td>1.8</td>
<td>5.7</td>
<td>.5</td>
<td>1.9</td>
<td>.243</td>
<td>.078</td>
<td>.590</td>
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<td>II</td>
<td>6.6</td>
<td>.4</td>
<td>1.5</td>
<td>5.8</td>
<td>.6</td>
<td>2.4</td>
<td>6.8</td>
<td>.6</td>
<td>2.2</td>
<td></td>
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</tr>
</tbody>
</table>

*Group I, Experimental; Group II, Control

**P ≤ .05
Fig. 15—A comparison of experimental and control group means to normative data for powerful others locus of control. Source: Normative data from J. Lawlis and G. F. Lawlis, Health Attribution Test, Dallas, Texas, 1980.
Fig. 16—A comparison of experimental and control group means to normative data for chance locus of control. Source: Normative data from J. Lawlis and G. F. Lawlis, *Health Attribution Test*, Dallas, Texas, 1980.
Fig. 17—A comparison of experimental and control group means to age-adjusted norms for sum of tricep and subscapular skinfolds (mm) over trials. Source: Percentile norms from AAHPERD, Lifetime health related physical fitness test manual, Reston, Va., 1980.
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