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Central activation of the sexual system

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Chapter 4

Conscious Processing of Sexual Information: Mechanisms of Appraisal

To elucidate some of the activational mechanisms of sexual response, this study investigated the effects of conscious appraisal of sexual and neutral stimuli on a categorization task and on ratings of sexual arousal. Conscious appraisal is dependent on memory, regulatory, and attentional processes, interacting with one another. It is proposed that regulation is activated by attention, furnished by representations from implicit and explicit memory. Participants (26 men and 25 women) were asked to respond to "target" stimuli that were preceded by supraliminal "prime" stimuli. Primes and targets were operationalized by slides with sexual (i.e., romantic vs. explicit) and neutral content. In a cognitive task, participants had to group randomly presented targets as quickly as possible into sexual and nonsexual categories. Categorization of sexual targets was delayed when they were preceded by sexual primes compared to neutral primes. This was interpreted as an inhibitory process and compared with the Sexual Content-Induced Delay (SCID) phenomenon (Geer & Bellard, 1996; Geer & Melton, 1997). No gender difference was found. In a subsequent affective task, participants provided an assessment of sexual arousal, followed by an evaluation of the target. This task was hypothesized to result in differential access to memory, where assessments of sexual arousal are influenced mainly by implicit memory, and where evaluations are influenced mainly by explicit memory. Gender differences were most prominent in the evaluation aspect of this task. It was concluded that cognitive processing of sexual information is similar for both genders, but that gender differences are present in affective processing of sexual information.

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Introduction

What happens when a person is confronted with a sexually competent stimulus? How is stimulus information transformed into particular sorts of actions? For a full blown sexual emotion, specific components have to be activated (e.g., genital arousal, a subjective experience of sexual arousal) as well as nonspecific components (e.g., heart rate changes, a subjective experience of tension). The activation of these components is mediated by physiological sensitivity (e.g., androgenic hormones) and environmental variables, such as stimulus context, rules, and opportunities. Cognitive processes figure prominently. The focus of this study is on these cognitive processes. Sex can be construed as an emotion (Everaerd, 1988; Geer et al., 1993) and emotional reactions depend on appraisal of the stimulus, which includes memory, regulatory, and attentional processes interacting with one another.

In a temporal perspective, unconscious activation of implicit sexual memory may be followed by a conscious appraisal of the sexual stimulus. In previous studies, we concentrated mainly on very early stages of activation in which effects of subliminally presented sexual stimuli were investigated (Chapter 2; Janssen et al., 2000). The aim of the present study was to clarify mechanisms at a later stage, the effects of consciously appraised sexual stimuli. In this stage, attention will be triggered and subjective arousal elicited. We will first describe three relevant cognitive concepts (memory, regulation, and attention) and situate them in an activational model of sexual response.

Memory

Long term memory is not a unitary entity, but can be subdivided into explicit (or declarative) and implicit (or procedural) memory (Squire, 1992; Tulving & Schacter, 1990). Explicit memory is consciously accessible; implicit memory is not. Regarding "sexual memory," that is, memory associated with sexual responding, explicit memory refers to, for instance, recollections of sexual encounters, attitudes toward sex, sexual fantasies, and knowledge about sexual rewards or costs. Implicit sexual memory refers to, for instance, innate sexual reflexes, learned (automatized) sexual scripts, and classically conditioned sensations. Explicit and implicit memories meet in

working memory and create an immediate conscious experience (LeDoux, 1996).

The pathways that lead from memory to experience are different for both types of memory. On the one hand, subjective experience is dependent on activated multiple, sexual as well as nonsexual, meanings in explicit memory (Everaerd, Laan, Both, et al., 2000; Geer et al., 1993; Janssen et al., 2000). On the other hand, sexual stimuli, like other significant emotional stimuli, may be processed implicitly. Implicit memories activate physiological responses and its feedback representations provide input to conscious awareness of emotional states (Morris, 2002). Both types of memory contribute differently in producing a subjective emotional experience. As noted by Damasio (2003), a feeling is "the perception of a certain state of the body along with the perception of a certain mode of thinking and of thoughts with certain themes" (p. 86). A complete emotional experience consists of awareness of bodily responses (e.g., "I feel sexually aroused") plus the cognitive appraisal of the stimulus as emotional (e.g., "this is a sexual arousing stimulus").

Explicit memory has been studied, with a focus on gender differences, using different experimental approaches. Geer and McGlone (1990) tested memory for sexually explicit, romantic, and neutral elements in a story. Males correctly identified more sexually explicit and females more romantic sentences, but the sexes did not differ on neutral sentences. It was hypothesized that men and women have different sexual schemata. A more abstract test for these gender differences in sexual memory was done using a "network model of knowledge representation" (Geer, 1996). The meaning of a concept was defined as the pattern of associates linked to the concept. The organization of meaning to concepts relevant to sexuality was investigated by participants' similarity judgements to word pairs. Networks were more similar within than between genders. Also, women had a more complex organization of knowledge for relationship-oriented words, whereas men were found to have a more complex knowledge organization for explicitly sexual words (see also Geer & Manguno-Mire, 1996). Differences in sexual responding between men and women may be traced to these differences in explicit sexual memory (e.g., the experience of sexual arousal in women is more blended with other emotional experiences compared to men; Everaerd, Laan, Both, et al., 2000).

