

Covariation of Sexual Desire and Sexual Arousal: The Effects of Anger and Anxiety

Alan W. Bozman, M.A.,¹ and J. Gayle Beck, Ph.D.^{1,2}

To test Kaplan's model of hypoactive sexual desire, this investigation examined the effects of anger and anxiety presented during sexual stimuli. Subjects included 24 male undergraduates, free from psychological and medical problems that interfere with sexual function. Each subject was presented with three audiotapes, containing sexual content and statements by the participants that were designed to evoke anger or anxiety or that were situationally appropriate (control condition). Penile tumescence and sexual desire were monitored continuously. Results indicated significant differences in sexual desire in each of the three conditions, with desire highest during the control condition, followed by the anxiety condition, and last, the anger condition. Tumescence was decreased during the anger condition, relative to the control and anxiety conditions, which were not significantly different from one another. These findings partially support Kaplan's model of maintaining factors in hypoactive sexual desire, by demonstrating that anger may be the primary mechanism through which sexual desire and arousal are inhibited. In this study, anxiety impaired desire but did not affect tumescence. Implications for the study of emotional influences on sexual responding are discussed, including the need for investigation of other parameters of sexual motivation.

KEY WORDS: hypoactive sexual desire; tumescence; anxiety; anger.

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¹University of Houston, Department of Psychology, 4800 Calhoun Road, Houston, Texas 77204-5341.

²To whom reprint requests should be addressed.

INTRODUCTION

Recognition of the importance of sexual desire in the human sexual response has been provided by Lief (1977) and Kaplan (1977, 1979). These initial discussions drew attention to the prevalence of low sexual desire among clients presenting for sex therapy. In the intervening decade, interest in sexual desire and related phenomena such as sexual aversions has increased dramatically to the extent that hypoactive sexual desire has been classified as a separate and distinct sexual disorder in diagnostic nosology (American Psychiatric Association, 1987).

Differentiating problems of hypoactive sexual desire from problems of sexual arousal, such as erectile dysfunction, rests on the notion that these two processes are separate and distinct. While this distinction has been drawn in DSM III (American Psychiatric Association, 1980) and DSM III-R (American Psychiatric Association, 1987), little empirical attention has been paid to the separate and interactive nature of sexual desire and arousal. Although many definitions of sexual desire exist, depending on the theoretical background of the author (e.g., Kaplan, 1979; Bancroft, 1983; Apfelbaum and Apfelbaum, 1985; Levine, 1981), most incorporate the following components: Sexual desire is a "subjective feeling state that may be triggered by both internal and external cues, and may or may not result in overt sexual behavior" (Leiblum and Rosen, 1988; p. 5). Thus, theoretically, sexual desire is viewed as determined by salient intrapsychic, interpersonal, social, and cultural processes, assuming the presence of normal physical functioning and the availability of sexual partners (Leiblum and Rosen, 1988). Sexual arousal, in contrast, is characterized by physical responses, such as penile tumescence in the male and vaginal vasocongestion and lubrication in the female. From this perspective, sexual arousal differs from desire, in that sexual desire is a subjective state and arousal is a physiological response.

In examining available models of sexual desire, perhaps the most complete account to date has been offered by Kaplan (1977, 1979, 1984). According to this intrapsychic conceptualization, hypoactive sexual desire can result from emotional conflicts involving both anxiety and anger. The sources of anxiety hypothetically can include performance fears, fear of pleasure, and "unconscious" fears of injury. Anger can stem from unresolved dyadic conflicts or "unconscious infantile transferences" (Kaplan, 1979, p. 39). According to Kaplan, both anger and anxiety activate an emotional "turn off" mechanism that suppresses sexual desire.

In considering this model, it is notable that the effects of anger on sexual responding (both desire and arousal) have been neglected in the research literature. However, a sizable collection of studies has examined

the effects of anxiety on sexual arousal. This research indicates that anxiety either facilitates sexual arousal or does not affect it (Beck and Barlow, 1984). For example, Wolchik *et al.* (1980) found that preexposure to anxiety-producing films (scenes of automobile accidents) actually increased tumescence in normal college males. Similarly, Barlow *et al.* (1983) reported that anxiety induced by shock threat increased penile tumescence in sexually functional college males, particularly shock threat that was contingent on the degree of tumescence. These findings are supported by the work of others, in particular, Barfield and Sachs (1968) and Beck *et al.* (1987) with male subjects and P. Hoon *et al.* (1977) with female subjects.

