The Sexual Inhibition (SIS) and Sexual Excitation (SES) Scales: II. Predicting Psychophysiological Response Patterns

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This study evaluated the predictive value of a newly developed measure of the propensity for sexual inhibition and excitation; the Sexual Inhibition & Sexual Excitation Scales (SIS/SES). Sexual, cardiovascular, and startle responses were measured in a group of 40 sexually functional men during the presentation of threatening and nonthreatening erotic films. Two levels of performance demand were created and two films were combined with a distraction task. Participants were assigned to high and low groups for each of the three SIS/SES scales. As predicted, men with high SES scores showed generally higher sexual responses. High and low SIS1 groups did not differ in their responses. Men with high and low SIS2 scores did not differ in their responses to nonthreatening stimuli; however, low SIS2 men showed greater genital response to the threatening stimuli. The findings provide support for the value of the SIS/SES scales in predicting sexual responses.

In a previous paper (Janssen, Vorst, Finn, & Bancroft, 2002), we reported on the psychometric properties of a new questionnaire that measures individual differences in the propensity for sexual responsiveness; the Sexual Inhibition & Sexual Excitation (SIS/SES) Scales. The underlying theoretical model postulates that sexual response and associated behavior depend on dual control mechanisms, involving excitatory and inhibitory neurophysiological systems (Bancroft, 1999; Bancroft & Janssen, 2000). Three scales emerged during this instrument's development, based on a single excitation factor (SES) and two inhibition factors (the threat of performance failure [SIS1] and the threat of negative consequences [SIS2]). All three scales showed close to normal distributions, respectable levels of internal consistency, test-retest reliability, and discriminant and convergent validity (Janssen et al., 2002).

To further validate the SIS/SES scales, a laboratory experiment was designed to explore the questionnaire's value in predicting psychophysiological response patterns in a group of sexually functional men, and to compare and contrast participants by grouping them in three ways: by high and low SES, SIS1, and SIS2 scores. Two principal aspects of psychophysiological response were assessed; genital response (penile erection) and emotional response. Penile erection was measured using the RigiScan monitor. Emotional responses were measured by means of subjective self-ratings and startle responses to sudden loud sound bursts. Lang, Bradley, and Cuthbert (1990) consider startle responses to index the disposition of a person to react with either an appetitive (approach) or an aversive (avoidance) response. The response is typically enhanced during aversive emotions and diminished during appetitive emotions. An attractive characteristic of this paradigm, as compared to the use of self-report measures, is that the startle reaction is a reflexive response and thus is not subject to intentional processes (e.g., social desirability). A description of how the we approached the validation of our three scales follows.

SES

High SES individuals were predicted to show greater genital response than low SES individuals to erotic stimuli in general.

SIS1

As this scale appears to be measuring inhibition proneness relevant to performance failure, there was no obvious way of varying that type of threat by means of erotic stimulus content. Based on the assumption that the having one's sexual response measured in the laboratory would be relatively threatening to a high SIS1 individual, we incorporated

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two manipulations: one to reduce this intrinsic threat and the other to amplify it. On the basis of results reported by Abrahamson, Barlow, Sakheim, Beck, and Athanasiou (1985; see also Barlow, 1986)—who found that in sexually functional volunteers distraction impaired genital response to erotic stimuli, whereas in dysfunctional men distraction either had no effect or increased genital response—we combined a distraction task with some of the otherwise nonthreatening stimuli. Our prediction was that this distraction would effectively reduce genital response in low SIS1 scorers, while having no effect or a positive effect on the high SIS1 group. Hence we would expect an interaction between group (high or low SIS1) and condition (distraction or no distraction).

The second manipulation involved a high and low *performance demand* condition. A number of studies, using a variety of experimental manipulations, have found that performance demand can increase sexual responses in sexually functional men while negatively affecting responses in men with erectile dysfunction (Abrahamson, Barlow, & Abrahamson, 1989; Heiman and Rowland, 1983). In our *high demand* condition, the participant was told that we were particularly interested in his erectile response. With the *low demand*, by misleading the participant into believing that the RigiScan also measured pulsatile flow in the penis, he was told that we would not be measuring and were not interested in his erection per se. We therefore predicted an interaction between group (high or low SIS1) and condition (high or low performance demand), with high SIS1 subjects expected to show a reduced genital response under high performance demand.

