The effects of exercise in the rehabilitation process of substance abuse

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THE EFFECTS OF EXERCISE IN THE
REHABILITATION PROCESS OF
SUBSTANCE ABUSE

by

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ABSTRACT

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by

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Exercise may assist in the rehabilitation process by providing a way for the dependent individual to achieve a mild, pleasurable state that does not require the use of substances.

Women between 18 and 43 years of age who were under supervision in a rehabilitation facility for substance abuse were randomly selected to be part of an exercise or a control group. They exercised three times a week for a total of two months. Subjects completed pre and post assessments of anxiety, depression, and readiness to change. They also completed pre and post assessments of resting heart rate, percent body fat, 1 minute curl up, sit-and-reach, and 3 minute step test. Post BDI-II, and BAI showed a significant difference between groups. Only post curl up, 3 minute step test, and percent body fat were significant.
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(Gabriela Vilarino Regino)
CHAPTER I

WOMEN AND SUBSTANCE ABUSE

Introduction

Health risk behaviors, which contribute to the leading cause of morbidity and mortality among youth and adults (Centers for Disease Control and Prevention (CDCP), 2006; Morbidity & Mortality Weekly Report (MMWR) 2006), often are established during youth, extend into adulthood, are interrelated, and are preventable (CDCP, 2006; MMWR 2006). The Youth Risk Behavior Surveillance System (YRBSS) (CDCP, 2006; MMWR 2006) uses six categories of health risk behaviors to assess youth and young adults. These categories include behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual behaviors that contribute to unintended pregnancy, and sexually transmitted diseases, unhealthy dietary behaviors, physical inactivity, and overweight.

The YRBSS (CDCP, 2006; MMWR 2006) report on risk behavior summarizes results from several sources, such as national survey, a 32-state survey, and 18 local surveys conducted among students in grades 9 to 12. The YRBSS (CDCP, 2006; MMWR 2006) data for 2005 indicated that nationwide, approximately 74.3% (±3.1) of students had one or more drinks of alcohol during their lifetime, approximately 43.3% (±2.7) had one or more drinks of alcohol in the preceding 30 days, and 25.5% (± 2.2) of students had five or
more drinks on one or more occasions in the past 30 days, i.e. episodic heavy drinking (YRBSS, 2006).

In the U.S., 70.8% of all deaths among youth and young adults aged 10-24 years result from only four causes: motor-vehicle crashes (32.3%), other unintentional injuries (11.7%), homicide (15.1%), and suicide (11.7%). Alcohol use is linked to all these causes. Additionally, 20.2% (±1.6) of students nationwide have used marijuana one or more times during the past 30 days, 3.4% (±0.6) have used a form of cocaine one or more times during the past 30 days, 2.1% (±0.3) of students have used a needle to inject illegal drugs into their body one or more times during their lifetimes, 12.4% (±1.3) of students have used inhalants one or more times during the past 30 days, 4.0% (±0.5) have taken steroids, 2.4% (±0.4) have used heroin, 6.2% (±0.9) have used methamphetamines, and 6.3% (±0.9) of students have used ecstasy one or more times during their lifetime (i.e., lifetime ecstasy use). Furthermore, alcohol and drug use are among only four risk behaviors that have worsened in adolescents during the past decade (Werch, Moore, DiClemente, Owen, & Bledsoe, 2003).

Among adults aged 25 years and older, 62.9% of all deaths in the U.S. result from cardiovascular diseases (39.4%) and cancer (23.5%), for which a lack of physical activity and the consequence of being overweight, are associated. Physical activity in general declines during adolescent years, and compared with recent increases in youth obesity, accentuates the critical importance of maintaining a physically active lifestyle during adolescence (YRBSS, 2006). Meanwhile, 33.4% of students nationally had an insufficient amount of physical activity, defined as neither participating in vigorous physical activity for 20 or more minutes on 3 or more of the past 7 days, nor participating.
in moderate physical activity for 30 or more minutes on 3 or more of the past 7 days of the week (Grunbaum, et al., 2002).

Many adolescent health behaviors share common determinants, in addition to being interrelated (Arthur, et al., 2002; Dryfoos, 1991; Durlak, et al., 1998; Kellum, Koretz, & Moscicki, 1999). This suggests that treatment interventions evaluating multiple adolescent health behaviors concurrently may be a successful strategy. The use of sports and/or physical activity in a substance abuse prevention/intervention program offers an innovative strategy that might have a greater appeal to adolescents than typical substance abuse-focused intervention (Werch, et al., 2003).

Physical activity has been identified as a major factor in the prevention and rehabilitation of many different disorders such as coronary artery disease, hypertension, diabetes and many others. Reliable research done mostly with alcohol dependent subjects shows evidence that regular exercise contributes to a decrease in depression, anxiety and other negative mood disorders (Byrne & Byrne, 1993). Consequently, exercise may affect both physical and mental health.

In previous research, participants reported experiencing a state of wellness, associated with exercise. As a result, exercise may assist in the rehabilitation process by providing a natural way for the dependent individual to achieve a mild, pleasurable state that does not require the use of substance and/or distressful behavior (Read & Brown, 2003).

Given that exercise may be beneficial for mental health, it is important to evaluate its effectiveness. This research involved implementing an exercise intervention to a group of women between the ages of 18 and 43, who were currently under supervision in a rehabilitation center due to substance abuse. The implemented exercise program was
performed 3 times per week, for a 2 month period. Pre and post tests were used. They
included psychological and physiological assessments of subjects to better assess the
results of the research.

Statement of the Problem

The purpose of this study was to examine if exercise might be an effective treatment
for clinically significant depression and anxiety. The problem directing this study is that,
although a substantial amount of literature verifies the many benefits associated with
exercise on the physiological health (Dwyer & Briggs, 1983) there is minimal research
that validates the benefits of exercise when associated with psychological disorders.
Substance abuse treatment programs should focus on the total well being of the patient
rather than just targeting functional sobriety. Traditional treatment programs
concentrate on cognitive therapy, emphasizing education and control, or spiritual
development (Fridinger & Dehart, 1993). Usually these short-term inpatient care
programs are done in a hospital setting. The hospitalization period allows for intensive
planning and initiation of the program. Frequently the length of stay is approximately 28
days, although it may vary according to insurance policies, programs, and/or patient
needs. Many programs might meet their goals in detoxifying their patients, but fail to
teach how to repair bodies and prepare minds for future challenges (Fridinger & Dehart,
1993). Treatment programs ignore or fail to introduce physical activity to their patient’s
lives. Health scientists agree on the positive effects that exercise have upon physical
wellness and upon specific variables (e.g. heart rate, blood pressure) (Sime, 1987). The
literature seems to support the idea that there is a place for programmed physical activity in a treatment setting.

Hypothesis

The first research hypothesis states that there will be a decrease in depression and anxiety due to the exercise intervention. The null hypothesis states that there will be no difference in the state of depression and anxiety.

Definitions

In this research, the independent variable will be the exercise intervention program, as it may affect the outcome of the other variables. The dependent variables will be the psychological and physiological states; depression and anxiety for the first, and resting heart rate, percent body fat, flexibility, muscular endurance, and cardiorespiratory fitness for the latter.

Limitations

The findings in this study are subject to multiple limitations. First, the results apply only to a particular group of women between the ages of 18 and 43 in a rehabilitation program; therefore, will not be representative of all women groups. Second, this study will only test for improvements in depression and anxiety. Third, the long-term efficacy of the exercise program on these psychological states will not be established. Consequently, no comment can be made on whether reported therapeutic effects are
maintained after exercise cessation or whether indefinite exercise is necessary to maintain the therapeutic effect
CHAPTER II

REVIEW OF LITERATURE

The following literature review will attempt to describe the relationship between women and substance abuse, and the relationship between exercise and mental health. Several examples will describe the process through which women may become addicted, and also the channels through which exercise may be beneficial in the rehabilitation process of substance abuse.

Women and Substance Abuse

The following will discuss the relationship between women and substance abuse. Often, drug users do not limit themselves to one specific drug, instead using multiple drugs. For example, amphetamine causes unwanted side effects such as insomnia, irritability, and mood reaction. As a result, users try to counter these effects by using other drugs, such as CNS depressants (Mycek, Harvey, & Champe, 1997). The use of multiple drugs can have severe consequences. Coffin et al. (2003) investigated opiates, cocaine, and alcohol combinations. The results demonstrated that over half of deaths caused by accidental overdose might be attributed to using a combination of two or more drugs. Interestingly, the National Center on Addiction and Substance Abuse at Columbia University (CASA, 2006) showed that multiple-drug users often have been diagnosed with a mood disorder
such as depression. Even more intriguing is the fact that several studies (Brecht et al., 2001; CASA, 2003; Feigelman et al., 1998) agreed that the majority of women who abuse drugs are multiple drug users.

Brecht et al. (2004) studied the relationship between gender, behavior, and methamphetamine abuse. He found that the female population of methamphetamine users had a much higher percentage of using other drugs in combination than the general population. The population investigated in this study was seeking treatment and 100% of them had used alcohol, 99% marijuana, 97% tobacco, 86% cocaine, and 28% heroin. Other studies seem to be in accordance with Brecht et al.’s (2004) findings. CASA (2003) reported a strong relationship among teen girls and the use of tobacco, alcohol, and other substances used in combination.

Feigelman et al. (1998) reported that a total of 44% of college-aged multiple drug users are women. The researchers found that the majority of college women in the late 1990s were multiple users of drugs. Research seems to conclude that multiple drug users usually have a mental health issue, such as suffering from a mood disorder such as depression (CASA, 2006). Furthermore, available research indicates that women seem to be multiple drug users (CASA, 2006). This becomes a question of which is the cause and which is the effect when one considers that there is a higher incidence of depression normally found among women (CASA, 2006). If a female is a drug user and is depressed, she is more likely to be a multiple drug user (Conway, Kane, Ball, Polling, & Rounsaville, 2003). In addition, most of the withdrawal symptoms of drugs include anxiety and/or depression, irritability, and insomnia. A depressed female who is a multiple drug user and who tries to withdraw from drug use or can not get a fix in time to
stop withdrawal symptoms, may experience withdrawal symptoms that intensity her depression symptoms. Hence, it is imperative that she receives proper rehabilitation addressing this problem.

Exercise and Mental Health

The literature describes how regular exercise produces positive results not only for sleep disturbances, but also for psychological issues as anxiety and depression through the use of humor, memory, and learning problems (Melo, Boscolo, Esteves, & Tufik, 2005). Exercise produces physiological, biochemical, and psychological changes and may be considered a non-medicinal intervention to treat disturbances related to psychobiological aspects (Melo et al., 2005).

Several studies conducted in an attempt to understand the relationship between exercise and psychobiological aspects of health verify the importance of exercise. The literature goes back to the 1970s, when the first studies involved aerobic exercise and its effect on mood and anxiety (Melo et al., 2005). Although these and other results demonstrated important benefits of exercise in cognitive functions, humor, and sleep disturbances, there is still a lack of research in this area. Unfortunately, most research done until the 1980s was conducted based on male perceptions, neglecting female drug use (CASA, 2006; Kandall, 1996; White, 2003).

The literature on drugs concerning gender and drug use, however, is limited, with studies virtually ignoring “gender as a factor influencing drug use and [extrapolating] from the male experience” (Henderson, 1993; McCallum et al., 1998; CASA, 2006). Lammers and Schppers suggested back in 1991 that female drug use had not been seen as
relevant, visible, or recognized due to its structural problem, and not so much due to the attitude of an individual researcher. McCallum et al. (1998) proposed that this invisibility of female's drug use could be explained by social conventions and sanctions. Despite this fact, more research on the topics of substance abuse and psychological benefits started to emerge in the 1980s.

In 1984, a workshop dealing with exercise and mental health sponsored by the National Institute of Mental Health reached a consensus stating that exercise is associated with a reduction in stress, as well as decrease in mild to moderate depression and anxiety symptoms. Workshop participants also agreed that exercise served as an adjunct in the treatment of severe depression and has beneficial emotional effects across all ages and in both sexes (Morgan, 1985). With this in mind, researchers began exploring the benefits of exercise as related to other mental health issues such as substance abuse. In the next section, this relationship will be addressed.

Biological, Socio-Cultural and Environmental Factors

Relating Women and Substance Abuse

*Biological*

Female drug use may be biological or behavioral in cause or, most likely, a combination or both at different levels. For example, biological factors that relate to women include a lower tolerance of alcohol than in males and reaching the same blood alcohol levels with a lesser amount of consumption (McCallum et al., 1998). On average, the lower body weight and lower percentage of water in female bodies (51% vs. 65%) translate into higher blood alcohol levels when imbibing the same amount of alcohol.
consumed by a male. Swift et al. (1995) argued that first-pass metabolism (i.e., absorption of part of ingested alcohol by the stomach) affects women less strongly than it does males, if at all (CASA, 2006; Ferreira, 2002).

Females are also more susceptible to alcohol-related brain injury and develop dependency at lower levels of use and in a shorter time than men do (CASA, 2006; Copeland, 1995a; White, 1998). A similar situation seems to happen with tobacco use in females. Evidence shows that males metabolize nicotine more quickly than females, and females are more sensitive to nicotine than males are (Carton, Jouvent, & Wildocher, 1994; CASA, 2006; Ferreira, 2002; Gray, Cinciripini, & Cinciripini, 1995; Krupka &Never, 1992; Swift et al., 1995; Winstanley, Woodward, & Walker, 1995). Females are also at risk for decreased fertility, irregular or absent periods, harm to fetus if pregnant, and a tenfold increased risk of a myocardial infarction for a female who smokes while taking contraceptive pills (Burkman, Schlesselman & Zieman, 2004; Winstanley et al., 1995).

Another biological variable, female fat tissue, affects the metabolism of different drugs (e.g., cannabis, benzodiazepines). The effects of these drugs in females seem to last longer due to the greater amount of lipid tissue women have over men. This higher fat level also affects the lipid-soluble response to medication absorption, breakdown, and distribution, resulting in higher fat storage and more gradual release of such substances as THC and benzodiazepines (Blume, 1990; Lex, 1991).

