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Relationship between physical exercise and sexual activity

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RELATIONSHIP BETWEEN PHYSICAL EXERCISE AND SEXUAL ACTIVITY

By

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An Abstract

of a thesis submitted in partial fulfillment

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Thesis Advisor: Dr. G. A. Sforzo

ABSTRACT

Both regular exercise training and acute exercise induce changes in endocrine function, including hormonal responses related to reproduction. The purpose of the present study was to examine the nature of the relationship between physical exercise and sexual activity. Male (n = 160) and female (n = 56) runners of local running clubs completed a questionnaire designed to measure exercise frequency (EF), exercise distance (ED), exercise time (ET), sexual frequency (SF), and sexual duration (SD). Multiple regression analysis revealed a significant relationship ($p < .01$) between exercise and sexual behavior in female subjects, with the exercise variables explaining 40.3% of the variance in SD. A significant relationship ($p < .01$) also existed between exercise and sexual behavior in all subjects, with the exercise variables explaining 7.4% of the variance in SD. Pearson correlations had significant negative values for EF (-.33) and ED (-.37) with SF in women. No significant prediction of sexual activity was obtained through multiple regression of exercise habits on sexual behavior in males. One low, positive correlation (.21) between EF and SF for the men was found not to be statistically significant. Negative correlations between EF and ED with SF in women may reflect alterations in sexual desire associated with athletic amenorrhea that sometimes accompanies heavy training. It is concluded that a moderate relationship exists between exercise and sexual behavior in females, i.e., lower sexual activity is associated with greater exercise involvement.

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A Thesis Presented to the Faculty of the Division of Health, Physical Education, and Recreation at Ithaca College

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In Partial Fulfillment of the Requirements for the Degree of Master of Science

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by

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May 1989

Ithaca College
Division of Health, Physical Education, and Recreation
Ithaca, NY

CERTIFICATE OF APPROVAL

MASTER OF SCIENCE THESIS

This is to certify that the Master of Science Thesis of

Christopher K. Hobler

submitted in partial fulfillment of the requirements for the degree of Master of Science in the Division of Health, Physical Education, and Recreation at Ithaca College has been approved.

Thesis Advisor:

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Candidate:

Chairman, Graduate Programs in Physical Education:

Dean of Graduate Studies:

Date: 5/7/89

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4. My daughter, Amanda, whose birth has given me great joy and happiness.

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DEDICATION

I wish to dedicate this thesis in loving memory of my mother, Madge G. Hobler, whose determination and courage during her illness inspired me throughout my graduate studies.

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Chapter 1

INTRODUCTION

Participation in various athletic endeavors and physical fitness programs has become a hallmark of social life in today's society. Distance running is one of the most popular forms of physical exercise. Considerable attention has been focused on the relationship between physical exercise and various types of human functioning. However, numerous factors, both physiological and psychological, have yet to be thoroughly examined. One such factor is the relationship between physical exercise and sexual activity.

Apart from the early work of Alfred Kinsey and his colleagues, the vast majority of field research into human sexual behavior has been conducted in the last decade. Most of these field studies were concerned with problems of contemporary sexual behavior. Unfortunately, while the subject of human sexual behavior has perhaps never before enjoyed such a wide and diversified communication, there exist few sound methodological studies of human sexual behavior. Recently, research has suggested that exercise affects hormones that could possibly affect sexual behavior (Bancroft, 1984; Feder, 1984).

Frauman (1982) suggested that an increase in physical exercise is associated with increases in both frequency of sexual behavior and frequency of desired sexual activity. However, little research exists to document the relationship

between endurance exercise and sexual activity, especially in a society that is becoming more fitness oriented. This study has been designed to examine that relationship.

Scope of the Problem

This study was undertaken to determine the relationship between physical exercise (exercise frequency, exercise duration, and exercise time) and sexual activity (sexual frequency and sexual duration). The subjects (N = 216) were members of local running clubs.

Data were derived from a questionnaire that each subject completed. The items on the questionnaire were designed to solicit information on personal characteristics, physical exercise characteristics, and sexual activity. Data from male and female subjects were analyzed collectively and separately.

Statement of the Problem

The purpose of this investigation was to examine the relationship between physical exercise and sexual activity. More specifically, this study was designed to investigate the following relationships in both male and female subjects: (a) physical exercise and frequency of sexual activity, and (b) physical exercise and duration of sexual activity.

Hypotheses

The following null hypotheses were investigated in this thesis:

1. There is no relationship between physical exercise and frequency of sexual activity.

2. There is no relationship between physical exercise and duration of sexual activity.

Assumptions of the Study

The following assumptions were made in this study:

1. Despite the sensitive nature of questions used in this study, each subject answered the questionnaire honestly.

2. Each subject was physically able to perform sexually.

3. Each subject was physically able to perform exercise.

4. Each subject had a regular sex partner.

5. The questionnaire used was an accurate method for subjects to report their running/walking and sexual activity characteristics.

Definition of Terms

The following terms have been defined to clarify the exact connotation used in this thesis:

1. Physical exercise: Voluntary participation in recreational running or walking, which specifically relates to exercise frequency (EF), exercise distance (ED), and exercise time (ET).

2. Recreation: Any activity that gives pleasure and is engaged in by free choice and not from necessity.

3. Sexual activity: The most frequent sexual act (e.g., sexual intercourse, masturbation) that one performs. Frequency (SF) and duration (SD) are measures of sexual activity.

Delimitations of the Study

The following delimitations were imposed on this study:

1. Only recreational runners/walkers belonging to running clubs participated in this study.

2. The only inventory used to assess physical exercise and sexual activity was a questionnaire designed by the researcher.

Limitations of the Study

The following limitations were evident in this study:

1. Results may only apply to male and female recreational runners/walkers belonging to running clubs.

2. Results may only apply when a questionnaire similar to the one used in this investigation is utilized to analyze subjects' physical exercise and sexual activity.

3. Correlation does not imply cause and effect, therefore the presence of a relationship between two variables does not necessarily mean there exists a causal link between them.

Chapter 2

REVIEW OF LITERATURE

Considerable attention has been focused on the relationship between physical exercise and various aspects of human functioning. Numerous factors have yet to be thoroughly examined. One such factor is the relationship between physical exercise and sexual activity. For the purpose of this chapter, the review of literature is presented under the following subtopics: (a) hormones and sexual behavior, (b) hormonal responses to exercise, (c) exercise and sexual behavior, and (d) summary.

Hormones and Sexual Behavior

Investigators have long been interested in the relationship between hormones and sexual activity in humans. Testosterone, cortisol, prolactin, and estradiol all have been found to influence sexual behavior. Clarification of the relationship between circulating hormone concentrations and sexual activity is important for understanding both normal and pathological variations in sexual behavior and the treatment of sexual dysfunction.

Previous research reviewed by Cooper, Ismail, Phanjoo, & Love (1972), Davidson and Levine (1972), Luttge (1971), and Rose (1972) has shown that testosterone administration to patients suffering from an androgen deficiency, such as occurs in primary hypogonadism, increases sexual behavior. The administration of cyproterone acetate, which interferes with the action of

testosterone, appears to reduce sexual activity in normal males (Cooper et al., 1972; Morse, Leach, Rowley, & Heller, 1973) and in patients suffering from hypersexuality. Several other studies have examined the relationship between testosterone levels and sexual activity.