Only a few studies of implicit memory have been conducted. Jacoby (1991) has suggested a method to separate conscious and unconscious influences on memory. His process dissociation procedure (PDP) consists of two conditions: in one condition, the two memory processes work in the same direction; in the other condition, conscious influences oppose the unconscious ones. Bush and Geer (2001) focussed on separate influences of implicit versus explicit memory using Jacoby's PDP. Explicit memory for sexual words was greater than for other emotional and neutral words; however, no implicit memory effects or gender effects were found. Studies with only men did show effects of implicit sexual memory. In a subliminal priming paradigm, Bargh, Raymond, Strack, and Pryor (1995) were able to show an implicit bidirectional link between sexual and power representations in men high in the likelihood to sexually harass (see also Bargh & Raymond, 1995). In a priming study by Janssen et al. (2000), sexual stimuli that were presented below the level of awareness affected penile circumference and facilitated recognition of other sexual stimuli. These data can be interpreted as implicit activation of sexual memory (see also Chapter 2).

Finally, the occurrence of response disagreement (e.g., low self-reported emotional rating and a relatively high physiological response; Laan, Everaerd, Van Bellen, & Hanewald, 1994) was explained by independent contributions from explicit and implicit memory. Sexual stimuli matched with implicit sexual memory and led to physiological sexual arousal. Meanwhile, the subjective experience of sexual arousal was absent because of activated nonsexual meanings in explicit memory (Everaerd, Laan, Both, et al., 2000; Geer et al., 1993; Janssen et al., 2000).

Regulation

Central regulation of emotional responses is essential for adaptive functioning. When a stimulus matches implicit and/or explicit sexual memories, it can be identified as sexual and, from that point on, regulation of information processing is needed; attention will be triggered to monitor responses. Although sexual excitement can be enhanced by intentionally bringing (explicit) sexual memories into awareness, probably most of the time regulation is inhibition. The sexual response basically is a "go-system" that with an appropriate stimulus and without inhibition would develop and unroll automatically (Everaerd et al., 2001); however, since sexual behavior

goes together with important concerns (e.g., reproduction, intimacy), attentional mechanisms are triggered and activational stages are accompanied by conscious inhibitory control (Baars, 1998b; Fuster, 1997; Gross, 1998).

The triggering of attention and activation of regulation modules may empirically correspond to the Sexual Content-Induced Delay (SCID) phenomenon (Geer & Bellard, 1996; Geer & Melton, 1997). This concept refers to hesitancy in decision-making when erotic material is presented. Evidence for the SCID phenomenon was found in unprimed and primed lexical decision tasks and was accentuated in women (Geer & Manguno-Mire, 1996). When SCID is conceived as conscious regulation, this gender difference might be explained by evolutionary development. Dissimilarities between prehistoric gender roles may have influenced information processing nowadays. Men have been selected to maximize their mating opportunities, women do not benefit by increasing the number of sexual partners and would risk producing offspring of low quality if they mated indiscriminately (Bailey et al., 1994). Hence, women may be more able to inhibit (i.e., regulate) sexual responses (Bjorklund & Kipp, 1996; Both, Everaerd, & Laan, 2003).

In a recent study from our laboratory (Chapter 5), we presented sexual and neutral "target" pictures that were preceded by consciously presented sexual and neutral "prime" pictures. Recognition of sexual targets was delayed by sexual primes compared to neutral primes. This effect seems similar to SCID. SCID was not found regarding neutral targets; there was no difference in recognition time between sexually and neutrally primed neutral targets. This supports the hypothesis that SCID can be seen as the activation of regulatory modules by sexual stimuli when an emotional response is elicited.

Attention

Conscious regulation of sexual response is realized by attention. Attention is a prerequisite of consciousness (Tassi & Muzet, 2001). The results of selection are always conscious, whereas the processes of selecting, deselecting, and maintaining selection may or may not be. As noted by Baars (1998a), "attention involves the selection of targets for the searchlight to shine on, while consciousness results from illumination of the target" (p. 59). Regarding sexual response, attention is needed to consciously appraise

the stimulus and later on for sustained responding. The same nonconscious state can give rise to quite different experience depending on the process that construct the latter from the former. The focus of attention in emotion can yield awareness of bodily phenomenology or emotion thoughts (Lambie & Marcel, 2002).

The amount of attention that is attracted by a sexual stimulus is correlated with its emotional valence. Stimuli that have the potential of eliciting more arousal, dependent on matches with sexual memory, attract more attention compared to less arousing stimuli. In experiments, heterosexual men and women, gay men, and lesbian women were instructed to locate dots on slides of (nearly) nude men and women (Wright & Adams, 1994, 1999). Decision times were the longest for slides of the preferred gender. Also, in studies with sex offenders (Abel, Huffman, Warberg, & Holland, 1998; Letourneau, 2002), the times to rate slides were the longest when sexual interest was the highest.

