SELF-REPORTED EXERCISE ADDICTION LEVELS OF COMPETITIVE ATHLETES

by

Joshua R. Oken

A THESIS

Presented to the Department of Psychology
and the Robert D. Clark Honors College
of the University of Oregon
in partial fullfillment of the requirements
for the degree of
Bachelor of Arts, Honors College

May, 1991

An Abstract of the Thesis of

Joshua R. Oken for the degree of Bachelor of Arts in the Department of Psychology to be taken May, 1991

Title: SELF-REPORTED EXERCISE ADDICTION LEVELS OF COMPETITIVE ATHLETES

Approved: [redacted]
Dr. Lewis R. Goldberg

The phenomenon of inescapable desire to exercise may be best described by the exercise-addiction paradigm. This study modified an alcohol and drug abuse self-report questionnaire in order to measure different types of athletes' addiction levels. Hypothesized differences between types of athletes were not statistically significant given the small subject samples.

ACKNOWLEDGEMENTS

I would like to thank Lewis R. Goldberg, Tina K. Rosolack, and Frances Cogan for keeping me on schedule, challenging me to pursue difficult prospects, and encouraging my ideas.

But most importantly I would like to thank Emily Carroll for being my dearest friend, encouraging my private goals, and teaching me a gentler way.

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

The fitness craze has dominated the leisure environment of this country for at least the past decade and a half. The craze started in the mid-seventies with the popularity of running, which seemed to affect nearly everyone, from high school students to the president and his Secret Service. The way exercise was viewed seemed to mark an important transition at this time. Because of its popularity, exercising went from something that one *had* to do, to something many people *wanted* to do. In addition to increasing their longevity, or to losing weight, people began to do it for pleasure. Health clubs sprang up in nearly every town. In general, the whole country has been showing more interest in exercise. Traditionally, people have thought of exercise as an endeavor with only positve results. Those who pursued it were rewarded with weight loss, inceased strength and endurance, and increased longevity. It seems to follow that the more one exercised, the healthier s/he would be. Unfortunately this is not always true.

One of the dangers of constant training is injuries due to overuse (e.g., shinsplints and tennis elbow). Another is exercise addiction. Exercise addiction has only come to the public's consciousness in the last few years. It is

usually talked about in reference to those who exercise every day, especially runners and aerobicizers. Scientists are now beginning to study the roots of this condition.

In the late seventies and early eighties, there was much talk of "Runner's high." While running, many alleged "to leave their bodies metaphorically and somewhat float in an existential ambience of wonder and magnificance. They are newborn, they are figuratively besides themselves, and they are free" (Pargman and Burgess, 1979). Naturally, this experience was likened to the effects of drugs. Studies began to appear linking exercise to an increase in plasma beta-endorphins. Beta-endorphins were thought to be a natural opiod, which bound itself to the same receptors in the brain as heroin and other opiates. Many researchers thought that this could be a reasonable explanation for the fanaticism of some runners.

In all studies, however, the beta-endorphins are measured in the blood and not in the brain. This is an important distinction because of the existence of the blood-brain barrier. The blood-brain barrier acts as a filter to protect the brain from any unwanted substances and perhaps the beta-endorphins do not pass through it. Several studies highlighted this point. In one study, 50,000 times the resting beta-endorphin level in the blood failed to produce noticeable effects in normal subjects (Foley, 1979 in Moore, 1982). In other recent studies, "mood changes, including

those following running, were not inhibited or altered by the opiate antagonist naloxone hydrochloride" (Melchonda et. al. 1984). Naloxone hydrochloride passes through the blood brain barrier and blocks the receptors that are supposed to bind to beta-endorphins. Thus, the beta-endorphin theory does not stand up. These new findings seem to eliminate the theory that exercise addiction is based on physiological addiction.