Based on all of these factors that are unique to women, it can be concluded that females are at increased risk of adverse effects from most drugs because of metabolism differences (Blume, 1990; CASA, 2006; Ferreira, Opland, Winters, & Stinchfield, 1995).
It is highly important, therefore, to consider these differences and ensure a wider understanding of the different variables that influence drug use and addiction in women when caring for the female addict.

**Peer Pressure**

Peer pressure seems to affect girls more strongly than boys. One study found that a girl is seven times more likely than a boy to drink alcohol if her closest friend smokes or drinks (Simons-Morton et al., 2001). Further, teens who are susceptible to peer pressure consume more tobacco, alcohol, and illicit drugs than those teens that experience less pressure (Santor et al., 2000). Girl’s perceptions of peer pressure seem to be greatest from middle school to high school (CASA, 2003). Many teen girls start smoking during these years in a desire to “fit in” with peer. Those who would like to quit, will not quit for fear of rejection or lack of support from peers (Seguire et al., 2000). Also, girls who feel the stress to maintain a certain image, maintain their status of being “popular”, or to project a rebellious, sophisticated image, will use drugs in an attempt to boost their image (Michell et al., 1997).

Women appear to engage in substance abuse for different reasons than men do. Women often use drugs to cope with very real pressures and tensions of their lives, for example, co-occurring mental illness such as depression (which women are likelier to experience) (CASA, 2006), low self-esteem, poor body image, and high levels of stress. Also, women who have been sexually or physically abused are at a greater risk for becoming abusers. On the other hand, males drink and use other drugs to deal with external pressures, for example, the rite of passage to confirm adulthood and masculinity,
such as binge drinking (Broom, 1994) and to feel disinhibited. Moreover, women get
hooked faster and suffer the consequences sooner than males. They are also more likely
to relapse with drinking and other drugs when feeling sad or depressed, and males when
delaining with external pressures (Buelow & Buelow, 1995; Lammers & Schippers, 1991;
McCallum, 1998; Winstanley et al., 1995). These factors must be considered when
planning a prevention, intervention, and treatment for substance abuse in order to help
girls and women (CASA, 2006.)

Exercise, Body Image, Self-Concept, and Self-Esteem

Body Image and Exercise

Body image is each individual’s perception of his or her body. Body image is
relatively flexible and may be modified through specific experiences. Possible
experiences include a decrease in body weight, an increase in energy levels, or an
increase in muscular tone, all attainable through exercise. Women are at a higher risk
than men are for problems related to body dissatisfaction and disordered eating behavior.
Studies have demonstrated that women are, in fact, more concerned with their
appearance, more likely to perceive themselves as heavier than they really are, more
dissatisfied with their bodies, more likely to engage in different forms of disordered
eating, and also desire to lose more weight (Kashubeck-West, Mintz, & Weigold, 2005).
The desire to lose weight is highly correlated with poor body image, and according to
Kashubeck-West (2005) it typically means that more women have a poor body image
than men. However, life orientation also shapes how an individual feels about his or her
body. Exercise habits, sexual experiences, and mood also influence the feelings people have toward their bodies.

In 1995, Palmer studies the psychological effects of an 8 week exercise program that included women with menstrual problems between the ages of 29 to 50. A pre and post test were performed measuring blood pressure, resting heart rate, Rockport Walking Test (1 mile walk) results, and levels of self-esteem and depression. There was also a control groups, which did not exercise. The post test revealed that the active group did significantly better on the Rockport Walking Test and blood pressure measurements. The author also noted significant increases in self-esteem levels.

In 1994, Koniak-Griffing investigated the effects of a 6 week aerobic exercise program in 58 pregnant adolescents. He/she measured levels of depression, self-esteem, and pregnancy discomfort. A control group, consisting of 23 pregnant adolescents, did not participate in the exercise program. The participants exercised two times a week. The experimental group had decreased depression and increased self-esteem levels. The control group reported increased pregnancy discomfort.

Self-concept

Self-concept may be defined as a cognitive structure that organizes the past experiences of an individual, real or imaginary, control the informative process, and acts as an auto-regulatory function (DiLorenzo et al., 1999; Frost et al., 2003; Melo et al., 2005). Usually there are three components to self-concept; evaluative, cognitive, and behavioral. The evaluative component is the self-esteem portion of the self-concept and consists of a total self-evaluation that an individual makes, creating self-through self-acceptance and feelings of self-worth and self-trust. This component is one of the most
important to psychological well-being and social function (Melo et al., 2005; Smith, 1986; Yeung et al., 1996). The cognitive component consists of an individual’s perception of present and desired or non-desired characteristics and abilities. The behavioral component consists of strategies of self-presentation that an individual uses with the purpose of transmitting to others a positive image of self (Melo et al., 2005). Nezlek and Plesko (2001) demonstrated that daily changes affecting the clear definition of one’s self-concept are correlated with positive and/or negative daily events and changes in humor. The authors hypothesized that self-concept clarity (SCC) would covary with daily negative events and affect (NA) and daily positive events and affect (PA). They believed that SCC would covary positively with daily self-esteem (SE) and that the strength of the day-level relationships between SCC and events and SCC and mood would vary negatively with measures of trait adjustments. They studied 112 psychological students, measuring their SCC at the trait and state levels. Trait levels represent how one generally feels, whereas state levels represent how one feels at a particular time (Nezlek & Plesko, 2001). Trait SCC was measured using items 1, 4, 8, and 9 from the original trait SCC scale, chosen based on factors reported by Campbell et al. The surveys were collected twice a week.

Trait and state SE were measure using the Rosenberg Self-Esteem Scale (RSE) (Rosenberg, 1965). The trait version of the scale was completed at the beginning and end of the study. Daily SE was measured using items 3, 6, 7, and 10 on the trait scales, which was reworded to refer to how subjects felt about themselves that day. PA and NA were measured at the trait and the state levels with the Positive and Negative Affect Schedule.
(PANAS) (Watson, Clark, & Tellegen, 1988). Daily events were measured using 22 of the 40 items from the Daily Events Survey (DES) (Butler et al., 1994). The investigators also added four new items to the scale, which consisted of 26 items: seven positive-social, seven positive achievements, six negative-social, and six negative-achievement.

Participants also completed the Beck Depression Inventory (BDI) (Beck, 1967), Beck Self-Concept Scale (BSC) (Beck, Steer, Epstein, & Brown, 1990), Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977), and trait anxiety subscale of the State-Trait Personality Inventory (Spielberger et al., 1979). Participants completed the questionnaires as follows: on the first day of the study, participants completed trait measures of SCC, BDI, and RSE; twice a week throughout the study they completed state SCC, RSE, mood measures, and reports of daily events; on the last day of the study, participants completed trait RSE, PANAS, the CES-D, and trait anxiety measure. BSC was completed 3 weeks before the study began.

The study by Nezlek and Plesko (2001) confirmed four of the hypotheses: (a) Daily SCC covaried with daily negative and positive events, daily NA, and daily SE; (b) day level relationships were not moderated by individual differences in trait SE and SCC or by trait anxiety, depressive symptoms, or a measure of the depressogenic aspects of the self-concept; (c) trait SCC was negatively correlated with state variability of SE, NA, and SCC; and (d) the relationship between SCC and negative events was much stronger than the relationship between SCC and positive events. One can refer to Tables 1-4 for an analysis of these hypotheses. The researchers concluded that events do lead to change in psychological states, and it seems that increases in SCC from positive events such as success and acceptance are much smaller than the decreases in SCC from negative events.
such as failure and rejection. Daily SE and daily SCC covaried and the research suggested that daily SE mediated the relationship between daily positive events and SCC. Daily SCC also covaried with NA that people experience each day. On days when SCC was lower, NA was higher. Daily events did not appear to lead to changes in SCC directly, but they did lead to changes in SE and NA, which in turn led to changes in SCC. This research suggested that the saying that 100 good things could happen, but it only takes one bad thing to ruin everything, may in fact be more than an old wives tale. Negative events tend to have a greater impact than positive events (changes in NA may have greater impact than changes in PA) (Nezlek & Plesko, 2001).

Baumgardner (1990) argued that people who were more uncertain about their SCC, in comparison to those who were more certain, were less likely to choose or be in environments in which they would excel and succeed. In turn, they were less likely to receive positive feedback. Therefore, if people are low in their SCC, they are more likely to lean towards negative things and situations. Thus, it is likely that women who abuse substances do so to numb feelings of worthlessness, increase self-esteem, and feel they belong in attempt to get rid of depression, and anxiety. In general, their SCC is associated with negative feeling or negative events. It may be plausible to suggest that by introducing multiple positive events or events that may lead to increases in multiple areas of SE to a woman’s daily routine during rehabilitation may add to the efficacy and speed of her recovery.

The tables in the following section analyze various day-level relationships.
Table 1

Day-Level Relationships between Self-Concept Clarity and Daily Events, Clarity and Mood, and Clarity and Self-Esteem

<table>
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<tr>
<th>Analysis</th>
<th>Coefficient</th>
<th>t Ratio</th>
<th>p Level</th>
</tr>
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<tr>
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<td>.01</td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
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<td>.01</td>
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<tr>
<td>Daily self-esteem</td>
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<td>5.0</td>
<td>.01</td>
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Table 2

Day-Level Relationships between Self-Concept Clarity and Daily Events, and Between Clarity and Mood, Controlling for Daily Self-Esteem

<table>
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<th>t Ratio</th>
<th>p Level</th>
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<tr>
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<td>&lt;1</td>
<td>Not significant</td>
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<td>4.3</td>
<td>0.01</td>
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<tr>
<td>Analysis</td>
<td>Coefficient</td>
<td>t Ratio</td>
<td>p Level</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>---------</td>
<td>-------------</td>
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<tr>
<td><strong>Without self-esteem</strong></td>
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</tr>
<tr>
<td>Positive events</td>
<td>0.02</td>
<td>&lt;1</td>
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</tr>
<tr>
<td>Negative events</td>
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<td>.03</td>
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<td>.01</td>
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<td>Not significant</td>
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Table 4

Relationships between State Variability and Trait Self-Concept Clarity (SCC) and Self-Esteem (SE): Coefficients and Multiple Correlations

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<th>R</th>
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<tr>
<td>Trait SE only</td>
<td>- .0167**</td>
<td>.41</td>
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<td>Trait SCC and SE</td>
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<td>-.0159**</td>
<td>.41</td>
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<td>.15</td>
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<tr>
<td>Trait SE only</td>
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<td>.14</td>
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<td>Trait SCC and SE</td>
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<td>-.0029</td>
<td>.16</td>
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<td>.32</td>
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<tr>
<td>Trait SE only</td>
<td>-.0150**</td>
<td>.31</td>
<td></td>
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<tr>
<td>Trait SCC and SE</td>
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<td>-.0086*</td>
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<td>Trait SCC only</td>
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<tr>
<td>Trait SE only</td>
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<td>.19</td>
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<tr>
<td>Trait SCC and SE</td>
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<td>-.0023</td>
<td>.36</td>
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</table>

*p < .05. **p < .01.
Fitness Performance and Self-Esteem

The influence of sports and physical activity on one’s self-concept has long been a topic of various discussion and research. This influence seems to depend on the benefits of physical activity on the physiological metabolism, as well as on social factors, with several studies showing the positive effects of regular physical activity on physical and mental health (Fridinger & Dehart, 1993; Werch, Moore, DiClemente, Owen, Jobli, & Bledsoe, 2003). For example, in Salokun’s 1994 study, a sample of young adults identified the impact of progress and success of a physical activity on the self-concept, observing a positive correlation between progress in attaining a physical activity’s ability and self-concept.

Salokun (1994) investigated the relationship between improvement in Total Positive Self-Concept scores and increase in sports skills before and after training as well as the interaction of age and sex on the pattern of the relationship. The participants consisted of 144 boys aged 12 to 14 and 144 girls aged 16 to 18. They were selected using a stratified random technique from two high schools. Participants were randomly assigned to different sports groups and trained for 10 weeks. Ninety-six participants were selected from the same two age groups to be part of the control group. A total of 96 subjects from the exercise group participated in field hockey and the remaining 96 athletes (32 to sprints, 32 to discs, and 32 to the long jump). The Tennessee Self-Concept Scale (Fitts, 1965) was administered to all participants. The exercise group completed the scale as a pre and post test, and the control group only completed the scale once. The modified Schmithal and French (1940) achievement test was used to assess skill in field hockey on dribbling, tackling, fielding, shooting, and game sense at the end of the 10 weeks. Test-
retest reliability coefficients of .74 and .78 were obtained, respectively, for the 12 to 14 and 16 to 18 years old groups.

The adjusted mean scores from an analysis of covariance for the different treatment groups with reference to global self-concept scores varied from one group to another. The results of the study revealed that the main treatment effect (i.e., hockey, athletics, and control) on global self-concept was statistically significant ($p = .05$). Scheffe post hoc analysis of the triple interaction indicated that participants who participated in exercise training scored significantly higher at post test on global self-concept than the control group did. Pearson correlations for the exercise group indicated stronger association (hockey group: ages 12-14 years girls and boys $r = 0.67$, ages 16-18 years girls $r = 0.65$, boys $r = 0.46$, athletics group: ages 12-14 years girls $r = 0.72$, boys $r = 0.82$, ages 16-18 years girls $r = 0.70$, boys $r = 0.72$; control group: ages 12-14 years girls $r = 0.28$, boys $r = 0.06$, ages 16-18 years girls $r = 0.22$, boys $r = 0.30$) for Total Positive Self-Concept scores with skill acquisition. The results of this study suggest that athletic success is positively associated with personal and social adjustments expressed as an individual’s feeling of worth and self-esteem.

Substance Abuse and Pregnancy: The NO Self-Role?

Heavy emphasis has been given to the effects of drugs on women’s reproductive functions and fetuses. As McCallum (1998) argued, to focus on drugs in pregnancy as the primary concern with women’s drug use reinforces the above stated rather than the self-role of females, which further reinforces female drug use as deviant. McCallum posed the question if the main reason for females to refrain from drug use is the impact on the fetus (or child), how are females who are not pregnant (or already mothers) to be addressed?
Hence, it is obvious that a woman's role becomes almost inexistent. Pregnant women and drug use is still a topic that needs to be addressed though researchers need to be aware of the social stereotypical expectation of women. It is noteworthy that pregnancy motivates long-term changes in substance use behavior by young females (McCallum, 1998).