Conscious appraisal

Now that memory, regulation, and attentional processes have been cursorily addressed, how do these processes interact in the activation of a sexual response when a sexual stimulus is perceived? Two different pathways are distinguished (see Figure 4.1). (1) Sexual stimuli may be processed implicitly, thus quick and unconscious. The subjective experience of sexual arousal cannot emerge without conscious evaluation, yet motor programs can be implicitly activated. Dependent on physiological sensitivity and context variables, implicit activation could become enough intense to trigger attentional mechanisms (Everaerd et al., 2001). (2) Conscious appraisal of the sexual stimulus results from attentional focus. The appraisal process is contingent on the match between stimulus characteristics and explicit memory.

After the stimulus is consciously evaluated as sexual, regulation modules are engaged. Now the subjective experience of sexual arousal emerges. For sustained response, attention to internal or external sexual cues is needed. Without attending, the sexual response will fade away. Regulation of the response also functions through conscious evaluation, for which attention is a prerequisite.

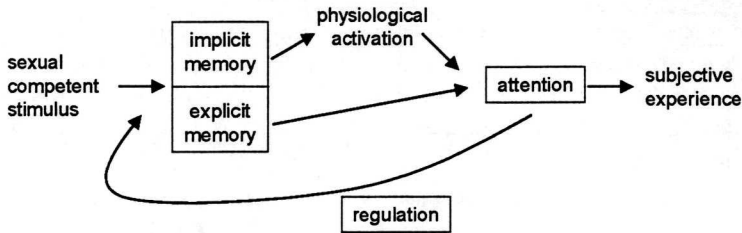


Figure 4.1. Regulation is activated by attention, which is provided with representations from implicit and explicit memory.

Overview of the study

The experiment in this study will concentrate on the effects of conscious appraisal of sexual stimuli to elucidate some of the activational mechanisms described above. We investigated mechanisms of appraisal by looking at the interaction of gender and sexual content of stimuli: romantic versus sexually explicit (cf. Geer et al., 1993; Geer & Manguno-Mire, 1996). This interaction has been studied before, with mixed results. In general, men reported more subjective sexual arousal than women in response to sexual stimuli (Geer & Manguno-Mire, 1996; Murnen & Stockton, 1997). A preference of women for affective, romantic sexual material over explicit sexual material was reported and an opposite relationship for men (Kinsey, Pomeroy, & Martin, 1948; Kinsey, Pomeroy, Martin, & Gebhard, 1953; see also Geer et al., 1993). However, also different effects were reported (for an overview, see Geer & Manguno-Mire, 1996) and some studies could not distinguish gender differences in the appraisal of different sorts of sexual stimuli (Dekker & Everaerd, 1989; Fisher & Byrne, 1978; Heiman, 1977; Schmidt, Sigusch, & Schafer, 1973; Quackenbush, Strassberg, & Turner, 1995).

It was decided to elaborate on the priming paradigm used by Janssen et al. (2000). Priming involves a change in response to a "target" stimulus as a consequence of a prior encounter with a related "prime" stimulus. Effects of stimuli (primes) are studied indirectly, uncontaminated by direct intentional influences. Primes and targets were sexual and neutral color slides. The primes were presented for 1000 ms. While this duration is too short for extensive cognitive elaboration, it will be long enough to start controlled conscious processing of sexual information (Neely, 1977; Posner

& Snyder, 1975). By varying instructions, a "cognitive" versus an "affective" task were created. In this way, effects of the primes can be analyzed for different response components: recognition time of sexual information and subjective sexual arousal respectively.

In both tasks, the participants were exposed to sexual (i.e., romantic and explicit) and neutral pictorial stimuli that were presented on slides. They were instructed to respond to randomly presented sex and neutral target stimuli that were primed by preceding sexual or neutral prime-stimuli. So, the basic design of the study was a 2 (Prime: Sexual vs. Neutral) x 2 (Target: Sexual vs. Neutral) factorial.

In the cognitive task, participants were asked to categorize the targets as quickly as possible. Latency of decision was the dependent variable. In a subliminal priming version of this task, it was found that sexual primes facilitated recognition of sexual targets (Chapter 2; Janssen et al., 2000). When the primes were consciously perceived, an opposite effect was obtained, that is, sexual primes decelerated the categorization of sexual targets (Chapter 5). This effect was comparable to the SCID phenomenon (Geer & Melton, 1997; Geer & Bellard, 1996).

In the affective task, participants were asked to rate the targets. Participants were asked two questions, in which the requested focus of attention differed in order to create a different access to memory (Robinson & Clore, 2002). In this way, we may distinguish between implicit versus explicit contributions to emotional self-report. First, participants were asked to provide an assessment of their level of sexual arousal. Second, they were asked to what degree they found the target sexually arousing. The first question required an introspective assessment of sexual arousal influenced by implicit memory and physiological feedback. The second question required a cognitive appraisal of the target and was mainly determined by explicit memories.

