8-1994

The Effects of Regular Aerobic Exercise on Sexual Desire in Women

Joanne Louise Kolean-Burley

Western Michigan University

Follow this and additional works at: http://scholarworks.wmich.edu/dissertations

Part of the Psychology Commons

Recommended Citation
http://scholarworks.wmich.edu/dissertations/1805

This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact maira.bundza@wmich.edu.
THE EFFECTS OF REGULAR AEROBIC EXERCISE
ON SEXUAL DESIRE IN WOMEN

by

Joanne Louise Kolean-Burley

A Dissertation
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Doctor of Philosophy
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
August 1994
A multiple baseline design across subjects was used to evaluate the effects of an 8-week aerobic walking program on sexual desire in 7 previously sedentary married women who met the DSM-III-R criteria for Hypoactive Sexual Desire Disorder (HSDD). Sexual desire was assessed on a weekly basis through a 6 to 9-week baseline period and the 8-week walking intervention using the Self-Acceptance and Mate-Acceptance subscales of the Sexual Interaction Inventory (SII) (LoPiccolo & Steger, 1974), the Sexual Activity Form, developed for this study to measure the frequency of female sexual initiation and responsivity, a behavioral counter and the Sexual Thoughts Matrix Form to assess the frequency of sexual thoughts. Mild improvement in scores on the SII was seen for all female subjects. An increase in average frequency of female responsivity to sexual advances from a baseline level of once every 4 weeks to a treatment frequency of once every 3 weeks was shown, although the average frequency for female sexual initiation remained unchanged at once every 5 weeks. The frequency of sexual thoughts pre- and post-intervention also remained relatively unchanged, although the frequency of positive sexual thoughts increased from 47% to 69%, with a corresponding decrease in the frequency of negative sexual thoughts from 26% to .09%. Results suggest that aerobic exercise may produce mild improvements in sexual desire in some women diagnosed with HSDD.
INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
The effects of regular aerobic exercise on sexual desire in women

Kolean-Burley, Joanne Louise, Ph.D.
Western Michigan University, 1994
ACKNOWLEDGMENTS

I would like to express my appreciation to my committee members, Dr. C. Richard Spates, Dr. Lisa Baker, Dr. Roger Zabik, and especially my advisor Dr. M. Michele Burnette for their recommendations and consistent support throughout all phases of this study. I also want to thank my research assistants for their dedication to motivating the subjects in this study to complete the walking program; I especially want to acknowledge Kristen Hansen, who took responsibility for overseeing the data collection phase of this study while I was away on internship and to thank her for all of her hard work and devotion to the completion of this study.

I would also like to thank my entire family for their never-ending belief in my abilities and their persistent encouragement. In particular, I want to thank my mother, Betty Kolean, and my father, Terry Kolean, for their faith in me and for tolerating my single-mindedness in the pursuit of my goals. I also want to express my appreciation to my mother-in-law, Louise Burley, and my father-in-law, John Burley, for their consistent reassurance and understanding. My son, Desmond Kolean-Burley, also deserves my love and thankfulness for "helping Mommy" at the computer. Finally, I want to thank my husband and best friend, Morris Burley, for his willingness to provide consistent emotional support, love, and understanding, and for his computer expertise while writing the results of this study.

Joanne Louise Kolean-Burley
TABLE OF CONTENTS

ACKNOWLEDGEMENTS ................................................................................................... ii
LIST OF TABLES ................................................................................................................ v
LIST OF FIGURES ............................................................................................................. vi
INTRODUCTION ................................................................................................................ 1
  Conceptualizations of Sexual Desire ................................................................. 1
  Prevalence of Decreased Sexual Desire .............................................................. 4
  Factors Associated With Sexual Desire .............................................................. 5
  Psychological Effects of Exercise ...................................................................... 11
  The Effects of Exercise on Sexual Desire .......................................................... 16
METHOD .............................................................................................................................. 20
  Subjects ......................................................................................................................... 20
  Setting .......................................................................................................................... 20
  Apparatus and Materials ...................................................................................... 21
    Subjective Measures ........................................................................................... 21
    Physiological Measures ...................................................................................... 24
  Procedure .................................................................................................................... 24
  Dependent Variables .............................................................................................. 28
  Research Design ........................................................................................................ 29
RESULTS .............................................................................................................................. 30
  Data Analysis .............................................................................................................. 30
  Subject Characteristics ........................................................................................... 30
  Self-Report Measures of Sexual Desire ............................................................... 31
  Fitness Measures ...................................................................................................... 46
Table of Contents—Continued

Other Self-Report Measures ................................................................. 47
Outcome by Diagnostic Classification ................................................ 48
DISCUSSION ......................................................................................... 50
APPENDICES ......................................................................................... 56
    A. Advertisement ............................................................................. 57
    B. Diagnostic Interview Questions .................................................. 59
    C. General Information Form ......................................................... 61
    D. Sexual Activity Form ................................................................. 64
    E. Medical History Questionnaire ................................................... 66
    F. Exercise Report Form ................................................................. 70
    G. Sexual Thoughts Matrix Form ..................................................... 72
    H. Informed Consent ....................................................................... 74
    I. Medical Clearance Form ............................................................ 79
    J. Subject Instructions for Recording Sexual Thoughts ................... 83
    K. Human Subjects Institutional Review Board Approval ................. 86
BIBLIOGRAPHY .................................................................................... 88
# LIST OF TABLES

1. Scores for Screening Measures ................................................................. 31
3. Number of Sexual Thoughts Per Day From Behavioral Counter for Individual Subjects ................................................................. 46
4. Summary Sexual Thoughts Matrices ............................................................. 47
5. VO2 Max Scores ............................................................................................. 48
6. BCS Scores ..................................................................................................... 49
LIST OF FIGURES

1. Sexual Interaction Inventory Scores for Individual Subjects .................. 34
2. Frequency of Female Sexual Initiation for Individual Subjects ............... 36
4. Frequency of Female Sexual Responsivity for Individual Subjects .......... 41
5. Male Report of Frequency of Female Sexual Responsivity for Individual Subjects .............................................................. 43
INTRODUCTION

Conceptualizations of Sexual Desire

The definition of Hypoactive Sexual Desire Disorder (HSDD) has been defined in the DSM-III-R (American Psychiatric Association, 1987) in the following way:

A. Persistently and recurrently deficient or absent sexual fantasies and desire for sexual activity. The judgment of deficiency or absence is made by clinician, taking into account factors that affect sexual functioning, such as age, sex, and the context of person's life.
B. Occurrence not exclusively during the course of another Axis I disorder (other than a Sexual Dysfunction), such as Major Depression. (p. 293).

DSM-III-R allows the clinician to further delineate this sexual dysfunction by classifying it as primary if the lack of desire for sexual activity has been present throughout the individual's life, or secondary, if the dysfunction appeared after a period of normal functioning. In addition, HSDD can be situational if it occurs only in certain contexts, such as with a particular partner, or generalized if it occurs across all partners and situations.

This definition for the problem of low sexual desire differs from that offered by the DSM III, which specified a diagnosis of Inhibited Sexual Desire if the individual reported a frequency for all sexual behavior of twice per month or less over the previous 6 months (American Psychiatric Association, 1980). This earlier definition for decreased sexual desire was limited because it failed to consider possible situations in which an individual may engage in sexual behavior but not desire it; in this case, sexual activity may be partner-initiated, or the individual may participate in sexual activity from external pressure to meet her or his partner's...
expectations or a perceived normative frequency for sexual activity. Thus, defining decreased sexual desire solely in terms of the frequency of sexual behavior does not include those individuals who engage in sexual activity for reasons other than their own sexual desire.

Schreiner-Engel and Schiavi (1988) found that 35% of a group of women diagnosed with Hypoactive Sexual Desire Disorder did not masturbate at all. 45% masturbated at the rate of once per month or less, and the remaining women reported masturbating at a higher rate. These data suggest that there is some variability with respect to the frequency of overt sexual behavior even in those diagnosed with HSDD. Many clinicians agree that although a definition of decreased sexual desire should include frequency of sexual behavior, defining the problem solely in terms of the frequency of overt sexual behavior is insufficient (Wincze & Carey, 1991; Trudel, 1991; Leiblum & Rosen, 1988; Lief, 1988; Rosen & Leiblum, 1988).

In addition to frequency of sexual intercourse and other sexual activity as an indicator of the level of sexual desire, many clinicians assess the cognitive dimension of sexual desire. A low occurrence rate of the cognitive correlates of sexual desire, including fantasies and sexual urges, is often associated with HSDD. Nutter and Condron (1983) found that compared to a group of sexually satisfied controls, women diagnosed with Inhibited Sexual Desire reported a much lower frequency of sexual fantasy, although the fantasy content did not differ between the two groups. Similarly, Schreiner-Engel and Schiavi (1988) found that the majority of their female patients diagnosed with HSDD reported having sexual fantasies only rarely.

Many clinicians also assess the affective states which are associated with decreased sexual desire (Leiblum & Rosen, 1988; Trudel, 1991). Wincze and Carey (1991) described three subtypes of affect which can accompany HSDD. First, they described a neutral state which is neither positive nor negative. The second subtype
of affect consisted of negative feelings, such as guilt or depression, which may occur as a result of the decreased sexual desire. Finally, they described a subtype of affect which may occur in the individual who avoids sexual activity because of fear of or aversion to it; however, in this instance, the person is more likely to be diagnosed with Sexual Aversion Disorder.

