Motor preparation and sexual action: a psychophysiological perspective on sexual motivation
Both, S.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
Summary and general discussion

In this thesis we have explored the usefulness of an experimental spinal reflex paradigm to test hypotheses about the elicitation of action tendencies in response to sexual stimuli in humans. This paradigm may help to specify the behavioral mechanisms underlying sexual actions, and the understanding of these behavioral mechanisms may eventually provide clues on how to handle or treat problems concerning sexual motivation. In this concluding chapter first the outcomes of the experimental studies will be summarized. These outcomes will be discussed in relation to the hypotheses on the behavioral mechanisms underlying sexual actions that were formulated in Chapter 1, the value of the experimental paradigm in the investigation of sexual motivation in humans, and the hypothesized gender differences in sexual motivation. We will attend to the limitations of the studies and discuss suggestions for future research. Finally, the implications of our conclusions for the treatment of problems concerning sexual motivation will be discussed.

The elicitation of action tendencies by sexual stimuli: Summary of the hypotheses and findings

In Chapter 1 we discussed incentive theories of sexual motivation and the close relationship between emotion and motivation. Current knowledge about neurobiological mechanisms of emotion and motivation and the role of dopamine in the motivational process was reviewed. We presented a model in which sexual action and the subjective experience of sexual desire result from the processing of sexually competent stimuli that energize emotion and motivation circuits in the brain, resulting in
bodily changes that prepare for sexual action. We hypothesized that emotional stimuli, including sexual stimuli, automatically generate action tendencies. The bodily changes that prepare for action were hypothesized to include specific genital responses as well as more general somatic motor preparation reflected in enhanced T reflexes. Dopamine was hypothesized to facilitate the wanting component of sexual motivation, and therefore to facilitate particularly action tendencies reflected in enhanced T reflexes.

In the first study (Chapter 2) processing of positive (sexual) and negative (anxiety and sexual threat) emotional stimuli, in contrast to a neutral stimulus, resulted in enhanced T reflexes. As expected, the participants in this study reported that during the threatening stimuli they felt the wish to avoid, and during the consensual sexual stimulus the wish to approach. Thus, in interaction with negative or positive emotional stimuli a tendency was generated to avoid or approach, and this action tendency was reflected in enhanced T reflex amplitude. The increase in T reflex amplitude in response to the sexual stimulus did not differ from the increase in response to the threatening stimuli. Sexual stimuli, like other emotional stimuli, generated an action tendency, which can be considered as an expression of motivation. As expected, the stimuli in this study resulted in different response patterns in sex-specific autonomic activity (genital blood flow), and in somatic motor system activity (T reflex modulation). The sexual stimulus resulted in a specific increase in genital response, while T reflexes were facilitated by all three emotional stimuli. The results support our view of sexual arousal as an emotional state, resulting in both sex-specific autonomic and general somatic motor responses that prepare for sexual action.

In the second study (Chapter 3) participants were exposed to sexual stimuli of increasing or equal intensity. Self-report of emotional experience and genital data confirmed the induction of increasing versus stable levels of sexual arousal. In addition, the participants reported that during exposure to the increasing intensity stimuli they felt an increasing tendency to approach. T-reflex amplitude increased with increasing levels of sexual stimulation, while T reflexes remained stable when exposed to three stimuli of similar intensity. Thus, action tendencies increased as the intensity of the sexual state increased.
In two experiments (Chapter 4), we studied sexual activity after laboratory induced sexual arousal to investigate whether confrontation with a sexually competent stimulus leads to action tendencies and, eventually, to sexual action. Participants were randomly assigned to a neutral or sexual film condition. The participants that were exposed to the sexual film showed genital responses, increased T-reflexes (Experiment 2), and reported sexual arousal and approach tendencies. Those exposed to the neutral film did not show these specific reactions. Moreover, in both experiments, we found that the participants who looked at the sexual film had engaged in more sexual activity than the participants who did not see the sexual film. Interestingly, feelings of sexual desire were not higher in participants in the sexual film condition, indicating that subjective feelings of sexual desire are relatively independent from actual sexual behavior. In Experiment 2, we also investigated whether a sexually aroused state would facilitate interest in (recorded by viewing times), as well as responsiveness to (recorded by T reflex magnitude) subsequent sexual stimuli. We did not find a sexually aroused state to increase viewing times of, or T reflexes during, the subsequent sexual pictures. In contrast, in men T reflexes during the sexual pictures were higher after viewing the neutral film. To explain this unexpected finding we speculated that the experimental situation in the neutral film condition could be understood as the withholding of sexual stimulation. The increased responsiveness of men in the neutral film condition may be the result of an increased attractiveness of sexual incentives through the forced layoff period.

