

Voluntary Control of Penile Tumescence Among Homosexual and Heterosexual Subjects

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Voluntary control of erectile responses represents a major threat to the validity of penile plethysmography. This study was designed to determine whether individuals can mimic a sexual orientation that differs from their actual sexual orientation. Since the presumed mechanism underlying voluntary control of penile tumescence involves a shift in attentional focus, a recall test was employed to assess the relationship between the ability to influence erectile responses and recall of critical test stimuli. Homosexual and heterosexual subjects were exposed to sexual materials under standard and "faking" instructions. The faking instructions consisted of asking subjects to suppress erectile responses to preferred stimuli and to enhance penile tumescence in the presence of nonpreferred stimuli. Across groups, results revealed some degree of suppression of erections but no significant enhancement of erections. Self-reported cognitive arousal under both conditions was consistent with erectile data. However, subjects' perceived control over erectile responses tended to be greater than their actual performance. No significant differences in recall were obtained. The recall procedure appears to interfere with subjects' ability to control erectile responses. Implications for clinical applications of penile plethysmography are summarized with suggestions for future research.

KEY WORDS: penile plethysmography; voluntary control; sexual arousal; penile erection.

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INTRODUCTION

The possibility of voluntary control of penile tumescence poses a major problem for the plethysmographic technique of measuring sexual responding (Earls and Marshall, 1983; Farkas, 1978). Voluntary control of penile tumescence can be achieved during plethysmographic assessment by deliberately diminishing tumescence in the presence of preferred erotic stimuli and by augmenting penile tumescence in the presence of nonpreferred stimuli. Alteration of penile tumescence has been demonstrated among some inpatient research participants (Freund, 1961, 1963, 1967a, 1967b; Freund *et al.*, 1979), small samples of nonclinical volunteers (Henson and Rubin, 1971; Laws and Rubin, 1969), men incarcerated for rape (Murphy *et al.*, 1984), and participants incarcerated for nonsexual offenses (Krisak *et al.*, 1981). Utilizing a small sample of nonclinical heterosexual volunteers, Quinsey and Bergersen (1976) and Quinsey and Carrigan (1978) observed increased tumescence in response to deviant stimuli (child-female, child-male) and decreased tumescence in the presence of nondeviant stimuli (adult female) in accord with instructions to participants.

Since deliberate distortion or "faking" is a problem common to all psychological tests, the two major issues are (i) whether individuals can successfully mimic the desired protocol and (ii) whether they can accomplish this goal without being detected. In terms of plethysmographic assessment, some methods of altering penile tumescence are readily detected, such as manipulation of the penis and tensing of the muscles (pumping) in the genital area (Freund *et al.*, 1988). Cognitive methods, such as not attending to relevant stimuli and distraction through the use of irrelevant stimuli fantasy, are more difficult to detect.

The present study attempted to determine whether individuals can successfully mimic a different sexual orientation without detection. Since it has been demonstrated that plethysmographic methods differentiate between heterosexual and homosexual orientation (Mavissakalian *et al.*, 1975; Sakheim *et al.*, 1985; Tollison *et al.*, 1979), these two groups were selected to determine the ability to suppress/enhance penile tumescence in the presence of preferred/nonpreferred erotic stimuli. Additionally, cognitive strategies are often employed by participants in the falsification of penile response patterns (Henson and Rubin, 1971; Laws and Holmen, 1978; Quinsey and Chaplin, 1987; Quinsey and Bergersen, 1976). Since they require an alteration of attentional focus, we examined verbal recall of stimulus materials under instructions to falsify penile tumescence.

The three general hypotheses in the present investigation are (i) that males under instructions to falsify actual penile tumescence in the presence of preferred and nonpreferred erotic stimuli would be capable of producing

a response profile that deviates from their reported sexual orientation; (ii) that the use of distraction strategies to achieve such a level of control of penile tumescence would be detected by diminished recall under instructions to falsify level of sexual responding; and (iii) that the subjective perception of levels of cognitive and physiological arousal in the presence of preferred and nonpreferred stimulus materials would be inconsistent with actual tumescence and vary as a function of instructions.