Sexual desire has also been conceptualized in terms of the relationship between the actual level of sexual activity in which the individual engages, including masturbation as well as intercourse, and the individual's perception or subjective experience of a "reasonable" level of sexual activity. Leiblum and Rosen (1988) reported using the individual's rating of "ideal" versus current frequency of sexual activity as a measure of sexual desire. Another method that has been used to measure sexual desire involves examining the frequency of all sexual activity engaged in, as well as the individual's subjective interest in participating in that activity (Schreiner-Engel & Schiavi, 1986). Garde and Lunde (1980) utilized a comparison between spontaneous desire for sexual activity and sexual activity which is evoked by some external stimulation, such as that provided by a partner. Rook and Hammen (1977) conceptualized individual differences in sexual desire in terms of the number of environmental cues which can elicit sexual desire: from this perspective, an individual with a diagnosis of HSDD would be expected to view few environmental stimuli as being sexually significant. They identified this as "cognitive labeling" and argued that this trait is relatively stable. Leiblum and Rosen (1988) expanded on this model with their conceptualization of sexual desire as a "subjective feeling state" (p. 5) that can be experienced only in the presence of the necessary external and internal cues. External cues may include such things as the presence of a willing partner, while internal cues consist of fantasy, as well as physiological correlates of sexual arousal such as vasocongestion.
In summary, there is agreement among clinicians that assessment of sexual desire should be multidimensional, including the measurement of behavioral, cognitive, and affective aspects of desire. However, the DSM III-R criteria for HSDD are somewhat vague and require subjective judgment on the part of the clinician. Unfortunately, there are no data available to indicate the typical dimensions of sexual desire in the total population, which would assist in the diagnosis of HSDD. Even if there were, it seems likely that there would be a great amount of variation with respect to all dimensions of sexual desire. For example, Lief (1988) suggested that some individuals report having hundreds of sexual thoughts per day, while others report having none at all.

Prevalence of Decreased Sexual Desire

As noted above, there are no data available which would indicate what is the normative level of sexual desire among the population at large. However, there are data to suggest that decreased sexual desire is a problem among females who do not present for sex therapy. Hite (1977) surveyed 3000 females aged 14 to 78 and found that 33% reported never or infrequently experiencing sexual desire. In another study, Frank, Anderson, and Rubenstein (1978) asked 100 non-clinical couples who described their marriages as "working out" to complete a questionnaire on various aspects of marriage. They found that 35% of the wives reported their lack of sexual interest as a problem.

A more recent study of 92 couples answering a newspaper advertisement seeking people in "stable" relationships found that only 10% reported low sexual desire (Schover & Jensen, 1988). In contrast, a recent study of British women revealed that 17% reported low levels of sexual desire (Osburn, Hawton, & Gath, 1988).
Thus, it appears that anywhere from 10% to 35% of non-clinical females may experience low levels of sexual desire.

With respect to the clinical population, prevalence estimates for decreased sexual desire range from 37% to 89% of females presenting for sex therapy. There is some evidence that the prevalence rate is increasing. LoPiccolo and Friedman (1988) reported that between 1974 and 1976, 32% of the couples presenting for sex therapy at the Stony Brook Sex Therapy Center were diagnosed with decreased sexual desire, with the female as the identified patient in 70% of the cases. Between 1977 and 1978, the number of couples had increased to 46%, with 60% of the couples having the female as the identified patient. By 1982, they found that 55% of the total cases consisted of sexual desire disorder, but of these, the number of cases where the female was the identified patient had decreased to 55%. In an outcome study, Schover and LoPiccolo (1982) reported that 49% of the wives being treated were given a diagnosis of low sexual desire. In another report, Hawton, Catalan, Martin, and Fagg (1986) found that 37% of their female sex therapy patients presented with sexual desire problems. In contrast, Segraves and Segraves (1991) reported the findings from a multi-site pharmaceutical study, in which 906 subjects were recruited to test the efficacy of an unidentified experimental drug designed to treat problems of sexual desire, arousal, and orgasm. They found that 89% of the 532 females met the DSM-III criteria for Inhibited Sexual Desire Disorder. Thus, estimates of the prevalence of decreased sexual desire in the female clinical population range from 37% to 89%.

Factors Associated With Sexual Desire

Sexual desire is determined by a variety of factors. One line of research has examined the possibility that female sexual behavior may be influenced by the same hormonal processes that regulate the menstrual cycle. Sanders, Warner, Backstrom.
and Bancroft (1983) found a significant relationship between phase of the menstrual cycle and sexuality. They found an increase in positive sexual feelings and thoughts beginning in the mid and late follicular phases, with a decline in these feelings following ovulation. Another study by Warner and Bancroft (1988) examined retrospective questionnaires from 4112 women regarding changes in mood and sexuality across the menstrual cycle. They found a significant relationship between phase of the menstrual cycle and sexual interest and enjoyment of sexual activity, with the most common pattern being high levels of sexual interest and enjoyment in the week following menstruation. These results are somewhat consistent with those reported by Sanders and colleagues, but in the latter study, the peaks in sexual interest occurred closer to ovulation. This discrepancy could be attributed to the difference in methods used to determine menstrual cycle phase, via blood samples in the Sanders et al. (1983) study and less reliable subject self-report in Warner's and Bancroft's (1988) study.

Another study which examined the relationship between female sexual desire and hormone levels utilized basal body temperature (BBT) in order to determine menstrual cycle phase (Stanislaw & Rice, 1988). The records of 372 couples were analyzed and found to reflect a strong positive correlation (.65) between the day of sexual desire onset and the day of BBT shift. In most women, ovulation is followed within 24 hours by the BBT shift. The authors speculated that the hormonal processes which regulate ovulation also control peaks in sexual desire, since the onset of sexual desire typically preceded the BBT shift by a few days. However, in this study, sexual desire was assessed by requesting subjects to indicate only the presence or absence of desire on a daily basis. Since much of the recent literature suggests that sexual desire can best be conceptualized as a collection of "motor behaviours, verbal...
behaviours, cognitions and fantasies as well as emotional reactions" (Trudel, 1991, p. 263), the meaning of these results is unclear.

Although these findings suggest that hormonal processes may mediate sexual desire in women, cultural and religious teachings concerning menstruation and sexual intercourse may be a potential confound. For example, Orthodox Jewish women are required to abstain from intercourse for seven days following the end of menstruation and may engage in sexual activity only after cleansing themselves in a ritual bath called the mikvah (Masters, Johnson, & Kolodny, 1986). Abstinence from intercourse during menstruation may also occur as a result of beliefs of both partners that the blood of a menstruating woman is dangerous or magical (Delaney, Lupton, & Toth, 1977). Cultural taboos against intercourse during menstruation may negatively impact sexual desire during this phase of the cycle, resulting in an artificial increase in sexual desire during the follicular phase of the cycle.

Research examining the influence of hormone levels on sexual desire in women has shown conflicting results. Waxenberg, Kinkbeiner, Drellich, and Sutherland (1960) measured estrogen secretory activity of female breast cancer patients and attempted to correlate it with estimated changes in sexual desire, activity, and responsivity reported by the patients secondary to the surgical treatment for their illness, bilateral oophorectomy/adrenalectomy. They found that sexual behavior in these patients was not related to estrogen levels. However, the extensive surgical procedures to which the participants were subjected, as well as the fact that estrogen levels were measured using a rather crude technique, differential cell count obtained from vaginal smears, makes these results difficult to interpret. Another study, which assessed the impact of estrogen on sexual activity in young, healthy females, examined plasma levels of estrogen, a more precise measure (Persky, O'Brien, & Khan, 1976). They also found no difference in estrogen levels between women who
reported high versus low levels of sexual activity. However, their system for categorizing women into these groups was based on estimates of average sexual activity which occurred in the two menstrual cycles prior to the cycle being monitored. In an attempt to correct the shortcomings of this study, Persky et al. (1978) monitored plasma estradiol levels of the female partners of 11 couples twice weekly over three menstrual cycles; following each blood sampling, they also conducted interviews with the couples to collect information on sexual behavior. They found that in young, premenopausal women, plasma estradiol levels were not related to sexual arousal, intercourse frequency, or sexual initiation. Although the frequent, intensive interviews conducted in order to assess sexual behavior represent an improvement over the measures of sexual behavior used in their earlier study, this method of assessment must still be considered retrospective, since during the interviews, the subjects were requested to discuss their sexual behavior which had occurred since the last interview.

In a more recent attempt to flush out the relationship between hormones and sexual desire, Schiavi and Schreiner-Engel (1988) compared individuals who were diagnosed with global Inhibited Sexual Desire (ISD), using the DSM-III criteria, to normal controls. They measured nocturnal hormone levels and found that the clinical group of men had significantly lower levels of testosterone than the control group; however, they found no hormonal differences between the female clinical and control groups. As in all the studies on hormones and sexual desire, these data are only correlational and cannot be interpreted causally. It is just as likely that environmental and behavioral factors influence hormone levels as it is that hormones influence behavior.

While the evidence regarding the relationship between hormone levels and sexual desire is conflictual, research examining the effects of pharmacological agents
on sexual desire is much more consistent. Segraves (1988), in a review of the effects of prescription drugs on sexual desire, reported that a variety of drugs have been associated with a decrease in sexual desire. Most notable are the suppressive effects of many antihypertensive agents, antipsychotic drugs, anticonvulsant medications, and anticancer chemotherapy. However, he noted that most of the information that is available is subject to the biases of physicians and their patients with respect to the definition of sexual desire and consists of case studies or retrospective questionnaires focused only on males. Although he argued that there is no reason to suspect that females would be less susceptible to the influence of these drugs on sexual behavior than males. Segraves indicated that evidence for a suppressive effect on female sexual desire exists only for antipsychotic drugs and anticancer chemotherapy.

Evidence also exists supporting the suppressive effects of recreational drugs on sexual desire. Abel (1985) reported that chronic alcohol use has been shown to have a negative effect on overall sexual functioning in both men and women. In addition, chronic use of both cocaine (Siegel, 1977) and narcotics (Abel, 1985) were reportedly associated with decreases in sexual desire in both sexes. The effects of marijuana on sexual desire, however, are not clear. Survey reports suggested that many individuals believe that marijuana enhances sexual desire (Koff, 1974), but it is unclear whether this effect is due to expectation or pharmacological action (Abel, 1985).

Depression may also impact on sexual desire. In an effort to examine this relationship, Channon and Ballinger (1986) studied women who were presenting for treatment at a menopause clinic. Subjects completed the Hamilton Depression Inventory and a retrospective questionnaire requesting information on changes in sexual functioning since menopause began. They found that scores indicating greater levels of depression on the Hamilton Depression Scale were highly correlated with
decreased sexual desire and enjoyment, with 58.8% of the women reporting decreased sexual desire since the onset of menopause.