There were six predictions. (1) Regarding the cognitive task, we predicted a SCID effect (i.e., sexual primes decelerate the categorization of sexual targets). (2) With respect to gender, the SCID effect was predicted to be larger in women (Bjorklund & Kipp, 1996; Geer & Manguno-Mire, 1996). (3) With respect to stimulus category, we expected the SCID effect to be the largest for the stimuli with the most arousing capacity: for women, the romantic slides; for men, the explicit slides (Geer & Manguno-Mire, 1996). (4) Regarding the affective task, we expected men to report more arousal

compared to women (Geer & Manguno-Mire, 1996; Murnen & Stockton, 1997). (5) For women, we predicted reports after romantically primed targets to indicate more arousal than assessments after sexually explicitly primed targets and for men we expected the opposite result (Geer et al., 1993; Kinsey et al., 1948, 1953). (6) Finally, we expected that the magnitude of the SCID effect in the cognitive task would correlate positively with assessments of arousal in the affective task.

Method

Participants

Fifty-one heterosexual undergraduates, 26 men and 25 women, participated in this study, which was conducted at the University of Amsterdam. Mean age for men was 22.6 years ($SD = 2.9$) and for women 22.0 years ($SD = 3.6$). Course credits were offered for participation. All participants completed written informed consent prior to participation.

Setting and Apparatus

The experiment was conducted in two adjacent rooms. Participants were seated at a table, facing a backlit milk colored projection screen. The size of the projected images was 13 x 26 cm. Viewing distance was approximately 130 cm, resulting in a 6° horizontal and 11° vertical visual angle. For the registration of responses, three button boxes were placed in front of the participant. The first button box was placed in the middle of the table. This box had seven buttons and was used to measure subjective responses on a 7-point scale. Two boxes with one button each were used to measure decision times. They were placed on the left and right side of the table. One was labeled with the word *sex*, the other with the word *plant*. The position (left/right) of these buttons was randomized across participants.

The experimenter and all technical equipment required for slide presentations and data collection were stationed in the adjacent room. Communication with the participant was established using an intercom system. Three Kodak slide projectors, each outfitted with a Displaytech ferroelectric liquid crystal shutter, were used to project the images on the screen. A Bull Z433D microcomputer was used to control the slide carousels as well as the sequencing and timing of the shutters.

Materials and Design

Slides with sexual content were made of photographs from erotic and pornographic magazines. Three subsets were created: *explicit*, *romantic*, and *models*. Selection was based on subjective assessments of three female and two male students. Slides of the *explicit* set portrayed heterosexual couples engaged in oral or genital sexual activity. These are typically male-oriented pornographic slides with genitals of both sexes clearly visible. The *romantic* slides depicted heterosexual couples making love as well as masturbating women. Characteristics of this category are: female's enjoyment, a general positive atmosphere, a pleasant background (e.g., nature, fireplaces), and genitals not explicitly in focus (cf. Heiman, 1977; Geer & McGlone, 1990).

The third category of sexual stimuli, *models*, was selected to function as targets in series in which participants rated their subjective sexual arousal and the arousability of the stimuli (see Table 4.1). To attribute differences in subjective arousal to the different prime-categories (i.e., explicit vs. romantic), this subset was made as homogeneous as possible. Slides depicted nude or nearly nude women, looking into the camera, photographed in Playboy-like fashion. Photographs of men only were not included to avoid inhibition in arousal when men view same-sex pictorial stimuli (cf. Money & Ehrhardt, 1972; Schmidt, 1975). A pilot study was conducted in which 23 men and 24 women rated an initial set of 80 slides. The question "To what degree did you find the last slide sexually arousing?" could be answered on a 7-point scale, varying from *not at all* to *extremely*. Forty slides were selected to form this subset; the mean for men was 3.1 ($SD = 1.1$) and for women 1.7 ($SD = 0.8$). This difference was statistically significant, $t(45) = 5.10$, $p < .001$.

The neutral, or *plant*, stimuli depicted pictures of flowers, plants, and bushes. All stimuli were selected to match on dimensions such as complexity, contrast, and luminance. For example, the number of main elements of a picture was not allowed to exceed two, excessively dark or light pictures were omitted, and an attempt was made to arrive at a broad range of colors for all sets.

A 2 (Gender) \times 2 (Prime: Sexual vs. Neutral) \times 2 (Target: Sexual vs. Neutral) \times 2 (Stimulus Set: Explicit vs. Romantic) factorial design with repeated measures was employed. The experiment consisted of four series of 40 trials each. In each trial, a sex or plant target was preceded by a sex or plant prime. In Series 1 and 2, the sexual primes were from the explicit set,

in Series 3 and 4, sexual primes were from the romantic set. The sexual targets in Series 1 to 4 came from the explicit, models, romantic, and models set respectively. The first part of the experiment was setup to contrast a subliminal priming experiment (Chapter 2). To keep this part similar to the subliminal priming study, the order of the stimulus sets (explicit/romantic) was not randomized or alternated.