Recently, scientists have not talked of the runner's high. However, a new phenomenon arose--that of the compulsive exerciser (Diekhoff, 1984). The compulsive exerciser theory began to grow strong in the early to middle eighties. However, it has a serious flaw: Someone who is obsessive/compulsive is thought to be out of control; his or her thoughts and actions are dominated by something that is neither wanted nor enjoyed. This does not fit the chronic exerciser because s/he usually looks forward to the ritual. This sounds like it would be a "healthy addiction," but like drug addiction, his/her behavior may be destructive to himself/herself, his/her relationships, and his/her work.

The paradigm of the exercise addict seems to hold the most validity. Although it may seem that it is merely a "timely" way to describe the phenomenon (i.e., in the age of the "War on drugs," everyone is addicted to something), over-exercising has some of the elements of a true addiction. What is addiction? Russel (1976) proposed a

definition whose crucial point is "A negative affect experienced in the absence of a drug, object or activity" (in De Coverley Veale, p.735). Addiction is neither an exclusively physical, nor an exclusively psychological phenomenon. Rather it is a melee of cultural, genetic, physiological, psychological, and social factors. Exercise addiction may have its own mixture of these factors, forming an addiction to what Russel calls, an "activity."

The "negative affect" that Russel describes could be the symptoms of withdrawal from exercise. One report includes some of these symptoms:

> Included (were) feelings of anxiety, restlessness, discomfort and irritation. LA (a subject) indicated that there was really something missing, and noted an increase in anxiety levels and problems with coping" (Sachs and Pargman, 1978).

These symptoms are described in nearly every report and usually emphasize depression. Thaxton (1982) found that merely one day's absence from running in a daily running group resulted in a significant increase in depression, as measured both by galvanic skin response and by the Profile of Mood States (in De Coverley Veale, p. 735.). Another symptom that is common and crucial to exercise withdrawal are guilt feelings. In the Sachs and Pargman study (1978), the authors refer to the words of subject DP; "I run - I'm not exactly sure why - but I've felt that running is an alternative to the feelings of guilt and anxiety that

develop within me when I don't run" (p. 149).

There is some evidence that seems to contradict the withdrawal argument in support of the addiction paradigm. In one Canadian study of runners and swimmers, virtually all the athletes reported that they were exercise addicted, yet after a day without training, "approximately as many reported more positive mood states as more negative moods" (Crossman and Jamieson, 1987 p.35).

At first reading, this appears to contradict the paradigm. However, the day off was not unexpected or against the will of the subjects; rather, it was part of their routine. Their day off had been reinforced positively so many times that most of the athletes didn't hesitate to enjoy it. So, exercise addiction may be the best way to describe the phenomena that may start out as a healthy routine and end in an all-consuming behavior.

The next logical step in describing exercise addiction, is to present a set of diagnostic criteria. One researcher established such criteria. Quoting De Coverley Veale's (1988) proposal:

(A) Narrowing of repertoire leading to a stereotyped pattern of exercise with a regular schedule once or more daily.
(B) Salience with the individual giving increasing priority over other activities to maintaining the pattern of exercise.
(C) Increased tolerance to the amount of exercise performed over the years.
(D) Withdrawal symptoms related to a disorder of mood following the cessation of the exercise schedule.
(E) Relief or avoidance of withdrawal symptoms by

further exercise.
(F) Subjective awareness of a compulsion to exercise.
(G) Rapid reinstatement of the previous pattern of exercise and withdrawal symptoms after a period of abstinence.

Associated Features

(H) Either the individual continues to exercise despite a serious physical disorder known to be caused, aggravated, or prolonged by exercise and is advised as such by a health professional, *or* the individual has arguments with his partner, family, friends, or occupation.
(I) Self induced loss of weight by dieting as a means towards improving your health.

De Coverley Veale's criteria seem to be reasonable, although I think the word *compulsion* should have been avoided in criterion F. To prevent confusion of the obsessive/compulsive model with the addiction paradigm, the word *drive* would be more appropriate. Also, it follows naturally that the more one trains, the higher one's tolerance to exercise will be. Therefore criterion (c) should be removed. In thinking about exercise addiction, one is likely to wonder about the kind of person who is most likely to suffer from it. The short answer is any athlete.