In a more direct examination of the relationship between decreased sexual desire and depression, Schreiner-Engel and Schiavi (1986) utilized both questionnaires and interviews to assess psychopathology in a group of individuals diagnosed with Inhibited Sexual Desire (DSM-III criteria) and a group of matched controls. Their results indicated that the ISD subjects were twice as likely as the controls to have experienced at least one episode of major depression in their lifetime. The findings of these studies support the inclusion of loss of sexual desire in the classical definition of depression (American Psychiatric Association, 1980; Kaplan, Freedman, & Saddock, 1980).

Sexual interest or desire may also be impacted by the level of stress to which a woman is exposed. One study compared the diagnoses of the working and non-working female partners of couples presenting for sex and marital therapy (Avery-Clark, 1986). Working women were further classified into groups including Career, which referred to employment of an ongoing, developmental nature, requiring special education/training, and Job, which referred to occupations "emphasizing the immediate organization of activities rather than increasing levels of responsibility" (Avery-Clark, 1986, p. 98) and that did not require special education/training. The results of this study indicated that women who were pursuing careers were twice as likely to experience inhibited sexual desire as non-working wives or women who were employed in jobs. Although perceived stress was not assessed in this study, the author argued that higher levels of stress among the career subjects may be responsible for their higher rate of inhibited sexual desire. Indeed, other authors have asserted that measured reductions in sexual desire among individuals experiencing high levels of stress may be due to the emotional and cognitive costs of dealing with
the stress (Kolodny, Masters, & Johnson, 1979). In support of this contention, Arnett, Prosen, and Toews (1986) found that when excessive stress resulted in feelings of anxiety, anger, depression, and guilt, sexual desire was decreased.

Warner and Bancroft (1988) found a relationship between sexual interest and measures of well-being in women. They asked women to indicate on a questionnaire during which time of the month they experienced the greatest and the least feelings of energy and "well-being." They found that reported feelings of positive well-being correlated highly with sexual interest in most of their subjects; conversely, negative well-being was usually associated with low sexual interest.

A relationship between body image attitudes and sexual desire has also been shown. Hangen and Cash (1991) examined the relationship between body image and sexual functioning in 113 college-aged females. They found that more negative body image attitudes were associated with lower levels of sexual satisfaction. Furthermore, their results indicated that higher levels of anxiety about exposing one's body were associated with lower levels of sexual drive. Thus, it appears that the level of body satisfaction may be related to sexual desire. The causal link, however, is unknown.

Psychological Effects of Exercise

Aerobic exercise has been shown to have a positive effect on various psychological states. Blumenthal, Williams, Needels, and Wallace (1982) compared a group of 16 middle-aged individuals who participated in a 10-week walking/jogging program to a group of matched sedentary controls on measures of mood and anxiety. They found that at the conclusion of the study, the exercising group scored lower on state and trait anxiety, as measured by the State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970), and on tension, depression, and fatigue, as measured by the Profile of Mood States (POMS) (McNair, Lorr, & Droppleman).
Similarly, Simons and Birkimer (1988) compared individuals participating in an aerobic exercise group to nonexercising controls on the POMS and found somewhat consistent results. In this study, the exercisers' scores on the anxiety, anger, confusion, and depression subscales evidenced greater reductions than did the scores of the controls; however, they found no change with respect to vigor and fatigue in either group.

In an attempt to contrast any psychological effects produced by aerobic exercise with those which might be produced by anaerobic exercise, Jasnoski, Holmes, and Banks (1988) compared 39 female and 63 male undergraduate students who participated in a fitness program which included both types of exercise. Multiple regression analyses showed that improvements in feelings of happiness, security, joining, control, and stability, as measured by the Sixteen Personality Factor Questionnaire (Cattel, Eber, & Tatsuleg, 1970), were associated with improved aerobic fitness. Improvements in abdominal and upper body strength were associated only with improved scores on the introversion and joining subscales. Their results also indicated that these effects were more pronounced in the female subjects. However, it is not clear to what extent these changes in psychological functioning could be considered clinically significant.

The psychological effects of varying intensities of aerobic exercise have also been evaluated. One study compared previously sedentary adults following high level aerobic exercise, moderate exercise, attention-placebo, and waiting list on several measures of psychological functioning (Moses, Steptoe, Mathews, & Edwards, 1989). They found that improvements were seen on levels of tension/anxiety and confusion, as measured by the POMS, only in the moderate exercise condition. They suggested that these results contradict the hypothesis that improvement in psychological functioning is due to increases in cardiovascular
fitness, since the scores of the group who attained the highest levels of cardiovascular fitness did not reflect the most improvement on psychological measures. However, the differences they found between the high and moderate exercise groups with respect to fitness level did not reach statistical significance. It is possible that the two groups were somewhat similar in terms of aerobic fitness and the reported psychological differences were due to some other factor.

The positive effects of aerobic exercise on individuals with elevated levels of tension and anxiety have also been shown (Steptoe, Edwards, Moses, & Mathews, 1989). In this study, previously sedentary adults classified as being close to or in the range for "clinically significant anxiety" (p. 538), as measured by the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983), participated in a moderate aerobic training group over a 10-week period. When compared to matched controls who participated in an attention-placebo group, the exercise group evidenced greater decreases in tension-anxiety and mental confusion, as measured by the POMS; however, there were no post-treatment group differences with respect to trait anxiety, as measured by the STAI, although the scores of all subjects did reflect a decrease on this dimension. Interestingly, they did not find a correlation between aerobic fitness level and improvement on the psychological measures, suggesting that the mechanism responsible for decreases in anxiety is not improved cardiorespiratory fitness.

Research has also been conducted to examine the acute effects of aerobic exercise on mood. Roth (1989) compared active and inactive college students who participated in a single 20-minute exercise trial to control subjects using the POMS. Although the scores of the subjects in the exercise group reflected decreases on the tension/anxiety portion of the POMS compared to the control subjects, there were no significant differences between active and inactive subjects on any measures. Steptoe and Cox (1988) compared fit and unfit women participating in high and low intensity
exercise trials using the POMS. The level of exercise intensity was determined by the
resistance used for the exercise bicycle. They found that brief strenuous exercise
resulted in increased feelings of tension/anxiety, while low intensity exercise was
associated with small improvements in vigor and exhilaration. This finding was true
for both fit and unfit subjects.

Research also has shown that exercise is effective in reducing stress. Pavett,
Butler, Marcinik, and Hodgdon (1987) examined the effects of exercise on work-
related stress in Navy and Marine Corps men on a Navy vessel. They compared 111
men who participated in a 12-week circuit weight-training exercise program to 134
controls on a questionnaire measure of perceived quantity and frequency of job stress.
They found that despite the fact that the crew failed a training assignment which
resulted in their return to sea for an extended period of time, the exercisers' job stress
scores were decreased following the exercise program. The authors suggested that
these data provide evidence for a buffering effect of exercise on job-related stress.

In support of this argument, Brown and Siegal (1988) have shown that
negative life events have less of an impact on adolescents who exercise regularly.
They compared non-exercising adolescents to those who exercised regularly on
reactivity to negative events over the course of a year. They found that the exercisers
reported that the negative events had less of an impact on them. However, the
evidence for the positive effects of exercise on perceived stress is inconsistent. One
study (Sinyor, Golden, Steinert, & Seraganian, 1986) found no change in scores on
the Daily Hassles and Uplifts Scale (DeLongis, Coyne, Dakof, Folkman, & Lazarus,
1982), The Hopkins Symptom Checklist (Derogatis, Lipman, Rickels, Uhlenhuth, &
Covi, 1974) and a self-rating of coping skills (Pearlin & Schooler, 1978) following a
10-week aerobic training program. However, these conclusions are based only on
measures taken pre- and post-exercise training. It is possible that subjects' responses
to stress did change as a result of the exercise program but were not detected due to the limited number of assessment opportunities.

Regular exercise has also been shown to have a positive impact on depression. Doyne, Chambless, and Beutler (1983) examined the effectiveness of exercise in the treatment of 4 depressed women. They utilized an attention-placebo baseline treatment, consisting of "subliminal assertiveness training" (p. 436) which was followed by a 6-week aerobic exercise program. The results indicated a significant reduction in depression with the exercise condition as compared to the placebo-control condition. Research also suggests that exercise may be as effective in the treatment of depression as more traditional treatment approaches (Klein et al., 1985). Comparisons between running therapy, meditation-relaxation therapy, and interpersonal/cognitive group therapy revealed that all three approaches were equally effective in reducing depression.

Research in this area has also focused on the question of whether the aerobic component is necessary to produce decreases in depression. Doyne, Ossip-Klein, Bowman, Osborn, McDougall-Wilson, and Neimeyer (1987) compared the effectiveness of aerobic and anaerobic exercise programs in treating women diagnosed with major or minor depressive disorder. They found that both the subjects in the running and weight-lifting groups showed significantly greater reductions than controls in depression on a variety of measures. However, this study did not include a measure of cardiovascular fitness, so it is not clear to what extent either group achieved an aerobic effect. In an effort to clarify the importance of the aerobic component of exercise, Martinsen, Hoffart, and Solberg (1989) compared a walking/jogging program to a strength/flexibility program. They found that both training programs produced similar reductions in depression and that improvements in cardiovascular functioning were not correlated with decreases in depression.
In summary, the evidence for some positive psychological effects of aerobic exercise appears to be consistent. Aerobic exercise consistently has been shown to decrease tension, anxiety, and mental confusion. There is some support for improvements in feelings of happiness, security, joining, control, and stability as a result of participation in aerobic exercise. There is conflicting evidence for a positive effect of aerobic exercise on fatigue. In addition, there is some evidence for a "buffering" effect of exercise on stress. Finally, both aerobic and anaerobic exercise have been shown to be as effective or more effective in decreasing depression as relaxation training and psychotherapy.