Table 4.1 *Division of the Subsets of Slides between the Cognitive (Series 1 and 3) and Affective Task (Series 2 and 4; number of slides in parentheses)*

	sexual			neutral
	explicit	romantic	models	
primes	Series 1, 2 (40)	Series 3, 4 (40)		Series 1, 2, 3, 4 (80)
targets	Series 1 (20)	Series 3 (20)	Series 2, 4 (40)	Series 1, 2, 3, 4 (80)

In Series 1 and 3 (i.e., the cognitive task), decision time was the dependent variable. Participants were asked to categorize the targets as quickly as possible by pushing either the sex or plant button. Decision time was measured from onset of the target to the pressing of a button. In Series 2 and 4 (i.e., the affective task), the dependent variables of interest were subjective sexual arousal and arousability of slides. Each target was followed by two questions. In the first question, participants were asked to indicate how sexually aroused they felt ("To what degree do you feel sexually aroused at this moment?"). Participants could press one of the 7 buttons, reflecting a 7-point scale with *not at all* and *extremely* as its anchors. The second question involved a rating of the sexual valence of the target and required participants, using the same 7-point scale, to answer the question: "To what degree do you find the last slide sexually arousing?" The two questions following the targets in Series 2 and 4 were presented on two slides.

Prime exposure duration was 1000 ms. In Series 1 and 3, target presentations were ended as soon as the participant pressed a button. In Series 2 and 4, targets were presented for 1000 ms, followed by the slide with the first question. After the participant responded, the second question was presented.

Randomization of conditions with regard to the Prime and Target factors was limited for both methodological and technical reasons. One

sequence was created that consisted of 160 trials. This sequence was randomly determined with one restriction: within each block of 40 trials, the four conditions were equally represented (i.e., each block contained 10 trials of each of 4 conditions: sex-sex, sex-plant, plant-sex, plant-plant). A mirror of this sequence was created by changing prime content, so that whenever a target was preceded by a sexual prime in the original sequence, it would be preceded by a plant prime in the "mirror" sequence, and vice versa. These two sequences were randomly distributed among the participants and split up into four series of 40 trials.

Regarding randomization of slides (i.e., the specific slides that represent the conditions), a random selection of 80, out of a total of 160, plant slides was used as prime; the other 80 were used as target. The subset of 60 explicit slides was randomly split in two parts, 20 targets for Series 1 and 40 primes for Series 1 and 2. The same procedure was followed for the subset of 60 romantic slides with regard to Series 3 and 4. The models subset consisted of 40 slides which were selected to function as targets in Series 2 and 4. One random sequence of the targets was made and used for all participants; the sequence of the primes was randomized afresh for each participant.

Procedure

All participants were tested individually by an experimenter of the same gender as the participant. The experiment, which took about 75 minutes to complete, consisted of five phases: (a) Adaptation, (b) Series 1: Explicit Set, Cognitive Task, (c) Series 2: Explicit Set, Affective Task, (d) Series 3: Romantic Set, Cognitive Task, (e) Series 4: Romantic Set, Affective Task.

Adaptation. The adaptation phase was included to permit habituation to room illumination level, to the light emitted by the slide presentations, and to familiarize participants with the slide presentation procedure. Participants were informed about the procedures in the dimly lit experimental room. After this, the experimenter went to the adjacent room and from that moment on all communication took place via the intercom system. As part of the adaptation, participants were presented with 15 slides (including both sex and plant slides), each lasting 30 seconds, and were asked to just watch the slides.

Series 1: Explicit set, cognitive task. It was explained that in this phase sex and plant slides would be presented sequentially. Participants were asked to decide on each trial whether the last slide (i.e., the target) was a sex or plant picture and to press the corresponding button with their right or left forefinger. They were instructed to respond as fast and accurately as possible. During a block of 12 practice trials, participants were familiarized with the task. After these trials, the presentation of the 40 experimental trials was started.

Series 2: Explicit set, affective task. After a 5-minute resting period, during which participants listened to music, a new block of trials was presented. Participants were informed that they would be exposed to a similar series of trials; however, this time they were asked to answer the two sexual arousal questions after each prime-target combination. Answers could be given by pushing one of the seven buttons on the box in front of them. In addition, it was explained to them that reaction times would not be measured during this series. The block of 40 experimental trials was preceded by six practice trials.

Series 3: Romantic set, cognitive task. Series 3 were the same as Series 1 with two exceptions. The Romantic stimulus set was used for sexual primes and there were six practice trials instead of 12.

Series 4: Romantic set, affective task. Series 4 were the same as Series 2 only now sexual primes were from the Romantic stimulus set.

Results

Series 1 and 3: Cognitive Task

The participants completed two series of 40 trials leading to an initial pool of 4,080 trials. Due to computer failure, one series (40 decision times) was missing. Three series (120 decision times) were excluded because participants did not correctly understand the instruction and responded on both, primes and targets (instead of targets only). Outliers were eliminated as follows: (1) response errors were excluded, that is, participants pressed the sex-button in response to a plant-target and vice versa; (2) decision times below 100 ms and above 2000 ms were excluded; and (3) decisions of three SDs above a participant's mean were removed (cf. Mogg et al., 1992; Ratcliff, 1993). There were 79 (2.0%) response errors. For the remaining trials, the outlier procedure led to the exclusion of another 97 decision times.

Together, 336 (8.2%) decision times were excluded. To see if the number of excluded decision times differed among different sorts of trials, means were computed for eight conditions, 2 Prime x 2 Target x 2 Stimulus Set. A Friedman test revealed no significant difference, $\chi^2(7, N = 51) = 10.45, p > .10$ (an alpha level of .05 was used for all statistical tests).