METHOD

Research Participants

Twenty-four nonclinical male volunteers were recruited from a college campus. The experimental groups were composed of 12 heterosexual and 12 homosexual males. Mean age of heterosexual subjects was 19.58 years and educational level was 13.58 years. The heterosexual males included 1 Black, 1 second-generation American of Oriental descent, and 10 Caucasians. These individuals reported no sexual experiences involving same-sex partners and a mean of 7.83 opposite-sex partners. The mean age for the homosexual sample was 27.17 years. The mean educational level for the homosexual males was 16.67 years. All homosexual participants included in the sample were Caucasian; they reported an average of 2.92 sexual experiences involving opposite-sex partners and an average of 41.00 same-sex partners.

Response Measures

Psychological Index of Arousal. A mercury-in-rubber (MIR) circumferential strain gauge similar to that described by Bancroft *et al.* (1966) was employed to quantify erectile responses. As penile circumference increases, distension of the strain gauge transducer causes changes in electrical resistance detected by a Parks electronic signal conditioner (preamplifier). Output from the Parks preamplifier is observed as voltage changes continuously recorded by a Grass Model 7 polygraph amplifier and an analog-to-digital (A-to-D) converter of an IBM-PC computer. A calibrating cone was used to provide a standard measure for estimating linearity of output. In this manner, changes in penile tumescence are quantified as millimeters of penile circumference represented by pen deflections on polygraph printouts and counts on the A-to-D converter.

Subjective Indices of Arousal and Erection. Following the presentation of each erotic scenario, each subject was requested to rate verbally his level of sexual arousal and degree of erection on a scale of 0 to 10. A sexual arousal rating of 10 indicated that the participant experienced maximum sexual excitement, whereas a rating of 0 indicated minimum sexual excitement or no change in arousal. An erection rating of 10 indicated that the participant perceived maximum tumescence (approaching 100%), whereas a rating of 0 indicated minimal or no change in degree of physiological arousal.

Index of Recall. To determine whether participants were attending to the slide/audiotape stimulus presentations, a memory test of recall was conducted. The memory test was composed of a list of 10 details from the audiotape and a list of five physical characteristics of individuals depicted in the slides. Participants were requested to describe in detail the scenarios depicted in each slide/audiotape presentation. Participants providing superficial descriptions were prompted one time (i.e., "please give me more details"). The experimenter recorded spontaneous recall verbatim. The number of items recalled constituted the index of recall.

Stimulus Materials

Explicit erotic stimulus material was presented via videotapes and audiotapes with slides. Videotapes were utilized to determine responsivity to sexual stimuli and to verify sexual orientation. Three videotapes (each exactly 3 min 22 sec in length) depicting sexual foreplay, oral-genital contact, and intercourse were presented. These three videotapes depicted heterosexual, male homosexual, and female homosexual activity. The lesbian videotape was included since it has been shown to be effective in classifying homosexual and heterosexual subjects (e.g., Mavissakalian *et al.*, 1975; Sakheim *et al.*, 1985). The videotapes were presented in randomized order.

Two scenarios of heterosexual activity and two scenarios of homosexual activity were recorded via audiotape. Each 2-min 15-sec scenario depicted sexual foreplay, oral-genital contact, and sexual intercourse. Each of these four scenarios contained unique physical characteristics of persons depicted and unique behaviors or settings in order to distinguish recall. Color slides of single male and female nudes which differed in terms of physical characteristics and poses of the persons pictured were included to furnish further details for recall. The female slides were presented concurrently with the heterosexual audiotapes and the male slides accompanied the homosexual audiotaped stimuli. The four scenarios were counterbalanced in the standard and falsify conditions.