In contrast with laboratory examinations, the clinical literature is replete with descriptions of the negative effects of anxiety on genital responding (e.g., Kaplan, 1984; Masters and Johnson, 1970; Zilbergeld, 1978). Yet, in these descriptions, the nature of anxiety is different from shock threat or anxiety-producing films. Specifically, the clinical literature describes anxiety as a response to dyadic sexual communication and self-statements, such as "What if I can't please my partner?". Additionally, the influence of anxiety on the sexual response differs in clinical accounts, depending on the level of physical intimacy. Given these considerations, it is important for laboratory investigations of the influence of emotional states upon sexual responding to include more naturalistic experimental manipulations involving varying degrees of intimate contact.

The present investigation was conducted to examine the effects of heightened levels of anxiety and anger on both sexual desire and sexual arousal, following Kaplan's model. An attempt was made to address the shortcomings of earlier studies by eliciting anxiety and anger using audiotapes containing descriptions of sexual interactions between a male and a female. The affect manipulation was based on a derivative of Abel's procedure (Abel *et al.*, 1975, 1977), developed originally to detect sexual arousal to violent behavior in sex offenders. In our study, three audiotapes were developed that contained identical descriptions of sexual activity with differing statements by a female and self-statements by a male, designed to evoke emotional states. Anxiety was elicited by performance demands stated by the female and self-statements, made by the male, that questioned his sexual ability. Anger was elicited by the female's annoying statements and the male's self-statements reflecting his irritation with her. In addition, a control condition was included, that involved statements and self-statements appropriate during a sexual encounter between two people. The tapes were constructed to include three levels of sexual intimacy: caressing, foreplay, and intimate contact (coitus). Subjects included 24 sexually functional males. Penile tumescence and subjective desire were monitored con-

tinuously. Subjects were presented with the three audiotapes, counter-balanced across individuals, in a repeated measures design.

METHOD

Subjects

Twenty-four male heterosexual students, ages 18–30 ($X = 21.9$, $SD = 3.5$), were recruited from the University of Houston. All subjects were screened through interview for psychological and medical disorders that would impair sexual functioning and none reported a current or past history of sexual arousal or desire disorders. Subjects were screened to ensure that they were not currently taking a prescription drug that would interfere with sexual responding and to ensure that they were not under the influence of any illicit drug or alcohol (e.g., had not used within 24 h). Subjects completed the Sexual Opinion Survey (Fisher *et al.*, 1983) and the Sexual Arousability Inventory (E. Hoon *et al.*, 1976) to assure that subjects' sexual attitudes and behavior fell within established norms. Although the Sexual Arousability Inventory originally was designed for use with females, norms exist for males (E. Hoon and Chambless, 1988) and were employed in this study.

Measures

A mechanical strain gauge was placed halfway down the penile shaft to assess tumescence (Barlow *et al.*, 1970; Barlow, 1977). This device consists of a metal ring upon which two strain gauges are affixed. During tumescence, the wings of the gauge separate, creating differential resistance changes. Prior to use, this device was calibrated with five circumference measures, that ranged from 2.7 cm to 3.5 cm, permitting transformation of the data to centimeter circumference.

Throughout the session, the subject was asked to move a subjective rating dial, modeled after the subjective lever developed by Wincze *et al.* (1976). The device consists of a potentiometer driven by a mechanical dial. Prior research has shown that use of this device is not disruptive for male subjects, except at low levels of arousal (Wincze *et al.*, 1980). This device provided a measure of subjective sexual desire based on instructions given to the subject before the experimental session. Subjects were told to move the dial continuously throughout the experimental session to rate the amount of sexual desire or sexual attraction to the imagined female, on a

scale of 0 to 100, with 0 equaling no sexual desire at all and 100 equaling intense sexual desire. Subjects were told not to rate their physical arousal or tumescence but to rate the intensity of their sexual desire during each audiotape.

The Profile of Mood States (POMS; McNair *et al.*, 1971) was administered immediately after each stimulus, to assess the affect manipulation. The POMS is a rapid method for identifying transient fluctuations in affective states. It assesses six mood states (tension-anxiety, depression, anger-hostility, vigor-activity, fatigue-inertia, and confusion-bewilderment) derived from 65 items scored on a 5-point rating scale.

Apparatus

Physiological measures were recorded on a Grass Model 7D1 polygraph. Each channel was sampled by an on-line IBM minicomputer, interfaced with the analog output of the polygraph. The minicomputer timed the stimuli, sampled the data, performed the appropriate data conversions, and transformed the signals into meaningful units.