It has been argued that exercise/sports may promote increases in self-esteem (CASA, 2006; DiLorenzo et al., 1999; Fridinger et al., 1993; Neslek & Plesko, 2001; Salokun, 1994). It has also been argued that participation in sports may be associated more so with a masculine than a feminine view (Baum, 1998; Delaney & Lee, 1996; McCallum 1998). Delaney and Lee (1996) studied the influence of physical activity between both sexes in a cross-sectional study. The study looked at 163 science students (72 males, 91 females) who were completing the 10th or 11th grade at an Australian high school. Students were between 14 and 17 years old (mean = 15.6 years). Students filled out an anonymous questionnaire with information such as age, sex, and participants in competitive and on-competitive sport and physical activity. They were then divided into two groups: high active group (50% of sample), consisting of those students who reported exercising 3 or more times per week, and low active, consisting of those who did not fit into the first group.

Students completed the Australian Sex Role Inventory (ASRI) in which they were asked to rate themselves by positive and/or negative masculine and feminine characteristics and other socially desirable and popular items. The students also completed the Schools Short Form of the Coopersmith Self-Esteem Inventory. The data was analyzed using a two-way MANOVA. The results showed significant differences
between the two groups in relation to self-esteem and positive-feminine measures of the ASRI. The researchers discussed the possibility that participation in exercise/sports promoted increases in self-esteem and consequently enabled young people to develop a sense of self that is free from social expectations (Delaney & Lee, 1996).

Delaney and Lee (1996) concluded that adolescents who exercise on a regular basis seem to have higher self-esteem and are more likely to describe themselves positively than those who do not exercise regularly or at all. Although this study seems to support the benefits associated with exercises, one might question the possibility that students with higher self-esteem are more likely to be physically active. The study was also conducted with a limited sample of students, meaning, only students from science class and from one high school. This may limit the generalizability of the results.

In a non-experimental study (Frost & McKelvie, 2003), 127 male and female elementary school (Grades 4, 5, and 6), high school (Grades 10 and 11), and college students in Lennoxville, Quebec, Canada, comprised the sample. They were classified as high or low exercisers and completed questionnaires that measured global self-esteem, body satisfaction, and body build. When groups were compared, high exercisers reported greater self-esteem than low exercisers, showing a positive relationship between exercise activity and self-esteem, which was strong across sex and age. High exercising male participants had a bigger body build than did low exercising male participants, and they also reported greater satisfaction with specific aspects of their bodies (body-cathexis). The following table presents the sample sizes in each group of high and low exercisers.
Table 5

Sample Sizes in each Group of High and Low Exercisers

<table>
<thead>
<tr>
<th>Sex of Participant</th>
<th>Elementary School</th>
<th>High School</th>
<th>University</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>13</td>
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<td>39</td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
<td>9</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
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<td>27</td>
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<tr>
<td>All</td>
<td>16</td>
<td>25</td>
<td>28</td>
<td>69</td>
</tr>
<tr>
<td>High</td>
<td>14</td>
<td>21</td>
<td>23</td>
<td>58</td>
</tr>
</tbody>
</table>

In this study (Frost & McKelvie, 2003), assessment materials were administered including a demographics questionnaire, self-esteem and body satisfaction measures, and body mass index scale. The demographics questionnaire asked questions about age, sex, height, weight, desired weight, and exercise activity. Self-esteem was measured with the Culture-Free Self Esteem Inventory (Battle, 1981). Body satisfaction was measured with the Body Cathexis Scale (Secord & Jourard, 1953), in which body parts are rated, and the Nine-Figure Silhouette Scale (Hallinan, Pierce, Evans, DeGrenier, & Andres, 1991), in which ideal and actual body shapes are selected, and the differences between actual and desired weight (actual – desired; Weight Satisfaction).

In all three questionnaires, a lower score indicated better body satisfaction. Actual body build was measured by Body Mass Index ($BMI = \frac{\text{height}}{\text{weight}^2}$, height in meters,
weight in kilograms). In order to correct for variations due to the sex and age (school) of the participants, the researchers converted BMI into a relative measure ($Z_{BMI}$) using the mean and standard deviation of BMI scores from the person’s sex/school group. Exercise activity was measured with questions about sport activity (e.g., soccer, basketball, skiing, swimming, and volleyball) on one page and other athletic activities (e.g., aerobics, karate, ballet, horseback riding, and fencing) on a second page. Participants were supposed to indicate whether or not they were involved in each case and, if they were, how many days and how many hours each week they devoted to the sport or athletic activity, as well as how long this activity had been occurring. Scoring was: No involvement = 0 points; 0-1 days = 1 point, 2-4 days = 2 points, 5-7 days = 3 points; 0-4 hours = 1 point, 4-8 hours = 2 points, more than 8 hours = 3 points; past 2 months only = 1 point, past year = 2 points, 2 years or more = 3 points). The exercise score could range from 0 to 9 for sport activity and from 0 to 9 for other athletic activity, for a total of 0 to 18 (Frost & McKelvie, 2003).

Due to a discrepancy in the exercise questionnaire, the researchers decided to classify participants as high exercisers if they spent 5 to 7 days per week on a sport or other activity, spent at least 4 hours per week on it, and had been doing this for at least the past 2 years. To form the low group of exercisers, the number of people in each sex/school group who had been classified as high exercisers was matched by choosing a similar number of participants who had the lowest exercise activity scores based on completing both parts of the questionnaire. As depicted in Table 6, the results demonstrated some variations in self-esteem and in body satisfaction as a function of sex of participant and of school level (Frost & McKelvie, 2003). The analysis focused on exercise activity and its interaction with these variables.
Table 6  
Mean Scores for Self-Esteem, Body Satisfaction, and Body Build for High and Low Exercisers

<table>
<thead>
<tr>
<th>Sex of Participant</th>
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<th>High School</th>
<th>University</th>
<th>All</th>
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<td></td>
<td></td>
<td>Self-Esteem</td>
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</tr>
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<td></td>
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<td>20.5</td>
<td>22.3</td>
<td>21.5</td>
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<tr>
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<td>17.3</td>
<td>20.6</td>
<td>19.8</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
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<td>18.6</td>
<td>20.4</td>
<td>19.8</td>
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</tr>
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</tr>
<tr>
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<td>-17.0</td>
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<td>-6.5</td>
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<td>1.2</td>
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<td>6.8</td>
<td>-2.2</td>
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</tr>
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<td>1.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10.0</td>
<td>11.4</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
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<td>12.2</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-4.3</td>
<td>11.1</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1.2</td>
<td>1.4</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>-6.5</td>
<td>0.7</td>
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</tr>
<tr>
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<td>1.2</td>
<td>3.5</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>-2.2</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|        | Standardized BMI Scores   |                          |                          |
|        |                           |                          |                          |
| Male   | 0.20                      | 0.07                     | 0.31                     |
|        | -0.09                     | -0.46                    | -0.45                    |
| Female | 1.00                      | -0.10                    | -0.11                    |
|        | -0.73                     | 0.20                     | -0.07                    |
|        | 0.09                      | -0.08                    |                          |
| All    | 0.50                      | -0.01                    | 0.13                     |
|        | -0.37                     | -0.11                    | -0.28                    |
|        | 0.15                      | -0.23                    |                          |

*Note: Maximum scores = 25 (high self-esteem), 105 (high cathexis, very bad feelings about one's body), 8 (body image, bigger discrepancy between ideal and actual). Weight difference = actual weight – desired weight.*
MANOVA was used to calculate statistical values. An initial 2 X 2 X 3 (Exercise Activity X Sex of Participant X School) MANOVA was conducted on scores for self-esteem, body-cathexis, body image, weight differences, and body build as dependent variables. The total sample size dropped from 127 to 96 because some participants did not answer questions about weight and height, which were necessary for the calculation of weight difference and BMI. There was a significant main effect of exercise activity, $F(5, 81) = 3.14, p = .012$, but exercise activity did not interact significantly with sex of participant or school ($p's > .20$). Self-esteem, the main effect of exercise activity was significant, $F(1, 115) = 7.83, p = .006 (MSe = 16.05)$, and it did not interact with either of the other variables ($p's > .45$).

Self-esteem was higher for high exercisers than for low exercisers ($Ms = 20.75, 18.72$). For body-cathexis, the interaction between exercise activity and sex participant was significant, $F(1, 115) = 4.14, p = .044 (MSe = 161.78)$. For male participants, scores were lower for high than low exercisers ($Ms = 42.6, 48.6$), whereas for female participants there was no significant difference ($Ms = 49.5, 48.1$). For body image and weight difference, there were no significant effects of exercise. For $Z_{BMi}$, the effect of exercise activity was significant, $F(1, 103) = 5.99, p = .016 (MSe = 0.99)$, and the effect of the three-way interaction was almost significant, $F(2, 103) = 2.70, p = .072 (MSe = 0.99)$. Overall, body build scores were positive ($M = 0.15$, above average, where average $= 0$) for high exercisers and negative ($M = -0.24$, below average) for low exercisers. This pattern appeared in all sex/school groups except for female high school students and female college students.
Overall, the study (Frost & McKelvie, 2003) found that global self-esteem was generally greater for high than low exercisers. This result replicated previous findings with men and boys and with women and girls who attended elementary school, high school, and university (Bosscher, 1993; Delaney & Lee, 1995; Finkenberg, 1990; Kalliopuska, 1987; Pascarella & Smart, 1991; Smith, 1986; Vealey, 1992). Of course, one cannot conclude that exercise activity causes higher self-esteem. As mentioned earlier, it is possible that people who already have higher self-esteem for other reasons may be more motivated to exercise compared to those who have lower self-esteem. Nevertheless, the relationship between self-esteem and exercise is strong (Frost & McKelvie, 2003).

BMI scores (corrected for sex and for age) were also greater for high than low exercisers. This was true for male participants in all three age groups and for female elementary school students, but not for female high school or female college students. The latter result is consistent with previous reports that there was no relationship between exercise activity and BMI for women (Lenart et al., 1995; Yeung & Hemsley, 1996).

The results of Frost and McKelvie’s (2003) study showed no significant relationships between exercise activity and body image or between exercise activity and weight satisfaction, although body-cathexis was better for high than low exercising male participants. This research did not show an association between exercise activity and body-cathexis with the female participants. The researchers argued the reason for this might have been that the relationship is weaker for women and girls than for men and boys and that sample sizes, which ranged from 5 to 12 for female participants, were not large enough to detect the effect. However, mean body-cathexis scores for high school
girls showed that they were slightly lower (i.e., better) for high than for low exercisers. In the college students, the scores were almost identical and, in the elementary school students, scores were higher for low than for high exercisers. Unfortunately, these last two groups had the smallest number of cases (5 and 6, respectively).

This study (Frost & McKelvie, 2003) suggests that a higher level of exercise activity is associated with a higher level of self-esteem, and this relationship occurs for male and female elementary school students, high school students, and college students. Although the non-experimental design of this study prohibited a more in-depth interpretation of these results, they are consistent with the idea espoused by other researchers that exercise has a beneficial effect on how people feel about themselves.

*Exercise, Anxiety, and Depression*

Anxiety is a normal reaction to stress. It helps one deal with tense situations in everyday life, at work, and in school. Mild to moderate anxiety helps one focus, study harder for an exam, and concentrate on an important speech. In general, anxiety helps one cope. At the same time, when anxiety becomes excessive and an irrational dread of everyday situations, the state becomes a disabling disorder. Anxiety may coexist with other conditions, such as depression or substance abuse. Sometimes alcoholism, depression, or other coexisting conditions have such a strong effect on the individual that treating anxiety disorder must wait until the coexisting conditions are brought under control (nimh.gov. Anxiety Disorders-Treatment of Anxiety Disorders. 31 Oct, 2007). The section below will address studies that have investigated how well exercise work in the treatment of anxiety disorders.
Beck (1996) compared the anxiety levels of 20 runners (10 men and 10 women) with 20 sedentary participants. The sample consisted of young adults, between the ages of 18 and 30. These subjects had been running under their own recognizance for at least 4 months prior to the study. All runners ran five sessions, during the study, lasting between 50 and 70 minutes per week. Their distances varied between 1200 and 6800 meters. The sedentary groups consisted of high school and college students as well as working professionals. All confessed that they had not exercised since a young age. Anxiety levels were measured with Beck Anxiety Inventory (BAI) and results were compared using parametric statistics, which indicated a significant difference, with active runners having a lower anxiety level than the sedentary group did.

King et al. (1995) investigated the effect of a 12 month exercise program with different intensity levels, in which participants were 357 adults between the ages of 50 to 65. The sample consisted of three groups: a high-intensity group – exercise group, a high-intensity – individual exercise done at home group, and a low-intensity – individual exercise done at home group. Over the length of the study, all subjects had a decrease in stress and anxiety levels. Subjects who had higher participation levels had a higher decrease in anxiety and depression independent of changes in physical fitness. The researchers concluded that, in an exercise program for healthy adults, neither the form of exercise (individual or group) nor the intensity of exercise (high or low) is a variable in the ability to attain positive psychological benefits.

Anxiety can be defined as a fearful concern or interest, or an abnormal and overwhelming sense of apprehension associated with physiological signs such as sweating, and increased pulse. According to Seligman, Walker, and Rosenhan (2001), anxiety is a
physiological state characterized by cognitive, somatic, emotional, and behavioral components. Due to these characteristics, the effect of exercise on anxiety becomes multifactorial (Byrne & Byrne, 1996). During several experiments, Morgan measured anxiety levels using the State-Trait Anxiety Inventory (STAI) in a pre and post vigorous exercise routine study. Fifteen adult man ran for 15 minutes and the researchers found that anxiety levels decreased immediately after running and continued low for another 20 minutes. Six men diagnosed with neurotic anxiety and six healthy men were tested before and after running on a treadmill until exhausted. The results demonstrated a decline in anxiety levels. O’Connor et al. demonstrated that decreased anxiety levels resulting from exercise depend on the individual’s pre-exercise program anxiety level. They found that decreased levels depends on post-exercise recovery time, since anxiety levels are increased within the first five minutes of recovery and only decline after ten to 10 minutes.