Participants' mean decision times ranged between 353 and 928 ms ($M = 497$; $SD = 100$). Means and SDs for each condition are shown in Table 4.2. A 2 (Gender) x 2 (Prime: Sexual vs. Neutral) x 2 (Target: Sexual vs. Neutral) x 2 (Stimulus Set: Explicit vs. Romantic) repeated measures ANOVA was performed on the mean decision times. Only main effects and two-way interactions were calculated. The ANOVA revealed a main effect for Target, $F(1, 45) = 4.13, p = .048$. Categorization of sexual targets was slower compared to categorization of neutral targets. Two significant interactions were found: Prime x Target, $F(1, 45) = 9.28, p = .004$, and Prime x Stimulus Set, $F(1, 45) = 6.61, p = .014$. No other significant main or interaction effects were found.

Table 4.2 Mean Decision Time (in ms) in a Categorization Task for Sex and Neutral Plant Targets by Prime Content ($N = 49$)

	Series 1,		Series 3,	
	Explicit set		Romantic set	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Sex targets				
Sex primes	535	123	502	129
Neutral primes	498	118	494	141
Neutral targets				
Sex primes	501	97	482	95
Neutral primes	492	108	490	112

Posthoc analysis of the Prime x Target interaction (see Figure 4.2, left panel) was performed. Contrasts revealed that, as predicted, categorization of sexual targets was slower when preceded by sexual primes compared to

neutral primes, $F(1, 50) = 11.86, p = .001$; there was no effect of Prime for neutral targets. Also, sexually primed sexual targets were categorized slower compared to sexually primed neutral targets, $F(1, 50) = 7.59, p = .008$. There was no effect between neutrally primed targets.

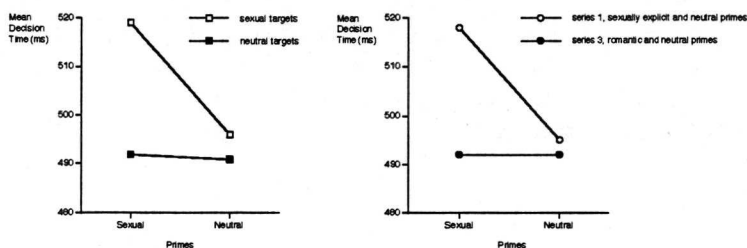


Figure 4.2. Mean decision time in a categorization task by prime content sketched for sex and neutral targets (left panel) and for Series 1 and 3 (right panel; $N = 49$).

Posthoc analysis of the Prime \times Stimulus Set interaction (see Figure 4.2, right panel) showed that in Series 1 mean decision times after explicit primes (regardless of targets) were slower compared to mean decision times after neutral primes, $F(1, 48) = 9.81, p = .003$; in Series 3 (with romantic primes), there was no effect of prime-content. Sexual primes from the Explicit Set (Series 1) led to slower decisions than sexual primes from the Romantic Set (Series 3), $F(1, 46) = 4.79, p = .034$. No effect was found between Series 1 and 3 with regard to decisions after neutral primes.

Series 2 and 4: Affective Task

The participants provided ratings on the two questions after each trial. Due to computer failure, one series (80 ratings) was missing. Only responses after sexual targets were analyzed for two reasons: (1) although from a methodological perspective (standardization) it was useful that Series 2 and 4 were comparable to Series 1 and 3, ratings of subjective sexual arousal regarding neutral targets are less meaningful; (2) because ratings after neutral targets were very low and had little variation, they were statistically difficult to analyze.

The mean response to the first question ("To what degree do you feel sexually aroused at this moment?") ranged from 1.0 to 4.7 ($M = 2.6$; $SD = 1.0$). For the second question ("To what degree do you find the last slide sexually arousing?"), the range was 1.0 to 5.3 ($M = 2.9$; $SD = 1.1$). The Pearson product-moment correlation between the two questions was $r = .75$ ($p < .001$). Means, SDs, and correlations between the two questions per condition are presented in Table 4.3. In order to determine the reliability of the questions, Cronbach's alpha coefficients were calculated in four conditions, 2 Prime x 2 Stimulus Set. Coefficients ranged between $\alpha = .93$ and $\alpha = .97$, indicating a strong internal consistency.

Table 4.3 *Subjective Responses to Sexual Targets (Subset Models) preceded by Explicit, Romantic, and Neutral Primes*

	Question 1, subjective arousal				Question 2, arousability of slides				Correlation between questions	
	Phase 2,		Phase 4,		Phase 2,		Phase 4,		Phase 2,	Phase 4,
	Explicit set		Romantic set		Explicit set		Romantic set		Explicit set	Romantic set
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>r</i>	<i>r</i>
Men ($n = 26$)										
Sex	2.7	1.1	3.1	1.2	3.5	1.1	3.5	1.1	.83 **	.81 **
Neutral	2.6	0.9	2.9	1.1	3.3	0.9	3.1	1.2	.80 **	.82 **
Women ($n = 25$)										
Sex	2.3	0.9	2.7	1.2	2.3	1.0	3.1	1.2	.47 *	.74 **
Neutral	2.0	0.9	2.7	1.2	2.0	0.9	3.0	1.2	.36	.68 **

* $p < .05$ ** $p < .01$

For each dependent variable, subjective arousal and arousability of slides, an ANOVA was carried out in which we only calculated main effects and two-way interactions. A 2 (Gender) x 2 (Prime: Sexual vs. Neutral) x 2 (Stimulus Set: Explicit vs. Romantic) repeated measures ANOVA was performed on the mean responses of the first question. Two significant main effects were found: Prime, $F(1, 47) = 34.02$, $p < .001$, and Stimulus Set, $F(1, 47) = 21.65$, $p < .001$. Inspection of the means showed that sexual targets preceded by sexual primes produced more arousal than sexual targets preceded by neutral primes and that the explicit primes elicited less arousal

than the romantic primes. No other significant main or interaction effects were found.