Athletes are often viewed as in pursuit of one goal: pure perfection. They are considered to have an "iron will," because they can endure all the hardships of training. They are "focused," because they can sacrifice most other pleasures to attain their goal. They do not consume alcohol or use drugs. To many, athletes seem superhuman.

However, what may appear to be an "iron will" may be

exercise addiction. What may be called "making sacrifices" for the sport may actually be a symptom of this dysfunctional behavior. The goal that they set may actually be an elaborate denial system, protecting their egos. Many athletes may be battling low self esteem and negative body image. For example, it has been hypothesized that exercise addiction can occur as a manifestation of anorexia nervosa (Blumenthal, Rose, and Chang, 1985).

Perhaps because athletes are idealized in our culture, they have been largely ignored by researchers of this addiction. Some may argue that the external rewards for being an athlete are so enormous that exercise addiction could not be the main reinforcement to train. However, it may be a larger or a smaller part, varying among athletes. In diagnosing any disorder, there is no point where the person's mental health status goes from healthy, to unhealthy. Rather, the mental health of anyone, in regard to any factor, should be measured on a continuum.

This was a crucial element in the way I studied this topic. In order to measure addiction, I developed a questionnaire, based on previous alcoholism and drug addiction diagnostic questionnaires. In addition to the modified questions, I created several original ones based on anecdotal and personal experience. This new questionnaire certainly could not be called diagnostic. In order to claim diagnostic power, I would have had to test clinically

diagnosed exercise addicts. I have chosen to compare different kinds of athletes on the number of responses answered in the addiction direction.

The groups of athletes I will be comparing are female versus male, endurance versus power, team versus individual, and elite versus non-elite. All the categories are defined by the event in which the athlete competes. Individual sports are those that involve the athlete competing without any assistance. For example, wrestling is a team sport, but the wrestlers grapple with their opponents unassisted and therefore are categorized as individual athletes. Endurance and power sports are defined by the percentage of the energy systems used (Hagerman and Falkel, 1986); the body uses anaerobic (without oxygen) energy systems in power sports, and aerobic (with oxygen) energy systems for endurance sports. An example of an anaerobic sport is weight lifting, whereas an example of an endurance sport is the long-distance running. The elite athlete is defined as one who is nationally or internationally ranked, or a professional. The athletes in each of these categories are compared by a simple comparison of means (i.e., the average score on the questionnaire for each group). The groups will be compared in this order: female/male, elite/non-elite, endurance/power, and team/individual.

My hypothesis is that some of these groups will score higher (more addicted) on the questionnaire than others,

based on what their motivations may be, and the number of external rewards that are indigenous to the sport. I would suspect that females would score higher than males because our society discourages women from being physically strong. Thus, exercise addiction may be what is keeping them involved. I would also suspect that the elite athlete would score higher than the non-elite, because the costs of getting to such a point could far outweigh the benefits. The endurance athlete may score higher than the power athlete. The training involved in power events demands a great deal of rest, which may inhibit addictive habits from forming, whereas the endurance athlete must train more frequently and with less rest. And, finally the individual athlete should score higher than the team athlete. A team athlete shares in the rewards of friendship, trust and team spirit. S/He also has typically more enjoyable workouts.

If there are significant differences between one or more of the groups, the information may serve to identify high risk sports or athletes. This information could be used to prevent exercise addiction from occuring.

CHAPTER II

METHOD

Subjects

Subjects were athletes from the University of Oregon, Montana State University, and from a local cycling club. There were a total of 58 subjects, of whom 32 were female and 26 were male. Their ages ranged from 18 to 32. Most of the athletes were contacted through their coaches. The local cyclists were contacted throught their team manager.