SIS2

Validation of this scale was approached by using erotic stimuli that vary in their potential to invoke inhibition. Two types of erotic film were used, one non-threatening (involving consensual sex) and the other threatening (involving coercive sex). The use of coercive sexual films to explore psychophysiological mechanisms of a more general nature is not uncommon in psychology. Coercive film excerpts have been used in, for example, studies testing the idea that vaginistic reactions are defensive reflexes to threat (van der Velde & Everaerd, 2001), and studies exploring the sensitivity of genital response measures to mixed emotional states of anxiety and sexual arousal (e.g., Laan, Everaerd, & Evers, 1995). While the specific nature of the threat involved in this type of stimulus has not been established (but could include the anticipation of social sanctions, the presence of conditional stimuli, etc.) it is important to emphasize that our putative inhibition systems are assumed to respond to a variety of sexually threatening situations (see Bancroft & Janssen, 2000; Janssen et al., 2002). We predicted that low and high scorers on the SIS2 factor would differ in their sexual responses to the coercive films, with genital responses in the low inhibition group being less influenced by the content of these films. We did not expect to find differences in their emotional responses, with both groups responding negatively to the coercive films (evidenced, in particular, by increased startle responses), which would support the assumption that both groups processed the threatening content of these films.

Method

Participants

Participants were recruited from Samples 1 and 2 described in Janssen et al. (2002). Thirty percent of the two samples had indicated an interest in participating in future studies involving psychophysiological testing. From this group, a selection of men were invited to participate in the current study to provide a range of scores on the inhibition and excitation scales.

We aimed at selecting a group of men varying in their inhibition and exitation scores such that, by using median splits of the scores from the original samples (see Janssen et al., 2002), the same group of participants could be assigned to high and low groups for each of the three scales, with those groups showing little or no difference in their scores on the other two scales. The results of this three-way split, involving in total 40 participants, are presented in Table 1. It will be seen that this was largely successful, with the one exception being the high and low SIS2 groups, who showed a significant difference in their SES scores ($p < .05$). This was dealt with by using the SES score as a covariant in the analysis. Also, 7 participants had to be excluded from the SIS1 comparison groups because their SIS1 score corresponded with the median split.

All 40 participants were sexually functional male undergraduate psychology students, who were paid $25 for their participation. Their mean age was 23 (SD = 2.8 years; range = 21–33 years). All participants but one (who indicated he was bisexual) described their sexual orientation as heterosexual, and the majority (92%) of the men were White. Twenty-two (55%) men indicated that religion was an important to very important factor in their life, 11 (27.5%) indicated that religion was slightly important,

Table 1. Scores on the SIS/SES Scales

	SIS/SES Scale		
	SES	SIS1	SIS2
Low SIS1 (n = 16)	55[a]	22[b]	26
High SIS1 (n = 17)	61	30	28
Low SIS2 (n = 18)	61	25	19[b]
High SIS2 (n = 22)	58	27	29
Low SES (n = 19)	51[b]	25	27
High SES (n = 21)	65	27	28

Note. The same participants were assigned to low/high SES, SIS1, and SIS2 groups. SES = Sexual Excitation Scale, SIS1 = Sexual Inhibition Scale-1 (Inhibition due to the threat of performance failure); SIS2 = Sexual Inhibition Scale-2 (Inhibition due to the threat of performance consequences).

[a]Means different at $p < .05$. [b]Means different at $p < .001$.

and 5 (12.5%) indicated that religion was not important. The mean number of sexual partners during the past year was 2.1 (SD = 1.9). Twenty–two (55%) men were in a current sexual relationship. Twenty (50%) participants reported having engaged in sexual activity at least once a week during a typical month in the past half year; the majority (31; 77.5%) reported having masturbated at least once a week. All men reported some previous exposure to sexually explicit photographs or films. The study protocol was approved by the Institutional Review Board.