In a previous study done by Palmer at al. (1998), the usefulness of physical exercise was examined as a treatment intervention to decrease depression and anxiety in adult inpatient alcoholics while increasing aerobic capacity and self-concept. The STAI (Spielberger, 1984), Tennessee Self-Concept Scale (TSCS) (Fitts, 1965), Zung Self-Rating Depression Scale (SDS) (Zung, 1965, 1981), and, for estimating maximum oxygen uptake, the Astrand-Rhyming bicycle ergometer (Astrand & Rodahl, 1977) were administered to a treatment and a control group on admission to and again at discharge from a 28 day inpatient program. The control group data were gathered before recruiting the exercise group and implementation of the exercise program. The control group consisted of 26 subjects (n = 7 white women, 2 black men, and 17 white men). The mean
The exercise group consisted of 27 subjects (n = 9 white women, 2 black men, and 19 white men). The mean age was 35.6 years.

The exercise program consisted of walking or jogging 3 days a week and was designed to meet requirements for intensity, frequency and duration as per the American College of Sports Medicine (1980). Intensity was determined by computing a heart rate for each subject, between 60% and 80% of their estimated maximum heart rate. Duration began at 20 minutes and was increased to 25-30 minutes by discharge. Each exercise session included a 10 minute warm up and cool down. A series of t-tests were performed, to test for group equivalency, on pre-test group means for all five dependent measures: state anxiety, trait anxiety, depression, self-concept, and estimated VO$_2$ maximum. The investigators set the alpha level at .10 for each t-test in an attempt to protect against falsely accepting the null hypothesis of no-existing group differences (Palmer et al., 1988).

No significant differences were found between the exercise and control group on any of the pre-teste measures. A multivariate t-test procedures was conducted on post-test scored using General Linear Models (GLM) program of the Statistical Analysis System (SAS) computer package (1979). Hotelling-Lawley Trace, a special case of Wilk’s lambda for two groups, was used to test ofr overall significance. A significant $F$ ratio of 3.27, 5/44 df ($p < .05$) resulted. The five dependent measures produced a significant multivariate effect. The researchers then tested each dependent measure’s $F$ ratio at an alpha of .01. The univariate analysis produced significant differences on post-test scores between the control and exercise groups on three of the five dependent measures: state anxiety, trait anxiety, and depression. Self-concept and VO$_2$ maximum differences were
not significant (Palmer et al., 1988). Palmer et al. (1988) concluded that regular physical exercise could be a beneficial component of inpatient alcohol treatment programs. The evidence from this study suggested that patients who participate in an organized exercise program as a component of an inpatient alcohol treatment program should be able to cope more successfully with post-discharge life-stresses.

Depression is a mood disorder that causes an individual to feel sad or hopeless for an extended period of time. More than just a bout of “the blues” or temporary feelings of grief or low energy, depression can have a significant impact on enjoyment of life, work, health, and the people one cares about. The symptoms of depression are often subtle and hard to recognize: despondent mood, inability to enjoy activities, problems concentrating, changes in eating habits or appetite, weight gain or loss, altered sleeping habits, difficulty with daily responsibilities, hopelessness, wondering if life is worth living (common), slowed thoughts and speech, preoccupation with thoughts of death or suicide, and complaints that have no physical cause (somatic complaints) such as headache and stomachache (Beck et al., 1988; Melo et al., 2005). The cause of depression is the subject of intense study. Experts believe genetic traits, along with stressful events, illness, medications, or other factors, can lead to an imbalance of neurotransmitters causing depression. There are many conditions that may trigger an episode of depression. Social and peer pressure in children and teens, alcohol ingestion, using illegal drugs, or having a substance abuse problem are among some of the possible causes of depression (WebMD, 2005-2007).

Palmer et al. (1995) studies the effects that different types of exercise had on depression in recovering substance abusers. Participants included 45 inpatients
undergoing a 28 to 45 day rehabilitation program at a state facility for people suffering from problems with alcohol, cocaine, or other drugs. Eleven women and 34 men, ranging in age from 18 to 55 (M = 28) participated. They were randomly assigned to three different groups: primarily aerobic (aerobic step program), primarily anaerobic (bodybuilding), or a combination of aerobic and anaerobic group (circuit training). Each group of composed of 15 participants and all groups exercised 3 times a week under the supervision of an investigator and facility’s staff.

Exercise session lasted between 30-40 minutes and included a 5 minute warm up and cool down. Pre and post tests were performed, which included the Center for Epidemiologic Studies Depression Scale (CES-Depression), Kasch Step Test, triceps skinfold, and the incline bench press. The tests were administered prior to the beginning of the exercise program and repeated after 4 weeks of participation. The aerobic step program was designed and videotaped by a trained fitness instructor. This exercise group followed the exercise for a total of 21 minutes. The circuit training program was designed to have participants exercising all major muscle groups against moderate weight resistance with little or no rest in between. The goal was to produce increases in strength and aerobic conditioning following guidelines of Fleck and Kraemer (1987), Pearl and Moran (1986), and Westcott (1991).

Participants performed two circuits around nine stations, changing stations every 70 seconds. The amount of weight each participant lifted was determined with a 15 repetition max (50%) strength test. The bodybuilding program was designed so subjects could exercise all major muscle groups against heavy resistance with rest intervals of 60-90 seconds. The goal was to increase muscle mass and strength following the
recommendations of Fleck and Kraemer (1987), Pearl and Moran (1986), Silvester (1992), and Westcott (1991). The group was dived into dyads and triads as a practical necessity (not enough exercise stations). Participants performed three sets of 10 repetitions at 70% of their previously determined maximum.

A mixed model ANOVA measured CES-Depression scores as the dependent variable and showed a significant interaction ($F_{2,42} = 3.23, p < .05$). Paired sample $t$-tests were used to identify which of the three groups showed a significant pre- to post-test change in depression scores. The bodybuilding group demonstrated a significant reduction in CES-Depression scores ($t_{14} = 3.43, p < .01$). There was no significant reduction in CES-Depression scores for the other two groups. A one-way ANOVA of pre-test CES-Depression scores indicated that pre-test scores of the three exercise groups did not differ significantly. None of the exercise programs produced significant changes in blood pressure, resting pulse, Kasch Step Test, triceps skinfold, or inclined-bench press. None of the exercise programs produced significant fitness changes in this experiment. Though 4 weeks is probably not enough time to obtain measurable effects, strength and fitness increases were apparent (Palmer et al., 1995).

In this study's conclusion, the researchers referred to McAuley et al. (1991) who had argued that many of the psychological benefits associated with exercise are due to mastery. Participants in the bodybuilding program experienced strength gains that may have served as indicators that they were mastering their physical regimen. These feelings of mastery may have been the mechanism by which depression was lessened in this group. Another plausible explanation Palmer et al. (1995) discussed was involvement in the program's social structure. Participants were training in dyads and triads and peer
interaction may have encouraged compliance and social bonds in this group: Social interaction may be an anti-depressive factor in the improvement of the bodybuilding group.

Physiological explanations may also play a role in anti-depressive effects. Weight lifters have described intense and physical rushes. Substitution of exercise-induced sensations of euphoria and excitement for those formerly found in drug use may somewhat inoculate recovering substance abusers from depression. Release of endorphins may also contribute to the decrease in depressive symptoms of the bodybuilding group (Palmer et al., 1995). Palmer et al. (1995) also discussed some of the limitations involving the CES-Depression scale, which has low test-retest reliability. The decrease in depression scores could have occurred due to statistical fluctuation, although this would have been expected in all groups since they were randomly selected, but did not occur in all groups. However, there is no guarantee that the variables are 100% nullified. The researchers concluded that strength training appeared to be beneficial for depressive symptoms in recovering substance abusers and that the combination of mastery, social bonding, sympathetic arousal, and endorphins release were a possible explanation for the mechanism of this effect.

Aerobic exercise has been used as an alternative form of therapy for individuals suffering from depression. In 1992, Stein and Motta studied the effects of aerobic exercise and anaerobic exercise on depression and self-concept. In this pre and post test study, 89 college students between the ages of 18 to 42 (mean age = 20 years) were randomly assigned to three different groups: aerobic exercise (swimming), anaerobic
exercise (weight lifting), and health education (introductory psychology class). The study
was conducted at a private university in Nassau County, New York. The subjects had not
engaged in any type of exercise for at least 3 months prior to the study and they did not
engage in any additional exercise during the study.

Evaluation of age, height, weight, income, and race showed no significant differences
between the three groups despite the fact the groups were composed of females and
males, conditions where one would normally expect to see significant differences exist.
All subjects completed pre- and post-psychological assessments consisting of the BDI,
the Depression Adjective Check List, and the Tennessee Self-Concept Scale. Subjects
participated in their assigned exercise two times per week in 90 minute sessions for a
period of 7 weeks. In addition, the swimming group was tested for aerobic capacity,
where swimming would increase their aerobic fitness levels. The weight lifting group
was involved in a Progressive Resistance Training Exercises (PRE) but no aerobic
exercise. The participants assigned to the lecture control group (psychology class) were
instructed not to exercise.

ANOVA was used to analyze the data obtained using pre-test scores as the covariates.
The aerobic and non-aerobic groups demonstrated a statistically significant difference
from the control group in terms of improvements in depression. Furthermore, the
anaerobic group demonstrated statistically significant difference from the control group
(stats) in terms of improvements in overall measure of self-concept and the subscales of
physical, personal, and social self. The personal self-subscale was the only statistically
significant difference between the anaerobic and aerobic groups, with members of the
anaerobic group reporting greater improvements.
Stein and Motta (1992) concluded that both aerobic and anaerobic exercise seemed to have a positive influence on psychological well-being and that the impact of exercise on psychological well-being was independent of improvements in fitness. The results seemed to contradict earlier findings suggesting that only aerobic types of exercise yield psychological benefit but they were consistent with more recent findings showing the psychological benefits of anaerobic exercise.

Paffenbarger et al. (1994) investigated the incidence of depression and suicide starting in 1967. The researchers studied 10,201 students and found that 387 (3.79%) suffered from severe depression, and yet there were no attempts of suicide. Suicide incidence was reported as 129 students (1.26%). The researchers examined the relationship between depression, suicide, and the behaviors and found that the frequency of depression was low among participants who exercised or played a sport and highest among participants who smoked. They also found that suicide was related to an increase in depression levels and not associated with alcohol consumption.

Thoren et al. (1990) stated that prolonged exercise might activate opioid receptors found in the central nervous system. They believe that the reason behind this activation may be increased nerve impulses in the afferent nerves by muscular contraction during exercise. Similar studies presented evidence that many of the cardiovascular and analgesics effects obtained through exercise may also be the result of this mechanism. Based on this hypothesis, Thoren et al. recommended using exercise for its benefits in treating pain, anxiety, depression, hypertension, anorexia nervosa, bulimia, and substance abuse.
The relationship between substance abuse, depression, and anxiety is complex, but several studies in recent years have indicated that elevated depressive symptoms are a risk factor for inappropriate behavioral choices and substance abuse outcomes (Greenfield et al., 1998; Hodgins et al., 1999; Rounsaville, Dolinsky, Babor, & Meyer, 1987). Research confirms that, among the general population who exercise regularly, the complete absence or presence of few symptoms of depression or anxiety may be a result of regular exercise. Even among individuals clinically diagnosed with depression, exercise has been shown effective in the reduction of depressive symptoms.

It is important to determine how decreases in mood disturbances occur after exercising. The key lies in understanding what an adequate level of intensity and duration of exercise is, in order to determine how exercise affects the reduction of these negative symptoms. One step is to comprehend the disturbance's etiology and what factors may or may not be responsible for the disorder. Some of these factors may include genetics, along with biological, behavioral, and environmental factors (1).

In a study investigating acute and chronic effects of vigorous exercise training on affect, nicotine withdrawal and cigarette craving, Bock and colleagues (1999), recruited only women smokers who were randomly assigned to cognitive behavioral smoking cessation plus either exercise or a contact control group. The subjects were “healthy”, sedentary women (defined as not meeting the American College of Sports Medicine guidelines for regular physical activity (1991) of engaging in vigorous exercise less than three times per week for 20 minutes each time) (≥18 years) who had regularly smoked 10 or more cigarettes per day for at least 3 years.
All subjects attended a 12-week group based smoking cessation program, which consisted of one hour per week of cognitive behavior therapy designed especially for women. It focused on topics of healthy eating, weight management, balancing and managing time and stress due to multiple roles. The “quit” date was set for the fourth week of the program.

The subject’s mean age was 38.9 years and they smoked an average of 22.7 cigarettes per day for 21.5 years. Subjects (n = 44) who were assigned to the exercise program participated in three 45- to 60-minute exercise sessions per week. The sessions included 5 minutes of warm-up, 30-40 minutes of aerobic exercise and 5 minutes of cool-down with stretching.

Subjects (n = 18) who were assigned to the contact program participated in a twelve-week “wellness” program, consisting of three 45-60-minute sessions per week. The contact program included lectures, handouts, films, and discussions on women’s health and lifestyle choices.

Prior the beginning of study and at the end of the study, all subjects completed a graded maximal exercise test on a stationary bicycle to determine fitness level and to verify training effects of exercise. Paired t sample tests were used and no significant differences were observed at baseline. However at the end of the study the exercise group showed a significant increase in estimated VO2 (+6.8%; t = 2.21, p < .05) in comparison to the “contact” group (+2.2%, ns).

The Positive and Negative Affective Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was used to assess current affect (positive and negative affective states occurring at a particular time). Scores range from 10-50 with higher scores indicating
more negative or positive affect. Cronbach's alphas range from .86-.90 for the positive mood and .84-.97 for the negative mood subscale (Watson et al., 1988). The analysis showed significant reductions in negative affect (overall $p < .05$) following exercise, but no contact sessions.

The investigators used the Evening Symptom Report (ESR) to assess the nicotine withdrawal symptoms. Smoking abstinence was assessed by carbon monoxide (CO) testing and saliva cotinine (cutoff = 10ng/ml) verification at the initial seven day abstinence and at the end of the twelve week program. The number of cigarettes smoked per day and CO were assessed at the end of each week of the program. Nicotine withdrawal symptoms and cigarette craving were significantly reduced (overall $p < .05$; over $p < .05$, respectively) following exercise, but no contact sessions.