Stimuli

Three audiotapes, each of 7½ min duration, were developed and piloted prior to conducting the study. The tapes were written from the perspective of the male participant and were narrated by a female. Each tape included identical descriptions of heterosexual caressing, foreplay, and coitus. Embedded in the sexual content of the tapes was the experimental manipulation: self-statements by the male and statements by the female that were designed to alter the subject's emotional state. Three tapes were developed: the first was designed to evoke anger with statements by the female partner that indicated a reluctance to participate in contrast with behavioral encouragement, and self-statements by the male indicating his frustration and anger. The second tape was designed to evoke anxiety with statements by the female drawing attention to the male's apparent nervousness and self-statements by the male acknowledging his anxiety. The third tape was designed as a control condition using situationally appropriate statements by the female and self-statements by the male. For example, at 2 min into the tape the following interaction between the female and the male occurred:

Anger condition

The *female* says, "I guess it's ok. I mean I think it will be all right" and the *male* thinks, "She should not be leading me on. If she doesn't want to, well o.k., but I

don't like to be teased. Oh what the hell, I am finally going to get to see that great body."

Anxiety condition

The *female says*, "I want you to make love to me, I want you" and the *male thinks*, "Oh no, I hope I don't screw this up! I'm finally going to see that great body. I feel so tense, what is wrong with me? Why am I letting this get to me?"

Control condition

The *female says*, "I want you to make love to me, I want you" and the *male thinks*, "This is great! I'm finally going to see that great body. She has a way of making me feel really comfortable. I like that."

The emotional statements were distributed equally throughout the duration of the tapes. The tapes were matched so that each text contained 40% of emotional statements and 60% sexual script. The first third of each tape contained descriptions of kissing or light petting and is referred to as caressing. The second third contained heavy petting and is referred to as foreplay, and the last third included coitus and is referred to as intimate contact.

Experimental Procedure

This procedure was reviewed by the University of Houston Committee for the Protection of Human Subjects. Each subject was assessed individually and provided informed consent. After placement of the strain gauge and explanation of how to use the subjective rating device, the experimenter described the procedure, including the POMS. The subject then sat quietly during laboratory adaptation (5–10 min). At the completion of adaptation, the three audiotapes were presented, separated by adequate baselines to prevent carry-over effects between conditions. The order of the tapes was counterbalanced across subjects. After each tape, the subject completed the POMS. Each subject was debriefed following the procedure. The debriefing procedure included affective ratings that allowed subjects to rate their predominant emotion during each tape.

Data Sampling and Reduction

Tumescence and subjective desire data were averaged to form 30-sec epochs. The strain gauge was scored as millimeters of pen deflection and converted to centimeters of circumference based on pre-session calibration. Data from the subjective dial were scored as millimeters of pen deflection and transformed to a 0–100 scale. The POMS was scored according to protocol.

Data Analysis

Data from the subjective rating dial and the strain gauge were analyzed using a repeated measures MANOVA. The data were analyzed in three blocks of 150 sec each (5 epochs) based upon changes in the level of sexual intimacy during the erotic tapes. Thus, the first 5 epochs (Block 1) contained descriptions of caressing; Epochs 6–10 (Block 2) contained descriptions of foreplay; and Epochs 11–15 (Block 3) contained descriptions of intimate contact. Each block was analyzed employing a Condition (3) \times Time (5) design.

Unlike the ANOVA, the MANOVA does not rely on the assumption of sphericity and therefore allows unbiased tests when nonsphericity is present, as it usually is in repeated measures designs (Vasey and Thayer, 1987). The data were analyzed using the MANOVA procedures available on SPSS-X (Norusis, 1986). This statistical package has the advantage of providing univariate statistics that are calculated using the multivariate approach, thus providing confidence that the Type I error rate was not inflated (Vasey and Thayer, 1987).

In order to compare tumescence and subjective desire relative to each other during each condition, data from both measures were converted to z scores, using the omnibus mean of each measure. These z scores then were examined using a Condition (3) \times Measure (2) \times Time (15) MANOVA.