In Chapter 5, we presented a placebo-controlled study on the effect of a single dose of levodopa on sexual response. We expected levodopa to affect the wanting component of sexual motivation, specifically the instigation of action, and therefore to result in stronger T reflex magnitudes in response to sexual stimulation. Secondly, we expected levodopa to facilitate genital response, subjective sexual arousal, and subjectively experienced tendencies for approach behavior. We found that levodopa did not affect the subjective sexual and the genital responses. However, in men, T-reflexes during sexual stimulation were stronger with levodopa. In women there were no effects of levodopa at all. It was concluded that the fact that levodopa increased male T reflex magnitude during sexual stimulation corroborates the evidence from animal research that dopamine is involved in the energetic aspects of
motivated behavior in males. Regarding the absence of an effect of levodopa on T reflex magnitude in women we concluded that this finding is in line with the conflicting reports about the effects of dopamine on sexual motivation in female rats and warrants further study. Based on indications for steroid-dopamine interactions in the literature we speculated that the gender difference in the effect of levodopa might be due to differences in sex steroid levels in the brain.

Conclusions

What can be concluded with respect to the hypotheses on the behavioral mechanisms underlying sexual actions that were formulated in Chapter 1? Taken together, the studies show that exposure to sexual stimuli (actually present or imagined in erotic fantasy) results in action tendencies as reflected in bodily changes, and in subjective feelings of sexual arousal. The bodily changes that are elicited by sexual stimuli include general somatic motor activity (reflected in T reflex enhancement), and sex-specific autonomic responses (increase in genital blood-flow). The action tendency instigated by sexual stimuli increases when the intensity of the emotional state increases. Dopamine seems to enhance, at least in men, the strength of the action tendency that is reflected by general somatic motor activity. And finally, the instigation of action tendencies by sexual stimuli facilitates actual sexual behavior.

These results provide a clear illustration of the incentive motivation view presented in Chapter 1. As stated in that chapter, sexual motivation, which is exemplified by physiological responses, the experience of sexual arousal, and by actual sexual behavior, results from the processing of sexual stimuli. Moreover, in line with recent sexual motivation models that are based on neurobiological knowledge derived from animal research (Pfaus, 1999; Pfaff & Agmo, 2001), we found that the preparation for sexual action includes general motor activity, which can be considered as an index for a general motivational state, and in genital responses, which can be considered as a specific sexual motivational response. The enhancing effect of levodopa on somatic motor activity in response to sexual incentives in men supports the hypothesized role of dopamine in the translation of affect into action. Thus, dopamine seems to be involved,
at least as was shown in men, in the wanting component of sexual motivation.

Thus, sexual motivation is the consequence of an incentive energizing general motivational and specific sexual systems. From this follows that sexual motivation comes about through sexual excitement. Without the excitation of response systems there will be no motivation. Therefore we conclude that, contrary to the view expressed in the dominant model of the sexual response cycle, sexual desire does not precede sexual excitement; excitement of the sexual system precedes sexual desire. Sexual desire does not appear out of the blue, without a stimulus that activates arousal there will be no desire. In fact, there is no good reason to assume that desire and excitement are fundamentally different phenomenon. We can phenomenologically distinguish them such that feelings of excitement represent the subjective experience of genital changes, perhaps combined with a conscious evaluation that the situation is indeed 'sexy', and that feelings of desire represent the subjective experience of an action tendency, of a willingness to behave sexually.

What can be said about the value of the experimental paradigm we explored to study the generation of sexual action? T reflex modulation proved to provide an index for motor preparation in response to emotional, including sexual, stimuli. We found T reflexes to be modulated by aversive stimuli and by sexually appetitive stimuli. In line with previous research (Bonnet et al., 1995), we showed that T reflexes are not sensitive to the valence of an affective state, but are modified by differences in arousal intensity. What is the advantage of the use of a measure that reflects general motor arousal in research on sexual motivation? First, as noted before, motivational influences that impact sexual behavior include general systems and specific sexual systems (Frohlich, Ogawa, Morgan, Burion, & Pfaff, 1999; Pfaff and Agmo, 2001). Pfaff and Agmo (2001) state that a significant component of a motivational mechanism is elementary arousal of brain and behavior. Frohlich et al (1999) review evidence from research in rodents indicating that hormones as well as neurotransmitters affect arousal components, like sensory alertness, motor activity, and emotional reactivity, including arousal in a sexual context. Hence, general psychomotor arousal signifies activity in motivational systems. Second, our study on the effect of levodopa proved the sensitivity of T reflex modulation for dopaminergic
effects. The facilitating effect of levodopa on T reflexes elicited during sexual stimulation in men, and the observed differences between smokers and non-smokers in the levodopa study, indicated that T reflex modulation is sensitive to differences in mesolimbic dopaminergic activity in humans. Recent incentive motivation models propose a balancing system in the brain by the combined action of opioid (involved in liking) and mesolimbic dopaminergic systems (involved in wanting) (Berridge & Robinson, 1998; Spruijt, van den Bos, & Pijlman, 2001). Thus, T reflex modulation seems to offer a tool to study the wanting component of the motivational process in humans. With respect to the sensitivity of T reflexes, we found that reflexes were modulated by sexual film, erotic fantasy, and even by brief exposure to sexual pictures, showing that T reflex modulation is sensitive to moderate and low levels of sexual arousal. We have to note, however, that the results of the study that involved low, medium, and high intensity sexual stimuli indicated that it might be difficult to pick up small differences in sexual arousal.