Procedure

Individuals who consented to participate in the investigation were first interviewed and rated as to sexual orientation on the basis of the Kinsey Heterosexual-Homosexual Rating Scale (Kinsey *et al.*, 1948). Subjects who reported an exclusive preference for female partners (Kinsey rating = 0) or a primary preference for female partners with only incidental sexual experience with males (Kinsey rating = 1) were tentatively assigned to the heterosexual group. For the homosexual subjects, those who reported an exclusive attraction to males ($n = 8$) or who reported a predominant attraction to males with only incidental sexual experiences with females (Kinsey rating = 4 or 5) were tentatively assigned to the homosexual group. Group assignment based on self-reported sexual orientation was subsequently verified by examining erectile responses to the videotaped stimuli. Individuals who identified themselves as heterosexual and exhibited increased penile tumescence to the heterosexual and lesbian videotapes with minimal response to the homosexual videotape were included in the heterosexual group. Subjects who identified themselves as exclusively or predominantly homosexual and who evidenced significant erection to the homosexual film while demonstrating decreased tumescence to the lesbian film were included in the homosexual group. Participants who did not evidence increased tumescence in the presence of any of the videotapes ($n = 2$) or who exhibited increased tumescence in the presence of all of these videotapes ($n = 7$) were excluded in order to maintain group homogeneity.

After each individual had again given further consent, he was accompanied to the experimental chamber which was furnished with a screen for projection of slides, a television for viewing videotapes, headphones for listening to audiotapes, an intercom system, a recliner, and an adjacent half-bath. The experimenter then instructed each participant (i) in the proper placement of the strain gauge; (ii) to communicate with the experimenter via the intercom; and (iii) to listen and follow closely all instructions. After answering any questions, the experimenter exited into the equipment room which housed the Parks plethysmograph, Grass polygraph, a VCR, a tape recorder, the IBM-PC, and the intercom. The experimenter then instructed each participant to attach the strain gauge and to seat himself in the recliner. In the interim, baseline adjustments were completed.

Prior to the first two slide/audiotape presentations, participants were instructed to place a set of earphones over their ears. They were instructed to listen carefully to the audiotapes and to look closely at the slides. Subjects were given standard arousal instructions immediately preceding the first two slide/audiotape presentations. The heterosexual and homosexual scenarios were presented to subjects in a counterbalanced order. Following

each slide/audiotape presentation, participants rated their level of sexual arousal and degree of penile erection and were requested to describe in as much detail as possible each slide and audiotape.

Prior to the final two slide/audiotape presentations, participants were clearly instructed to falsify sexual arousal patterns. The participants were instructed to respond to novel slides/audiotapes in a manner that was contrary to their reported sexual orientation. Specifically, heterosexual participants were instructed to avoid becoming aroused and to suppress tumescence to heterosexual stimuli while becoming highly aroused to the homosexual stimuli. Similarly, homosexual participants were instructed to suppress arousal to the homosexual stimuli and to enhance arousal to the heterosexual stimuli. They were also instructed to listen very carefully to the audiotapes and to look closely at the slides. Following each slide/audiotape presentation, participants were requested to rate sexual arousal and penile erection and to describe in as much detail as possible the slides and the audiotapes. Following these final presentations, participants were debriefed and dismissed.

RESULTS

The data were analyzed for penile tumescence, subjective reports of arousal and erection, and recall of stimulus material.

Penile Tumescence

Penile tumescence scores for each subject were divided into five blocks of time intervals (cf. McAnulty and Adams, 1990). A sample of 20 one-second responses was obtained for each interval and a mean tumescence score was derived for each interval. These data were analyzed by a $2 \times 2 \times 2 \times 5$ mixed-model analysis of variance (ANOVA) with one fixed factor (Groups) and three repeated factors (Stimulus Type, Instructions, and Time Intervals). Tests for compound symmetry revealed that the assumption of equal variance-covariance was not violated. The main effects of Stimulus Type, Instructions, and Time Intervals were significant, $F(1, 400) = 8.34, p < 0.01$; $F(1, 400) = 12.59, p < 0.01$, $F(4, 400) = 26.07, p < 0.01$, respectively. These main effects indicate that there was an overall greater responsiveness to heterosexual stimuli, more response to standard than faking instructions, and that there was an increase in penile tumescence over time. The two-factor interactions of Groups by Stimulus Type and Groups by Time Intervals were also significant, $F(1, 400) =$