Kraemer et al. (1976) examined the relationship between testosterone levels and sexual activity in normal males. The subjects were 20 normal heterosexual males, 20 to 28 years old. Each subject had a regular sex partner throughout the study. During the course of the 2-month study, the subjects carried out their normal daily activities. The subjects were asked to keep a record of their sexual activity during this period, including the number of times they had intercourse, masturbated, or performed any other sexual activity to achieve orgasm. Every other day between 8 and 9 a.m., a blood sample was collected from each subject to determine plasma testosterone levels. For each subject, testosterone readings were separated according to whether or not any orgasm was reported. Results of the study indicated that high testosterone levels were associated with sexual arousal.

Brown, Monti, and Corriveau (1978) investigated the relationship between serum testosterone concentration and sexual activity and interest in men. Serum testosterone concentration was determined in two blood samples taken 1 week apart from each of 101 adult men, 20 to 30 years old. Following blood sampling, subjects completed a questionnaire related to sexual behavior,

sexual interest, and drug use. They were also asked to rate their sexual interest and daily frequency of sexual thoughts. Testosterone concentrations in the two blood samples were highly correlated, indicating intraindividual consistency. Results of the study indicated that high testosterone concentrations are associated with increased frequency of orgasm.

Knussmann, Christiansen, and Couwenbergs (1986) investigated the relationship between serum testosterone levels and sexual behavior in men. Subjects consisted of 33 healthy men, 19 to 31 years old, who maintained their normal daily routines. Every subject provided blood samples between 8 and 9 a.m. on Monday, Wednesday, and Friday over a 2-week period. A questionnaire was used to assess the extent of sexual activity during each day of the testing period. Results clearly indicated significant ($p < .01$) positive correlations of serum testosterone with sexual stimulation and with sexual arousal. However, a higher positive correlation was found between serum testosterone levels and frequency of orgasm. The results of a study by Doering, Brodie, Kraemer, Becker, and Hamburg (1974) point in the same direction. Davidson et al. (1983) also found a significant ($p < .05$) positive correlation between testosterone and the frequency of orgasm.

Rowland et al. (1987) examined the response of testosterone to sexual arousal in men. Volunteers for the study included 16 men, 18 to 40 years old. All subjects indicated exclusive heterosexual preference and moderate to extensive sexual

experience. Subjects were asked to provide information on their sexual experience and sexual functioning. Penile circumference was continuously monitored during sexually explicit videotapes. Blood samples were drawn at 10-min intervals. Results indicated that subjects with higher testosterone levels showed greater penile responses.

Rowland et al. (1987) also examined the response of cortisol to sexual arousal in men. Results showed that cortisol concentrations decreased in sexually aroused subjects and appeared to inhibit sexual response when elevated. High levels of anxiety are known to interfere with sexual arousal (Lange, Wincze, Zwick, Feldman, & Hughes, 1981), so anxiety, coincident with elevated cortisol levels, may inhibit sexual activity.

Perryman and Thorner (1981) and Schwartz, Baumann, and Masters (1982) showed that prolactin has an effect on penile dysfunction. In addition, research by Rowland et al. (1987) examined the response of prolactin to sexual arousal in men. Results indicate that increases in prolactin levels increase erection inhibition.

Knussman et al. (1986) examined the relationship between estradiol and sexual behavior in men. Using a sample of 33 healthy men, six blood samples were obtained in the course of 2 weeks to determine estradiol levels. A questionnaire was used to assess the extent of sexual activity during each day of the testing period. Results of the study indicated that estradiol levels showed a significant negative correlation with frequency

of sexual activity without orgasm. Unfortunately, this was the only available study examining the relationship between estradiol and sexual activity.

Hormonal Responses to Exercise

The evaluation of hormonal responses to various types of acute and chronic physical exercise is a relatively young field of research. Test responses of plasma testosterone to exercise are quite variable. Some authors reported a decrease in testosterone levels following exercise (Aakvaag, Sand, Opstrand, & Fonnum, 1978; Dessypris, Kouppasalmi, & Adlercreutz, 1976; Guezennvec, Ferre, Serrurier, Merino, & Pesquies, 1982), and others reported an increase (Keizer, Soest, Kuipers, Beckers, & Janssen, 1984; Vogel, Books, Ketchum, Zauner, & Murray, 1985).

Testosterone in Females

Hale, Kosasa, Krieger, and Pepper (1983) investigated the effect on female runners' testosterone levels before and after a marathon. Volunteers for the study included 31 women runners, 20 to 53 years old. Each woman was a trained distance runner and had baseline testosterone levels determined before the marathon. At the completion of the marathon, the subjects had a postmarathon sample of blood drawn. Results indicated an overall increase in testosterone level of 195%, with no difference by age group.

Shangold, Gatz, and Thysen (1981) examined the effects of exercise on plasma concentration of testosterone in recreational women runners. Six healthy women runners, 25 to 47 years old,

volunteered to participate in this study. All of the subjects had been running on a regular basis for 1.5 to 12 years. Their average weekly mileage ranged from 6 to 20. Blood samples were drawn before and after running 30 min at their customary pace. Results indicated that the postexercise testosterone mean for the group was significantly greater than the preexercise mean (pre-, 37.8 +/- 2.9 ng/dl; post-, 51.7 +/- 4.2 ng/dl; $p < .01$).

Baker et al. (1982) investigated the effects of a long-distance run on testosterone levels in female runners. Six normally menstruating women, who ran regularly, volunteered to participate in this study. Blood samples were taken before and after a 10-mile race. Baseline testosterone levels were higher in runners than in controls. Results of the study indicated that concentrations of testosterone were significantly ($p < .05$) higher after completion of the race.

In summary, it is quite evident that endurance exercise elevates plasma testosterone levels in females. Furthermore, this effect seems more pronounced in trained athletes.

Testosterone in Males

Males differ from females in that they have greater baseline testosterone levels. Studies of the effects of exercise on testosterone levels in males have also been done. Mathur, Toriola, and Dada (1986) investigated the effects of short-term exercise on plasma testosterone levels in trained male distance runners and male nonathletes. Seven healthy and actively training male long distance runners, 24 to 28 years old, and five

male nonathletes, 22 to 26 years old, volunteered to participate in this study. Preexercise values of serum testosterone levels showed higher levels of serum testosterone in distance runners (28.8 +/- 2.5 nmol/l) than nonathletes (25.8 +/- 3.4 nmol/l). This value may be attributed to a training adaptation. Immediately after exercise, serum testosterone increased in both the distance runners (34.1 +/- 3.6 nmol/l) and the nonathletes (34.2 +/- 4.3 nmol/l). At 1 hour of recovery, the level of testosterone decreased more in the distance runners (27.6 +/- 4.7 nmol/l) than in the nonathletes (28.0 +/- 1.1 nmol/l). Results indicated that exercise has an effect on serum testosterone concentration. However, the increase was more pronounced in nonathletes, in whom persisted even at 1 hour of recovery.

MacConnie, Barkan, Lampman, Schork, and Beitins (1986) investigated testosterone secretion during exercise in male marathon runners. Six highly trained marathon runners, who were running 125 to 200 km per week, participated in the study. The control group consisted of 13 healthy age-matched men who participated only in noncompetitive recreational physical activities and who did not run more than 5 km per week. All subjects were in good health and reported that they had normal sexual function. During short-term exercise, a treadmill run at 75% of maximal oxygen consumption (VO_2 max) for 2 hours, blood samples were drawn. Baseline testosterone levels were found to be higher in marathon runners (6.2 +/- 0.46 ng/ml) than in controls (6.0 +/- 0.36 ng/ml). This difference may be attributed

to a training adaptation. During the exercise, plasma testosterone concentrations increased to a similar extent in the runners and controls. There was no significant difference found in either peak testosterone concentrations (12.5 +/- 1.19 ng/ml in the runners vs. 12.0 +/- 1.23 ng/ml in the controls). An identical study was performed 3 weeks after the first study, and the mean concentrations of plasma testosterone were identical to those observed during the first study. Once again, results clearly indicated that exercise has an effect on serum testosterone concentration.