Film Stimuli

The participants were shown a series of six erotic film extracts each lasting 3 minutes; there were two film excerpts for each stimulus condition (two pleasant erotic, two pleasant erotic combined with distraction, and two threatening erotic film excerpts). The pleasant erotic excerpts were taken from films produced and directed by a woman and depict combinations of petting, foreplay, and intercourse in which both partners were equally involved (Laan, Everaerd, Bellen, & Hanewald, 1994). The threatening erotic excerpts were from the commercially available films "Extremities" and "A Reason to Believe" and depict coercive sexual interactions, with no explicit sexual activity being shown.

Distraction was based on arithmetic equations (additions, subtractions, multiplications, and divisions) displayed for 10 seconds in a corner of the screen. Participants were asked to solve the equation while continuing to watch the film, and to write down the answer on a form (Janssen, Everaerd, van Lunsen, & Oerlemans, 1994).

To minimize the possibility that different response patterns would be due to different levels of attention—and thus to rule out alternative interpretations in terms of distraction—an effort was made to ensure that participants were viewing the film excerpts that were not combined with the distraction task. This was accomplished by presenting asterisks on the screen, at random times and positions, and requiring subjects to press a button each time one appeared.

Presentation of the three stimulus conditions and the six film excerpts was counterbalanced using Latin Square designs (Kirk, 1968). A 15-minute neutral film excerpt (taken from a documentary about cats) was used for the determination of physiological baseline levels, and further neutral film excerpts were used for the 3-minute return-to-baseline intervals between erotic stimuli. The average response during the last minute of each baseline episode was used for statistical analysis.

Performance Demand

Half of the consensual and threatening sexual film excerpts (the order of these conditions again being counter-balanced) were associated with high performance demand and half with low performance demand (as defined above). At the end of the session it was explained to the participants that in reality erectile responses were measured during all conditions. Two questions were asked at this interview: did you believe that we were measuring your erections when we said we were, and did you believe that we were not measuring your erections when we said we were not. Each was rated on a 1 to 100 scale.

Measures

Genital response. Penile tumescence and rigidity was monitored by means of the RigiScan device (Timm Medical Technologies; for a discussion of its validity and reliability see Geer & Janssen, 2000; Munoz, Bancroft, & Marshall,1993). This computerized system measures penile circumference at 15-second intervals, and by means of controlled compression of the penile shaft, measures rigidity at 30-second intervals once the circumference has increased by 20%. Genital response will be reported in terms of maximum penile rigidity at the base of the penis. (Other variables derived from the RigiScan behaved in essentially the same way and will not be reported.)

Startle response. Acoustic startle probes were presented binaurally through a headphone, each probe consisting of a 50-ms burst of 120dBA white noise with near instantaneous rise time (Graham, Janssen, & Sanders, 2000). Participants were told that they would hear a few brief, loud sound bursts. A total of 9 startle probes were presented randomly during each 3-minute film excerpt. In addition, a total of 10 startle stimuli were presented during the return–to–baseline intervals. Eyeblink responses were recorded from orbicularis oculi EMG activity with Ag/AgCl disk electrodes. Raw EMG was digitized using a Contact Precision Instruments (CPI) system and an IBM-compatible (486) computer. A sampling rate of 400 Hz was used in a time window from 100 ms prior to onset to 600 ms after onset of blink-eliciting stimuli.

Subjective ratings. The Self-Assessment Manikin (SAM; Bradley & Lang, 1994; Lang, 1980), a pictorial assessment technique, was used to measure valence (positive vs. negative), arousal (excited vs. calm), and dominance (feeling controlled vs. in control) associated with the participant's affective reaction. The SAM reflects a 5-point scale and was completed prior to the first stimulus presentation, and after each stimulus presentation.