For the means of responses to the second question, a 2 (Gender) x 2 (Prime: Sexual vs. Neutral) x 2 (Stimulus Set: Explicit vs. Romantic) repeated measures ANOVA revealed three main effects. Responses of men were significantly higher than responses of women, $F(1, 47) = 6.54, p = .014$. Regarding the factor Prime, sexual targets were rated as more arousing when preceded by a sexual prime compared with targets preceded by a neutral prime, $F(1, 47) = 33.52, p < .001$. The main effect of Stimulus Set showed that targets following romantic primes were rated as more arousing than targets following explicit primes, $F(1, 47) = 20.86, p < .001$. Also, a significant Gender x Stimulus Set interaction was found, $F(1, 47) = 26.08, p < .001$ (see Figure 4.3, right panel). No other significant interaction effects were found.

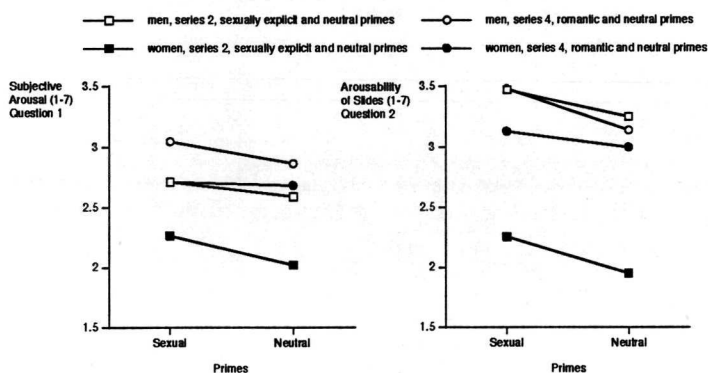


Figure 4.3. Subjective responses after sexual targets (subset models) for men ($n = 26$) and women ($n = 25$) after sexually explicit, romantic, and neutral primes.

Posthoc analysis of the Gender x Stimulus Set interaction was performed. Contrasts revealed that for Series 2 (i.e., explicit sexual primes), men rated the targets as more arousing than women, $F(1, 49) = 21.82, p < .001$, and there was no gender difference in Series 4 (i.e., romantic primes).

The targets from the subset models were rated in a pilot study. The question in this pilot study was the same as was used as Question 2 in Series 2 and 4: "To what degree do you find the last slide sexually arousing?" To examine how much arousal was added by the different sexual primes (explicit vs. romantic), we subtracted the mean ratings of the pilot study (3.1 and 1.7 for men and women, respectively) from the mean ratings of the second question of the sexually primed targets. The explicit primes added 0.4 ($SD = 1.1$) points for men and 0.6 ($SD = 1.0$) for women; an independent sample t tests revealed no significant difference. The romantic primes added 0.4 ($SD = 1.1$) for men and 1.4 ($SD = 1.2$) for women; an independent sample t tests revealed that the mean addition in arousal after romantic primes was larger for women compared to men, $t(47) = 44.74, p = .003$.

Pearson product-moment correlations were computed between (1) a SCID effect in the cognitive task, that is, difference between decisions to sexually primed sex-targets and neutrally primed sex-targets, and (2) the "subjective priming" effect, that is difference between ratings (Question 1 and 2) after sexually primed sex-targets and neutrally primed sex-targets. No significant correlations were found.

Discussion

The results are reviewed in order of our six predictions. In the cognitive task, a significant Prime \times Target interaction confirmed our first prediction. Decisions after sexual targets were delayed by sexual primes. This effect is comparable to the SCID phenomenon described by Geer and Manguno-Mire (1996). The effect was found by comparison to neutrally primed sexual targets as well as by comparison to sexually primed neutral targets. Sexual information appears to inhibit or decelerate only decisions concerning sexual information. SCID can be seen as an effect of drawing attentional resources: the regulation which is needed when a sexual response is requested.

Contrary to our second and third prediction, no gender differences were found in the cognitive task. The SCID effect was pronounced in women (Geer & Bellard, 1996; Geer & Melton, 1997), but this was not replicated in the present study. Also, the predicted Gender \times Stimulus Set interaction, with SCID being larger after romantic primes for women and larger after explicit primes for men, was not found. Bush and Geer (2001)

speculated that as our culture changes and evolves, females are becoming socialized to believe that it is not necessary to hide interest in sexual stimuli. As data continue to be collected, identified gender differences in sexual memory will lessen. This might be applicable here.