Bottecchia, Bordin, and Martino (1987) investigated the changes that occur in the plasma testosterone levels during and after physical exercise. Five healthy, normal, male medical students, 23 to 25 years old, volunteered to participate in the study. Subjects were exercised at 75% of VO_2 max for 30 min. Blood samples were obtained before and after exercise. Baseline testosterone levels were reported within normal values for males of this age group. Results of the study indicated that physical exercise produced an increase in the plasma level of testosterone; however, this increment was not statistically significant, possibly because of the small group size.

Bunt, Bahr, and Bemben (1987) examined the testosterone levels during and immediately following prolonged exercise in moderately active and trained males and females 21 to 30 years old. Blood samples were drawn during rest, during treadmill exercise at 60% of VO_2 max, and during recovery. Sex differences

were found in resting levels of testosterone (males, 4.8 +/- 1.2 ng/ml; females, 0.6 +/- 0.4 ng/ml). During exercise, testosterone increased in both trained and moderately active runners, male and female. However, trained runners exhibited greater increases during exercise than moderately active runners. Results indicated that exercise effects plasma testosterone levels.

In summary, it is quite evident that endurance exercise elevates plasma testosterone in males. As with females, this effect seems more pronounced in athletes. The implications of this finding might suggest that athletes have higher baseline testosterone levels, which may effect sexual behavior.

Cortisol

Cortisol has been extensively reviewed elsewhere (Shephard & Sidney, 1975), however, investigators have been unable to clarify the influence of exercise on this hormone. MacConnie et al. (1986) recently investigated cortisol secretion during exercise in male marathon runners. Six highly trained marathon runners, who were running 125 to 200 km per week, participated in this study. All subjects were in good health and reported that they had normal sexual function. During short-term physical exercise (a treadmill run at 72% of VO_2 max for 2 hours), blood samples were drawn. At the end of the 2-hour run, the cortisol concentration increased significantly, from a basal level of 12.4 +/- 2.5 ng/dl to a maximum of 20.9 +/- 2.9 ng/dl, and then declined continuously throughout the recovery period. The

results indicate that exercise has an effect on serum cortisol concentration.

Mathur et al. (1986) investigated the effects of short-term exercise on serum levels of cortisol in trained male distance runners and male nonathletes. Preexercise levels of cortisol were found to be significantly lower in distance runners than in nonathletes, but within normal limits. Cortisol levels increased by 36.9% immediately after exercise in the distance runners. A one-way analysis of variance (ANOVA) showed this change to be statistically significant. However, in the nonathletes, cortisol values increased by 161.3% after exercise. This higher elevation in the level of cortisol was attributed to poor state of training. Results of the study indicate that exercise increases cortisol concentrations in both runners and nonathletes, with nonathletes increasing levels to a greater extent.

In summary, research has demonstrated that cortisol concentration does increase following exercise. When compared to nonathletes, cortisol levels in athletes do not attain levels as high following exercise. As mentioned previously, elevated levels of cortisol inhibits sexual activity. The implications of this are that athletes have lower levels of cortisol until they exercise, and this may have an effect on sexual activity.

Prolactin

One hormone that has received a lot of attention in recent years is prolactin, the peptide produced by the anterior

pituitary. Prolactin remains in most respects an enigma. Even in the female, in whom it plays a definite role in the establishment and maintenance of lactation as well as ovarian function, its precise effects are still far from clear. In the male, no physiological function has been identified, but in the presence of abnormally high prolactin levels (> 200 ng per ml), as with prolactin-secreting tumors of the pituitary, male sexuality is impaired (Bancroft, 1984). Recently, effects of exercise on prolactin concentrations have been reported in the literature.

Shangold et al. (1981) examined the effects of exercise on plasma prolactin concentration in female recreational runners. Six healthy women runners, 25 to 47 years old, volunteered to participate in this study. All of the subjects had been running on a regular basis for 1.5 to 12 years. Their average weekly mileage ranged from 6 to 20. Concentrations of prolactin increased in all subjects after exercise to values ranging from 19% to 398% above baseline values. The postexercise prolactin mean for the group was significantly greater ($p < .05$) than the preexercise mean (pre-, 17.0 +/- 2.7 ng/ml; post-, 42.5 +/- 8.9 ng/ml).

Baker et al. (1982) investigated the effects of a long-distance run on prolactin levels in female runners. Normally menstruating women ($n = 6$) who ran regularly volunteered to participate in this study. Nonathletic women ($n = 12$) served as controls. Blood samples were taken before and after a 10-mile

race. Baseline prolactin levels were found to be lower in runners than in controls. A significant increase ($p < .05$) in prolactin concentration was found after the race.

MacConnie et al. (1986) investigated prolactin secretion during exercise in male marathon runners. Six highly trained marathon runners participated in the study. During short-term exercise, blood samples were drawn. Plasma prolactin concentrations increased throughout the entire run, from a basal level of 8.6 +/- 0.5 ng/ml to a peak of 23.3 +/- 2.8 ng/ml. Results of the study indicate that significant ($p < .01$) elevation in plasma prolactin levels occur due to exercise.

Hashimoto, Migita, and Matsubara (1986) investigated the effect of exercise on the secretion of prolactin. Subjects for the study included 21 healthy male students, 20 to 22 years old. Blood samples were drawn before and after a 10-km run. Prolactin levels rose from 12.1 +/- 2.0 ng/ml to 47.7 +/- 9.3 ng/ml in the marathon runners during exercise. Also, baseline levels of prolactin were found to be lower in athletes than in nonathletes. Results clearly indicated that plasma prolactin concentration increases during exercise in both athletes and nonathletes. As mentioned previously, elevated levels of prolactin inhibit sexual activity. The implications of this study are that athletes have lower levels of prolactin, which may have a positive effect on sexual activity.

Estradiol

The response of plasma estradiol to exercise has not been

extensively investigated. Bunt et al. (1987) examined the estradiol levels during and immediately following prolonged exercise in 28 males and females, 21 to 30 years old. Subjects were recruited on a volunteer basis and classified by sex (male vs. female) and training (runners vs. controls). Blood samples were drawn during rest, during treadmill exercise at 60% of VO_2 max, and during recovery. Sex differences were found in resting levels of estradiol (males, 43.2 +/- 26.4 ng/ml; females, 142.4 +/- 72.8 ng/ml). Absolute increases in estradiol levels were found in all subjects during exercise. However, runners exhibited greater increases during exercise. In summary, significant differences were found between athletes and nonathletes during exercise, with athletes exhibiting greater increases during exercise.

Research has shown that testosterone, cortisol, prolactin, and estradiol levels are influenced by exercise. Because these hormones have also been found to influence sexual behavior, it is conceivable that a physiological connection between exercise habits and sexual behavior exists.

Exercise and Sexual Behavior

It has been suggested that runners make better lovers ("Runner's World Update," 1980). Peter Wood, deputy director of the Stanford Heart Disease Prevention Program, maintained that running has features that make it an erotic activity, and that sexual activity may be enhanced by running. Little research exists to substantiate these claims.

Katzman (1976) investigated the relationship between physical activity and frequency of sexual behavior among males 45 to 74 years old. Members of exercise/recreation groups, 155 males, completed a questionnaire dealing with physical activity, sexual behavior, desire for sex, and mental attitude. Results of the study clearly indicated that there was a significant relationship between the level of physical activity and the frequency of sexual activity in males 45 to 74 years old. Results also revealed that males in their late 40s and 50s, who engage in regular physical exercise and possess a positive mental attitude, can expect to participate in sex with frequency comparable to men much younger. However, this study limited its subjects in regard to age and sex, in that it only looked at male subjects of middle to old age.