RESULTS

Validity of Affect Manipulation

Table I displays the means for the six subcategories of the POMS within each condition. As shown, the anxiety subscale was significantly elevated in the anxiety condition relative to the control condition, $F(1, 46) = 9.20, p < 0.005$. Additionally, the confusion/bewilderment subscale was significantly elevated in the anxiety condition ($p < 0.05$). Relative to the control condition, the level of anger on the POMS was significantly greater in the anger condition, $F(1, 46) = 43.08, p < 0.001$. It should be noted that the anger condition significantly increased ratings in the tension/anxiety, depression, and confusion/bewilderment subcategories ($p < 0.05$), while decreasing scores in the vigor category ($p < 0.05$) relative to the control condition.

Table I. Comparison of POMS Subscales Averaged by Condition^a

POMS subscale	Condition		
	Control	Anxiety	Anger
Tension-anxiety	7.417 _a	12.917 _b	12.125 _b
Depression	3.208 _a	6.792 _{ab}	9.000 _b
Anger-hostility	2.167 _a	5.167 _a	14.333 _b
Fatigue-inertia	5.803 _a	4.417 _a	5.167 _a
Confusion-bewilderment	4.750 _a	8.500 _b	9.875 _b

^aMeans with different subscripts are statistically different from one another ($p < 0.05$).

Tumescence

A significant Condition \times Time effect was noted for the first sequence of sexual activity, caressing (Epochs 1–5), $F(8, 184) = 3.20$, $p < 0.005$. These data are plotted in Fig. 1, which reveals that in the first 2¹/₂ min of the audiotapes, tumescence was highest during the control condition, followed by the anxiety condition. The lowest level of tumescence occurred during the anger condition. Tukey's follow-up tests, with adjusted error terms, indicated that tumescence was significantly higher during both the anxiety and control conditions relative to the anger condition ($p < 0.05$). Additionally, a significant Time effect was noted, $F(4, 92) = 27.76$, $p < 0.001$, with tumescence during each epoch significantly greater than the previous epoch. No significant effects were found for the second and third blocks: foreplay (Epochs 6–10) and intimate contact (Epochs 11–15).

Subjective Desire

A significant Condition \times Time interaction was found for the first block, caressing (Epochs 1–5), $F(8, 184) = 9.39$, $p < 0.001$. Tukey's follow-up test revealed significantly greater desire during the control condition relative to the anxiety condition ($p < 0.05$) and anger condition ($p < 0.05$) at Epochs 2–4 and greater desire during the anxiety condition, relative to the anger condition ($p < 0.05$) at Epochs 3–5.

Additionally, a main effect for condition was found during the second and third blocks (foreplay and intimate contact), $F(2, 46) = 30.89$, $p < 0.001$, $F(2, 46) = 13.27$, $p < 0.001$, respectively. Tukey's follow-up tests revealed that the control condition produced significantly greater desire, relative to the anxiety and anger conditions ($p < 0.01$) during both the second and third blocks. Additionally, desire during the anxiety condition

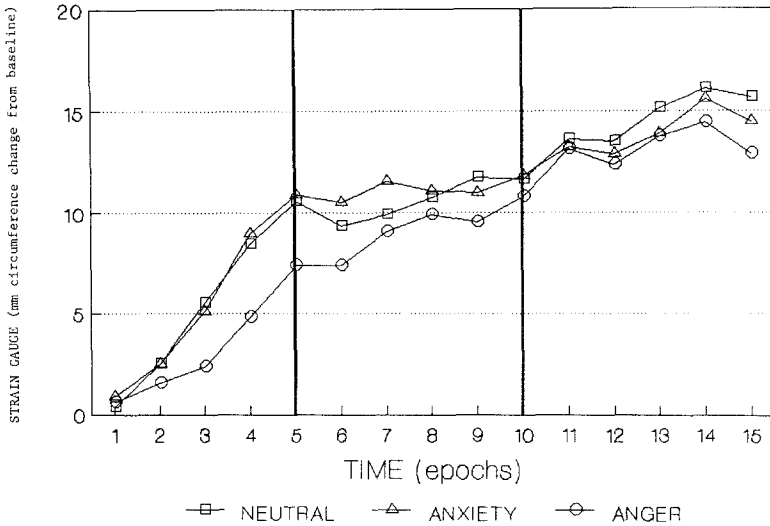


Fig. 1. Mean tumescence by condition (Epochs 1-5 = caressing, 6-10 = foreplay, 11-15 = intimate contact).

was significantly higher, relative to the anger condition ($p < 0.05$) for both foreplay and intimate contact. A main effect was noted for Time, $F(14, 322) = 78.24, p < 0.001$, indicating that subjective desire increased as the stimuli progressed. These data are plotted in Fig. 2.