The Effects of Exercise on Sexual Desire

Exercise has long been reported anecdotally to enhance sexual desire and sexual functioning (e.g., Cooper, 1982). However, only recently has the popular media begun reporting on the sexual benefits of exercise: Redbook (Howard, 1992), Vogue (1985), and Bicycling (Pena, 1989) have all featured articles recently. Researchers have also begun to address the question from a more scientific viewpoint. DeVillers (1989) surveyed 8,000 women and found that 83% reported exercising aerobically three times a week for a minimum of 3 months. Of this group, 25% indicated that they have experienced increased sexual desire following workouts. In addition, 40% reported being more easily aroused, 31% said they have sexual intercourse more often, 25% reported they reached orgasms more quickly, and 5% indicated that their orgasms were more intense. However, these conclusions are based on retrospective survey data and should be viewed cautiously.

The results from another more rigorous study examining the relationship between sexual functioning and exercise in women did not support the conclusions drawn from DeVillers' survey research. Kolean-Burley (1992) compared female
exercisers to nonexercisers on several questionnaire measures of sexual functioning and arousability. Sexual arousability was also assessed through two extragenital physiological measures during exposure to erotic stimuli. Exercise frequency was determined by self-report. I found no differences between the two groups on any of the measures of sexual functioning or arousability. However, the data suggested that the two groups were not substantially different with respect to exercise frequency. Furthermore, the accuracy of these data are suspect since this measure was based only on self-report.

There is also some research which suggests a relationship between exercise and sexual functioning in men. Weismier, Forsythe, Sundstrom, Ullis, and Hertz (1986) found that college men who did not participate in college sports and college athletes had different perceptions about sex. They administered an 80-item questionnaire about sexual concerns to 582 college men and found that 41% of the non-athletes reported having "sexual concerns." whereas only 33% of the athletes reported sexual concerns. The authors speculated that this difference could be attributed to the "macho" attitude of the athletes and/or the locker room social pressures to maintain a particular sexual profile; however, it is possible that this difference could be attributed to exercise participation.

There is also some evidence that exercise is effective in enhancing sexual functioning in older adults. Whitten and Whiteside (1989) interviewed male competitive swimmers ranging in age from 40 to 70. They found that 97% of the subjects in their 40s and 92% of those in their 60s reported that they were sexually active, with a frequency of sexual intercourse average for both groups of about 7 times per month. Interestingly, the results of this study also showed that subjects who swam more than 18 hours per week reported diminished sexual desire. Thus, the relationship between sexual functioning and exercise may be mediated by variables
such as fatigue or the total time commitment to exercise. However, it should be noted that these conclusions are based on research employing a pre-experimental design.

Only one study has directly assessed the impact of exercise on sexual functioning. White, Case, McWhirter, and Mattison (1990) compared previously sedentary men who participated in a 9-month aerobic exercise program to men who participated in a nonaerobic walking program on a variety of factors, including sexual functioning. Subjects completed diaries which included descriptions of exercise, smoking, diet, and sexual behaviors. The results indicated significantly greater enhancement in sexual responsiveness and function in the aerobic exercise group. Aerobic exercisers reported increases in frequency of intimate activities and percentage of satisfying orgasms. They also reported decreases in the percentage of times they experienced difficulty in achieving an erection, as well as decreases in sexual dissatisfaction. Although changes in sexual desire, defined as the frequency of major sexual fantasies, orgasms desired, and intercourse desired, were not significantly different between groups, the degree of improvement in sexual desire was correlated with the degree of improvement in individual fitness. The authors also indicated that several subjects spontaneously postulated that their increased sexual interest was due to changes in the way they viewed their bodies following completion of the exercise program. The results of this study would suggest that aerobic exercise may in fact impact sexual functioning in men. However, White and his colleagues did not include women in their study, nor are there any studies to date which examined the effects of exercise on sexual desire in women. Additionally, all information concerning sexual functioning in the study by White and his colleagues was obtained from subject diaries rather than from standardized inventories of sexual functioning.
The purpose of the present study is to evaluate the effects of regular aerobic exercise on sexual desire in women. It was hypothesized that previously sedentary women who meet the DSM III-R criteria for Hypoactive Sexual Desire Disorder and who participate in a regular aerobic walking program will report increased sexual desire, including increases in the frequency of initiation of and responsivity to sexual activity with their partners and increased frequency of sexual fantasy. A secondary hypothesis predicted that women who report improvement in sexual desire will also demonstrate higher levels of body satisfaction.
METHOD

Subjects

Subjects were 7 non-menopausal heterosexual women between the ages of 25 and 55 and their mates. All subjects were involved in an ongoing sexual relationship with a duration of at least 3 months and were cohabiting with their sexual partner. Subjects were recruited through newspaper advertisements soliciting sedentary females experiencing decreased sexual desire, referrals from local gynecologists, and advertisements posted at a local women's festival (see Appendix A).

All female subjects met the DSM III-R criteria for Hypoactive Sexual Desire Disorder (see Appendix B for interview questions). Subjects who also met the criteria for other sexual dysfunctions were not eligible for participation. An inclusion score of 100 or more for each female subject and her partner on the Dyadic Adjustment Scale (Spanier & Cole, 1974) was used to screen for relationship dysfunction. Female subjects whose scores exceeded 50 on the Self-Rating Depression Scale (Zung, 1965) were not included in the study. Women whose partners were unwilling to participate in the study also were excluded.

Setting

Subjective measures were completed during the initial meeting in a large laboratory room containing a chair and table. Fitness testing was completed in the same laboratory room by the researcher and/or her assistants. Subjects exercised by walking at parks or inside local shopping malls.
Subjective Measures

General demographic information regarding the length of the sexual relationship, type of relationship (dating, cohabitating, married), number of children living with the subject, income, and education level was assessed by the General Information Form (see Appendix C).

Sexual satisfaction and functioning were assessed with the Sexual Interaction Inventory (SII) (LoPiccolo & Steger, 1974). The SII consists of a list of 17 heterosexual behaviors, with 6 questions pertaining to each behavior. When used to assess a couple's sexual functioning, responses from each member of the couple are summed across all 17 behaviors and the totals are used to create an 11-scale profile. The SII discriminates between sexually dysfunctional heterosexual couples and satisfied normals. For the purpose of this study, only the Self-Acceptance subscale for females and the Mate-Acceptance subscale for males was used. The Self-Acceptance subscale for females provides a measure of "ideal" versus current sexual functioning to measure sexual desire. On this subscale, high scores on a scale of 0 to 85 indicate that the individual would like to experience more pleasure from sexual activities than she does currently. The Mate-Acceptance subscale for males provides a measure of the male's perception of his partner's sexual responsivity. On this subscale, high scores on a scale of 0 to 85 indicate that the individual perceives his partner to be sexually unresponsive. These two subscales individually have test-retest reliability correlations of .713 and .902, respectively.

Although these correlations are significant at the 0.05 level or better, the SII appears to be a somewhat reactive test. LoPiccolo and Steger (1974) suggested that individuals are likely to alter their report of their sexual behavior simply as a result of
keeping records of it. However, Bellack and Hersen (1988) suggested that the scores on behavioral inventories usually will stabilize with repeated assessment.

The frequency of initiation of sexual activity by both the subjects and their partners and the frequency of female sexual responsiveness to the male partner's sexual advances were assessed by the Sexual Activity Form (SAF), which was developed for the purpose of this study (see Appendix D). The Self-Initiated score from the SAF is the female's report of her frequency of sexual initiation and is obtained from the response to question 1 ("How many times in the past week have you initiated sexual contact with your mate?"); the Partner-Initiated score is her partner's report of her frequency of sexual initiation, obtained from the response to question 3 ("How many times in the past week has your mate initiated sexual contact with you?"). The Responsivity score is the female's report of the number of times she was interested in her partner's sexual advances, obtained from the response to question 4 ("Out of the times your mate initiated sexual contact, how many times were you interested?"); the Partner-Response score is the male's report of the number of times his wife responded to his sexual advances with interest, which consists of the response to question 2 ("Out of the times you initiated sexual contact, how many times did your mate respond as if she/he were interested?").

The Body-Cathexis Scale (BCS) (Secord & Jourard, 1953) was used to assess body image satisfaction. Body image satisfaction was assessed pre- and post-treatment to explore further any relationship that may exist between sexual desire and satisfaction with body image. The BCS consists of a list of 45 body parts which respondents rate with the use of a 5-point Likert scale which ranges from "Have strong feelings and wish change could somehow be made" to "Consider myself fortunate." The BCS has split-half reliability of .83 for females but no validity data are available. In addition, there are no normative data for the population at large.
The Medical History Questionnaire was used to assess general health (see Appendix E). It contains questions regarding medication use, alcohol and other drug use, and chronic diseases.

Report forms with spaces for recording exercise type, duration and date outside of experimental sessions were provided for subjects (Appendix F).

The Dyadic Adjustment Scale (DAS) (Spanier & Cole, 1974) was used to assess each couple's relationship. The DAS is a 32-item inventory that assesses the quality of marital adjustment through questions concerning satisfaction, consensus, cohesion, and affectional expression in marriage and other dyads. The DAS has a test-retest reliability coefficient of .96 and concurrent validity coefficient of .86 among married respondents and .88 among divorced respondents.

The Self-Rating Depression Scale (SDS) (Zung, 1965) was used to screen for depression. The SDS contains 20 items which measure the presence and severity of three aspects of depression including pervasive affect, physiological concomitants, and psychological concomitants. Respondents rate each item on a sliding scale of how it applies to them at the time of testing. Although reliability data are not available, the SDS distinguishes between depressed and nondepressed samples.

A behavioral counter worn on the wrist was used by female subjects to record the frequency of sexual thoughts. The frequency display on the counter was covered to prevent any reactivity which could result from knowing the number of thoughts already recorded. In addition, the Sexual Thoughts Matrix was used by female subjects to record other relevant dimensions of sexual thoughts, including the positive, neutral, or negative nature of the thought, whether it is a physical sensation, an emotional response, or a cognition (see Appendix G). This form also included a space for the intensity of the thought.
Physiological Measures

Fitness testing was accomplished through the use of a Monark 818E bicycle ergometer. During fitness testing in the laboratory, heart rate was monitored with the Polar Pacer Heart Rate Monitor, Model 145930.