This study demonstrated promising results in regards to aerobic exercise as an addition to smoking cessation programs. It showed that aerobic exercise reduces negative effect, craving for cigarettes, and symptoms of nicotine withdrawal among women attempting to quit. Moreover, other studies have demonstrated improvements in mood by using only an aerobic exercise such as weight lifting (Doyne et al., 1987; Norvell & Belles, 1993) or by demonstrating improvements in mood before achieving any changes in physical fitness (McCann & Holmes, 1984). Interestingly, it seems that the participation in exercise and not the physical fitness per se, has an impact in the observed psychological effects in these studies.

Byrne et al (1993) conducted a literature review including links between exercise treatments on depression, anxiety and other mood disorders. Despite potential methodological problems, which were considered by investigators, the review
supported claims of the mood enhancing effect of exercise as treatment for depression, anxiety. The review included 30 studies dating back from 1975, and focused mainly on experimental studies, with 13 non-clinical samples and 17 clinical samples being examined. Most of the studies with clinical samples focused on depression and most of studies with non-clinical samples focused more on general measures of mood states. Aerobic exercise (with changes in aerobic capacity) was the main type of activity chosen in the majority of the studies, although anaerobic exercise was examined in some cases. About 90% of the studies investigated the effects of exercise in combating depression and anxiety. Byrne et al suggests that the research seems to support the concept that exercise has beneficial impacts on the psyche of participants. The authors also argued, based on the review, that anaerobic activity (weight training) has similar positive benefits as an anti-depressive and anti-anxiety treatment when compared to aerobic activity (running). Positive changes in mood seem to not be limited to aerobic activity with an increase in aerobic capacity.

Some of the methodological problems were also identified. These include the suitability of the measures used, such as the Profile of Moods States (POMS), for non-clinical populations. They suggest that such measures have been designed for use with existing psychological problems and due to this fact, may be insensitive to psychological changes in non-clinical populations. The comparability of the studies was also complicated due to the vast range of assessment instruments used. In addition, the findings of some studies may be limited by the selection of convenience samples, with little consideration of psychological or exercises status, the lack of random assignment to treatment conditions, and in some cases the absence of control groups. A lack of
longitudinal or follow-up data in the studies reviewed is also identified. Therefore, no comments could be made on whether the benefits of exercise on mood states or depression were maintained after the cessation of exercise or whether continuing exercise was necessary to maintain these effects. Finally, the authors suggest that the links between improvements in fitness and improvements in mood require more thorough investigation.

In a research conducted by Brown et al (1992) a small group of psychiatrically institutionalized adolescents (16 boys, 11 girls) were assigned to a 3-day per week running/aerobic exercise program or a regular physical activity class. The program lasted for 9 weeks, with 11 subjects remaining throughout the program. Dependent measures of body-mass index, timed performance on a one-mile run, resting, exercise, and recovery heart rates, and measures of depression, mood-states, and self-efficacy were assessed pre-, mid-, and post-9 week treatment and at a 4 week follow up. Twenty-seven in-patients (16 boys, 11 girls; mean age = 15.6 years) from a private psychiatric facility comprised the sample in this study. Only 11 participants completed the study due to the fact that several participants were discharged from the facility during the treatment intervention.

All participants were already participating in regular physical education classes. Subjects were randomly assigned to a treatment (11 boys, 6 girls) or control condition (5 boys, 5 girls). The treatment group participated in 3 days per week of running/aerobic exercise over a 9 week period and continued with their regular physical education classes on other days. The control condition continued to participate in regular scheduled physical education classes during the 9 week program. Assessments of physiological and psychological measures were conducted prior to the program, mid- program (4.5 weeks),
upon completion of the program (9 weeks) and 4 weeks later. Psychological assessments included the Beck Depression Inventory (BDI), the Profile of Mood States (POMS) and a Self-Efficacy Questionnaire developed by one of the authors. An activities questionnaire, which measured participation in athletics and self-reported fitness levels, was also administered. Data was analyzed using factorial MANOVA procedures. The results indicate that girls who were in the treatment group experienced decreased depression and anxiety while both boys and girls who were in the treatment group reported improvements in anger, vigor and feelings of self-efficacy relative to the control group. These changes were evident at both mid-program and end of program assessments but had disappeared by the 4 week follow up. The small sample size and loss of subjects during the treatment period limit the conclusions that can be made from this study.

A study conducted by Lopes (27) observed the effects of an 8 week aerobic exercise program on serotonin and depression levels in women between the ages of 50-72. The Beck Depression Inventory (BDI) was used to measure depression and laboratory analysis was used to check for changes in serotonin levels. The results indicated a drop in plasma fat percentages and serotonin levels. The author suggests that the relationship between exercise and fat mobilization may provide improvement in mood states. The benefits of a regular exercise program also seem to reflect enhancements in quality of life of those who experience mood disturbances and many studies have shown that exercise may have a positive influence on depression (Byrne, & Byrne, 1993; Doyne, Chambless, & Beutler, 1983; Doyne et al., 1987; McCann, & Holmes, 1984) and in improvements in mood (Berger, & Owen, 1992; Bock, Marcus, King, Borrelli, & Roberts, 1999). In addition, several controlled studies have demonstrated that aerobic exercise is associated
with positive outcomes for depression when compared to no-treatment control conditions (Doyne et al., 1983, 1987) and with more traditional treatments such as cognitive behavior therapy (Freemont, & Craighead, 1987) and antidepressant medication (Babyak et al., 2000). As a result, exercise may be an efficient alternative therapy to use in treating mood disorders.

Exercise as an Intervention

*Group Activity and Social Support*

The role of social support in recovery of substance abuse has been noted in the literature (Humphreys, Moos, & Finney, 1995; Longabaugh, Wirtz, Zweben, & Stout, 1998). Family ties, friendships, and involvement in social activities have been shown to offer a psychological buffer against stress, anxiety, and depression (CASA, 2006). Social support can also help individuals cope better with health problems. Exercising with a group of like-minded individuals may facilitate social support and create a healthy circle of sober individuals who can then rely on each other for recovery from substance abuse. Some data suggests that group exercise may increase adherence to an exercise protocol and may offer psychological benefits as well (Martin, & Dubbert, 1982). Research also suggests individuals prefer to exercise in groups rather than individually (Heinzelmann & Bagley, 1970; Murphy et al., 1986). Thus, encouraging rehabilitation facilities to introduce group exercise to substance abuse programs would seem wise, serving as a stimulus for participation and continued avoidance of substance abusing.

Palmer et al. (1995) used a controlled study to check the role of social interaction in exercise and substance abuse recovery. Exercise showed influence in depression among
substance abusing inpatients in the bodybuilding group but not in the circuit training or aerobic step groups. The authors concluded that the influence of exercise on depression that was seen in the bodybuilding group might have been a function of the fact that the bodybuilding participants were exercising in dyads or triads whereas those in the other groups exercised individually. It appears that group exercise promotes social support without the use of drugs, which can help build a healthy social support system.

As may be seen from the above studies, exercise may be useful as a positive alternative to substance use. The time individuals spent doing drugs can be occupied with the healthy alternative of exercise. Early in recovery, many individuals may find themselves with too much free time reminiscent of pre-treatment time when their behaviors were often associated with substance abuse. During recovery this behavior and the associated free time need to be changed and physical activity may serve as a substitute behavior (Marlatt, 1985). One important aspect of a positive alternative is that patients should be allowed and encouraged to develop rewarding and enjoyable social recreational activities (Smith, & Meyers, 1995). Physical activity may not only provide patients with the positive aspects identified in above sections, but also may help them embrace a better quality of health in the process of recovering. Bartha and Davis (1982) suggested that the exercise might help to educate patients about the benefits that they describe as “high-level wellness”.

Decrease Stress and Improve Coping

Females have the tendency to become stressed or anxious when reacting to stress (Aneshensel et al., 1991). One way of coping with stress is by turning to substance
In fact, CASA research reports that girls are more likely to use drugs in response to stress than boys are (Byrne et al., 1995). One of the most common reasons girls (grades 5 through 12) report using substances is for stress relief. This being the number one answer for girls who are depressed or who have been abused (Schoen et al., 1997). In a study conducted by Keller, 60 subjects were randomly assigned to exercise, music appreciation or meditation classes. The purpose of the study was to determine whether improvements in physical fitness accelerated recovery from psychological stress. All groups met four times a week for a total of ten weeks. Physical fitness was measured through the recovery heart rate (HR) from the 3 minute step test and psychological fitness was measured from skin conductance (SC) recovery during emotionally stressful tasks. The tests were conducted in three different sessions. Mean recovery HR for all groups were not significantly different in session one; however, at the end of the study, the exercise group recovered significantly faster from physical stress than the other groups. The SC test in session one also showed no significance between the three groups. On the other hand, in session two and three of the tests the exercise group recovered significantly faster than the music and meditation group. The findings in this study demonstrate that as physical fitness improves so does autonomic recovery from psychological stress. Consequently physically fit individuals may be able to cope better with psychological stresses than the unfit.

To reiterate, females often use drugs to cope with very real pressures and the underlying tensions of their lives, and they are more likely to relapse with drinking and other drug use when feeling sad or depressed (Buelow & Buelow, 1995; Lammers & Schippers, 1991; Winstanley et al., 1995). It has been documented that in this case, drug
use becomes “self-medication”, i.e., to relieve emotional discomfort, stress, and to escape/cope emotionally (Lammers, 1995; Opland et al., 1995; Windle & Barnes, 1988). It has been suggested by some cognitive social theorists that part of an individual’s reason for drinking is a lack of basic coping skills to deal with daily life stresses (Miller et al., 1995; Monti, Rohsenow, Colby, & Abrams, 1995). Based on this theory, Hobson Rejeski, and Keller (1980) suggest that exercise could serve to reduce stress response and replace drinking as a main coping mechanism, because individuals appear to have a decreased reaction to psychosocial stress on both subjective and physiological measures when they participate in aerobic exercise (Sinyor, Schwarts, Peronnet, Brisson, & Serganian, 1983). Aerobic exercise also appears to have a buffering effect against mental stress (Rejeski, Gregg, Thompson, & Berry, 1991). The relationship between participation in an exercise program (strength, flexibility, and endurance training) and emotional reactivity to stressful conditions has shown that exercise produces reactivity reduction in psychological stress (Calvo, Szabo, & Capafons, 1996). In view of the fact that drinking is also considered a drug, this theory could just as well be applied to patients who utilize other drugs to cope with stress.

**Prevention Opportunities throughout a Girl’s Life**

The broad based prevention programs that exist today take a general approach with a unisex view to treatment. Needless to say, these programs fail to influence and reach out to millions of females. Girls and women are at risk throughout their lives for substance abuse. Prevention is a tool best introduced during childhood, before an individual has had the chance to experiment with tobacco, alcohol, or other drugs, before unhealthy behaviors set in, and before they are inundated with pro-substance-use messages from
peers and the media. Parents are usually the best resource of prevention, but it is never too late to intervene.

As explained earlier in this research, females are more likely to experience depression, eating disorders, and be physically/sexually abused. These are the main factors that may lead them into substance abuse. Females are also more likely than boys to use drugs and alcohol in attempt to better their mood, reduce inhibitions and enhance sex (CASA, 2006).

It is important to reiterate the central theme of this research, which is the addition of an exercise program as an intervention in the process of rehabilitation of women affected by the abuse and addiction of illicit drugs. Additionally, the literature review examined how the psychosocial, personal, biological, socio-cultural and environmental factors have an affect in shaping much of young women’s drug use, and how this information is important in creating an intervention program. The existent body of literature has demonstrated that physical activity as an intervention produces positive interaction with integrating most of the “women’s” issues (decreasing depression, anxiety; increasing self-concept, self-esteem, body image, and therefore self-acceptance).
CHAPTER III

METHODS

Design Statement

The study is a 2 [Exercise (Intervention, Self-Directed)] x 2 [Test (Pre, Post)] mixed-design. Factor Exercise is between-subjects with 2 levels, exercise intervention and self-directed exercise. Factor Test is within-subjects with 2 levels, pre-test and post-test. The dependent measures of interests are the test scores on depression and anxiety and the physical measures of fitness (percent body fat, resting heart rate, 3 minute step test, sit-and-reach, and curl-up).

Sample

The sample participants were composed of women between the ages of 18 and 43 years of age who were under supervision at Westcare facility, where they lived, and were being treated for substance abuse. Inclusion criteria consisted of those potential participants who were cleared by the facility’s director and secondarily by this researcher based on medical records, the Physical Activity Readiness (PAR-Q), and their Health History questionnaires. Participants were asked questions about their health history. These questions helped determine whether a participant was eligible for inclusion in the exercise program or not. The questionnaires were meant to protect the health of potential participants. In addition, some medical conditions could intensify when under a general exercise program.
Exclusion criteria included potential participants who were not cleared by the director based on medical records as well as participants who were not cleared by this researcher based on the PAR-Q and the Health History Questionnaire. Those excluded from participation were anyone with signs/symptoms of cardiovascular and/or pulmonary disease (i.e., symptoms of pain, discomfort in the chest, neck, jaw, or other areas that may be due to ischemia, shortness of breath at rest or with mild exertion, dizziness or syncope, ankle edema, palpitations or tachycardia, intermittent claudication, known heart murmur, unusual fatigue, or shortness of breath with usual activities). The signs/symptoms listed may represent a positive sign of a serious disease or illness, which may place the individual at high risk or even fatal situation during the exercise program. Pregnant women were also excluded because the exercise program was not designed for pregnant women.

Participants’ rights were protected and recruitment was only initiated after the IRB committee approved the study. Once cleared, a group meeting was scheduled with the Westcare facility, which the director and potential participants attended, as well as the student investigator and the exercise instructor. Introductions were made to the women’s group, followed by an explanation of the study and the exercise intervention. At this point, interested potential participants were chosen using a selective random assignment to be either in the experimental group or the control group, by alternately giving each person either an experimental group consent or control group consent and so on.