Comparison of Sexual Desire and Tumescence (Z scores)

The comparison of the desire and tumescence z scores resulted in a significant Condition \times Measure \times Time interaction, $F(28, 644) = 3.01, p < 0.0001$. Since this analysis was conducted to examine tumescence and desire relative to each other, Tukey's follow-up tests were used only to examine differences between these two measures at each level of condition and time. Tukey's follow-up tests revealed that during the anger condition, tumescence was significantly elevated relative to desire at Epochs 8, 9, 11, and 12 ($p < 0.05$). In contrast, during the control condition tumescence was significantly lower relative to desire at Epochs 8, 9, 10, and 15 ($p < 0.05$). No significant differences between measures were noted during the anxiety condition (Fig. 3).

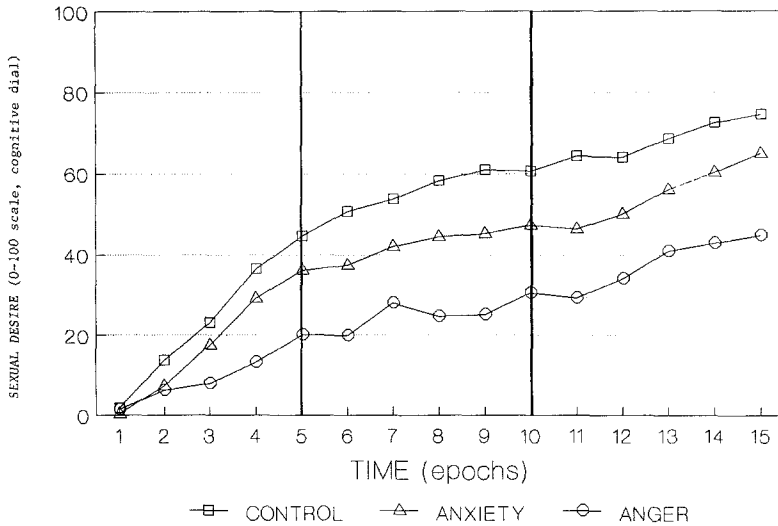


Fig. 2. Mean subjective desire by condition (Epochs 1-5 = caressing, 6-10 = foreplay, 11-15 = intimate contact).

DISCUSSION

The present study was designed to examine the effects of anger and anxiety on tumescence and sexual desire during audiotaped descriptions of ongoing sexual activity, in a test of Kaplan's model of disorders of sexual desire. The results indicate that in a sample of young, sexually functional men, the anger condition significantly reduced both desire and tumescence, particularly during the initial stages of sexual contact. The anxiety condition appeared to reduce desire, with no notable effect on tumescence. Comparison of the tumescence and desire data, using z-score transformations, indicated that tumescence was significantly greater than desire during the anger condition for the latter portion of the stimulus, whereas in the anxiety condition no significant differences were noted between desire and tumescence. During the control condition, desire was significantly greater than tumescence for Epochs 8-10 and 15. Thus, measures of tumescence and desire showed opposite patterns during the anger and control conditions.

Examination of the poststimulus ratings supports the validity of the anxiety and anger manipulations. The observation that the anger tape resulted in increases on the POMS subscales assessing anxiety, depression,

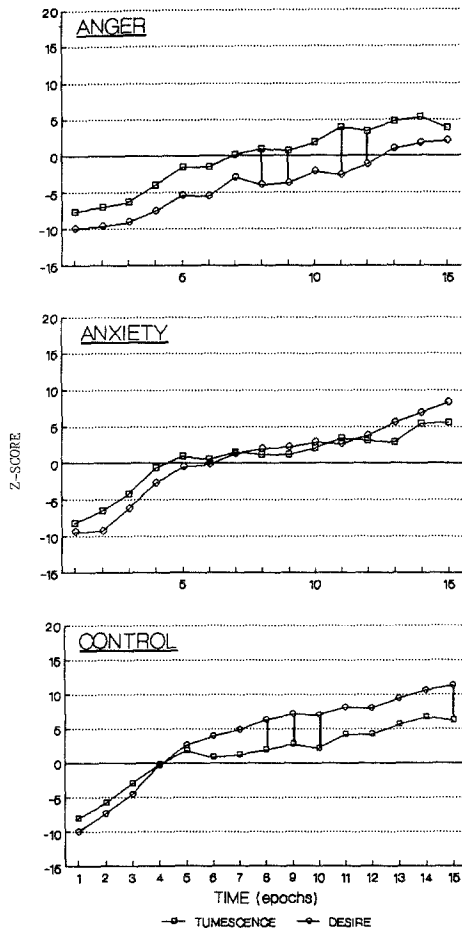


Fig. 3. Z-score transformations, measure by condition and time (Epochs 1-5 = caressing, 6-10 = foreplay, 11-15 = intimate contact).