Frauman (1982) hypothesized that self-report of increased time spent in physical exercise would be associated with a higher reported frequency of sexual behavior and desired sexual activity. This study involved two groups of volunteer subjects, sophomores in a health class and persons who were approached while passing through a fieldhouse. A printed self-report questionnaire was used to determine sexual behavior, desired sexual activity, and physical exercise. Even though the results indicated that self-report of increased time spent in physical exercise was associated with a higher reported frequency of sexual behavior and frequency of desired sexual activity, this study used a biased sample, in that subjects were limited to

those exercising in an athletic facility and sophomore students in a health class.

In an article about running and sexual activity, Flippin (1987) reported that running can improve one's sexual response. Flippin explained that running makes one happier, makes one feel better about how one looks, makes one look better to other people, and allows one to open up emotionally. He believes that this can give one greater emotional intimacy with his/her partner. This article relates to the possible psychological and social correlates of the relationship between running and sexual activity. However, Flippin used subjective findings, not objective findings, in presenting this contention.

McDonald (1988) reported on a study performed by Phillip Whitten, a behavioral scientist at Bentley College. In a study of 160 swimmers, Whitten found that not only were the swimmers having more sex compared to their nonphysically active counterparts, but also they were enjoying it more. Whitten believed that the difference was psychological, because the swimmers were proud of their bodies and felt younger. This study also used subjective findings to explain the possible psychological correlates of exercise and sex.

Summary

Many studies have reported on the hormonal responses to exercise and the effects of hormones on sexual behavior, but few have presented a connection between exercise and sexual behavior. Testosterone, cortisol, prolactin, and estradiol are hormones

that have been found to influence sexual behavior.

Testosterone has been shown to increase sexual behavior (Cooper et al., 1972; Davidson & Levine, 1972; Luttge, 1971; Rose, 1972) in men. Increased levels of testosterone have been associated with increased sexual arousal (Kraemer et al., 1976), an increased frequency of orgasms (Brown et al., 1978; Davidson et al., 1983; Knussman et al., 1986), and greater penile response (Rowland et al., 1987). In female subjects, however, little research has been conducted investigating the effects of testosterone on sexual behavior.

Elevated levels of cortisol have been found to inhibit sexual response, and decreased levels of cortisol were associated with sexual arousal (Rowland et al., 1987). Elevated levels of prolactin have been associated with erection inhibition (Rowland et al.). Finally, elevated levels of estradiol were found to be associated with sexual activity without orgasm (Knussman et al., 1986).

Testosterone, cortisol, prolactin, and estradiol also have been found to be influenced by exercise. Testosterone levels have been shown to increase significantly following exercise in both males (Bottecchia et al., 1987; Bunt et al., 1987; MacConnie et al., 1986; Mathur et al., 1986) and females (Baker et al., 1982; Hale et al., 1983; Shangold et al., 1981). Furthermore, this effect was found to be more pronounced in trained athletes, in whom baseline testosterone levels were higher than in nonathletes.

Prolactin levels also have been found to increase significantly following exercise in both males and females (Baker et al., 1982; Hashimoto et al., 1986; MacConnie et al., 1986; Shangold et al., 1981). However, baseline prolactin levels were found to be lower in athletes than in nonathletes. Estradiol levels have also been shown to increase following exercise (Bunt et al., 1987). Furthermore, this effect was found to be more pronounced in athletes.

There have been few studies that have shown that exercise may enhance sexual activity. Frauman (1982) and Katzman (1976) reported that an increase in physical exercise was associated with a higher frequency of sexual activity. Furthermore, Flippin (1987) reported that running can improve one's sexual activity, and McDonald (1988) reported that swimmers were having more sex and enjoying it more than their nonphysically active counterparts.

Because exercise affects hormones that affect sexual behavior, there is a strong possibility that exercise affects sexual behavior.

Chapter 3

METHODS AND PROCEDURES

The following chapter will describe the methods and procedures used in this study. The chapter is divided into the following sections: (a) selection of subjects, (b) method of data collection, (c) instrumentation, (d) scoring of data, and (e) treatment of data.

Selection of Subjects

Subjects for this study were men and women from local running clubs. Recruitment letters were sent to the Finger Lakes Runners' Club and the Chemung Valley Runners' Club, informing them of the purpose of the study and the need for volunteers to take part in the study. A listing of members as well as listings of runners participating in local races was then provided by the clubs. Of the 500 questionnaires distributed, 216 (43%) were completed and returned, with 160 male and 56 female respondents.

Method of Data Collection

During a 3-month period (April to June, 1988), the investigator distributed questionnaires (Appendix A) and self-addressed stamped envelopes to local runners. Each subject was required to read and sign an Informed Consent Form (Appendix B) if he/she was willing to participate. It was explained that all data would remain anonymous, but if they wanted the results of the study, they could fill in their name and address in the space provided on the Informed Consent Form (Appendix B).

Instrumentation

A questionnaire (Appendix A) was used for this study. This design allowed anonymity, in light of the fact that subjects were required to answer questions that were personally sensitive and revealing. It also allowed for a large sample of subjects for better validity and faith in statistical results necessary to complete this study.

In the questionnaire, each subject was asked to provide information on personal characteristics, physical exercise characteristics, and sexual activity. In order to examine personal characteristics, each subject was asked to provide information as to age, sex, height, weight, marriage length, health status, education level, and number of children.

The physical characteristics were determined by asking each subject to quantify his/her personal exercise characteristics. Each subject was asked to indicate frequency of running/walking, distance per week of running/walking, length of time per workout, and time spent stretching during each workout.

Finally, sexual activity was determined by asking each subject to indicate frequency of sexual activity, duration of sexual activity, strength of sexual urge, frequency of orgasm, level of sexual enjoyment, and sexual satisfication. Inasmuch as this information is of a confidential and private nature, it was pointed out in the informed consent form (Appendix B) that participation was voluntary, and subjects were free to leave the questionnaire uncompleted or to stop anytime during completion of

the questionnaire.

Scoring of Data

The data from the returned questionnaires were submitted to the computer after being arranged into three categories: demographic characteristics, exercise characteristics, and sexual activity. Demographic characteristics included subject's sex, age, self-rated health, height, weight, length of marriage, education level, and number of children. Subject's sex was scored as 1 for male and 2 for female, age and length of marriage were scored in years, height in inches, and weight in kilograms. Self-rated health was scored with Likert-type values ranging from 1 to 4, with a number value of 1 representing poor health and 4 representing excellent health. Education level represented the highest level of education completed and was also scored with Likert-type values ranging from 1 to 5. A value of 1 represented a high school education, 2 represented a 2-year college education, 3 represented a 4-year college education, 4 represented graduate level education, and 5 represented postgraduate education. Finally, the number of children was recorded quantitatively.

Exercise characteristics included frequency of exercise, distance per week of exercise, length of time per workout, and time spent stretching during each workout. Frequency of exercise was scored as the number of days the subject ran or walked in an average week. Distance per week was scored as the number of miles per week the subject ran or walked in his/her exercise

program. Length of time per workout and time spent stretching during each workout were recorded in minutes.