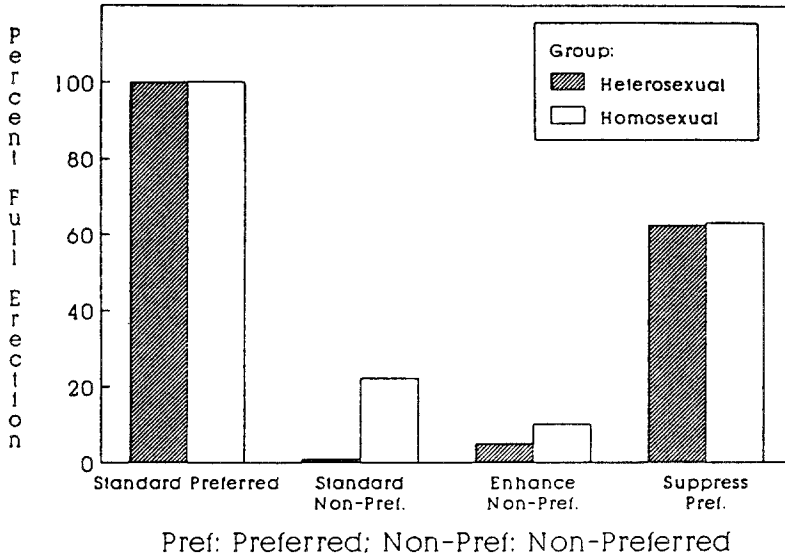


Fig. 1. Erection data by group per condition.

166.51, $p < 0.01$; $F(4, 400) = 3.50$, $p < 0.01$, respectively. The results of the Tukey Wholly Significant Difference (WSD) test for the interaction of Groups by Stimulus Types indicate that there was a significant increase in penile tumescence when individuals were exposed to stimulus material consistent with their stated sexual orientation ($p < 0.01$) but no increase in penile tumescence in the presence of nonpreferred sexual stimuli. The results of the Tukey WSD test for the Groups by Time Intervals interaction indicate that the homosexual group initially showed less responsiveness than the heterosexual group, but provided greater overall penile tumescence during the last time interval.

These effects are further clarified by a significant three-factor interaction of Groups by Stimulus Type by Instructions and Groups by Stimulus Type by Time Intervals, $F(1, 400) = 8.18$, $p < 0.01$; $F(4, 400) = 12.73$, $p < 0.01$, respectively. The results of the Tukey WSD test for the Groups by Stimulus Type by Instructions interaction indicate that, although both groups were able to suppress their tumescence significantly to preferred sexual stimuli (approximately 37%), neither group was able to enhance their penile tumescence to nonpreferred sexual stimuli, as illustrated in Fig. 1. As a matter of fact, the homosexual group actually decreased in tumescence when instructed to increase their penile tumescence although this effect was not statistically significant.

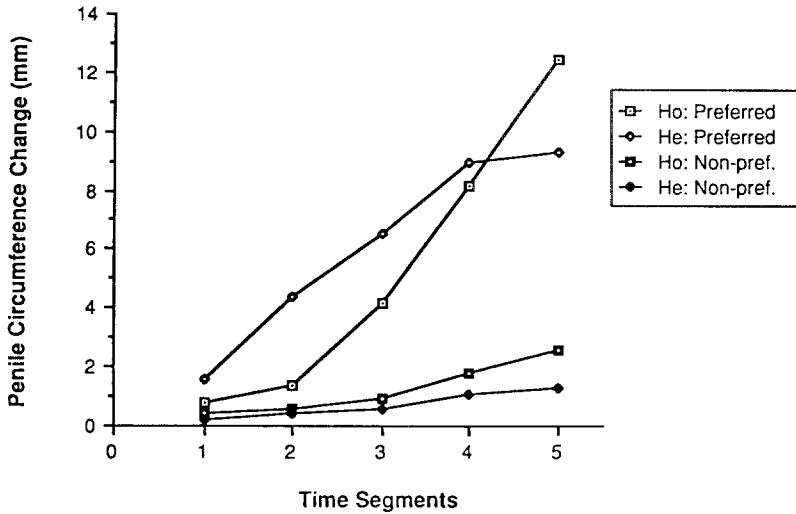


Fig. 2. Group erection data by condition over time segments.