Instruments

The subjects were administered two questionnaires. The first was the self-report exercise addiction survey. It is composed of 29 questions, each to be answered "yes" or "no." The questions were modified from the Michigan Alcoholism Screening Test (MAST) and the Drug Abuse Screening Test (DAST), both considered standards (Serenity Lane). In addition, I created several questions based on personal and anecdotal experience. The second questionnaire was the MacAndrew scale for alcoholism from the MMPI, which consists of 51 true and false questions. I intended the latter to be used as a general measure of addiction, to be compared with the first measure to see if there is any

relation between the two (See appendix a).

Procedures

The subjects were given the packets by their coaches or by myself and were told to fill them out on their own time. On the front of the packet was an information sheet, which briefly explained the nature of the questionnaire and the subject's rights (See appendix b). Upon completion of the questionnaire, they returned it to a collection site where they picked up their debriefing sheet (see appendix c).

The questionnaires were scored by assigning one point to each question answered in the direction of addiction. The range of possible scores on the Exercise Addiction questionnaire was 0-29, with 0 being the lowest (least likely to be addicted) and 29 being the highest (most likely to be addicted). The range of possible scores on the MacAndrew questionnaire was 0-51, with 0 being the least likely to have alcoholism and 51 being the most likely to have alcoholism.

CHAPTER III

RESULTS

Reliability of the Exercise Addiction Questionnaire (n=72)

A. Question 24 had no variance and therefore was not scored.

B. The mean score on the exercise addiction questionnaire was 9.0 with a standard deviation of 4.2, indicating no ceiling or floor effects. The reliability (coefficient alpha) was equal to .75, and the mean inter-item correlations was only .09. Analysis of the questionnaire showed that questions 1,6,7,25,26,28,and 29 reduced the overall reliability. This suggested that all the items were not measuring the same phenomenon. To test this, I factor analyzed the items using princpal component analysis and varimax rotation, which are recommended for examining how items are grouped (Tabachnik and Fidell, 1983). Three factors were found, comprised of these questions:

	I	II	III
Question	2 3 7 8 10 11 12 13 14 15	4 5 6 16 17 18 19 21 22 23 25 27 29	1 20 26 26

(See appendix a).

These groups have no recognizable common themes.

Validity of the Exercise Addiction Questionnaire (n=72)

The validity of the exercise addiction questionnaire was tested by its correlations with the MacAndrew scale, and its correlation with the number of workouts per week. The mean score on the MacAndrew scale was 20.7 with a standard deviation of 3.9. The reliability (coefficient alpha) was .44. The correlation between the two questionnaires was .15, which was not statistically significant.

The mean number of workouts was 6.2, with a standard deviation of 1.9 and a range of 4-11. The exercise addiction questionnaire did not relate to the number of workouts (correlation coefficient=.07).

Addiction Scores of Different Groups of Athletes (n=58)

Due to incomplete information, 14 questionnaires were removed from the sample. In order to avoid the confounding of the many different independent variables, it was necessary to break the subjects into groups where they would only be represented once. The sample sizes, means and standard deviations are provided in the table on the next page. There is no distinction between endurance and power for team athletes. An analysis of variance was used to test the significance between the groups. The results were all insignificant. The hypotheses were correct 13 out of 20 times, and are provided on the next page.

Means, Standard Deviations, and Numbers of Subjects

		TEAM		INDIVIDUAL	
		male	female	male	female
	power			x=10.5 sd=4.6 n=8	x=5.0 sd=0.0 n=1
ELITE		x=9.0 sd=8.5 n=2	x=9.2 sd=3.0 n=11		
	endurance			x=8.0 sd=0.0 n=1	
	power			x=8.0 sd=3.6 n=3	x=4.8 sd=1.8 n=5
NONELITE		x=7.1 sd=5.2 n=7	x=10.4 sd=4.3 n=11		
	endurance			x=10.4 sd=4.8 n=5	x=12.5 sd=3.7 n=4