Finally, sexual activity included frequency of sexual activity per week, frequency of orgasm per week, duration of sexual activity, strength of sexual urge, level of enjoyment, and sexual satisfaction. Frequency of sexual activity and frequency of orgasm per week were recorded quantitatively. Duration of sexual activity was recorded as the typical duration, in minutes, of the subjects' sexual activity. Sexual urge, level of enjoyment, and sexual satisfaction were scored with Likert-type values ranging from 1 to 7, with 1 representing the most negative judgment and 7 representing the most positive judgment.

Treatment of Data

Pearson product-moment correlation revealed the interrelationships among demographic, physical exercise, and sexual activity variables. Multiple regression was utilized to estimate the multivariate relationship between physical exercise variables (frequency of exercise, distance per week of exercise, and length of time per workout) and each of the individual sexual activity variables (frequency of sexual activity and duration of sexual activity). Male and female data were analyzed together, then separately. The .01 level of statistical significance was utilized to test the null hypotheses.

Chapter 4

ANALYSIS OF DATA

The results of the investigation are presented in this chapter. The chapter is divided into the following sections: (a) demographic data, (b) intercorrelation of physical exercise and sexual activity variables, (c) multiple regression analysis, and (d) summary.

Demographic Data

Data from the 216 completed questionnaires were used for the analysis of data. Actual raw data can be found in Appendix C. Subjects' demographic characteristics are reported in Table 1. It can be seen that respondents were not evenly distributed according to gender, with 160 males and 56 females. The male and female groups' mean ages and marriage lengths were similar, however, the mean weights were different.

Subjects' physical exercise characteristics are found in Table 2. It can be seen that mean exercise frequency (EF), exercise distance (ED), and exercise time (ET) were higher for the males.

Subjects' sexual activity characteristics are reported in Table 3. Mean sexual frequency (SF), frequency of orgasm (OF), and sexual duration (SD) were similar among males and females.

Intercorrelations of Physical Exercise and Sexual Activity Variables

The relationships among physical exercise and sexual activity variables were examined using Pearson product-moment

Table 1

Demographic Characteristics of Subjects

	M	SD
Age (years)		
Male[a]	35.04	7.70
Female[b]	33.82	9.06
Weight (kg)		
Male[a]	73.82	8.01
Female[b]	56.51	4.79
Length of Marriage (years)		
Male[a]	9.66	9.49
Female[b]	9.29	9.40

[a] n = 160 for all male data.

[b] n = 56 for all female data.

Table 2

Physical Exercise Characteristics

	M	SD
Exercise Frequency (sessions/week)		
Male[a]	5.63	1.05
Female[b]	5.02	1.21
Exercise Distance (miles/session)		
Male[a]	33.49	17.74
Female[b]	24.11	11.64
Exercise Time (min/session)		
Male[a]	51.99	15.76
Female[b]	44.62	13.07

[a] n = 160 for all male data.

[b] n = 56 for all female data.

Table 3

Sexual Activity Characteristics

	M	SD
Sexual Frequency (acts/week)		
Male[a]	2.66	1.07
Female[b]	2.84	1.14
Frequency of Orgasm (orgasms/week)		
Male[a]	2.70	1.15
Female[b]	2.83	1.01
Sexual Duration (min/act)		
Male[a]	25.41	9.52
Female[b]	28.04	12.27

[a] n = 160 for all male data.

[b] n = 56 for all female data.

correlations. For the purpose of this study, physical exercise variables included exercise frequency (EF), exercise distance (ED), and exercise time (ET); sexual activity variables included sexual frequency (SF) and sexual duration (SD).

Relationships among physical exercise and sexual activity variables across all subjects are reported in Table 4. Significant r values ($p < .01$) were found for the relationships between ET and SF and between ED and SD. Specifically, as ET increased, SF decreased, resulting in an r value of -.191. As ED increased, SD decreased, resulting in an r value of -.185. In general, weak r values were found between exercise and sexual activity in the sample at large.

Male subjects' relationships among physical exercise and sexual activity variables are reported in Table 5. A significant r value ($p < .01$) was found for the relationship between EF and SF. Specifically, as EF increased, SF increased, resulting in an r value of .206. In general, weak r values were found between male physical exercise and sexual activity variables.

Female subjects' relationships among physical exercise and sexual activity variables are reported in Table 6. Significant r values ($p < .01$) were found for the relationships between SF and EF and between SF and ED. Specifically, as EF and ED increased, SF decreased, resulting in correlations of -.326 and -.374, respectively. In general, significant negative r values of low to moderate magnitude were found between female physical exercise and sexual activity variables.

Table 4

Intercorrelations of Physical Exercise and Sexual Activity Variables for All Subjects

	Sexual Frequency	Sexual Duration
Exercise Frequency	.026	.017
Exercise Distance	-.081	-.185*
Exercise Time	-.191*	-.157

*$p < .01$.

Table 5

Intercorrelations of Physical Exercise and Sexual Activity Variables for Males

	Sexual Frequency	Sexual Duration
Exercise Frequency	.206*	.069
Exercise Distance	.064	-.122
Exercise Time	-.113	-.139

*$p < .01$.

Table 6

Intercorrelations of Physical Exercise and Sexual Activity Variables for Females

	Sexual Frequency	Sexual Duration
Exercise Frequency	-.326*	.039
Exercise Distance	-.374*	-.267
Exercise Time	-.176	-.121

*$p < .01$.

Multiple Regression Analysis

In order to assess the overall degree of relationship between the set of predictor variables, EF, ED, and ET, and a single criterion measure, SF or SD, multiple regression was utilized. This procedure was conducted in order to analyze if sexual activity can be predicted from a combination of the independent variables related to physical exercise characteristics.

Sexual Frequency

In the analysis of all subjects, ET was found to be the variable accounting for the greatest proportion of the variance in sexual frequency (see Table 7). However, the three variables combined accounted for only approximately 3.9% of the variance in sexual frequency. The analysis of variance (ANOVA) for this multiple regression showed this was not a significant amount of variability explained, $F(3, 212) = 2.84$, $p > .01$. These results led to the acceptance of the first hypothesis that stated there is no relationship between physical exercise and sexual activity in the population at large.

When the same procedure for the multiple regression was performed using only male subjects, EF was found to be the variable accounting for the greatest proportion of the variance (see Table 8). Here again, the combined variables explained only a small amount (6.4%) of the variance in sexual frequency. The analysis of variance for this multiple regression also indicated the equation did not explain a significant amount of variability,

Table 7

Multiple Regression of Physical Exercise on Sexual Frequency: All Subjects

The regression equation:

$$SF = 3.13 + 0.0469\ EF - 0.00017\ ED - 0.0137\ ET$$

$$R^2 = 3.9\%$$

Predictor	Coefficient	SD	t
Constant	3.131900	0.562800	5.57*
EF	0.046860	0.099310	0.47
ED	-0.000172	0.008168	-0.02
ET	-0.013667	0.006528	-2.09

*p < .01.

Analysis of variance:

Source	df	SS	MS	F
Regression	3	9.785	3.262	2.84
Error	212	243.252	1.147	
Total	215	253.037		

SS explained by each variable when entered in the order given

Source	df	Sequential SS
EF	1	0.167
ED	1	4.589
ET	1	5.028

Table 8

Multiple Regression of Physical Exercise on Sexual Frequency:

Male Subjects

The regression equation:

$$SF = 1.59 + 0.284\ EF - 0.00532\ ED - 0.00702\ ET$$

$R^2 = 6.4\%$

Predictor	Coefficient	SD	t
Constant	1.5865	0.6860	2.31
EF	0.2839	0.1242	2.29
ED	-0.0053	0.0087	-0.61
ET	-0.0070	0.0067	-1.04

Analysis of variance:

Source	df	SS	MS	F
Regression	3	11.631	3.877	3.58
Error	156	168.769	1.082	
Total	159	180.400		

SS explained by each variable when entered in the order given

Source	df	Sequential SS
EF	1	7.682
ED	1	2.775
ET	1	1.174

$F(3, 156) = 3.58$, $p > .01$. These results led to the acceptance of the hypothesis, when specified for males, that there is no significant relationship between physical exercise and sexual frequency.