In addition, participants were asked to indicate their subjective sexual arousal (overall and strongest feelings) and estimated degree of erection, using visual analogue scales (VAS). Ratings were made from 0 (not at all) to 10 (very strongly) on a 100-mm line. These measures were filled out prior to the first film presentation, between film presentations and return-to-baseline periods, and after the last presentation.

Procedure

To help participants make an informed decision, the experimental procedures and stimuli used were described in advance over the phone and in a letter. On arrival at the laboratory, the procedures were explained again, and an informed consent form was read and signed. Throughout

testing participants were seated in a recliner chair, next to a small table which held a clipboard and an intercom, used to communicate with the experimenter. The male experimenter provided instructions on how to place the RigiScan and on how to use the rating scales. Then, after the experimenter had left the room, the participant put the RigiScan in place and a disposable sheet and towel over his lap. When the participant signaled that the device was in place, the experimenter reentered the room to attach the electrodes which were used to measure the startle response. Following this the experimenter left the room and a 15-minute adaptation period was started. During this adaptation period, which ended with a 1-minute baseline measurement phase, the participant viewed the sexually neutral film. After the baseline period the first erotic film was presented. At the end of the testing session, payment arrangements were made and participants were debriefed regarding the purpose and hypotheses of the study. Testing sessions took approximately 90 minutes.

Data Reduction and Analysis

For each dependent variable of interest, an analysis of variance was carried out with SIS/SES group (excluded in the analyses assessing overall effects of film and demand), stimulus (nonthreatening, nonthreatening/distraction, and coercive), and performance demand (high or low) as factors. Due to the difference in SES scores between the groups, an analysis of covariance was used when examining the high/low SIS1 grouping, with the SES score as covariant. BMDP [4v] was used for the multivariate MANOVAS, analyses of covariance and follow-up tests (ANCOVA) (BMDP, 1990). SuperANOVA (Abascus, 1989) was used for univariate analyses and post-hoc tests (simple mean comparisons). The Greenhouse-Geisser epsilon procedure was applied to correct for violations of the sphericity assumption (Vasey & Thayer, 1987).

Results

Main Effects of Film/Stimulus and Demand Condition

As the three analyses (i.e. high and low SES, SIS1 and SIS2) are based on the same sample, the main effects of film stimulus and demand condition will be basically the same for each grouping variable, and these will be reported first.

Genital responses. A 2 (demand) x 3 (film) repeated-measures analysis of variance (ANOVA) on maximal rigidity measured at the base of the penis revealed a main effect of film type ($F(2,72) = 20.94$, $p < .0001$). Follow-up tests revealed responses to the erotic stimuli without distraction to be greater than responses to both the stimuli with distraction ($F(1,36) = 12.27$, $p < .001$) and the coercive stimuli ($F(1,36) = 41.78$, $p < .0001$). Also, the stimuli with distraction led to greater responses than the coercive stimuli ($F(1,36) = 8.77$, $p < .005$). While no significant main effect of demand was found, the interaction between film type and demand was significant ($F(2,72) = 3.26$, $p < .05$), and follow-up tests revealed that there was a trend for high performance demand to increase responses during consensual stimuli ($F(1,36) = 3.37$, $p < .08$) and to decrease them during coercive stimuli ($F(1,36) = 3.14$, $p < .09$).

Subjective sexual arousal. A multivariate repeated-measures analysis of variance (MANOVA) was carried out with the following VAS items: sexually aroused overall, sexually aroused strongest, and estimated degree of erection. The main effect of film type was significant ($F(6,31) = 15.28$, $p < .0001$), revealing a pattern similar to the genital response findings (overall: $F(2,72) = 46.19$, $p < .0001$; strongest: $F(2,72) = 45.52$, $p < .0001$; erection: $F(2,72) = 34.64$, $p < .0001$). No significant main or interaction effects of demand were found.