The Tukey WSD test for the significant interaction of Groups by Stimulus Type by Time Intervals indicated that both groups responded to their preferred sexual stimuli but at somewhat different rates. This interaction is illustrated in Fig. 2. There was little or no responsiveness to non-preferred sexual stimuli over time, although there was a small but insignificant increase in penile tumescence by homosexual subjects to heterosexual stimuli.

Subjective Report of Arousal and Erection

The subjective report data were analyzed by $2 \times 2 \times 2 \times 2$ mixed-model ANOVA with one fixed factor (Groups) and three repeated factors (Instructions, Stimulus Type, and Arousal/Erection Self-reports). Because subjective report measures were collected at the end of each stimulus presentation rather than at each of the five time-intervals, these data were not analyzed for differences across time. The main effects of Instructions and Arousal/Erection Self-reports were significant, $F(1, 150) = 11.005, p < 0.01$; $F(1, 150) = 6.59, p < 0.05$, respectively. These results indicate that the subjects reported experiencing more cognitive arousal than erection and perceived that more arousal and erection occurred under standard instruc-

Table I. Self-Reported Arousal/Erection by Group and Instructions^a

Self-report	He group				Ho group			
	He stimuli		Ho stimuli		He stimuli		Ho stimuli	
	Std	Fake	Std	Fake	Std	Fake	Std	Fake
Arousal	4.58	4.33	0	0	2.00	1.68	5.46	4.33
Erection	4.08	3.08	0.08	0.66	1.37	0.58	4.87	2.50

^aA difference between means of $dT = 2.14$ is significant at $p < 0.05$ level of confidence. He: heterosexual; Ho: homosexual; Std: standard instructions; Fake: faking instructions.

tions. The two-factor interaction of Groups by Stimulus Type was significant, $F(1, 150) = 120.12$, $p < 0.01$. Three-factor interactions did not reach significance. The four-factor interaction of Groups by Stimulus Type by Instructions by Arousal/Erection Self-report was significant, $F(1, 150) = 4.43$, $p < 0.05$. Post hoc analyses were performed for the significant two- and four-factor interactions utilizing the Tukey WSD test.

The results of the Tukey WSD test for the interaction of Groups by Stimulus Type indicate that both groups reported greater overall arousal and erection to preferred stimuli. Heterosexuals and homosexuals perceived themselves to have been more cognitively and physiologically aroused by preferred stimulus materials. However, heterosexual males reported no significant cognitive and physiological sexual arousal when presented with homosexual stimulus materials. Although the homosexual males reported less arousal and erection to heterosexual than homosexual stimuli, they did report significantly more erection and arousal to nonpreferred sexual stimuli than did the heterosexual males.

The four-factor interaction of Groups by Stimulus Type by Instructions by Arousal/Erection Self-report permits interpretation of the effect of instructions upon participants' perceptions of their own degree of cognitive and physiological arousal when presented with preferred and nonpreferred sexual materials. Results of the WSD test, as shown in Table I, indicate that neither group reported that they had been completely capable of suppressing cognitive arousal to preferred sexual materials or enhancing cognitive arousal to nonpreferred sexual materials. Heterosexual males do not differ from homosexual males in terms of their reports of their ability to control cognitive sexual arousal in the presence of preferred and nonpreferred sexual materials. With regard to self-reported physiological arousal, heterosexual males reported that they were able to suppress and enhance sexual responding. However, the homosexual males reported that they were able to suppress their response to preferred sexual stimuli but were unable to enhance their penile responses to nonpreferred stimuli.