Results of Comparisons Between Groups

E.=elite, **N.**=non-elite, **M.**=Male, **F.**=female, **END.**=endurance

POW.=power, **T.**=team

Groups	Supports Hypothesis?	Groups	Supports Hypoth.?
F.E.T.>M.E.T.	YES	F.E.POW.<M.E.POW.	NO
F.N.T.>M.N.T.	YES	F.N.POW.>M.N.POW.	YES
F.N.END.>M.N.END.	YES	END.M.E.<POW.M.E.	NO
END.M.N.>POW.M.N.	YES	END.F.N.>POW.F.N.	YES
POW.M.E.>T.M.E.	YES	POW.F.E.<T.F.E.	NO
END.M.E.<T.M.E.	NO	POW.M.N.>T.M.N.	YES
POW.F.N.<T.F.N.	NO	END.M.N.>T.M.N.	YES
END.F.N.>T.F.N.	YES	E.M.T.>N.M.T.	YES
E.F.T.<N.F.T.	NO	E.M.END.<N.M.END.	NO
E.M.POW.>N.M.POW.	YES	E.F.POW.>N.F.POW.	YES

CHAPTER IV

DISCUSSION

Reliability analysis revealed interesting results. Question 24 on the questionnaire had no variance among the subjects and have been removed. Questions 1,6,7,25, 26,28,and 29 reduced the overall reliability and therefore might be removed. The coefficient alpha reveals that overall, the questionnaire was reliable. However, the inter-item correlations mean was low, indicating that perhaps there were several scales measuring different attributes within the questionnaire. Carefull scrutiny of the question groups that were produced revealed no separate recognizable subscales.

The correlations between the exercise addiction questionnaire and the MacAndrew alcoholism survey *and* the number of workouts were not significant. Although this could be interpreted to show that the exercise addiction questionnaire has less power, it is more likely that comparing the two is not a good test of their validity; because the MacAndrew scale has a low reliability and the range of workouts is restricted.

Analyses of variance revealed no significant difference between groups. The hypotheses that one group would score higher than another (elite > non-elite, endurance > power, women > men, and individual > team) was rejected. More significant results would likely be found if there were more

subjects. In addition, many of the subjects did not fill out the questionnaires completely. There were 72 questionnaires returned but only 58 could be used.

It is important to note which subject groups were the smallest. Although the elite sample would naturally be the smallest, there were other notable differences. When I questioned one of the elite male distance runners why nobody was returning the questionnaires, he replied, "They're too busy." In the case of the women distance runners, access to nearly all of them was denied. The coach told me that they had "enough problems to think about." He talked of eating disorders and negative body image. Then he said, "All my athletes are compulsive people. I don't want them to worry about exercise addiction." I pointed out that these were the people that would benefit from a study like this, but he sharply added, "I don't let my athletes be guinea pigs." Hence, highly addicted athletes may have been omitted from the sample.

If I continue with this research there are a number of issues I would like to address. The first issue would be whether there *are* any differences among the subject groups. This could only be achieved by administering questionnaires to more subjects. Next, I would pay close attention to the family history questions. These may suggest that nonspecific addiction can be passed from generation to generation. And last, I would like to study

the social and cultural pressures that may drive someone to exercise addiction.

APPENDIX A

Sex: male/female

In what sport and <u>event</u> do you compete?_____

Are you an elite athlete? (nationally or internationally ranked, professional) yes____ no____

When in training, how many times do you work out per week?_____

YES or NO QUESTIONS

<u>Circle One</u>

Y/N 1 Do you feel that you train normally?

Y/N 2 Have you ever trained against the advice of a physician or coach when you had an injury or illness?

Y/N 3 Do your friends/family/parents ever complain about your training?

Y/N 4 Can you miss a workout without feeling guilty?

Y/N 5 Do you ever feel that you train to escape your problems?

Y/N 6 Do your fellow athletes think you are a normal athlete?

Y/N 7 Would you interrupt your workout for a brief conversation?