Participants were asked to fill out the informed consent they received prior to any medical screening or participation. Once the consent process was completed, the director used participant’s medical records to clear participants for inclusion in the study. Those,
whom the director had cleared, were then asked by this researcher to fill out the following forms: the PAR-Q and the Health History Questionnaire. These forms were used to clear participants for final inclusion in the study.

**Equipment**

Two health screenings were used: the PAR-Q and a health history questionnaire. The PAR-Q was designed to identify the small number of adults for whom physical activity might be inappropriate or those who should receive medical advice concerning the most suitable type of activity (ACSM, 2005). The PAR-Q is a publication of the Canadian Society for Exercise Physiology and permission is granted to anyone wishing to use the form, as long as the entire form will be used. It can be found and downloaded at http://www.csep.ca/main.cfm?cid=574.

The health history questionnaire is a medical history questionnaire that includes questions concerning personal and family health history. The questionnaire examines the participant’s record of personal illnesses, surgeries, and hospitalizations; assesses previous medical diagnoses and signs and symptoms of disease that have occurred within the past year or are currently present; and analyzes the participant’s family history of diabetes, heart disease, stroke, and hypertension.

Five physiological tests were included in this study to evaluate participants’ fitness levels (Heart Rate, Flexibility, Muscular Endurance, Cardiovascular, and Percent Body Fat). Resting heart rate measure was done manually by palpating the radial artery at the right wrist for a full minute. The YMCA Sit and Reach Test was used to assess flexibility. This test primarily measures the flexibility of the hamstring and erector spinae muscles, although it has been suggested to be a better measure of hamstring flexibility.
than of lower back flexibility (ACSM, 2005). The Sit and Reach test is easy to administer, requires minimum equipment, and has been used by many and is valid and reliable. Disadvantages in using this measure may include the slight risk of injury due to the position required of participants who are seated unsupported with forward flexion. Another disadvantage is the length of a person’s trunk and legs because it may influence the score. A Sit-and-Reach box was not used during this test. A simpler method was utilized instead, consisting of a tape measure and masking tape.

The Sit and Reach Test’s reliability depends upon how strictly the test is conducted and the individual’s level of motivation to perform the test. Reliability may also depend on the amount of warm-up allowed each participant and whether the same procedures are followed each time. Most norms used with the test are based on no previous warm-up, although best results are achieved after a warm up. Procedures and norms for this test can be found on ACSM’s Guidelines for Exercise Testing and Prescription (2005).

The One Minute Curl-Up test was selected to measure muscular endurance. This is a simple field test used to evaluate the endurance of the abdominal muscle groups. The curl-up test possesses logical (i.e., content and construct) validity (Axler & McGill, 1997; Flint, 1965; Godfrey et al., 1977; Juker et al., 1998; Noble, 1981) as a test of abdominal strength and endurance. This finding if logical validity is based on anatomical analyses and through electromyography studies. Due to a lack of definitive criterion measures of abdominal strength, it is difficult to document fully absolute validity of the curl-up assessment as a field test of abdominal strength and endurance. Procedures and norms for this test can be found on ACSM’s Guidelines for Exercise Testing and Prescription (2005).
Cardiovascular fitness was assessed using the Three-Minute YMCA Step Test. The test is based on the participant’s recovery heart rate following a set exercise procedure. This recovery heart rate is then used to obtain a rating of fitness from published normative tables (ACSM, 2005). A 12 inch step is used with a metronome set to 96 bpm, which corresponds to a stepping rate of 24 steps/min. A stopwatch is necessary to keep time. One-minute recovery heart rates were palpated manually at the radial artery at right wrist. The step used was The High Step with a non-slip surface on a platform that supported up to 200 lbs. The actual size of the step was a square measuring 16x12 inches. This size step was endorsed by Freidrich (2006) and more information and the step can be found at her website www.cathe.com, product code 574. The stopwatch was by Athletic Works with a chronograph of 1/100 second containing split-reset, mode, and start-stop buttons. The metronome was a QwickTime QT-5 Quartz Metronome, battery CR-2025 operated. Information can also be found on the following website www.qwicktunetuners.com.

Percent body fat was measured using a Lange Skinfold Caliper manufactured by Beta Technology Incorporated, 151 Harvey West Blvd, Santa Cruz, CA 95060-2142. The Lange Skinfold Caliper has spring-loaded levers which provide a constant standard pressure of 10gm/sq mm over the entire operating range and it has an accuracy of ± 1 mm. Skinfold measurement is based on the assumption that close to one-third of total fat is found subcutaneously and subcutaneous fat is proportional to the total amount of body fat (ACSM, 2005). Reliability of this measurement depends on regression equations used to convert body density to percent body fat.
Subcutaneous total fat varies mostly between age and sex, so regression equations need to take these variables into account when using a Lange Skinfold Caliper. The accuracy of the prediction is approximately 3.5% if proper techniques and equations were used (ACSM, 2005). Poor technique, inexperience, an obese or extremely lean participant, and an uncalibrated caliper may account for inaccuracies in measurements. The Seven-Site Formula Jackson & Pollock for Females was used in this study to determine body density. The Percent Fat Siri Equation was used to convert body density to percent body fat. The Jackson & Pollock equation has been found reliable and valid for both males and females. The resulting equation correlates 0.94 with underwater weighing (Heyward & Stolarczyk, 1996; Jackson & Pollock, 1978, 1980, 1985).

Three psychological tests were included in this study: the Beck Depression Inventory-II (BDI-II), Beck Anxiety Inventory (BAI), and University of Rhode Island Change Assessment (URICA). The BDI-II and BAI were purchased using a grant awarded by the Graduate and Professional Student Association (GPSA). The items were ordered from Harcourt Assessment, Inc. The “Beck Depression Inventory”, BDI, "Beck Anxiety Inventory", and "BAI" are U.S. registered trademarks of Harcourt Assessment, Inc. The URICA test is not copyrighted and may be downloaded or reprinted without permission of the researchers.

The BDI-II was designed to measure the presence of depression, which is in line with the depression criteria of the “Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition” (DSM-IV; APA, 2000). This new edition of the BDI-II is the most widely used instrument for detecting depression and is more clinically sensitive than the past version (Beck, Steer, & Brown, 1996). The test developers compared item-option
characteristic curves after testing original and new items on a large clinical sample (n = 500). The new edition showed improved clinical sensitivity, with the reliability of the BDI-II (coefficient alpha = .92) higher than the BDI (coefficient alpha = .86) (Beck et al., 1996). Content validity seems to be quite high since the BDI-II appears to evaluate well a variety of symptoms and attitudes associated with depression.

The BDI-II is a 21-item test presented in multiple-choice format. Each of the 21-items of the BDI attempts to assess the intensity of depression in clinical and normal patients. Each item is a list of four statements arranged in increasing severity about a particular symptom of depression. Items indicate increases or decreases in sleep and appetite, agitation, concentration difficulty and loss of energy. The BDI-II was also revised to reflect how each statement relates to the way one has felt for the past two weeks, to more accurately correspond to the DSM-IV criteria.

The BAI was developed to address the need for an instrument that would reliably discriminate anxiety from depression, while displaying convergent validity. The purpose of the BAI is, therefore, to measure symptoms of anxiety, which are minimally shared with those of depression, such as those symptoms measured by the BDI-IA (Beck & Steer, 1993a; Clark et al., 1994; Creamer, Foran, & Bell, 1995; Fydrich, Dowdall, & Chambless, 1992). The BAI is a 21-item self-report questionnaire measuring common symptoms of clinical anxiety in adults. Respondents indicate the degree to which they are bothered by each symptom, most of which closely represent DSM-III-R criteria for panic disorder. Each symptom is rated on a 4-point scale ranging from 0 to 3. The items are added up to obtain a score that can range from 0 to 63 (Beck et al., 1993a; Fydrich et al.,
A centroid cluster analysis of the BAI found the inventory to have four clusters reflecting neurophysiological, subjective, panic, and autonomic symptoms of self-reported anxiety. The neurophysiological subscale included seven symptoms (item numbers in parentheses): (1) numbness or tingling, (3) wobbliness in legs, (6) dizzy or light-headed, (8) unsteady, (12) hands trembling, (13) shaky and (19) faint. The subjective subscale included six symptoms: (4) unable to relax, (5) fear of the worst happening, (9) terrified, (10) nervous, (14) fear of losing control, and (17) scared. The panic subscale included the symptoms typical of those experienced during panic attacks: (7) heart pounding or racing, (11) feelings of choking, (15) difficulty breathing, and (16) fear of dying. The autonomic subscale included four symptoms: (2) feeling hot, (18) indigestion or discomfort in abdomen, (20) face flushed and (21) sweating (not due to heat) (Beck et al., 1993a; Osman, Barrios, Aukes, Osman, & Markway, 1993).

Numerous studies have been conducted on the internal consistency of the BAI, all concluding that the BAI possesses a high degree of internal consistency (Beck et al., 1988; Beck, Steer, Ball, & Ranieri, 1996; Creamer et al., 1995; Enns et al., 1998; Fydrich et al., 1992; Hewitt & Norton, 1993; Jolly et al., 1993; Kabacoff et al., 1997; Osman et al., 1993; Somoza et al., 1994; Spitzer & Williams, 1983; Steer et al., 1998; Steer, Kumar, & Ranieri, 1995; Steer et al., 1993). These studies found the internal consistency of the BAI to range between .90 and .94, which is considered exceptionally high. Fydrich et al. conducted a multitrait-multimethod correlational analysis study of the convergent and discriminant validity of the BAI. The two traits they used were depression versus
anxiety, and the two methods they used were daily diary ratings of mood versus
questionnaire.

In the Fydrich et al. (1992) study, all respective instruments were administered to a
sample of 71 people with a primary diagnosis of anxiety disorder. The instruments were
then correlated with one another. Using the State-Trait Anxiety Inventory (STAI) as a
benchmark, they found that the BAI correlated significantly with both the subscales of
the STAI (i.e., .58 for the STAI-Trait and .47 for the STAI-State). The BAI was also
found significantly correlated with diary anxiety ratings (.54), whereas the STAI-Trait
not only failed to correlate significantly with diary anxiety, but also often correlated more
strongly with measures of depression than with measures of anxiety. The conclusion was
that the BAI appears to have better convergent and discriminant validity than the most
widely used self-report measure of anxiety, namely the STAI.

In terms of convergent validity, scores on the BAI were correlated with scores on the
anxiety subscale of the Cognition Checklist (CCL-A), which measures the frequency of
dysfunctional cognitions related to anxiety and found to be .51 (Fydrich et al., 1992;
Kabacoff et al., 1997). The BAI also had a .51 correlation with the Revised Hamilton
Rating Scale for Anxiety (HARS) (Beck et al., 1993a). These findings are in line with
those of Fydrich et al. (1992), where diary ratings were used as opposed to interview
ratings in the Beck and Steer study. In terms of discriminant validity, the BAI’s
correlation with the depression subscale of the Cognition Checklist (CCL-D) was
significant at .22. The BAI also had a correlation of .48 with the BDI-IA and .25 with the
HRSD. These relatively low correlations supported the discriminant validity of the BAI.
The correlation of .15 found between the BAI and the BHS further supported the claim
that the BAI has discriminant validity as the BDI-II and the BHS were found to have good convergent validity with a correlation of .68 (Beck et al., 1996). The BAI was chosen for inclusion in the present research project, as it is one of the most popular and widely used instruments for assessing levels of anxiety.

The URICA has become the most common way of measuring stages of change. McConnaughy, DiClemente, Prochaska, and Velicer (1983, 1989) developed the URICA as a method of classifying subjects in stages of change located along a theorized continuum of change. The scale consists of 32 items that reflect four stages of change factors: precontemplation, contemplation, action, and maintenance. Items rated on a 5-point Likert scale describe how an individual might think or feel at different stages of therapy. The items describe attitudes, intentions, and behaviors associated with changing a particular behavior. Furthermore, the URICA items are written generically, so they can apply to change in a range of behaviors.

Patient's answers on the URICA reflect their degree of agreement to a specific stage: strongly disagree (score of 1), disagree (2), undecided (3), agree (4), and strongly agree (5). The items are scored in the "positive" direction for each stage, so that the higher the score a person receives for a stage, the "more" he or she supports attitudes and behaviors particular to that stage. Each stage consists of eight items, therefore, the highest score a patient can receive per stage is 40 and the lowest is 8. For each of the four subscales, internal consistency coefficients (Cronbach's alphas) for outpatient alcohol treatment were found to be .69, .75, .82, and .90, respectively. Validity has also been established (DiClemente & Hughes, 1990).
Clinical researchers have been evaluating the use of a continuous “readiness to change” score on the URICA. The score is calculated by summing the subscale scores for the contemplation, action, and maintenance stages and subtracting the precontemplation subscale score. This readiness score has been found to predict abstinence from drinking outcomes among outpatients receiving alcoholism treatment (Connors, Donovan, & DiClemente, 2001).

Protocol

*Week 1- Day 1*

The testing process began 2 days following the selective random assignment and medical clearance of participants. Pre-test, including the psychological tests and physical tests, took 2 days to be completed and this researcher administered them all. All testing was conducted at Westcare. The BDI-II, BAI, and URICA were administered on day 1 of testing. There was no time limit and the completed tests were collected and stored in a sealed envelope.

*Week 1- Day 2*

Day 2 of testing consisted of the fitness tests. All women were directed to sit still for about 5 minutes to allow their heart rate to drop close to a resting level. This researcher measured the resting heart rate at the radial artery of the right wrist of each woman. Following this measurement, the order of the remaining tests was: 3 minute step test, Sit-and-Reach, percent body fat and 1 minute curl-up test. All participants completed the 3 minute step test before we moved on to Sit-and-Reach and so on.
The 12 inch step was assembled and one woman at a time was called into the room to test. The test was fully explained and demonstrated separately for each participant. Testing guidelines and norm tables were used according to ACSM (2005). The participant stepped for 3 minutes and immediately sat down when test was done. Pulse at the radial artery of the right wrist was located within 5 seconds of participants sitting down and recovery heart rate was measured for 1 minute.