Affective and eye-blink responses. An analysis of variance of the items of the SAM measuring valence (positive vs. negative) revealed a significant main effect of film type ($F(2,72) = 81.81$, $p < .0001$). Contrasts indicated that participants experienced more negative affect during the coercive film clip than during both the erotic film ($F(1,36) = 142.86$, $p < .001$) and the erotic film with distraction ($F(1,36) = 105.80$, $p < .001$). No differences were found between the erotic film and the film combined with distraction. Also, no significant main or interaction effects of demand were found.

Eye-blink data from 10 of the 40 participants had to be rejected because they did not consistently show a startle response. Performance demand was not included as a factor in the analysis because of the smaller number of participants and the presence of missing observations. Instead, separate repeated-measures analyses were conducted for the two demand conditions. Results showed a significant effect of stimulus ($F(2,50) = 3.73$, $p < .04$) for the low demand condition only. Contrasts revealed that eye-blink responses were greater during the coercive film than during the consensual film ($F(1,25) = 7.33$, $p < .01$). Again, no significant effects were found for demand.

Comparison of High and Low SES Groups

Genital responses. A significant main effect of group was found ($F(1,34) = 4.63$, $p < .04$), indicating that the high SES participants responded with higher response levels to all stimuli. No significant interactions between film type and SES group were found. Only one significant interaction effect was found, and this involved the factors Group and Performance Demand ($F(1,34) = 5.64$, $p < .03$). Post-hoc tests revealed a trend for larger penile responses under high performance demand in the low SES group ($F(1,16) = 3.57$, $p < .08$). No effects of performance demand were found for the high SES group.

Subjective sexual arousal. A significant main effect of group was found ($F(3,33) = 2.98$, $p < .05$). Univariate tests revealed that, as for the genital responses, the high SES group showed higher levels of subjective sexual response than the low SES group (overall: $F(1,35) = 4.75$, $p < .04$; strongest: $F(1,35) = 3.79$, $p < .06$; erection: $F(1,35) = 6.66$,

$p < .02$). No interactions between film type and SES group were found. The interaction between demand and group was not significant for subjective sexual responses.

Affective and eye-blink responses. No significant main or interaction effects of SES group were found.

Comparison of High and Low SIS1 Groups

Genital responses. No significant main or interaction effects of SIS1 group were found. As the experimental manipulation of performance demand was principally intended for validation of the SIS1 grouping factor, and as it depended on misleading participants about the purpose of the low demand condition, we redid the analysis after excluding participants who indicated during the postexperimental interview that they had not been fully misled. Only participants who gave ratings greater than 60 (on a 1-100 scale) to both questions were included. In total 18 participants gave a rating lower than 60 to both questions and were excluded from this analysis. No significant effects (other than the main effect of film) were found in this reanalysis. Similarly, in addition to the initial median split (on the basis of which seven subjects had to be excluded), the data were reanalyzed using the mean SIS1 score as the basis for a split. Again, no significant effects (other than the main effect of film) were found in this reanalysis.

Subjective sexual arousal. No significant main or interaction effects of SIS1 group were found.

Affective and eye-blink responses. No main or interaction effects of SIS1 group were found.

Comparison of High and Low SIS2 Groups

Genital responses. There was no significant main effect of SIS2 group (i.e., the high and low SIS2 groups did not differ overall in their genital response levels). However, there was a significant interaction between film type and group ($F(2,68) = 5.74$, $p < .007$; see Figure 1). Post-hoc tests revealed that the high and low SIS2 groups did not differ in their responses to the consensual sexual films ($p > .7$). However, the low inhibition group's response to the sexually threatening stimulus was significantly greater than that of the high inhibition group ($F(1,35) = 4.58$, $p < .04$). No other significant main or interaction effects were found.