In contrast, the analysis of female subjects separately in this multiple regression found ED to be the variable accounting for the greatest proportion of the variance (14.0%). Other variables added no significant explained variability (see Table 9). It should be noted that the negative correlation between ED and SF indicates the longer the exercise distance the lower the sexual frequency for female subjects. The ANOVA for this multiple regression indicated the variability explained was not significant ($F(3, 52) = 3.55$, $p > .01$). These results led to the acceptance of the hypothesis, when specified for females, indicating there is no significant relationship between physical exercise and sexual frequency.

Sexual Duration

In the analysis of all subjects, ED was found to be the variable accounting for the greatest proportion of the variance in sexual duration (see Table 10). However, the three variables combined accounted for only approximately 7.4% of the variance in sexual duration. The ANOVA for this multiple regression showed that this variability explained is statistically significant. However, for practical purposes, the regression equation does not provide a good prediction for sexual duration when knowledge of exercise habits for both sexes is provided.

Table 9

Multiple Regression of Physical Exercise on Sexual Frequency: Female Subjects

The regression equation:

$$SF = 3.67 - 0.0451\ ED - 0.079\ EF + 0.0146\ ET$$

$R^2 = 17.0\%$

Predictor	Coefficient	SD	t
Constant	3.672	1.682	2.18
ED	-0.046	0.041	-1.11
EF	-0.079	0.253	-0.31
ET	-0.146	0.032	0.46

Analysis of variance:

Source	df	SS	MS	F
Regression	3	12.168	4.056	3.55
Error	52	59.385	1.142	
Total	55	71.554		

SS explained by each variable when entered in the order given

Source	df	Sequential SS
ED	1	9.99
EF	1	1.93
ET	1	0.24

Table 10

Multiple Regression of Physical Exercise on Sexual Duration: All Subjects

The regression equation:

$$SD = 17.3 + 2.68\ EF - 0.256\ ED + 0.0319\ ET$$

$$R^2 = 7.4\%$$

Predictor	Coefficient	SD	t
Constant	17.308	5.322	3.25*
EF	2.681	0.939	2.85
ED	-0.256	0.077	-3.32*
ET	0.032	0.062	0.52

*p < .01.

Analysis of variance:

Source	df	SS	MS	F
Regression	3	1730.5	576.8	5.62*
Error	212	21751.0	102.6	
Total	215	23481.5		

*p < .01.

SS explained by each variable when entered in the order given

Source	df	Sequential SS
EF	1	6.6
ED	1	1696.4
ET	1	27.4

When the same procedure for the multiple regression was performed using only male subjects, ED was found to be the variable accounting for the greatest proportion of the variance in SD (see Table 11). The combined variables explained only a very small amount (3.0%) of the variance. The ANOVA indicated this multiple regression was not significant, $F(3, 156) = 3.72$, $p > .01$. These results led to the acceptance of the null hypothesis, when specified for male subjects, indicating there is no significant relationship between physical exercise and sexual duration.

The analysis of only female subjects using multiple regression found ED to be the variable accounting for the greatest proportion of the variance (11.9%) in SD when observed independently of the other variables. However, in contrast to the male results, approximately 40.3% of the variance in SD was accounted for by the combined variables (see Table 12). The ANOVA revealed this was a significant multiple regression, $F(3, 52) = 4.98$, $p < .01$. These results led to the rejection of the second hypothesis, when specified for females, that there is no relationship between physical exercise and sexual duration.

Summary

In summary, Pearson product-moment correlations for the physical exercise and sexual activity variables revealed significant negative correlations between SF and EF (-.326) and SF and ED (-.374) in female subjects. One low, positive correlation between EF and SF was found to be significant for

Table 11

Multiple Regression of Physical Exercise on Sexual Duration:

Male Subjects

The regression equation:

$$SD = 14.1 + 3.03\ EF - 0.202\ ED + 0.0056\ ET$$

$R^2 = 6.7\%$

Predictor	Coefficient	SD	t
Constant	14.058	6.161	2.28
EF	3.025	1.116	2.71
ED	-0.202	0.078	-2.59
ET	0.006	0.601	0.09

Analysis of variance:

Source	df	SS	MS	F
Regression	3	974.64	324.88	3.72
Error	156	13615.36	87.28	
Total	159	14590.00		

SS explained by each variable when entered in the order given

Source	df	Sequential SS
EF	1	68.64
ED	1	905.26
ET	1	0.74

Table 12

Multiple Regression of Physical Exercise on Sexual Duration: Female Subjects

The regression equation:

$$SD = -46.0 + 12.1\ EF - 2.15\ ED + 1.46\ ET$$

$$R^2 = 40.29\%$$

Predictor	Coefficient	SD	t
Constant	-46.02	15.35	-3.00*
EF	12.09	2.31	5.24*
ED	-2.15	0.37	-5.81*
ET	1.46	0.29	5.06*

*p < .01.

Analysis of variance:

Source	df	SS	MS	F
Regression	3	3337.8	1112.6	11.70*
Error	52	4946.1	95.1	
Total	55	8283.9		

*p < .01.

SS explained by each variable when entered in the order given

Source	df	Sequential SS
EF	1	12.6
ED	1	892.7
ET	1	2432.5

male subjects.

Multiple regression for the physical exercise and sexual activity variables for all subjects showed a significant relationship between physical exercise and SD, with exercise explaining 7.4% of the variance in SD. Also, a significant negative relationship was found between physical exercise and SD for female subjects, with exercise explaining 40.3% of the variance in SD.

Chapter 5

DISCUSSION OF RESULTS

This study examined the relationship between physical exercise and sexual activity in male and female runners. A discussion of the results from this investigation is presented in this chapter.

All Subjects

Because the correlation of ED with SF was most important in the multiple regression of physical exercise on SD, the simple correlation of SD with ED is important to note. Even though multiple regression with all subjects was significant, this was not really interpretable, because the male simple correlation was positive and the female simple correlation was negative.

Male Subjects

In general, the relationship between physical exercise and sexual activity variables showed no practically significant correlations for males. Frauman (1982) suggested that self-report of increased time spent in physical exercise was associated with a higher reported frequency of sexual behavior and frequency of desired sexual activity in male and females. The results of the present study do not support such a conclusion.

A significant positive correlation was found between exercise frequency (EF) and sexual frequency (SF), but it was very low. Research suggested that exercise increases testosterone levels in male runners (Baker et al., 1982). It is

also known that high levels of testosterone may be associated with higher sexual activity (Kraemer et al., 1976). One possible explanation for the significant positive correlation between EF and SF in male runners is that exercise causes an increase in testosterone, which increases male sexuality. However, given the low value, which has little practical significance, exercise may only have a minimal relationship, if any, with male sexuality.

The data presented also suggested that male frequency of orgasm (OF) is slightly greater than male SF (orgasm = 2.70 +/- 1.15; SF = 2.65 +/- 1.06). However, raw data revealed that only 7 of the 160 male subjects were responsible for the difference between OF and SF, by reporting more orgasms than sexual acts per week, and it is doubtful that this is related to an exercise effect.

Female Subjects

The data presented suggest that physical exercise is negatively related to sexual activity in female runners. Various hormones, including prolactin and estradiol, are known to be altered by exercise and may also affect female sexuality.