These groups differ in terms of their reports of their success in controlling penile tumescence and in terms of their success in suppressing versus their success in enhancing penile tumescence. However, both groups perceived themselves as having been more capable of controlling penile tumescence than cognitive arousal.

Recall of Stimulus Materials

Participants' memory for the details of erotic materials presented in audiotape and slide format was recorded in terms of the number of details recalled by each participant following each stimulus presentation. The number of details recalled from the audiotape and the number of details recalled from the slide were summed. These data were analyzed by a $2 \times 2 \times 2$ mixed-model ANOVA with one fixed factor (Groups) and two repeated factors (Stimulus Type and Instructions). Neither the main nor the interactions effects were significant.

DISCUSSION

This research investigated three general hypotheses: (i) that males, under instructions to falsify the level of penile tumescence in the presence of preferred and nonpreferred erotic stimuli, would be capable of controlling tumescence to the extent that a deviant profile, rather than their typical response, would be produced; (ii) that the degree of voluntary control of penile tumescence, demonstrated by participants, would be achieved by altering attentional focus away from the stimulus material in attempting to falsify penile tumescence, resulting in a decrease in recall of stimulus material; and (iii) that the participants' report of arousal and erection would be consistent with their penile tumescence scores, yet would vary as a function of instructions.

The results indicated that participants produced significantly increased penile tumescence in the presence of preferred sexual objects and activities, and produced no significant increase in penile tumescence in the presence of nonpreferred sexual material, under conditions of standard instructions. These findings are consistent with the results of Freund (1961, 1963, 1967a, 1967b), Freund *et al.* (1973, 1974, 1975, 1979), and McConaghy (1967). However, when subjects were instructed to suppress penile tumescence in the presence of preferred stimulus material and to enhance their penile tumescence in the presence of nonpreferred stimulus material, the results were quite different. Under instructions to suppress penile tumes-

cence, both homosexual and heterosexual participants were able to do so to a significant degree (i.e., approximately 37% of maximum erections). On the other hand, the amount of enhancement of penile tumescence in the presence of nonpreferred sexual material was insignificant. These results imply that participants were generally unable to invalidate their protocols to the extent of being misclassified with respect to sexual orientation. However, there were individual variations in faking ability as some subjects evidenced a significant amount of suppression while others appeared completely unable to suppress erections to preferred stimuli.

In terms of self-reported cognitive arousal under falsify instructions, neither group perceived themselves to be capable of inhibiting cognitive arousal in the presence of preferred stimuli or of enhancing their cognitive arousal in the presence of nonpreferred stimuli. This is in direct contrast to the participants' subjective evaluation of control of erectile responses. The heterosexual group reported some enhanced tumescence in the presence of homosexual materials and suppressed tumescence in the presence of heterosexual materials. However, the homosexual group, while indicating suppressed tumescence in the presence of homosexual materials, did not feel that they enhanced physiological arousal in the presence of heterosexual materials. In evaluating their own ability to suppress penile tumescence, then, both groups were fairly accurate, as observed by consistency between self-reported physiological arousal and actual tumescence. The homosexual group reported nearly 50% suppression of maximum tumescence, whereas the heterosexual group reported approximately 25% suppression of maximum tumescence, an amount quite similar to 37% suppression, on an average, actually exhibited.

Quite different results were obtained on subjective estimates of degree of success in enhancing erectile responses. The heterosexual group perceived enhanced tumescence to some extent, yet showed no change in actual tumescence. The homosexual group, on the other hand, perceived no enhancement at all in the presence of nonpreferred materials (instead, they indicated a decrease) which was indeed the case. One explanation for these results is that the participants were, in fact, attending to the sexual stimuli during the "fake" instructional conditions. In so doing, they were unable to control sexual arousal effectively because of this interference, and were able to report such a lack of control fairly accurately, i.e., they could not develop competitive sexual fantasy to facilitate enhancement while listening to the tapes and viewing the slides, and they could not completely inhibit sexual arousal in the presence of preferred audio/slide stimulus material. Concerning the ability to enhance actual penile tumescence reported by the heterosexual group, in the complete absence of any such ability, these results may be explained in light of Tollison *et al.* (1979). Some degree of control over penile tumescence

may be regarded by other heterosexual males as evidence of valued sexual knowledge and experience. Neither group, however, reported such an ability to control cognitive sexual arousal. This discrepancy between reported levels of cognitive and physiological sexual arousal suggests that participants believe these phenomena are somewhat independent of one another. Self-reported cognitive arousal rather than self-reported erection may prove to be better indicators of actual penile tumescence.