and confusion, in addition to anger, is typical of other studies utilizing mood induction paradigms. For example, Schwartz and Weinberger (1980) presented normal subjects with descriptions of emotionally laden situations and instructions to imagine their reactions to these. In this report, anger-producing images created increases in anger, as well as less pronounced increases in anxiety, depression, and sadness, as measured by the Differential Emotional Scale. It appears that anger frequently is accompanied by anxiety and other emotional states, in laboratory research of this type. Thus,

although the anger tape in the present study created increases in several negative emotional states, including anger, related research has established that this is a common finding. In addition, during debriefing interviews, subjects indicated that anger was the predominant emotion experienced during the anger condition.

Several methodological features of this study deserve mention in comparing the present findings with previous investigations. Prior research (e.g., Barlow *et al.*, 1983; Wolchik *et al.*, 1980) relied on manipulations such as threat of electric shock and film sequences to create anxiety. In the present study, the use of audiotaped stimuli permitted integration of the anxiety and anger manipulations with sexual stimuli, resulting in a more naturalistic examination of the effects of these mood states on sexual responding (although this approach clearly differs from actual sexual encounters). Our results indicate that when addressed in this manner, anxiety did not affect tumescence relative to a control condition. Additionally, the stimuli involved in the present investigation were 7½ min in duration, and thus were considerably longer than stimuli employed in previous research (e.g., Barlow *et al.*, 1983, used 3 min films, as is typical of other studies). Longer stimuli provided the advantage of permitting study of the effects of the anxiety and anger manipulations during differing levels of sexual intimacy, ranging from caressing through coitus. As the data indicate, the most pronounced effects of the affect manipulation were noted during the least intimate stages of sexual contact, particularly upon tumescence. This suggests that the results of previous studies may have been influenced by using brief stimuli depicting intimate sexual behavior and intercourse. If clinical reports are accurate, heightened states of anger (and other accompanying negative emotions) and anxiety may serve to deter more intimate sexual contact by reducing sexual desire, suggesting that greater empirical attention needs to be paid to emotional influences at the beginning of sexual interaction.

While laboratory investigations cannot duplicate the diversity of demographic and social variables encountered in a clinical population, nor can they recreate actual sexual encounters, laboratory experimentation does permit the isolation of factors that may be relevant in understanding the effects of negative emotional states on sexual responding. Additional research is required to determine how well these findings generalize to other settings and populations.

These data indicate that sexual desire and sexual arousal are two distinct processes, as hypothesized originally by Kaplan (1977). While this study does not answer the question of whether desire precedes arousal (or vice versa), our results demonstrate that sexual desire and tumescence operate somewhat independently in the laboratory. For example, the effect

of the anger manipulation on tumescence was pronounced and statistically significant during the first 2¹/₂ min of the stimuli, whereas the effect of this affect manipulation on desire was significant and consistent across the duration of the stimuli. Additionally, sexual desire steadily increased across the duration of the tapes, while tumescence followed an asymptotic pattern, with the largest increases occurring during the first third of the stimuli. Perhaps most importantly, sexual desire and arousal appear to be influenced differently by anger (and accompanying negative emotions) and anxiety as measured by this study. Tumescence was influenced less by these negative emotions, whereas desire was diminished by both. Thus, it appears that Kaplan's clinical speculations concerning the role of negative emotional factors in reducing sexual desire warrant continued empirical exploration.

In this study, subjects were not presented with the opportunity to terminate their exposure to the sexual stimuli. Yet, in actual sexual encounters, it is typical for individuals with hypoactive sexual desire to refuse or terminate sexual contact that is initiated by their partner (Kaplan, 1979; Leiblum and Rosen, 1988). While the data from this study provide evidence for the detrimental effects of anger and anxiety on subjective sexual desire, it is unclear whether reduced desire would influence an individual's willingness to continue participation in sexual activity. Future research, exploring subjective desire, arousal, and "sexual motivation" (Singer and Toates, 1987) appears necessary in continued examination of maintaining factors of hypoactive sexual desire.

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