Estimates of percent body fat were made with Lange skin calipers as a benefit to subjects. This instrument is used to measure the thickness of a fold of skin at specified body sites that reflects the amount of subcutaneous fat present.

Procedure

Volunteers were solicited through an advertisement placed in the local newspaper requesting responses from sedentary females who were experiencing decreased sexual desire. In addition, local gynecologists provided information about the study, including the telephone number of the researcher, to appropriate patients. Interested women telephoned the Clinical Research Laboratory and left their name and telephone number. The researcher contacted potential subjects and provided the following description of the study:

This study is investigating the effects of exercise on psychological functioning and sexual desire in women. To be involved in this study, you must be between the ages of 25 and 60; you must be involved in an ongoing sexual relationship with a duration of at least 3 months; you must be living with your partner; you must be experiencing decreased sexual desire; and you must be a person who does not exercise more than twice per month (exercise includes walking (to exercise, not daily locomotion), running, bicycling, aerobicising, toning, weight lifting, swimming (laps), tennis, racquetball, or other activities which are commonly considered to be exercise). Participation in this study would involve exercising by walking for 30 minutes, three times per week for 8 weeks, and you and your mate completing a questionnaire about your sexual desire on a weekly basis. In return for your participation, you will receive free fitness testing, including an estimate of percent body fat, motivation to exercise on a regular basis, and $25 at the conclusion of the study. Do you think you would be interested in participating?
Candidates who met these criteria and who expressed interest in participating in the study were asked to schedule an appointment to come to the laboratory with their partners to receive more information. At this meeting, potential female subjects signed the informed consent form (see Appendix H), completed the interview with the researcher, the Self-Rating Depression Scale, the Dyadic Adjustment Scale, and the Medical History Questionnaire to determine eligibility for participation. The partners signed the informed consent form and completed the Dyadic Adjustment Scale.

Eligible candidates provided the researcher with a list of times during which they were available for exercise. Female subjects were instructed not to change their current level of exercise. Prior to the first session, female subjects were required to provide the researcher with a signed form from their physician indicating her/his permission to initiate a walking program and participate in sub-maximal fitness testing (see Appendix I). Finally, an appointment for the first session was scheduled and subjects were given instructions to wear appropriate clothing for fitness testing.

The first session consisted of the female subject coming to the laboratory for fitness testing. First, an estimate of percent body fat was made using skin calipers. Measurements were taken at three body sites, including the right tricep, the right suprailliac, and the front of the right thigh. At each site, three measures were taken and averaged. The three averaged measures were summed and percent body fat was estimated according to the Jackson-Pollock Formula (Jackson & Pollock, 1978).

Following the estimate of percent body fat, the bicycle ergometer seat was adjusted according to the subject's height. The researcher instructed the subject in attaching the heart rate monitor, which was strapped to the chest with a wide elastic band with the electrode placed beneath the breast bone. The starting resistance on the bicycle ergometer was set at .5 kilopons for all subjects regardless of fitness level. The subject was instructed to pedal at a constant speed, maintaining a rate of 50
revolutions per minute according to the built-in monitor on the ergometer. Heart rate was monitored at this resistance for 3 minutes and recorded at the end of this 3 minutes.

Following the Y's Way to Physical Fitness (Golding, Myers, & Sinning, 1989) fitness testing protocol, the tension for the second workload was determined by the heart rate at the end of the first workload and adjusted accordingly, while the subject continued pedaling. The subject continued pedaling for 3 minutes at the second workload. Again, at the end of 3 minutes, heart rate was recorded and used to determine the workload for the final 3 minutes. At the conclusion of the third workload, the heart rate was recorded and the subject was instructed to pedal slowly for several minutes in order to cool down. At all times during fitness testing, the subject was monitored visually for signs of fatigue and/or difficulty in breathing.

Following fitness testing, each subject was given her fitness results, including her raw scores and her fitness rating according to the Astrand and Ryhming formula (Astrand & Ryhming, 1954).

Following fitness testing, the subject was given a folder containing 30 copies of the SII, 15 of which were labeled with her subject code and 15 of which were labeled with her partner’s subject code. The folder also contained 30 copies of the Sexual Activity Form, with 15 copies labeled with her subject code and 15 labeled with her partner’s subject code. Twenty stamped and addressed envelopes for mailing the forms during the baseline period also were included in the folder. She was instructed to complete one copy of the SII and one copy of the Sexual Activity Form at the same time each week and to ask her partner to do the same. In addition, each subject and her partner were asked not to share their responses on the inventories with each other. Separate envelopes were provided to allow the subject and her mate to mail the forms in to the researcher individually during the baseline period. During the
8-week intervention period, each subject returned her completed questionnaires and her partner's questionnaires to the research assistant at the beginning of each walking session. In order to insure confidentiality of the partners' data, partners were instructed to place their questionnaires in a sealed envelope and sign their names across the seal.

The subject was also given the wrist counter for recording the frequency of sexual thoughts, the Sexual Thoughts Matrix Forms for recording other dimensions of the sexual thoughts, and an instruction sheet which was reviewed with the subject (Appendix J). Each subject was instructed to wear the counter for one weekday within the first week of meeting with the researcher, from the time she arose in the morning until she retired at night. Each subject was requested to complete the Sexual Thoughts Matrix Forms on the next consecutive day.

Following the instructions for the SII, the SAF, the sexual thoughts counter, and the Sexual Thoughts Matrix Forms, the researcher described the exercise program. The subject was told that the walking program would consist of walking for 30 minutes at a time, 3 times per week either at a nearby park or inside a local shopping mall, depending on the subject's preference. Each subject was assigned a research assistant who served as a walking companion to insure adherence to the exercise program. The assistant was introduced to the subject and together they coordinated their schedules to develop a regular time for walking.

Subjects participated in the walking exercise program for an 8-week period. Subjects were allowed to begin the program after scores on the SII and SAF had stabilized. The research assistant met the subject at the park or shopping mall and was responsible for timing the walking session and setting the walking pace. In order to guarantee that each walking session constituted aerobic exercise, the research assistant recorded the subject's heart rate after 5, 15, and 25 minutes of walking.
during each session. Subjects walked at a pace that kept their heart rate between 65% and 85% of their predicted maximum heart rate, which was calculated for each subject by subtracting her age from 220. The research assistant also collected the exercise frequency forms and other questionnaires from the subject. Research assistants were instructed to avoid discussing any aspect of the study with the subject, although friendly conversation was permitted.

In the last week of the exercise program, the research assistant gave each subject the sexual thoughts counter, Sexual Thoughts Matrix Forms, and instructed them to record the information as they had done previously over the course of two full weekdays. Subjects were instructed to return the form to the researcher when they returned for fitness testing.

Following the completion of the 8-week walking program, subjects scheduled an appointment to come to the laboratory for Session II. This session included fitness testing and administration of the Body Cathexis Scale. Following the fitness testing, subjects were given their raw fitness scores, fitness level ratings, and $25.00 for participating in the study.

Dependent Variables

Subject scores and the scores of their mates on the Sexual Interaction Inventory and the Sexual Activity Form, as well as the overall frequency of sexual thoughts and frequency of positive, neutral, and negative thoughts as measured by the sexual thoughts counter and matrix forms were used to assess the effects of the walking program on sexual desire in female subjects.
Research Design

A multiple baseline design across subjects was used to assess the effects of exercise on sexual desire. Baselines were staggered from 0-12 weeks, with an average of approximately 5 weeks between baselines, to allow independent replication of the treatment's effect upon the dependent variables. The administration of the independent variable (exercise) for each subject occurred after the subject's scores on the Self-Acceptance subscale of the SII and the scores on the SAF had stabilized.
RESULTS

Data Analysis

The effects of the aerobic walking program on sexual desire in women diagnosed with HSDD were assessed by visual inspection of the data for each individual subject and by calculating descriptive statistics for subjects as a group.

Subject Characteristics

All subjects met the criteria for a diagnosis of Hypoactive Sexual Desire Disorder, with 5 being further classified as acquired (developing after a period of normal functioning), generalized, (subjects 1, 3, 5, 6, 7) and 2 subjects being identified as acquired, situational (limited to certain situations or with certain partners) (subjects 2, 4). Subjects ranged in age from 25 to 55, with a mean of 40 and modes of 32 and 42. All subjects had been married to their partners for between 5 and 19 years, with a mean duration of relationship of 11.6 years. Two subjects had 2 children living with them (ages 8 months and 4 years, and 2 and 5 years, respectively), and 2 subjects had 1 child living with them (ages 13 months, and 20 years, respectively.) Three subjects were employed full time, and the remaining 4 subjects were unemployed. Household income ranged between $25,000-34,000 and greater than $55,000, with a modal income range of $35,000-44,000. One subject had completed some graduate school, 2 were college graduates, 2 had completed some college, and 2 were high school graduates. Table 1 summarizes the scores for all subjects on the SDS and the DAS. All subjects demonstrated 50% or less of the
depression measurable by the SDS, placing them in the normal to minimal range of depression. All subjects exceeded the cut-off of 100 on the DAS.

Table 1
Scores for Screening Measures

<table>
<thead>
<tr>
<th>Subject</th>
<th>SDS</th>
<th>DAS</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>122</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>136</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>48</td>
<td>133</td>
<td>138</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>114</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>49</td>
<td>139</td>
<td>134</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>143</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>121</td>
<td>124</td>
<td></td>
</tr>
</tbody>
</table>

Self-Report Measures of Sexual Desire

Table 2 summarizes the overall mean female Self-Acceptance and male Mate-Acceptance subscale scores for all subjects from the SII. Scores on the SII were obtained by summing the responses of each member of the couple across all 17 behaviors to derive an 11-scale profile. For the purpose of this study, only the scores from subscale 4, Self-Acceptance for females, and subscale 9, Mate-Acceptance for males were used in data analysis. The mean for the Mate-Acceptance scores is calculated on only 6 partners' responses since the partner for subject 5 was unable to complete the SII after the second week of baseline due to time constraints. Overall,
female sexual desire, as measured by the Self-Acceptance subscale, increased from baseline to treatment, whereas their partners' appraisals of their sexual desire remained essentially unchanged. LoPiccolo and Steiger (1974) reported that the mean Self-Acceptance score for sexually satisfied women was 6.79; the pre-treatment mean Self-Acceptance score for women presenting with a sexual dysfunction was 15.74, with an improvement to a post-treatment mean of 7.56. The mean Mate-Acceptance subscale score for sexually satisfied men was 10.00, with a pre-treatment mean of 21.25 for men presenting with a sexual dysfunction and a post-treatment mean of 8.81.