In considering the role of reproductive hormones in female sexuality, one is immediately confronted with the uniquely female characteristic of the menstrual cycle. There have been quite a few studies on the distribution of sexual activity during the menstrual cycle in women. Many of them have methodological weaknesses, but there is one consistent finding. It is much more common for female sexual activity to be greatest shortly before,

shortly after, or even during menstruation (Bancroft, 1984). It would be expected that female sexual activity would be greatest around the time of ovulation, or at least increase during the follicular phase. However, women distance runners are prone to develop menstrual irregularities, such as amenorrhea, in response to regular participation in a program of physical exercise (Loucks & Horvath, 1985). This effect of exercise is likely related to a direct or secondary influence of exercise upon endocrine function.

One possible explanation for the finding of lower sexual activity associated with higher exercise in females in this study is that prolactin levels increase with exercise. This increase in prolactin may contribute to menstrual abnormalities and training-related amenorrhea (Boyden et al., 1982; Bunt, 1986). Bancroft (1984) suggested that women experiencing disruptions in their menstrual cycle may experience a decline in their sexual activity. The results of this study seem to support such a suggestion. In other words, exercise, possibly because of an increase in prolactin release, alters menstrual cycle function, which in turn may decrease sexual activity. That is one possible explanation for the present results, but this cannot be substantiated here, because menstrual dysfunction was not assessed in the current investigation.

Another possible explanation may be related to the role of estradiol in female reproductive function. Estradiol reportedly also increases as a result of exercise in women. Once again,

research has shown that increased estradiol levels decreases sexual activity in males. It is difficult to explain how estradiol could affect female sexuality. There is evidence that estradiol influences female sexuality by its effect on the vaginal wall. In states of estradiol deficiency, as with amenorrhea, Bunt (1986) suggested that vaginal lubrication can be impaired and can lead to discomfort during intercourse. This condition can be successfully treated with estradiol therapy. Loucks and Horvath (1985) reported that a consistent finding among amenorrheic runners was chronically low estradiol levels. The implication is that as women increase their exercise, estradiol levels decrease, possibly causing vaginal lubrication impairment that results in discomfort during intercourse, which may lead to decreased sexual activity.

Beta-endorphin is a pituitary hormone that stimulates secretion of prolactin and suppresses the secretion of luteinizing hormone (LH), which is important in promoting ovulation. Exercise has been shown to increase beta-endorphin levels. Recent studies have also demonstrated that beta-endorphin plays an important role in the regulation of the normal menstrual cycle (Blankstein, Reyes, Winter, & Faiman, 1981; Grossman, Moult, & Gaillard, 1981). Because exercise increases circulating levels of beta-endorphin, which suppresses LH secretion and stimulates prolactin secretion, beta-endorphin may be closely related to disrupted menstrual function in exercising women. In other words, the effects of suppressed LH secretion

may inhibit ovulation, which is essential to menstruation. This endorphin mechanism may help further explain the lower sexual activity associated with greater exercise participation in females.

Summary

In general, physical exercise and sexual activity variables showed no significant correlations for males, although a significant low positive correlation was found between EF and SF.

In contrast, the data from this study do support the conclusion that physical exercise is negatively related to sexual activity in female runners. This relationship may be a function of the role of estradiol and prolactin in female reproductive function. As women increase their exercise, estradiol levels decrease, possibly causing vaginal lubrication impairment that results in discomfort during intercourse. Also, exercise, possibly because of an increase in prolactin release, alters menstrual cycle function, which in turn may decrease sexual activity. This may explain the lower sexual activity levels associated with higher exercise levels in women runners.

Chapter 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

Summary

The purpose of this investigation was to examine the relationship between physical exercise and sexual activity. More specifically, this study was designed to investigate the following relationships in regard to sexual activity: (a) physical exercise and frequency of sexual activity, and (b) physical exercise and duration of sexual activity. The subjects were 160 men and 56 women from local running clubs. Data were derived from a questionnaire that each subject completed. Male and female subjects were analyzed collectively and as separate groups.

Pearson product-moment correlations were used to examine the relationships among each pair of physical exercise and sexual activity variables. In male subjects, results revealed a statistically significant, but low, positive correlation between EF and SF. In general, weak r values were found between male physical exercise and sexual activity variables. In contrast, female subjects' results revealed statistically significant negative correlations of low to moderate magnitude between SF and both EF and ED. In general, significant negative r values were found between female physical exercise and sexual activity variables.

Multiple regression was also used to examine the

relationship between physical exercise and sexual activity variables. In male subjects, results showed no significant relationship between exercise and sexual activity. However, in female subjects, results revealed a significant negative relationship between exercise and SD. The finding of a low but statistically significant relationship between SD and exercise for the total sample was not readily interpretable, because the variable with the greatest influence was ED, which was positively related ($p > .01$) to SD for males, but negatively related ($p < .01$) to SD for females.

Conclusions

The results of this study support the following conclusions:

1. Exercise participation is related to lower sexual activity in female runners. This may be related to the menstrual disturbances and low estradiol levels associated with regular exercise participation in women. This conclusion is based upon the following subconclusions:

A. There is a moderate, but statistically significant, multiple correlation between exercise variables and SD, as well as a significant low multiple correlation between exercise variables and SF for female subjects.

B. There is a significant low to moderate negative correlation between EF and SF for female subjects.

C. There is a significant low to moderate negative correlation between ED and SF for female subjects.

2. There does not seem to be any practically significant

relationship between exercise and sexual activity in male subjects.

Recommendations for Further Study

The findings of this investigation lead to these recommendations for further study:

1. A study should be conducted involving a larger number of female subjects. This would allow for greater generalizability and greater statistical power.

2. A study should be conducted that examines the differences in sexual activity between an exercise group and a control group. This may allow the investigator to better quantify whether sexual activity is affected by exercise and whether the potential effects of exercise are mediated by acute responses or chronic adaptation to exercise participation.

3. A study should be undertaken that examines the relationships among age, exercise, menstrual regularity, sexual activity, and discomfort during intercourse. This may allow the investigator to determine the role of menstrual regularity during exercise training in sexual activity. This would also allow the investigator to see if menstrual irregularity is related to discomfort during intercourse.

4. Finally, more studies should be conducted examining the relationship between hormone levels and sexual activity in females. This could help determine if hormones actually affect sexual behavior in females.

Appendix A

QUESTIONNAIRE

ANSWER EACH QUESTION AS IT CURRENTLY APPLIES TO YOU. IN ORDER FOR VALID INFORMATION TO BE OBTAINED, IT IS CRUCIAL FOR YOU TO ANSWER EVERY QUESTION HONESTLY. THANK YOU.

Demographic Characteristics

1. Sex: _____Male _____Female

2. Age: _____

3. Height: _____

4. Weight: _____

5. Length of relationship (married or living together): _____

6. Self-rated health: ___Poor ___Fair ___Good ___Excellent

7. Education Level (highest completed):
___HS ___2 yr. college ___4 yr. college ___MS ___other

8. Children: ___0 ___1 ___2 ___3 ___4 ___5 or more

Exercise Characteristics

1. How many days do you run or walk (circle one) for exercise in an average week?
_____days

2. Carefully describe how far you run or walk in your program (per week).
_____miles

3. Approximate as close as possible the average length of time of your workout.
_____minutes

4. How long do you stretch during each workout?
_____minutes

Sexual Activity

For the purpose of this questionnaire, sexual activity is defined as the most frequent sexual act that you perform (i.e., sexual intercourse, masturbation, etc.).