The significant Prime x Stimulus Set interaction required a reinterpretation of the data. It was found that decisions after romantic primes did not differ from decisions after neutral primes and explicit sexual primes decelerated all subsequent decisions, including the categorization of neutral targets. Explicit sexual primes seem to elicit emotional regulation that was not limited to sexual response. This effect can be compared to an experiment where neutral, sexual, and threatening primes had to be ignored and following sexual and neutral targets had to be categorized (Chapter 5). In this study, sexual and threatening primes decelerated decisions to sexual targets, compared to neutral primes. Sexual and neutral primes did not differ in their effect on neutral targets; however, threatening primes decelerated decisions. It is suggested that the explicit primes in this study had a stronger emotional valence than the romantic primes, not reducible to sexually specific valence only.

Results of the affective task showed that the two different questions yielded somewhat different patterns of means. We predicted men to report more arousal compared to women (fourth prediction). In general ratings of men were higher compared to women (see Figure 4.2), although only the mean ratings of the second question (arousability of slides) was significant. Gender differences may be accentuated in explicit memory.

With regard to our fifth prediction, the Gender x Stimulus Set interaction, the ratings of the second question corresponded more to the ratings of the first question (subjective arousal). Regarding the first question in Series 2 (explicit sexual primes), less arousal was elicited compared to Series 4 (romantic primes) for both genders. A Gender x Stimulus Set interaction was found for ratings of the second question; as predicted, men rated targets as more arousing when they had been preceded by explicit primes than did women. No gender difference was found after romantic primes. When the initial ratings of the targets from the pilot study were subtracted it turned out that the romantic primes yielded a higher addition of ratings to sexual targets in women compared to men. In conclusion, our idea that men and women would appraise romantic and explicit primes

differently merely stemmed from the fact that explicitly primed targets were appraised as less arousing by women.

The sixth prediction had to be rejected. No correlations were found between the SCID effect and the subjective priming effect. This limits the usefulness of the paradigm (e.g., for diagnostic purposes). If the SCID effect merely stems from sexually specific inhibition, it could be associated with dysfunctions where this inhibition is assumed to play an important role, as in psychogenic erectile disorder (Barlow, 1986; Everaerd, Laan, & Spiering, 2000). The data of this study did not support such an application.

Correlations between the two questions were higher for men than for women. After explicit primes correlations for women were low (see Table 4.3). This could contribute to an explanation of response disagreement (Everaerd, Laan, Both, et al., 2000; Laan et al., 1994). Explicit primes match with implicit sexual memory and activate physiological arousal but activated representations in explicit memory are nonsexual. When the focus of attention is internal, and an introspective assessment is requested (i.e., first question), physiological feedback representations might result in subjective sexual arousal. In addition, when focus of attention is external, and an evaluation of the stimulus is requested (i.e., second question), ratings after explicit primes were low (see Figure 4.2). Considering the lack of a physiological measure of sexual arousal, this explanation remains somewhat speculative.

A weakness of the current study is that the order of the slide sets (explicit vs. romantic) was not balanced. Participants responded to explicitly primed slides first and romantically primed slides in the second part of the experiment. Habituation effects could influence responses after the romantic slides. Along with other studies (Laan & Everaerd, 1995), we might conclude that habituation of arousal is not to be expected. All the more so since attentional focus is kept relatively constant, participants were actively involved in all the experimental tasks (Koukounas & Over, 1999, 2001); however, an order effect remains an alternative explanation for all effects with the factor Stimulus set.

Taken together, the two tasks do not give the unequivocal picture we predicted. Results of the cognitive task indicated that the amount of attention triggered by sexual stimuli was larger for explicit sexual primes compared to romantic sexual primes while the later elicited the most subjective sexual arousal. Future research could possibly analyze the SCID effect in terms of

antecedent- versus response-focused regulation, concepts presented by Gross (1998). Response-focused regulation has no direct consequences for subjective experience. This might be the case in this study. However, the main issue is the specificity of the SCID effect. It probably reflects emotional regulation in general, as was also indicated by a comparable experiment with threatening primes (Chapter 5).

Gender differences were not present in the categorization task. Gender differences in the affective task were most prominent on the second question, in association with conscious evaluation of sexual stimuli. It can be concluded that in this study basic cognitive processing of sexual information is similar for both genders and gender differences merely exist in explicit sexual memory. Regarding the difference between explicit versus romantic sexual stimuli, we can conclude that although explicit primes yielded the strongest priming effects these are not due to the greatest *sexual* valence.

In the Introduction, a sequential model of conscious activation of sexual response was presented. To what extent does the present study support this model? The subjective experience of sexual arousal can emerge by a match with implicit sexual memory without a conscious evaluation of the stimulus as sexually arousing, as might be indicated by the low correlation between the two questions in women after explicit primes. Also, the deceleration of sexual decisions by sexual primes could represent the activation by attention of inhibitory modules in the brain to supervise the development of sexual response. But while subjective sexual arousal and subjective sexual appraisal are clear concepts, the activation of sexual regulation seems to be highly associated with a broader concept of emotional regulation. For a full blown sexual emotion, specific as well as nonspecific response components have to be activated. If more attention is paid to this difference, especially concerning emotion regulation, then future research along this line could lead to a deeper understanding of pathways of activation of sexual response.