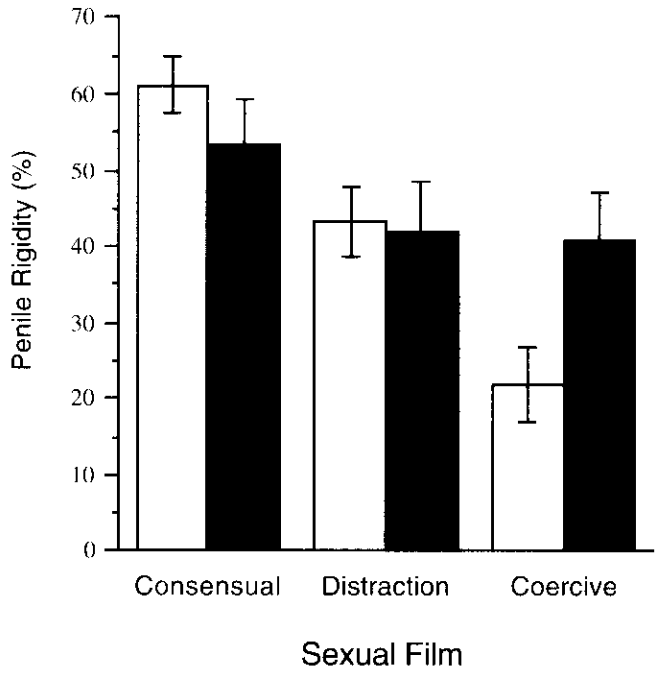
Subjective sexual arousal. As for the genital responses, no main effect of SIS2 was found, indicating that the two inhibition groups overall reported similar levels of sexual arousal. The subjective measures differed from genital response, however, in that no interaction between subjective ratings and stimulus was observed (i.e., subjective ratings for the two groups did not differ for any of the three types of stimulus).

Affective and eye-blink responses. No main or interaction effects of SIS2 group were found.

Discussion

The SIS/SES scales (Janssen et al., 2002) specifically assess psychophysiological response patterns that are associated with two types of sexual situation: nonthreatening (and hence most relevant to assessing propensity for excitation) and threatening (relevant to propensity for inhibition). Given the physiological basis of our theoretical model and the reliance of the questionnaire on sexual response patterns, the use of a psychophysiological method of validating the three scales was considered appropriate. Our attempt to do this in the current study worked well for both SES and SIS2. It did not work well for SIS1.

Figure 1. Penile Rigidity for High and Low SIS2 Groups



The findings of this study provide clear validation of the SIS2 scale. The high and low SIS2 groups did not differ in their genital response to the consensual sexual stimuli, but the low SIS2 group showed significantly greater genital response to the sexually threatening stimuli. This pattern was not apparent with the subjective reports of sexual arousal, and, of particular interest, both groups showed evidence of negative affect during the threatening stimuli, both in subjective reporting and objectively with the startle response. Thus, in spite of a negative affective response, the low inhibition participants showed more genital response. In the circumstances, the lack of group difference in ratings of subjective sexual arousal could have resulted from a social desirability effect.

There is also good validation of the SES scale. The high SES group showed generally higher genital and subjective sexual arousal responses regardless of erotic stimulus type. The high and low SES groups did not differ in their affective responses, either subjectively or objectively measured, which indicates that the SES effect directly reflects excitatory responsiveness to sexual stimuli and is independent of the emotional valence of the stimulus, which is more relevant to inhibitory response.

We did not succeed in providing validation of our SIS1

scale. Analyses of variance revealed no interactions between the high and low SIS groups and either performance demand or distraction conditions. There are a number of possible reasons for this. The loss of a number of participants because they fell on the median of the SIS1 scale reduced power. The performance demand paradigm was only partially successful in convincing participants that in the low demand condition their erectile response was not being measured. The distraction paradigm has been shown to discriminate between functional and dysfunctional men (e.g., Abrahamson, et al.,1985; Janssen et al., 1994), but our high SIS1 group was not dysfunctional in the clinical sense. Psychophysiological validation of this scale may well require other techniques, the use of a clinically dysfunctional high SIS1 group, or larger groups of nonclinical high SIS1 participants to achieve greater power. In addition, if high inhibitory tone is the key to SIS1 (see Janssen et al., 2002), then other psychophysiological means of demonstrating this, either in the waking or sleeping state and possibly using pharmacological manipulations, may be required to demonstrate satisfactory psychophysiological validation of this scale.

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