---

1. How would you rate your average frequency of sexual activity?

per week: (circle) 0 1 2 3 4 5 6 7 8 9 10
per month: (if less than 4x per month) 0 1 2 3

---

2. As far as you are concerned, that frequency is (circle):

1 2 3 4 5 6 7
not enough about right too much

---

3. What is the typical duration of your sexual activity?
_____minutes

---

4. As far as you are concerned, the strength of your sexual urge is generally (circle):

1 2 3 4 5 6 7
none moderate strong

---

5. In your sexual activity, how often do you reach orgasm?

per week: (circle) 0 1 2 3 4 5 6 7 8 9 10
per month: (if less than 4x per month) 0 1 2 3

---

6. The general level of enjoyment of your sex life is (circle):

1 2 3 4 5 6 7
unpleasurable pleasurable very pleasurable

---

7. How generally satisfied are you with your sex life (circle)?

1 2 3 4 5 6 7
not satisfied satisfied very satisfied

NOTE: You may receive the results of the study by adding your address to the Informed Consent Form.

Appendix B

INFORMED CONSENT FORM

1. a) Purpose of the Study: To examine the relationship between physical exercise and sexual activity.
   b) Benefits: Information from this study may lead to further research that may help individuals suffering from sexual problems.
2. Method: You will be asked to complete a questionnaire relating to the quantitative and qualitative aspects of physical exercise and sexual activity. Some people may consider sexual questions offensive, and you are warned not to complete or read the questionnaire if you are sensitive to such issues. Additionally, you are free to stop filling out this questionnaire at any time if you desire. The questionnaire will take about 15 minutes to complete, and you should know that it will be scored in a completely anonymous fashion, i.e., no one will ever associate you with your answers.
3. Will this hurt?: Participation in this study does not involve any major physical or psychological risks. There is a slight chance of a subject becoming embarrassed or offended by questions of a sexual nature.
4. Need more information?: Additional information about this study can be obtained from either Christopher Hobler (607-273-3026) or Dr. Gary Sforzo (607-274-3359). All questions are welcomed and will be answered.
5. Withdrawal from this study: Participation is voluntary. You are free not to complete the questionnaire, or you may stop anytime during completion of the questionnaire.
6. Exclusion from this study: All subjects in this study must be at least 18 years of age and report having a regular sex partner.
7. Will the data be maintained in confidence?: All data will be confidential. Questionnaires are coded into numbers and referred to only by those numbers in the future. Published material will only be reported in group form. You may receive the results of the study by adding your address to this form. Questionnaires will be separated from this form once they are returned, ensuring confidentiality of responses.
8. I have read the above and understand its contents, and I agree to participate in this study. I acknowledge that I am 18 years of age or older.

_____	_____
SIGNATURE	RETURN ADDRESS
_____	_____
DATE	(complete to obtain results)

Appendix C

SUMMARY OF RAW DATA

Demographic Characteristics

1. Sex — Male (n = 160) — Female (n = 56)

2. Age (years)

	Male	Female
20-25	6	8
26-30	58	9
31-35	16	20
36-40	33	2
41-45	17	8
46-50	5	8
51-55	25	1
M +/- SD:	35.04 +/- 7.70	33.82 +/- 9.06

3. Height (in)

	Male		Female
69	26	58	8
70	24	63	9
71	29	65	8
72	24	66	7
73	24	67	17
74	16	70	7
75	9		
76	8		
M +/- SD:	71.75 +/- 2.09		65.14 +/- 3.55

4. Weight (lb)

	Male		Female
130-135	8	110-115	17
136-140	13	116-120	9
141-145	2	121-125	7
146-150	25	126-130	0
151-155	23	131-135	7
156-160	21	136-140	16
161-165	18		
166-170	18		
171-175	0		
176-180	8		
181-185	9		
186-190	0		
191-195	0		
196-200	7		
201-205	8		
M +/- SD:	162.4 +/- 17.62		124.32 +/- 10.58

(appendix continues)

	Male	Female
5. Marriage (years)		
1-5	73	28
6-10	34	11
11-15	17	0
16-20	11	10
21-25	8	6
26-30	13	0
31-35	4	1
M +/- SD:	9.66 +/- 9.49	9.29 +/- 9.40
6. Health		
Good (3)	16	4
Excellent (4)	144	52
M +/- SD:	3.85 +/- 0.04	3.86 +/- 0.35
7. Education		
HS	8	8
2 yr. college	10	6
4 yr. college	54	13
MS	32	23
other	56	6
M +/- SD:	3.9 +/- 1.17	3.57 +/- 1.19
8. Children		
0	54	22
1	16	7
2	40	18
3	40	4
4	8	5
M +/- SD:	1.64 +/- 1.43	1.14 +/- 1.47

(appendix continues)

	Male	Female
Exercise Characteristics		
1. Exercise Frequency (times/week)		
3	0	8
4	38	8
5	34	23
6	72	9
7	16	8
M +/- SD:	5.63 +/- 1.05	5.02 +/- 1.21
2. Exercise Distance (miles)		
0-10	8	8
11-20	44	23
21-30	36	16
31-40	36	0
41-50	8	9
51-60	8	0
61-70	12	0
71-80	8	0
M +/- SD:	33.49 +/- 17.74	24.11 +/- 11.64
3. Exercise Time (min)		
20-25	4	7
26-30	16	1
31-35	8	7
36-40	24	8
41-45	28	8
46-50	28	8
51-55	0	0
56-60	12	17
61-65	4	0
66-70	8	0
71-75	12	0
76-80	4	0
81-85	0	0
86-90	12	0
M +/- SD:	51.99 +/- 15.76	44.62 +/- 13.07

(appendix continues)

	Male	Female
4. Stretch (min)		
0-5	58	40
6-10	68	16
11-15	20	0
16-20	4	0
M +/- SD:	7.80 +/- 5.28	6.14 +/- 2.55

Sexual Activity

1. Sexual Frequency (times/week)		
1	16	8
2	72	9
3	32	31
4	31	0
5	9	8
M +/- SD:	2.66 +/- 1.07	2.84 +/- 1/14
2. Enough sex?		
Not enough (1)	8	0
(2)	8	0
(3)	72	16
About right (4)	72	40
M +/- SD:	3.30 +/- 0.78	3.71 +/- 0.45
3. Sexual Duration (min)		
0-10	9	0
11-15	28	16
16-20	51	10
21-25	16	0
26-30	29	15
31-35	0	0
36-40	4	7
41-45	19	0
46-50	5	8
M +/- SD:	25.41 +/- 9.52	28.04 +/- 12.27

(appendix continues)

		Male	Female
4.	Sexual urge		
	Moderate (3)	8	8
	(4)	48	16
	(5)	40	32
	(6)	32	0
	Strong (7)	32	0
	M +/- SD:	5.20 +/- 1.21	4.43 +/- 0.74
5.	Frequency of Orgasm (times/week)		
	1	25	0
	2	56	25
	3	32	23
	4	41	0
	5	7	8
	M +/- SD:	2.70 +/- 1.15	2.83 +/- 1.01
6.	Enjoyment		
	Pleasurable (3)	8	0
	(4)	16	8
	(5)	32	16
	(6)	64	24
	Very Pleasurable (7)	40	8
	M +/- SD:	5.69 +/- 1.11	5.57 +/- 0.91
7.	Satisfaction		
	Not Satisfied (1)	8	0
	(2)	0	0
	(3)	16	0
	Satisfied (4)	8	0
	(5)	56	0
	(6)	56	56
	Very Satisfied (7)	16	0
	M +/- SD:	5.05 +/- 1.44	6.00 +/- 0.00

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