Table 2 also summarizes the mean Sexual Initiation, Sexual Responsivity, Partner Initiated, and Partner Response scores from the Sexual Activity Form during baseline and treatment. The scores for these measures reflect the average frequency per week for all subjects. Overall, the average frequency of female sexual initiation remained unchanged during baseline and treatment at approximately once every 5 weeks.

Figure 1 shows scores on the SII for individual female subjects and their partners during baseline and treatment. As predicted, some subjects displayed initial reactivity to recording information about sexual behavior. On the Self-Acceptance subscale of the SII for females, all subjects showed mild improvements in the average scores from baseline to treatment periods, whereas only 4 of the 6 partners' scores demonstrated increases in the Mate-Acceptance subscale.

Figure 2 shows Sexual Initiation scores from the SAF for individual female subjects. Figure 3 shows Partner-Initiated scores from the SAF for individual male subjects. Figure 4 shows the Responsivity scores from the SAF for individual female subjects. Female sexual responsivity increased from approximately once every 4
Table 2
Means of Self Report Measures of Sexual Desire

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SII</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Acceptance</td>
<td>11.1</td>
<td>5.7</td>
</tr>
<tr>
<td>Mate-Acceptance</td>
<td>20.2</td>
<td>20.5</td>
</tr>
<tr>
<td><strong>SAF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Initiated</td>
<td>.21</td>
<td>.20</td>
</tr>
<tr>
<td>Responsivity</td>
<td>.23</td>
<td>.34</td>
</tr>
<tr>
<td>Partner-Initiated</td>
<td>.22</td>
<td>.19</td>
</tr>
<tr>
<td>Partner-Response</td>
<td>.21</td>
<td>.36</td>
</tr>
</tbody>
</table>

weeks on average during baseline to once every 3 weeks on average during treatment. Figure 5 shows Partner-Response scores from the SAF for individual male subjects. Overall, 3 female subjects reported increases in the frequency of sexual initiation, 1 did not change, and 3 subjects indicated decreases in frequency; however, their partners disagreed, with only 2 indicating increases in the frequency of female sexual initiation and 5 reporting decreases. On the measure of female sexual responsivity, 5 female subjects reported improvements, with 1 reporting no change, and 1 indicating a decrease in frequency, whereas the partners' report indicates that 6 of the 7 females increased in the frequency of responsivity.

Table 3 summarizes the frequency of sexual thoughts obtained from the behavioral counter and Sexual Thoughts Matrix Forms (STMF) for each subject pre- and post-treatment. Overall, the mean number of sexual thoughts for all subjects
Figure 1. Sexual Interaction Inventory Scores for Individual Subjects.
Figure 1-Continued
Figure 1-Continued

Figure 2. Frequency of Female Sexual Initiation for Individual Subjects.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 2-Continued
Figure 2-Continued

Figure 3. Male Report of Frequency of Female Sexual Initiation for Individual Subjects.
Figure 3-Continued
Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 4. Frequency of Female Sexual Responsivity for Individual Subjects.
Figure 4-Continued
Figure 4-Continued

Figure 5. Male Report of Frequency of Female Sexual Responsivity for Individual Subjects.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 5-Continued
increased from 1.6 thoughts per day pre-treatment to 2 per day post-treatment.

Table 4 represents the summary matrices pre- and post-treatment containing the mean number of positive, neutral, and negative sexual sensations, emotions, and thoughts for all subjects. Overall, the mean total number of sexual sensations, emotions, and thoughts recorded on the Sexual Thoughts Matrix Forms decreased from a mean of 6 per day pre-treatment to 3 per day post-treatment; however, the number of positive private sexual experiences recorded on the STMF increased from 47% pre-treatment to 69% post-treatment. There was also a corresponding decrease
in the number of negative ratings from 26% pre-treatment to .09% post-treatment.

Neutral private experiences also decreased slightly from 26% pre-treatment to 22%

Table 3

Table 3 summarizes the VO2 Max scores obtained for 6 of the 7 subjects pre-and post-treatment. Fitness testing was not completed for Subject 4 since she was unable to obtain permission from her physician to complete fitness testing following an episode of dizziness and shortness of breath during a stress test one year prior to this study. All but 1 subject who completed fitness testing demonstrated

<table>
<thead>
<tr>
<th>Subject</th>
<th>Baseline</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>
improvement, with an increase from a mean VO2 Max of 24.6 pre-treatment to a mean of 27.0 post-treatment. This improvement corresponds to a 9.8% change in

Table 4
Summary Sexual Thoughts Matrices

<table>
<thead>
<tr>
<th></th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S  E  T*</td>
<td>S  E  T</td>
</tr>
<tr>
<td>Positive</td>
<td>4 10 13</td>
<td>2 4 10</td>
</tr>
<tr>
<td>Neutral</td>
<td>2 5 8</td>
<td>0 2 3</td>
</tr>
<tr>
<td>Negative</td>
<td>0 4 11</td>
<td>0 0 2</td>
</tr>
</tbody>
</table>

*S=Sensation, E=Emotion, T=Thought

VO2 Max scores across subjects. In addition, 4 subjects lost weight (3, 4, 11, and 3 pounds), 1 subject gained weight (1 pound), and 1 subject's weight remained the same.

Other Self-Report Measures

Scores on The Body-Cathexis Scale (BCS) (Secord & Jourard, 1953) were calculated by summing the ratings of the 45 body parts, which respondents rate with the use of a 5-point Likert scale which ranges from "Have strong feelings and wish change could somehow be made" to "Consider myself fortunate," and dividing by 45 to arrive at the mean rating. Higher scores reflect more body satisfaction. Overall, subjects demonstrated a slight increase in body satisfaction from a mean of 2.6 pre-treatment to 2.8 post-treatment. Table 6 summarizes the BCS scores pre- and post-treatment for individual subjects.
Table 5
VO2 Max Scores

<table>
<thead>
<tr>
<th>Subject</th>
<th>Baseline</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>26.5</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>14.6</td>
</tr>
<tr>
<td>7</td>
<td>34</td>
<td>36</td>
</tr>
</tbody>
</table>

Outcome by Diagnostic Classification

With respect to outcome by the further diagnostic classification of HSDD, the mean score on the Self-Acceptance subscale of the SII improved from 10.14 during baseline to 5.84 during treatment, whereas the 2 subjects whose low sexual desire was classified as situational improved from 13.5 during baseline to 5.0 during treatment. On the measure of sexual initiation, those who were identified as generalized remained unchanged throughout baseline and treatment with a mean of .17 initiations per week, whereas the subjects diagnosed as situational remained about the same from .33 during baseline to .31 initiations per week during treatment. Finally, subjects classified as generalized showed improvement on the measure of sexual responsivity from .24 to .33 times per week, while those whose low desire was described as situational improved from .20 to .38 positive responses per week.
Table 6
BCS Scores

<table>
<thead>
<tr>
<th>Subject</th>
<th>Baseline</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>2.6</td>
<td>2.8</td>
</tr>
<tr>
<td>3</td>
<td>3.3</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>2.6</td>
<td>2.8</td>
</tr>
<tr>
<td>5</td>
<td>3.1</td>
<td>4.3</td>
</tr>
<tr>
<td>6</td>
<td>2.9</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>3.7</td>
<td>3.6</td>
</tr>
</tbody>
</table>
DISCUSSION

This study assessed the effects of regular aerobic exercise on sexual desire in women diagnosed with Hypoactive Sexual Desire Disorder during a no-exercise baseline period and an 8-week walking program. The results of the study generally support the prediction that women who meet the DSM-III-R criteria for Hypoactive Sexual Desire Disorder and who participate in a regular aerobic walking program will report increased sexual desire, as measured by increases in the frequency of responsivity to sexual activity with their partners and increased frequency of sexual fantasy. The prediction that the women would report increases in the frequency of sexual initiation with their partners was not supported overall, although some subjects did demonstrate such improvements. The prediction that women who reported improvement in sexual desire would also demonstrate increases in body satisfaction was also not supported.

The results of treatment were modest overall, with 100% of female subjects reporting mild improvements in sexual desire as measured by the SII, but only 43% reporting minor increases in sexual initiation, and 71% reporting increases in sexual responsivity. A question arising from the moderate effects shown in this study concerns the amount of improvement that should be expected as a result of treating this particular sexual dysfunction. A study of traditional sex therapy treatment outcome for women with low sexual desire by Schover and LoPiccolo (1982) showed increases in overall sexual satisfaction, initiation of sexual activity, positive responses to a spouse's sexual advances, and masturbation for subjects who had an initial low frequency. However, they noted that despite the impressive improvement in sexual desire for most of the sample, the typical couple "is not describing a life of sexual
ecstasy" (p. 196); rather, treatment appears to produce only an absence or reduction of distress. Although no changes were shown in the average frequency of female sexual initiation in this study, the frequency of female sexual responsivity, at approximately once every three weeks on average seen during treatment, suggest a picture similar to that described by Schover and LoPiccolo.