Y/N 8 Have you ever talked to your friends about being "addicted" to your training?

Y/N 9 Has training ever created problems between you and a romantic partner?

Y/N 10 Has a romantic partner ever asked anyone for help concerning your training?

Y/N 11 Have you lost any of your friends because of your training.

Y/N 12 Have you ever gotten in trouble at work or school because of your training?

Y/N 13 Have you ever lost a job or failed a class, because of your training?

Y/N 14 Have you ever neglected your obligations, family, work or school for more than two days because of your training?

Y/N 15 Do you ever work out past your bedtime?

Y/N 16 Have you ever had a serious overtraining injury (e.g., a stress fracture)?

Y/N 17 Have you ever thought that you looked out of shape after taking a few days off from training?

Y/N 18 Have you ever felt that you competed in order to justify your training?

Y/N 19 Do you train because you feel you have to do it, rather than for the love of the sport?

Y/N 20 Does anyone in your family abuse alcohol or drugs?

Y/N 21 Do you do more workouts than your coach wants you to do?

Y/N 22 Have you ever been an exercise addict?

Y/N 23 Have you experienced symptoms such as guilt or low self esteem, when unable to train?

Y/N 24 Have you been involved with a treatment program specifically related to exercise addiction?

Y/N 25 Would you be content if you were not training as hard as you currently are?

Y/N 26 Can you enjoy leisure time without working out (e.g., camping vs. backpacking)?

Y/N 27 Do you work out so as to feel better when you are depressed?

Y/N 28 Did you grow up with a parent that was an abuser of alcohol or drugs?

Y/N 29 Could you stop training if you wanted to?

TRUE or FALSE QUESTIONS

Circle One

T/F 1 I like to read newspaper articles on crime.

T/F 2 Evil spirits possess me at times.

T/F 3 I have a cough most of the time.

T/F 4 My soul sometimes leaves my body.

T/F 5 As a youngster I was suspended from school one or more times for my behavior.

T/F 6 I have never vomited blood or coughed up blood.

T/F 7 Many of my dreams are about sex matters.

T/F 8 I am a good mixer.

T/F 9 Everything is turning out just like the prophets of the Bible said it would.

T/F 10 I have not lived the right kind of life.

T/F 11 I think I would like the kind of work a forest ranger does.

T/F 12 I do many things that I regret afterwards (I regret things more or more often than others seem to).

T/F 13 I enjoy a race or game better when I bet on it.

T/F 14 I do not like to see women smoke.

T/F 15 In school I was sometimes sent to the principal for my behavior.

T/F 16 I know who is responsible for most of my problems.

T/F 17 The sight of blood neither freightens me nor makes me sick.

T/F 18 I have several times given up doing a thing because I thought too little of my ability.

T/F 19 I like to cook.

T/F 20 I have never been in trouble with the law.

T/F 21 I have had periods in which I carried on activities without knowing later what I had been doing.

T/F 22 I frequently notice that my hand shakes when I try to do something.

T/F 23 I have used alcohol excessively.

T/F 24 My parents have often objected to the kind of people I went around with.

T/F 25 My table manners are not quite as good at home as when I am out in company.

T/F 26 I have been quite independent and free from family rule.

T/F 27 I have few or no pains.

T/F 28 I have had blank spells in which my activities were interrupted and I did not know what was going on around me.

T/F 29 I have often felt that strangers were looking at me critically.

T/F 30 I sweat very easily even on cool days.

T/F 31 If I were a reporter I would very much like to report sporting news.

T/F 32 I liked school.

T/F 33 I seem to make friends about as quickly as others do.

T/F 34 I deserve severe punishment for my sins.

T/F 35 I played hooky from school quite often as a youngster.

T/F 36 I have at times had to be rough with people who were rude or annoying.

T/F 37 I am certainly lacking in self confidence.

T/F 38 I used to keep a diary.

T/F 39 I was fond of excitement when I was young (or in childhood).