The flexibility test was performed right after the 3 minute step test, so participants would not need extra time to warm-up. Participants removed their shoes to perform the Sit-and-Reach test. The tape measured was secured on the exercise mat at the 15 inch mark using masking tape. Masking tape was also secured 6 inches to the right and left perpendicular to the 15 inch mark. One woman at a time was called into the room to perform the test. The test was fully explained and demonstrated separately for each participant. Participants placed their feet at the 6 inch mark on both sides of the tape, and with knees fully extended, they reached forward as far as they could. They were asked to stretch forward 3 times and at the end of each stretch they were given a score. The best score was compared to guidelines and norm tables according to ACSM (2005).

The body composition test was conducted in a private room, in which only this researcher and the participant being tested were allowed inside. The seven sites, for the seven site skinfold test, were marked first. Skinfolds were done three times at each site for test-retest reliability purposes. Percentages were not calculated at the time.

The 1 minute curl-up test required the use of masking tape to mark the site where fingertips should touch during the test. One participant was called into the room and asked to lie on her back on the exercise mat. One piece of masking tape was placed just
under the right and left fingertips. The other piece was placed 6 inches below, on both
sides. This initial marking was used with all participants. The test was explained and
demonstrated separately for each participant. Participant was asked to curl-up and touch
fingertips on the second set of masking tape. This counted as one crunch. They had a total
of 1 minute to perform as many crunches as they could. Scores were compared to
guidelines and norm tables according to ACSM (2005). Participants were aware they
could change their minds at any time during the process of this study.

**Week 2 – Week 9**

During this period the women participated in a two-month exercise program that was
conducted three times per week. The exercise class took one-hour including warm-up and
stretches at the beginning and a cool-down session and more stretches at the end. There
was no weight training. An undergraduate student in Kinesiology conducted the exercise
class. The class included a combination of resistance band training, body weight training
and core training. The exercise program was conducted in a safe and effective manner.
The exercise prescription followed guidelines from the ACSM (2005). This researcher
was present at all times during the exercise sessions.

After Week 5, participants were directed to take the URICA test again. The test was
administered at Westcare, right before one of the exercise sessions. Tests were collected
and placed in a sealed envelope. After Week 9, the exercise program was completed and
participants were then asked to perform all the psychological tests and the physical tests
again. This researcher conducted all the tests mentioned above at Westcare. All forms
and test results were collected and kept in confidentiality.
Statistical Analysis

Statistical analyses were conducted using the Statistical Program for the Social Sciences (SPSS version, Chicago, IL.) computer software package. Descriptive statistics were performed on each variable. One analysis of covariance (ANCOVA) was used for each dependent variable. The dependent variables were classified as all of the post-test scores. The independent variables were classified as the treatment group. The covariate was the pre-test scores. ANCOVA was used to accurately assess treatment effect by adjusting the dependent variable and removing the influence of the pre-test on the post-test (Bonate, 2000). The Chi-Square Test of Independence was used to examine the relationship between subjects on the readiness to change stages.
CHAPTER IV

RESULTS

To review, the study’s research hypothesis states that there will be a decrease in depression and anxiety due to the exercise intervention. The null hypothesis states that there will be no difference in the state of depression and anxiety.

Data Analysis

For the dependent variables of continuous nature, a series of analysis of covariance (ANCOVA) procedures was applied to test this study’s hypotheses. ANCOVA is the appropriate technique for this study, since it is the preferred method of analysis when baseline non-comparability between groups may be present (Senn, 1994; Beaupre & Dunham, 1993). Analysis of covariance can be thought of as a statistical control technique because in pre-test post-test analyses, such as the present study, it treats the pretest score as a covariate. A covariate is a continuous variable that represents a source of variation that has not been controlled for in the experiment and is believed to affect the expected value of the posttest score (Kirk, 1982). In this way, ANCOVA adjusts the dependent variable for the influence of the pre-test on the post-test, thus answering the question: are the treatment effects different between groups when applied to individuals with the same baseline pretest score. Therefore, ANCOVA was used to analyze pre and post sit-and-reach, curl-up, 3 minute step test, resting heart rate, and percent body fat,
BDI-II, and BAI. The dependent variables were all of the post-test scores, while all pre-test scores served as covariates.

Next, to analyze the pre- and post-URICA measures, which are not continuous in nature, a chi-square test of independence was applied. The chi-square test of independence is appropriate for testing the association between two categorical variables.

**Sit-and-Reach Analyses**

Figure 1 presents the results for the pre and post sit-and-reach test mean values for exercise versus control group:

![Figure 1. Pre and post Sit-and-Reach mean values](image)

As displayed, the sit-and-reach test mean values between exercise and control group. The mean value for exercise group is 21.16 compared to the mean value for the control group of 18.45. Treatment Group for the Sit-and-Reach test was not significant ($F(1, 23) = .524, p = .477$). This indicates that there isn't a significant difference between Exercise and Control groups on Post Sit-and-Reach scores, when taking into account the Pre Sit-and-Reach scores. Pre Sit and Reach scores are significant covariate ($F(1, 23)=56.016$, $p<.001$).
Curl-up Analyses

Figure 2 presents the results of the pre and post curl-up test mean values between exercise and control group:

![Bar chart showing pre and post curl-up mean values for exercise and control groups.](image)

Figure 2. Pre and post Curl Up mean values

When taking into account Pre Curl Up scores, there was a significant difference between exercise and control group Post Curl Up scores, F(1, 23)=26.06, p <.001. Judging from the Figure 2 above, the exercise group’s score was approximately 20 points higher than the control group (46.7 vs. 26.6).

3 Minute Step Test Analyses

Figure 3 presents the results of the 3 Min Step test mean values between exercise and control group:
The statistical analyses revealed a significant difference in Post 3 Minute Step Test scores between the exercise and control groups (F(1,23)=36.628, p<.001). Specifically, the exercise group’s scores (96.6) were significantly lower, on average, than the control group’s (102.36). The Pre 3 Minute Step covariate was also significant, (F(1, 23)=87.326, p<.001).

**Resting Heart Rate Analyses**

The subsequent Figure displays the results of the resting heart rate test mean values between exercise and control group:
There was no significant difference between treatment and control groups on Post RHR scores, \( F(1, 23) = 2.994, p = 0.097 \), however, the Pre RHR covariate was significant, \( F(1,23)=12.460, p=.002. \)

**Percent Body Fat Analyses**

Figure 5 represents the Percent BF mean values between exercise and control group:

![Figure 5. Pre and post Percent BF mean values](image)

There was a significant difference in Post Percent BF between exercise and control groups, when Pre Percent BF is taken into account \( F(1, 20)=51.678, p<.001 \). The statistical analyses also indicated that Pre Percent BF covariate was significant, \( F(1,20)=51.678, p<.001. \) According to Figure 5, the exercise group had a significantly lower Post Percent BF (25.66) on average, as compared with the control group (32.58).

The following section will display the results of the psychological variables.
BDI-II Analyses

Figure 6. Pre and post BDI-I mean values

The Treatment Group factor was significant, $F(1,23)=64.550$, $p<.001$. This means that there is a significant difference between the Exercise and Control groups on the Post BDI-I scores, when taking into account the Pre BDI-II scores. The Figure above shows a very big difference in mean scores between the two groups. It is also shown that the Pre BDI-I scores is a significant covariate ($F(1,23)=61.932$, $p<.001$).
Again, there is a significant difference between the treatment and control groups. When taking into account Pre BAI scores, there is a significant difference between exercise and control group Post BAI scores, $F(1, 24)=17.444$, $p < .001$. Judging from the Figure above, the exercise group’s score was again much lower than the control group’s score (13.1 vs. 24.8). We also see that the Pre BAI score is a significant covariate ($F(1.24)=56.525$, $p<.001$).

**URICA**

According to Figure 8, a considerably greater percentage of the exercise group was in the Action category as compared with the control group (33.3% vs. 8.3%), whereas the opposite was found for the Contemplation and Maintenance groups (13.3% vs. 33.3% and 13.3% and 25.0%, respectively).
Figure 8. URICA Pre Readiness to Change

Post test scores, in Figure 9, indicate a marked difference between the exercise and control groups in Action and Contemplation categories. Specifically, the exercise group had a greater percentage of people in the Action category (53.3% vs. 16.7%) while the control group had a greater percentage of people in the Contemplation category (50% vs. 6.7%).

Figure 9. URICA Post Readiness to Change
Chi Square on URICA

Finally, below is the Chi-Square Test of Independence for the Readiness to Change stages of the URICA test. Below is the Chi-Square Test of Independence for the Pre-scores on Readiness to Change. Table 7 indicates that for the exercise group, there are more than expected numbers of people in the Action (n=5) and Pre Contemplation (n=6) categories. The control group, on the other hand, shows more than expected numbers of people in the contemplation (n=4) and pre-contemplation (n=4) categories. Other groups have about or fewer than expected numbers in the categories. Regardless of the patterns shown in the data below, pre-readiness to change is not related to treatment group, as indicated by Chi-square (df=3) = 3.645, p = .302.

Table 7
Cross Tabulation

<table>
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<th>Treatment Group</th>
<th>Pre Readiness to Change</th>
<th>Total</th>
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<tbody>
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<td></td>
<td>A</td>
<td>C</td>
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<tr>
<td>X</td>
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<td>C</td>
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<td>EC</td>
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</tbody>
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(A= Action, C = Contemplation, M = Maintenance, PC = Pre-Contemplation; X = Exercise, CT = Control, EC = Expected Count, C = Count)

Below is the Chi-Square Test of Independence for the Post-scores on Readiness to Change. The post test scores show something different. Although for the exercise group
there are more than expected numbers of people in the action (n=8) and maintenance (n=3) categories, the control group shows more than expected numbers of people in the contemplation (n=6) category. Other groups have about or fewer than expected numbers in the categories. The data in Table 27, and 28 show there is a significant relationship between treatment group and post test readiness to change scores, Chi-square (df=3)=7.936, p = .047. Therefore, it can be concluded that readiness to change stage on the post-test is contingent upon treatment group.

Table 8
Cross Tabulation

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>A</th>
<th>C</th>
<th>M</th>
<th>PC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>8</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>EC</td>
<td>5.6</td>
<td>3.9</td>
<td>2.2</td>
<td>3.3</td>
<td>15.0</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>EC</td>
<td>4.4</td>
<td>3.1</td>
<td>1.8</td>
<td>2.7</td>
<td>12.0</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>6</td>
<td>27</td>
</tr>
</tbody>
</table>

(A = Action, C = Contemplation, M = Maintenance, PC = Pre-Contemplation; X = Exercise, CT = Control, EC = Expected Count, C = Count)
CHAPTER V

DISCUSSION

The purpose of this study was to determine if exercise might be an effective treatment for clinically significant depression and anxiety. The research hypothesis stated that there would be a decrease in depression and anxiety due to the exercise intervention.

The primary finding in this investigation is that physical activity, when implemented to a substance abuse rehabilitation program, affects measures of depression, anxiety, and readiness to change. In this present investigation Post Beck Depression Inventory II (BDI-II) scores showed a significant difference between exercise and control groups when taking into account the Pre-BDI-II scores. Post Beck Anxiety Inventory (BAI) scores also showed a significant difference between exercise and control group, when taking into account Pre BAI scores. These findings are in general agreement with Palmer et al. (1988) where significant differences in state, and trait anxiety, and depression were found between the control and exercise group. The exercise, in this case, consisted of a 3 times per week, walk/jog routine. The subjects were also undergoing an inpatient rehabilitation program, but the program only lasted for 28 days. The present study differed slightly from that of Palmer et al. (1988) in that it incorporated a two-month exercise program and subjects relied on body weight, elastic band resistance, and core training exercises. These findings are also in agreement with King et al.’s (1995) study in
which subjects experienced a decrease in their depression and anxiety levels due to an exercise program. Interestingly, the latter study reported that the decrease in depression and anxiety were independent of the changes in physical fitness.

The difference between groups in post Sit-and-Reach test scores was not significant. This shows neither the control or exercise group significantly improved the flexibility of the hamstrings and lower back. In contrast, there was a significant difference between the exercise and control group’s post Curl-up scores. The exercise group’s score was approximately 20 points higher than the control group (46.7 vs. 26.6 curl-ups). Hence there was a significant increase in abdominal endurance for the exercise group. There was also a significant difference in post 3 Minute Step Test scores between the exercise and control groups (with the pre 3 Minute Step Test scores designated as a covariate). Once again, the exercise group presented a significantly lower score (96.6 bpm), on average, than the control group did (102.36 bpm); the exercise group experienced an increase in cardio-respiratory endurance. Post RHR scores showed no significant differences between exercise and control groups. Post Percent BF for the exercise group was significantly lower (25.66%), on average, when compared to BF for the Control group (32.58). Consequently, those who participated in the exercise program could now be classified into a healthier range of body fat percentage, according to ACSM Guidelines (2005). Despite the fact that the relationship between changes in fitness and depression and anxiety could not be explored, it is important to note that some of the fitness variables and the decrease in depression and anxiety occurred together. For example, the exercise group demonstrated better scores on the post test of three of the five fitness variable: Curl-up test, 3 Minute Step test, and percent BF.
For the Pre URICA measure, it was shown that there was no relationship between control and exercise groups. That is, there was no significant indication that any one of the URICA categories was found with more than expected frequency (based on the rules of probability) in one treatment group vs. the other. In the post URICA, it was found that there is a significant relationship between readiness to change and exercise. Specifically, the most striking finding was for the Action category for the exercise group (Figure 9).

Additionally, 4.4 people were expected in the “Action” group for the control group; however only 2 were actually in that category. Also, 3.1 were expected to be in the Contemplation category for the control group, yet 6 were observed to be in this category. This seems to indicate that more than expected numbers of people were in the “Action” category, yet fewer than expected numbers of people were in the “Contemplation” category for the exercise group. Moreover, fewer than expected numbers were found to be in the “Action” category, yet more than expected were in the contemplation category for the control group.

Conclusion and Future Directions

The results of this study indicates that physical activity might serve as an important tool, in addition to traditional rehabilitation protocol, in the recovery of depression and anxiety symptoms of substance abusers. Whether exercise can be offered to patients as a stand-alone therapy remains to be seen, but the existing evidence suggests that this might be worthwhile adjunctive treatment (Daley, 2002).