One possible reason for the mild treatment effects may have been that the walking program used was low level aerobic exercise, with most subjects exercising at 65-75% of predicted maximum heart rate. The average VO2 Max score of 27.0 following completion of the walking program still would be categorized as Poor to Below Average in terms of fitness level (Golding, Myers, Sinning, 1989). Although the walking program did produce improvements in the fitness level in 5 of the 6 subjects who completed fitness testing, the improvements in sexual desire shown in this study are less impressive than those reported in a similar study of men. Previous research with men, which demonstrated significant improvements in sexual functioning and reported a positive correlation between improvement in sexual desire and cardiovascular fitness level, employed a high level aerobic running program (White, Case, McWhirter, & Mattison, 1990). It is possible that increasing the level of aerobic exercise may have resulted in corresponding improvement in sexual desire in women. However, given that all subjects had been sedentary prior to their participation in this research, the walking program used in this study provided them with a safe, achievable exercise program. Future research should address the possibility of differential effects of exercise on the sexual desire of men and women.

Another potentially critical element of this treatment program was the subjects' expectations about treatment. The purpose of the study was not camouflaged in any way during subject recruitment, baseline, or treatment periods and therefore may have influenced the results of the study. Informal comments made
during walking sessions and reported by the research assistants who walked with the subjects suggest that most subjects believed that the walking program would increase their sexual desire. One notable exception was Subject 1, who clearly and correctly predicted against anything improving her level of sexual desire, although her scores on the SII did demonstrate some very mild improvement. Subject expectations for treatment outcome were not measured directly. However, this study was designed in this way so that the results could be compared with those achieved in outpatient treatment settings; the rationale for not attempting to counteract or decrease the effects of expectancy on treatment outcome was that when clients enter into traditional treatment for sexual dysfunction, the same expectations are present. For the purposes of increased understanding of the specific effects of exercise on sexual desire in this population, future research should attempt to decrease the influence of expectancy on outcome.

Although the overall improvements in sexual desire for female subjects as measured by the SII were mild, the average score for the treatment period was 5.7. This actually indicates a higher level of pleasure obtained from sexual activity than the mean score of 7.56 for female clients diagnosed with a variety of sexual dysfunctions following traditional sex therapy and even that for satisfied normals of 6.79, in LoPiccolo and Steger's study (1974). However, their partners' average score during treatment of 20.5, indicating a perception of their partner as being much more sexually unresponsive, is higher than the post-treatment males in LoPiccolo and Steger's study, whose average score was 8.81; in fact, the partners' scores in this study are more consistent with the average score for male clients pre-treatment of 21.25. One possible explanation for this lack of improvement may have arisen from a change in the male partners' expectations of their wives' sexual participation. Given the willingness of their partners' to participate in an experimental treatment of low sexual
desire, the male subjects may have anticipated greater improvement than was shown. Although there were no interviews post-treatment with the male partners in this study, their expectations for treatment may be a fruitful area of investigation for future research.

With respect to the high level of satisfaction with their current level of sexual desire reported by the female subjects, one reason for this may arise from the phrasing of the questions on the SII for this subscale. The questions on the SII instruct the subject to indicate how she "currently finds" a particular activity and how she "would like to find" this activity. Although this measure has been cited by Leiblum and Rosen (1988) and by Leiblum, Bachman, Kemmann, Colburn, and Swartzman (1983) as an accurate indicator of level of sexual desire, it may be the case that for women with a low level of sexual desire, the answer for these two questions is the same. This produces a low score, which would indicate a high level of consistency between "real" and "ideal" self, and consequently a high level of sexual desire. That is, women who have low sexual desire may answer these questions in terms of their current level of sexual desire, without considering what they would like their sexual desire to be.

On a similar note, another possible explanation for the moderate improvements, as well as the initial reactivity noted on the SII for female subjects, concerns their ability to evaluate their own sexual performance. It may be the case that during baseline, subjects may not have had enough experience in rating their sexual desire to do it accurately; however, as their experience increased, their ability to identify their level of satisfaction with their sexual desire may have improved.

It is interesting to consider which aspects of the walking program may function as causal variables in producing the mild increases in sexual desire. Hurlbert (1993) demonstrated a relationship between improvement in sexual desire in women...
with low sexual desire and what he called "orgasm consistency." In this study, a control group of female subjects receiving traditional sex therapy was compared to the experimental group which also was trained in achieving orgasm consistency, defined as increased frequency of and satisfaction with orgasm, as well as increased sexual knowledge and intimacy with a partner. He found that the women in the experimental group showed greater sexual arousal and sexual assertiveness following treatment than did those in the control group. Since orgasm is a physical response involving vasocongestion (via blood flow), it is possible that changes in sexual functioning could result from improvement in the cardiovascular system through aerobic conditioning. Therefore, it is possible that participation in the walking program produced alterations in the frequency of orgasm and level of satisfaction with orgasm. If this were the case, then a corresponding increase in the frequency of orgasm and overall sexual satisfaction should be seen. Although the frequency of orgasm was not assessed, the Pleasure mean subscale of the SII does provide an overall indicator of the level of sexual satisfaction. However, an analysis of these scores revealed no change in sexual satisfaction from baseline to treatment. Thus, it does not appear that improvements in sexual desire were mediated by increases in sexual satisfaction.

Another potential mediating variable which may have contributed to improvements in sexual desire was the regular contact female subjects had with the research assistants who served as their walking partners. Although conversation during the walking sessions was limited to non-sexual topics, several subjects spontaneously mentioned at the end of treatment that having someone to talk to on a regular basis may have contributed to an improvement in their overall mood or "well-being." This, in turn, may have influenced their level of sexual desire. Similarly, as an ample body of research has shown, the aerobic exercise itself may have impacted
positively on mood. Regrettably, depression, which would have tapped into the issue of mood and possible well-being was assessed only for screening purposes; therefore, no comparison score is available post-treatment. Future research which may replicate this study could contribute to the field by monitoring not only depression but also general mood throughout baseline and treatment.

Another question of interest is the relationship between sexual desire and satisfaction with body image. Previous research has suggested that negative body image attitudes were associated with lower levels of sexual satisfaction among college women (Hangen & Cash, 1991). Given this information, body image was assessed in this study as a possible mediating variable; however, no consistent relationship between these two variables was shown. Although 4 subjects did show some improvement on this measure, with 1 subject remaining unchanged and 2 subjects becoming more dissatisfied, the overall average for body image satisfaction prior to baseline was 2.6 with a mild increase to 2.8 post-treatment. This corresponds to a rating of body satisfaction between "Don’t like but can put up with" and "Have no particular feelings one way or the other." It appears that change in body image satisfaction does not correspond reliably with improvement in sexual desire for women diagnosed with HSDD.

In summary, this first study assessing the effects of regular aerobic exercise on sexual desire in women diagnosed with HSDD demonstrated mild improvements in sexual desire. Although the number of subjects studied was small and the level of aerobic exercise was mild, the improvements reported suggest that there may indeed be a significant relationship between exercise and sexuality. Subsequent research should provide further clarification of this connection.
APPENDICES
Appendix A

Advertisement
Non-exercising women who experience decreased sexual desire wanted for research in Western Michigan University Psychology Department. $ and free fitness testing for participation. Call 387-4489.
Appendix B

Diagnostic Interview Questions
Diagnostic Interview Questions

1. Have you ever experienced sexual desire?

2. How do you feel about sex in general?

3. How often do you masturbate?

4. How often do you have sexual intercourse?

5. Do you enjoy sexual intercourse?

6. How often do you have sexual fantasies?

7. What are your sexual fantasies about?

8. Do you love your spouse?

9. Do you find your spouse physically attractive?

10. Is your spouse sexually skilled (good lover)?

11. Why do you think you have low sexual desire?
Appendix C

General Information Form
DATE__________________________________________

SUBJECT CODE_____________________________________

AGE______________________________________________

LENGTH OF RELATIONSHIP____________________________

CHECK THE CATEGORY WHICH APPLIES TO YOUR CURRENT SEXUAL RELATIONSHIP:
   ___ MARRIED   ___ COHABITING

NUMBER OF CHILDREN CURRENTLY LIVING WITH YOU ___

AGES OF CHILDREN____________________________________

CHECK THE CATEGORY WHICH CURRENTLY APPLIES TO YOU:
   ___ EMPLOYED FULL TIME   ___ EMPLOYED PART TIME
   ___ UNEMPLOYED           ___ DISABLED

CHECK THE CATEGORY WHICH DESCRIBES YOUR HOUSEHOLD INCOME:
   ___ $0-14,999              ___ $15,000-24,999
$25,000-34,999     $35,000-44,999

$45,000-54,999     OVER $55,000

CHECK THE CATEGORY WHICH BEST DESCRIBES YOUR LEVEL OF EDUCATION:

SOME HIGH-SCHOOL     HIGH-SCHOOL GRADUATE
SOME COLLEGE         COLLEGE GRADUATE
SOME GRADUATE SCHOOL  MASTER’S DEGREE
Ph.D.                POST DOCTORATE TRAINING

WHAT WAS THE DATE WHEN YOU LAST MENSTRUATED?__________
Appendix D

Sexual Activity Form
Sexual Activity Form

Subject Code_____ 

1. How many times in the past week have you initiated sexual contact with your mate?__________________________

2. Out of the times you initiated sexual contact, how many times did your mate respond as if she/he were interested?___________

3. How many times in the past week has your mate initiated sexual contact with you?__________________________

4. Out of the times your mate initiated sexual contact, how many times were you interested?__________________________
Appendix E

Medical History Questionnaire
Medical History Questionnaire

Regarding your medical/surgical history:

1. Describe your general state of health: __________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. List the medicines that you now take, either regularly or now and then:

__________________________Dosage____Frequency____________

__________________________Dosage____Frequency____________

__________________________Dosage____Frequency____________

__________________________Dosage____Frequency____________

__________________________Dosage____Frequency____________

__________________________Dosage____Frequency____________

3. Alcoholic drinks:
   a. Do you ever take an alcoholic drink in the:
      morning? ___________________________
      almost every morning? ______________
      once or twice a week in the morning? _____
   b. Do you usually have a drink with lunch? ________
c. Do you usually have a drink before dinner?________

d. Do you usually have wine with dinner?________

e. Do you usually have a drink (mixed drink, beer, or wine) in the evening?__________________________

How many?____________________________________

Just before bedtime?__________________________

How many?____________________________________

4. Are you presently under medical care for any condition? Please specify:__________________________

____________________________________________

____________________________________________

____________________________________________

5. Have you ever been diagnosed as having:

___ Diabetes

___ Heart Disease

___ Neurological conditions

___ Endocrine (hormonal) conditions

___ Allergies

___ Genito-urinary conditions

___ Gonorrhea

___ Syphilis

___ Other. Please specify:__________________________

____________________________________________
6. Do you currently use "street drugs" (marijuana, hashish, "speed," "acid," "barbs," etc.)? If so, please specify: _______________________

7. Is intercourse ever painful? If so, explain: ________________

8. What surgical procedures have you had? ____________________
Appendix F

Exercise Report Form
Exercise Report Form

<table>
<thead>
<tr>
<th>Date</th>
<th>Type of Exercise</th>
<th>Duration of Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix G

Sexual Thoughts Matrix Form
Print the letter "L" for "LOW," "M" for "MEDIUM," or "H" for "HIGH," to indicate how strong the sensation, emotion, or thought is for each time.
Appendix H
Informed Consent
INFORMED CONSENT FOR PARTICIPATION IN AN INVESTIGATION

Investigators: Joanne Kolean-Burley, M.A.,
and M. Michele Burnette, Ph.D.