T/F 40 I enjoy gambling for small stakes.

T/F 41 If I were in trouble with several friends who were equally to blame, I would rather take the whole blame than to give them away.

T/F 42 While in trains, buses, and planes, I often talk to strangers.

T/F 43 I have used alcohol moderately (or not at all).

T/F 44 Christ performed miracles such as changing water into wine.

T/F 45 I pray several times a week.

T/F 46 I am worried about sex matters.

T/F 47 I readily become one hundred percent sold on a good idea.

T/F 48 I have frequently worked under people who seem to have things arranged so that they get credit for good work but are able to pass off mistakes onto those under them.

T/F 49 I cannot keep my mind on one thing.

T/F 50 I would like to wear expensive clothes.

T/F 51 The one to whom I was most attached as a child was a woman. (Mother, sister, aunt, or other woman.)

APPENDIX B

Athlete;

I would like to begin by thanking you for giving me some of your time.

This study is concerned with the ways athletes view their training. Although some of the questions may appear unrelated to training or even strange, I ask you to complete all of them.

I assure you absolute anonymity with your responses. Only average values will be presented, rather than individual responses. Although some of these questions are very personal, in order for the study to have value, all questions need to be answered honestly. If for any reason you feel that you *can't* or *don't want* to answer the questionnaire, then please return it unanswered. Again, I guarantee absolute anonymity.

When you have returned the questionnaire, there will be an information sheet that further explains the study. Please pick one up and read it.

If you have any questions concerning the study, feel free to call me at 344-6522 during business hours.

Thanks,

Joshua Oken
Honors College
Psychology

APPENDIX C

Athlete;

Thank you for completing the questionnaire. This study is concerned with exercise addiction. The questions serve to measure this. The scores will be grouped by sport or type of performance (for example- team,individual, endurance, etc). Then they will be compared to see which type of sport is more likely to have excercise addicted athletes. This information could be useful to coaches and athletes in those sports that have a high number of athletes who are exercise addicted. It also could indirectly provide some insight about the kinds of motivation that seem to be healthier for the athletes involved.

This study is my senior thesis for the Honors College at the University of Oregon. If you would like to read it, or have a copy of it, please contact me. If you have any further questions on the study, call me as well. My number is 344-6522. (Business hours)

Thanks,

Joshua Oken
Honors College
Psychology

REFERENCES

Blumenthal, J.A., Rose, S., & Chang, J.L. (1985). Anorexia Nervosa and Exercise, *Sports Medicine*, 2, 237-247.

Crossman, J.,& Jamieson, J. (1987). Responses of Competitive Athletes to Lay-Offs in Training: Exercise Addiction or Psychological Relief? *Journal of Sport Behavior*, 10, 28-38.

De Coverley Veale, D.M.W. (1987). Exercise Dependence. *British Journal of Addiction*, 82, 735-740.

Diekhoff, G.M. (1984). Running Amok: Injuries in Compulsive Runners. *Journal of Sport Behavior*, 7, 120-129.

Hagerman, F.C., & Falkel, J.E.(1986,October/November). Defining the Energy Systems. *American Rowing*, pp.36 -39.

Melchionda, M.A., et al. (1984). The Effect of Local Isometric Exercise on Serum Levels of Beta -Endorphin/Beta-Lipotropin. *The Physician and Sportsmedecine*, 12, 102-106.

Moore, M., (1982). Endorphins and Exercise: A Puzzling Relationship. *The Physician and Sportsmedicine*, 10, 111-114.

Pargman, D., & Burgess, S.S. (1979) Hooked on Exercise: A Psychobiological Explanation. *Motor Skills: Theory into Practice*, 3, 115-122.

Sachs, M.L., & Pargman, D. (1978). Running Addiction: A Depth Interview Examination. *Journal of Sport Behavior*, , 143-155.

Tabachnick, B.G., & Fidell, L.S. (1983) *Using Multivariate Statistics*. New york: Harper & Row