The literature review suggests that for many variables there is evidence indicating that a relationship exists between exercise and improved mental health. This is apparent in the
case of a reduction of anxiety and depression (Byrne et al., 1993; Fridinger et al., 1993; Palmer et al., 1988; MacMahon, 1990). For these topics, there is now considerable evidence derived from studies with thousands of subjects to support the claim that “exercise is related to a relief in symptoms of depression and anxiety”. There is also a strong need to further examine variables, such as biological factors, peer pressure, and body image. Concerning the area of depression and anxiety, however, there is either a need for more research on these topics or more quantitative reviews of the research that already exists. Additionally, the relatively new topic on the influence of exercise on positive mood states is in need of more research studies, whereas the area of exercise and self-esteem needs quantitative reviews. At the present time, it appears that aerobic exercise enhances physical self-concept and self-esteem, but more research needs to be done to confirm these initial findings. Exercise is related not only to a relief in symptoms of depression and anxiety but it also seems to be beneficial in enhancing self-esteem, producing more restful sleep, and helping people recover more quickly from psychosocial stressors.

The overall positive patterns of findings in the available literature provide great confidence that exercise has an important role to play in promoting sound mental health. Further research is also needed to determine the relapse rate for programs which include fitness and health promotion efforts in comparison to those that do not. New research should examine post-treatment differences between exercises and controls, particularly with regards to adherence to exercise and abstinence rates.

Additionally, to generalize results to a larger population, participants should be drawn from non-clinical groups. Therefore a careful selection of subjects is also necessary in
future research. Consideration should also be applied to research where exercise is being evaluated against non-exercise conditions. The non-exercisers should, then, be placed in a structured activity not involving exertion, in order to control for possible non-specific effects of attention or simply human contact on mood elevation (Byrne et al., 1993; Palmer et al., 1988). Similarly, the effects of exercise within a social context should be compared with those from self-imposed exercise as an individual activity, in order to examine whether exercise or simply social contact associated with exercise programs, acts to improve mood, depression, anxiety and self-esteem. Future investigation seems indicated as treatment facilities continue to adapt and improve their programs to most effectively treat the recovering addict. New studies may also be directed at identifying the mechanism through which exercise influences psychological status, and whether it transfers benefits into areas such as academic performances or social skills (MacMahon, 1990).

The above discussion demonstrates a growing body of literature suggesting improvements in self-esteem, anxiety level, depression and overall sense of well-being associated with participation in regular exercise. Rehabilitation treatments should encompass a network of positive changes. For example, negative emotions could be controlled by physical exercise. Ongoing recovery means replacing negative aspects with positive attributes. Consequently, newly sober individuals will have to learn a whole new way of living without substances. Teaching recovering addicts how to make new friends, how to find positive activities to replace the old habit, and tapping into aspects of life that lead to fulfillment are a few strategies in which these individuals should be exposed to.
(Bowden, 1997). At this time, modifying treatment programs to include physical exercise appears worthwhile and it should be part of this network of positive changes.
APPENDIX A

BECK DEPRESSION INVENTORY

Instruction: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group.

1. Sadness
0 – I do not feel sad.
1 – I feel sad much of the time.
2 – I am sad all the time.
3 – I am so sad or unhappy that I can’t stand it.

2. Pessimism
0 – I am not discouraged about my future.
1 – I feel more discouraged about my future that I used to be.
2 – I do not expect things to work out for me.
3 – I feel my future is hopeless and will only get worse.

3. Past Failure
0 – I do not feel like a failure.
1 – I have failed more than I should have.
2 – As I look back, I see a lot of failure.
3 – I feel I am a total failure as a person.

4. Loss of Pleasure
0 – I get as much pleasure as I ever did from the things I enjoy.
1 – I don’t enjoy things as much as I used to.
2 – I get very little pleasure from the things I used to enjoy.
3 – I can’t get any pleasure from the things I used to enjoy.

5. Guilty Feelings
0 – I don’t feel particularly guilty.
1 – I feel guilty over many things I have done or should have done.
2 – I feel quite guilty most of the time.
3 – I feel guilty all the time.
6. Punishment Feelings
0 – I don’t feel I am being punished.
1 – I feel I may be punished.
2 – I expect to be punished.
3 – I feel I am being punished.

7. Self-Dislike
0 – I feel the same about myself as ever.
1 – I have lost confidence in myself.
2 – I am disappointed in myself.
3 – I dislike myself.

8. Self-Criticalness
0 – I don’t criticize or blame myself more than usual.
1 – I am more critical of myself than I used to be.
2 – I criticize myself for all of my faults.
3 – I blame myself for everything bad that happens.

9. Suicidal Thought or Wishes
0 – I don’t have any thought of killing myself.
1 – I have thought of killing myself, but I would not carry them out.
2 – I would like to kill myself.
3 – I would kill myself if I had a chance.

10. Crying
0 – I don’t cry anymore than I used to.
1 – I cry more than I used to.
2 – I cry over every little thing.
3 – I feel like crying, but I can’t.

11. Agitation
0 – I am more restless or wound up than usual.
1 – I feel more restless or wound up than usual.
2 – I am so restless or agitated that it’s hard to stay still.
3 – I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest
0 – I have not lost interest in other people or activities.
1 – I am less interested in other people or things than before.
2 – I have lost most of my interest in other people or things.
3 – It’s hard to get interested in anything.

13. Indecisiveness
0 – I make decisions about as well as ever.
1 – I find it more difficult to make decisions than usual.
2 – I have much greater difficulty in making decisions than I used to.
3 – I have trouble making any decisions.

14. Worthlessness
0 – I do not feel I am worthless.
1 – I don’t consider myself as worthwhile and useful as I used to.
2 – I feel more worthless as compared to other people.
3 – I feel utterly worthless.
15. Loss of Energy
0 – I have as much energy as ever.
1 – I have less energy than I used to have.
2 – I don’t have enough energy to do very much.
3 – I don’t have enough energy to do anything.

16. Changes in Sleeping Pattern
0 – I have not experienced any change in my sleeping pattern.

da – I sleep somewhat more than usual.
db – I sleep somewhat less than usual.

2a – I sleep a lot more than usual.
2b – I sleep a lot less than usual.

3a – I sleep most of the day
3b – I wake up 1-2 hours early and can’t go back to sleep.

17. Irritability
0 – I am no more irritable than usual.
1 – I am more irritable than usual.
2 – I am much more irritable than usual.
3 – I am irritable all the time.

18. Changes in Appetite
0 – I have not experienced any change in appetite.

1a – My appetite is somewhat less than usual.
1b – My appetite is somewhat greater than usual.

2a – My appetite is much less than before.
2b – My appetite is much greater than usual.

3a – I have no appetite at all.
3b – I crave food all the time.

19. Concentration Difficulty
0 – I can concentrate as well as ever.
1 – I can’t concentrate as well as usual.
2 – It’s very hard to keep my mind on anything for very long.
3 – I find I can’t concentrate on anything.

20. Tiredness or Fatigue
0 – I am no more tired or fatigued than usual.
1 – I get more tired or fatigued more easily than usual.
2 – I am too tired or fatigued to do a lot of the things I used to.
3 – I am too tired or fatigued to do most of the things I used to.

21. Loss of Interest in Sex
0 – I have not noticed any recent change in my interest in sex.
1 – I am less interested in sex than I used to be.
2 – I am much less interested in sex now.
3 – I have lost interest in sex completely.
APPENDIX B

BECK ANXIETY INVENTORY

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

<table>
<thead>
<tr>
<th></th>
<th>Not At All</th>
<th>Mildly, but it didn’t bother me much</th>
<th>Moderately — it wasn’t pleasant at times</th>
<th>Severely — it bothered me a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbness or tingling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling hot</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Wobbliness in legs</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unable to relax</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of worst happening</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Dizzy or lightheaded</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Heart pounding/racing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unsteady</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Terrified or afraid</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Nervous</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Feeling of choking</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hands trembling</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Shaky/unsteady</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of losing control</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Difficult in breathing</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fear of dying</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Scared</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Indigestion</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Faint/lightheaded</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Face flushed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hot/cold sweats</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Column Sum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scoring — Sum each column. Then sum the column totals to achieve a grand score. Write that score here _______.

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APPENDIX C

UNIVERSITY OF RHODE ISLAND CHANGE ASSESSMENT (URICA) SCALE

Each statement describes how a person might feel when starting therapy. Please indicate the extent to which you tend to agree or disagree with each statement. In each case, make your choice in terms of how you feel right now, not what you have felt in the past or would like to feel. For all the statements that refer to your “problem”, answer in terms of the problem you have written at the top. And “here” refers to the place of treatment.

There are FIVE possible responses to each of the items in the questionnaire: Strongly disagree, disagree, undecided, agree, and strongly agree. Circle the number that best describes how much you agree or disagree with each statement.

<table>
<thead>
<tr>
<th>There are FIVE possible responses:</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. As far as Em concerned, I don’t have any problems that need changing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I think I might be ready for some self-improvement</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I am doing something about the problems that had been bothering me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. It might be worthwhile to work on my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I’m not the problem one. It doesn’t make much sense for me to be here.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. It worries me that I might slip back on a problem I have already changed, so I am here to seek help.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I am finally doing some work on my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I’ve been thinking that I might want to change something about myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I have been successful in working on my problem, but I’m not sure I can keep up the effort on my own.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. At times my problem is difficult, but I’m working on it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Being here is pretty much of a waste of time for me because the problem doesn’t have to do with me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. I’m hoping this place will help me to better understand myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I guess I have faults, but there’s nothing that I really need to change.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>14. I am really working hard to change.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I have a problem and I really think I should work on it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. I’m not following through with what I had already changed as well as I had hoped, and I’m here to prevent a relapse of the problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. Even though I’m not always successful in changing, I am at least working on my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. I thought once I had resolved the problem I would be free of it, but sometimes I still find myself struggling with it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. I wish I had more ideas on how to solve my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. I have started working on my problems but I would like help.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. Maybe this place will be able to help me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. I may need a boost right now to help me maintain the changes I’ve already made.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. I may be part of the problem, but I don’t really think I am.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. I hope that someone here will have some good advice for me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25. Anyone can talk about changing: I’m actually doing something about it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26. All this talk about psychology is boring. Why can’t people just forget about their problems?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27. I’m here to prevent myself from having a relapse of my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28. It is frustrating, but I feel I might be having a recurrence of a problem I thought I had resolved.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29. I have worries but so does the next guy. Why spend time thinking about them?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30. I am actively working on my problem.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31. I would rather cope with my faults then try to change them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>32. After all I had done to try and change my problem, every now and again it comes back to haunt me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
APPENDIX D

PAR-Q & YOU

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?

2. Do you feel pain in your chest when you do physical activity?

3. In the past month, have you had chest pain when you were not doing physical activity?

4. Do you lose your balance because of dizziness or do you ever lose consciousness?

5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?

6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?

7. Do you know of any other reason why you should not do physical activity?

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

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

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.
Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

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

• Find out which community programs are safe and helpful for you.

Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

**DELAY BECOMING MUCH MORE ACTIVE:**

• if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or

• if you are or may be pregnant – talk to your doctor before you start becoming more active.

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

• start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.

• take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

**NOTE:** If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

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

**NAME**

__________________________________________

**SIGNATURE**

__________________________________________

**DATE**

__________________________________________

**SIGNATURE OF PARENT**

__________________________________________

**WITNESS**

__________________________________________

or GUARDIAN (for participants under the age of majority)
Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

(A Questionnaire for People Aged 15 to 69)

YES NO

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

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HealthCanadaSantéCanada
HEALTH HISTORY QUESTIONNAIRE

Date ___________________________

Name __________________________________________________________

Age ________________ Date of Birth __________________________

Physical Profile

1) Physical injuries: ________________________________________________

Limitations: ______________________________________________________

2) Have you ever been diagnosed as having any cardiovascular abnormalities?
   Yes_______ No_______

If yes, what was diagnosed and when? __________________________________

3) Have you ever had any of the following cardiovascular problems? Please check if yes:
   Heart murmur_______
   Myocardial infarction_______
   Fainting/Dizziness ______
   Intermittent Claudication_______
   Chest pain_______
   Palpitations_______
   Ischemia_______
   Tachycardia_______
   Ankle Edema_______
   Stroke_______

4) Do you have any form of breathing ailments?

Asthma_______ Bronchitis_______ Emphysema_______ Common Cold_______
5) Have you had any of the following? Please check if yes:

- Rheumatic Fever
- Kidney/Liver Disease
- Diabetes
- High Blood Pressure
- Obesity
- High Cholesterol

6) Does anyone in your family have any of the conditions listed above? If yes, please list family member and problem and age they developed the problem:

________________________________________________________________________

7) Is your mother living? Yes  No  Age of death:  Cause:

8) Is your father living?  Yes  No  Age of death:  Cause:

9) Are you on medications? Yes  No
If yes, please list:

________________________________________________________________________

10) Do you have any allergies? Yes  No
If yes, please list:

________________________________________________________________________

11) Have you been seen by a physician in the past year? Yes  No
If yes, please elaborate:

________________________________________________________________________

12) Have you ever experienced any adverse affects during or after exercise (such as fainting, vomiting, palpitations, or hyperventilation)? Yes  No
If yes, what?

Lifestyle Factors

Do you smoke cigarettes, cigar, or a pipe? Yes  No

If yes: How many years?  How many cigarettes, cigars, pipe per day?

If no: Have you ever smoked? Yes  No

If yes: How many years did you smoke for?
How many years since you quit?
How many cigarettes per day?

Please indicate how many servings of each of the following you drink every day:

- Coffee: Cups/day
- Alcohol: Hard liquor  Beer: oz/day
- Tea: Cups/day
- Wine: glasses/day
REFERENCES


http://www.webmd.com/hw/depres8ion/aa25628.a5p


Harcourt Assessment, Inc., 19500 Bulverde Road, San Antonio, Texas 78259. *Beck Depression Inventory (BDI); Beck Anxiety Inventory (BAI). U.S. registered trademarks of Harcourt Assessment, Inc.*


Lange Skinfold Caliper. Beta Technology Incorporated, 151 Harvey West Blvd, Santa Cruz, CA 95060-2142.


VITA

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