The data from the recall tests indicate that the individuals were retaining as much of the stimulus material in the fake instructional condition as they were under the standard instructions. This lack of a significant difference in the two instructional situations was probably due to the fact that the participants were instructed to attend to the sexual material while attempting to suppress/enhance their sexual arousal. Such "cognitive overload" may have resulted in inefficient control of penile tumescence but good recall under faking instructions. The strategies of simply not responding to the stimulus material to suppress arousal or using preferred sexual fantasy to enhance arousal were apparently not employed. Being instructed to view the slide and listen to the audiotape may have interfered with the simultaneous use of these strategies. An alternate explanation is that the present method of measurement was insensitive to actual differences in recall between standard and falsify conditions. Future research in this area should be conducted with the use of more sophisticated methods of measuring recall.

The present results are consistent with the findings of Abel *et al.* (1975), Abel, Becker *et al.* (1981), Able, Blanchard *et al.* (1981), Avery-Clark and Laws (1984) and Malcolm *et al.* (1985), all of whom found that, with various populations, suppression in the presence of preferred stimulus material ranged from 10 to 50%. This is in direct contrast to the findings of Hall *et al.* (1988) who demonstrated that approximately 80% of their participants, consisting of male sexual offenders, were able to deliberately inhibit sexual arousal completely. These differences may be explained by the instructions given to inhibit sexual arousal. In the present study, the participants were instructed to listen very carefully to the audiotapes and to observe very closely the slides during their presentation but to inhibit their sexual responses. It is rather obvious that an individual instructed to suppress arousal without also being instructed to attend to the sexual stimuli presented may simply choose to ignore the stimuli, resulting in no sexual arousal or erection. Whether this was indeed the case in the Hall *et al.* (1988) study is not clear.

The present study is one of the few in the literature that attempts to determine whether individuals are capable of enhancing their penile tumescence in the presence of nonpreferred sexual stimuli. Of the investigations reviewed concerning voluntary control of penile tumescence, only four

studies involved some form of enhancement instructional conditions (Laws and Rubin, 1969; Quinsey and Bergersen, 1976; Quinsey and Carrigan, 1978; Rosen *et al.*, 1975). The present data suggest that enhancement appears to be a much more difficult task than inhibition of penile tumescence. The reason for this is not clear since it seems as though individuals might easily substitute arousing sexual fantasy during the stimulus presentations under instructions to enhance tumescence. Again, this may have been impossible due to the cognitive effort required by compliance with instructions to attend closely to the stimulus materials. The provision of a recall task may be analogous to the signal detection task used by Quinsey and Chaplin (1987) as both may interfere with subjects' ability to resort to the competency cognitive activity underlying voluntary control of penile tumescence.

One of the major problems with previous research is the use of various types of erection scores in reporting results that do not permit determination of consistent increases in tumescence over time. In future research, it is recommended that penile tumescence data be reported over time intervals to distinguish between systematic increases in penile engorgement and random baseline shifts. Presently, such distinctions cannot be determined from the majority of the previous studies. Additional questions that require empirical verification are the responses of heterosexual and homosexual individuals to aggressive, nonadult, and other deviant objects and activities, as well as the distinction between sexual responses to depicted sexual objects (such as a child or an adult) and sexual responses to depicted sexual activities (such as intercourse vs. fondling vs. force). Empirical answers to such crucial questions can significantly increase our understanding of the psychophysiological phenomenon of sexual arousal.

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