I understand that I am being invited to participate in a research study which will examine the effect of regular aerobic exercise on psychological functioning and sexual desire in women. I also understand that this study will fulfill the dissertation requirement for Joanne Kolean-Burley, M.A.. I understand that participation in this study involves the following:

1. Exercising by walking briskly for 30 minutes at a time, three times per week for eight weeks.
2. Me and my sexual partner completing two questionnaires about my sexual desire on a weekly basis.
4. Completing five questionnaires which ask for general information about me and my feelings, information about my relationship with my sexual partner, and information about how I feel about my body.
5. Keeping a record on four different days of how many thoughts about sex I have.

I understand that in return for my participation I will receive free fitness testing, including an estimate of body fat using skin calipers. I understand that the fitness testing will involve pedaling on a stationary bicycle for approximately 9 minutes while my heart rate and blood pressure are monitored. I understand that the researcher will estimate my percent body fat by loosely pinching together and measuring folds of skin on my tricep, stomach, and thigh. I also understand that this
procedure is not painful. I will also benefit by being encouraged to exercise on a regular basis. Finally, I understand that I will receive $25.00 at the conclusion of the study.

I understand that my participation in this study is voluntary. There is no cost to me for participation. I may withdraw from the study at any time without penalty. I understand that no physical injury is anticipated and that neither the investigator nor Western Michigan University will bear the cost of medical care for any illness or injury which may occur during my participation in this study. The primary benefits to me for participation are free fitness testing, a better understanding of what exercise can do for me, and $25.00 for completing the study.

All information obtained during the course of this study will be held in strict confidence. A code number will be assigned to me and used to identify all information used for the analysis in this research. Name and number codings will be destroyed after analysis of the data. I understand that any questions or complaints that I have now or may have in the future can be answered by contacting Joanne Kolean-Burley, M.A. at 387-4489 or Michele Burnette, Ph.D. at 387-4482. My signature below indicates that I have read and understood the above information and have decided to participate in the study.

Signature of Subject ___________________________ Date __________
INFORMED CONSENT FOR PARTICIPATION IN AN INVESTIGATION

(Partner)

Investigators: Joanne Kolean-Burley, M.A.

and M. Michele Burnette, Ph.D.

I understand that I am being invited to participate in a research study which will examine the effect of regular aerobic exercise on psychological functioning and sexual desire in women. I also understand that this research study will fulfill the dissertation requirement for Joanne Kolean-Burley, M.A..

Participation in this study involves me and my sexual partner completing two questionnaires about my own sexual desire and her sexual desire on a weekly basis for 10 to 16 weeks. I understand that in return for my participation I will be assisting my partner in her participation in this study. I understand that my participation in this study is voluntary. There is no cost to me for participation. I may withdraw from the study at any time without penalty. I understand that my primary benefit for participating in this study is assisting my partner in her participation. I also understand that the only risk to my participation is possible embarrassment. I understand that all information obtained during the course of this study will be held in strict confidence. A code number will be assigned to me and used to identify all information used for the analysis in this research. Name and number codings will be destroyed after analysis of the data. I understand that any questions or complaints that I have now or may have in the future can be answered by contacting Joanne Kolean-Burley, M.A. at 387-4489 or Michele Burnette, Ph.D. at 387-4482.

My signature below indicates that I have read and understood the above information and have decided to participate in the study.
Appendix I

Medical Clearance Form
Dear Doctor:

Your patient ___________________________ (Name of Participant) is interested in participating in a study, which involves sub-maximal fitness testing to evaluate cardiorespiratory fitness and an aerobic walking program.

The fitness test consists of two or three work loads in which the individual will pedal on a stationary bicycle at gradually increasing tension levels while her heart rate and blood pressure are monitored by the researcher. At no point will this activity become too strenuous as physiological responses will be closely monitored by the researcher. If the participant's heart rate exceeds 150 beats/min, the test will be terminated. In addition, if the participant's systolic blood pressure exceeds 200 or the diastolic pressure exceeds 110, the procedure will be terminated. Finally, the participant will be informed of unusual internal stimuli to monitor during the testing procedure (e.g., heavy breathing, perspiring, light-headedness, muscle soreness, joint pain, loss of coordination, tightness in chest). If any unusual symptoms should occur, the participant will be instructed to stop pedaling and inform the researcher.

Participation in the aerobic walking program will involve walking three times per week for thirty minutes at a time for eight weeks. Participants will be accompanied by a research assistant who will assist participants in monitoring their heart rates to achieve an aerobic effect. The target heart rate range will be 65-75% of the maximum heart rate (220 minus the age of the participant) for each participant.

By completing this form, you are not assuming any responsibility for the administration of the fitness testing program.

If you are aware of any medical reason why participation in either sub-maximal fitness testing or the aerobic walking program by this applicant would be
unwise, please indicate so on this form. In addition to your medical approval and recommendations, the participant will be asked to sign informed consent forms prior to engaging in fitness testing or the walking program.

Please release the following information concerning my ability to participate in the fitness testing procedure or the aerobic walking program described above:

Participant’s Signature ______________________________________________
Date ______________________________________________________________

____ I am aware of no reason why the applicant may not participate.
____ I believe the applicant can participate, but I urge caution because:

_________________________________________________________________

_________________________________________________________________

____ The applicant should not engage in the following activities:

_________________________________________________________________

_________________________________________________________________

____ I recommend that the applicant NOT participate.

Physician’s Signature ______________________________________________
Date ______________________________________________________________
Address ___________________________________________________________
City and State _______________________________________________________
Zip ______________________ Telephone _______________________________

If you have any questions, please call: Joanne Kolean-Burley, M.A., or Dr. M. Michele Burnette, (616) 387-4489.
Please mail to: Dr. M. Michele Burnette
Department of Psychology
Western Michigan University
Kalamazoo, MI 49008
Appendix J
Subject Instructions for Recording Sexual Thoughts
INSTRUCTIONS FOR THE SEXUAL THOUGHTS COUNTER
AND MATRIX FORMS

I would like you to click this button every time you notice that you are thinking about sex or having a sexual feeling. Do not include sexual dreams or thoughts feelings you may have while you are having intercourse. I would like you to keep track of your sexual thoughts/feelings for one entire day, from the time you get up until you go to bed.

After the day you use the counter, I would like you to keep track of your sexual thoughts/feelings again but this time I would like you to notice if you are having a physical sensation (you felt physically sexually aroused, like your nipples were hard or you were lubricating), a feeling or emotion that is related to sex (you were feeling affectionate in a sexual way toward someone, like you were feeling "I really love him and I want to make love to him" or you were feeling sexually turned off, like you were feeling sexually aroused toward someone who you don't like or who you are angry with), or a thought about sex (like you were thinking "I want to have a romantic evening and have sex" or "I wonder what his body looks like?" or "I know he's going to want sex tonight and I don't feel like it."). Another way to think of it is to look at where you believe the sexual experience is coming from: your body, your heart, or your head. I would also like you to indicate if the physical sensation, feeling, or thought was positive (or pleasant, a good feeling), neutral (if it was neither pleasant or unpleasant), or negative (if it was unpleasant or a bad feeling). Finally, I would like you to indicate how strong the physical sensation, feeling, or thought was with an "L" for "low," an "M" for "medium," and an "H" for "high." I would like you to write the "L," "M," or "H" in the correct box. Continue writing these letters in the boxes until a box is full; then you may use the next form in the pack until a box on
that page is full. When the day is finished (this would be the second overall day that you recorded), put this packet in your envelope for that week and mail it to me. Bring the counter with you the first time you walk with your partner and give it to her.

**Minireview questions:**

1. I am watching T.V. and I see a man and a woman passionately kissing and I start thinking that my boyfriend and I haven't had sex for two weeks. How would you indicate this on the paper forms?

2. I am driving to work in a hurry because I'm late for an important meeting and to my great dismay, I notice my vagina is throbbing. How would you indicate this on the paper forms?

3. My husband brings me flowers and I suddenly feel a rush of love toward him and want to feel his body against mine. How would you indicate this on the paper forms?

To review, choose two days in a row within the next week to record sexual thoughts. The first day only use the wrist counter. The second day only use the paper forms. Give the wrist counter to your walking partner and mail the paper forms in with your weekly questionnaires.
Appendix K

Human Subjects Institutional Review Board Approval
Date: January 6, 1993

To: Joanne Kolean-Burley

From: M. Michele Burnette, Chair

Re: HSIRB Project Number 92-12-18

This letter will serve as confirmation that your research protocol, "The effects of exercise on sexual desire in women" has been approved after full review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application.

You must seek reapproval for any change in this design. You must also seek reapproval if the project extends beyond the termination date.

The Board wishes you success in the pursuit of your research goals.

xc: Burnette, PSY

Approval Termination: January 6, 1994, 1993


group psychotherapy vs. exercise treatments for depression. *International Journal of Mental Health.* 13(3-4), 148-177.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.