Besides T reflexes, we explored the measurement of actual sexual behavior. It was demonstrated that, on a group level, sexual responses exhibited in the lab relate to sexual behavior outside the lab. This finding strengthens the external validity of laboratory research on sexual responses, and indicates that in laboratory research on factors influencing sexual motivation measurement of post experimental sexual behavior may be useful. The observation in study 3a and b that the induction of a sexually aroused state did affect post experimental sexual activity but not post experimental sexual desire is in line with evidence for the relative independence of the behavioral and experiential components of emotions (Lang, 1993), and with the observation in research on pathological forms of motivation, like drug addiction, that subjective feelings of craving and actual drug intake may be relatively independent (Berridge & Robinson, 1998; Verheul, van den Brink, & Geerlings, 1999). If one wants to obtain a full picture of the motivational process, it seems useful to measure subjective response, bodily responses, as well as actual behavioral responses.

Regarding the hypothesized gender differences in sexual motivation the studies show mixed results. In both men and women exposure to explicit sexual films generated genital response, subjective sexual arousal, subjective approach tendencies, enhanced T reflexes, and actual
sexual behavior. This indicates largely similar motivational response patterns of the men and women that participated in our studies, which is in line with other experimental studies that found strong similarities in sexual response patterns in women and men (e.g., Heiman, 1977; Wincze et al., 1980). T reflex amplitude in response to sexual stimulation, which allows for direct comparison of male and female arousability, did not show a difference in response strength between men and women. Thus, men and women do not seem to differ in arousability when it comes to somatic motor activity in response to explicit sexual stimuli. However, we did observe stronger subjective sexual responses in men. We found stronger subjective genital sensations in men in Study 1, stronger subjective sexual arousal, genital sensations, and post experimental sexual desire in men in Study 3b and Study 4. Thus, although T reflex data showed no gender difference in response strength, overall subjective ratings indicated stronger sexual feelings in men. Interestingly, we observed no difference between men and women in the frequency in sexual activity following induced sexual arousal. Although women reported less sexual desire following induced sexual arousal, they were not less sexually active. Thus, in line with the T reflex data, there was no gender difference in response strength at the level of actual sexual behavior.

An explanation for the observed gender difference in the intensity of sexual feelings may be that men are more willing to report such feelings than women. However, the results show that women were willing to report sexual feelings, since they did indicate themselves as sexually aroused. In addition, the sexual activity data show that the women were not less willing than men to report about the frequency of their sexual activity. A more likely explanation for the difference in subjective sexual arousal may be that in women other (stimulus or situational) information beyond genital arousal determined their feelings, whereas for men peripheral feedback from genital arousal was a significant determinant of their subjective experience (Laan & Everaerd, 1995a; Laan & Janssen, in press). Generally, in women there is a low correlation between genital response and subjective sexual arousal (Laan & Everaerd, 1995a). In line with this, in study 3, we observed higher correlations between subjective and genital responses in men than in women. Emotional stimuli can evoke emotional responses without the involvement of conscious cognitive
processing (Spiering & Everaerd, in press). Our data suggest that physiological reactions in response to explicit sexual stimuli occur relatively automatic and to the same extent in both men and women, whereas feelings that follow or coincide these automatic responses differ between men and women.

In addition to the observed gender difference in sexual feelings, in Study 3a we observed a difference between men and women in the effect of the induced sexual arousal on the responsiveness to subsequently presented sexual pictures. In men, and not in women, responsiveness, as measured through T reflex magnitudes, was stronger following the neutral film. As noted before, we speculated that this may point to an enhancing effect of a forced layoff period of sexual stimulation in men. Also, in Study 4, we observed a gender difference in the effect of levodopa on T reflex responses during sexual stimulation. Only in men, levodopa had a facilitating effect. Further research is needed to allow for firm conclusions regarding the influence of dopamine on the instigation of sexual action in men and women. However, possibly, though highly speculative, in men sexual motivation is more sensitive to manipulations of internal state variables than in women.

We conclude that our data do not support that men are more sexually ‘arousable’ than women. Our data do indicate that, when brought into a sexually aroused state, men seem to experience more sexual arousal and sexual desire than women. This may partly explain the so often found gender difference in feelings of ‘spontaneous’ sexual desire (e.g., Baumeister, et al. 2001; Basson, 2001); men may not be more easily aroused, but they are more aware of their sexual responses, resulting in more frequent experience of sexual arousal and desire. This experience may, however, provide them with more positive feedback in the motivational process, resulting in a more amplified sexual response.

However, recent imaging studies showed stronger brain activity in response to sexual stimuli in men than in women, indicating stronger ‘arousability’ in men (Hamann, et al. 2004; Karama et al. 2002). Hamann et al. (2004) found that the amygdala and the hypothalamus were more strongly activated in men than in women when viewing sexual pictures, even while women reported greater sexual arousal. Our observation that only in men levodopa enhanced T reflexes during sexual stimulation may
indicate that in men the connection of the amygdala with the nucleus accumbens is more strongly activated by sexual stimuli.

As noted before, another explanation for stronger sexual motivation in men may be that the environment provides more sexual stimuli for men than for women. We have some data supporting this. Using a monitoring instrument, 31 men and 38 women registered, during a period of one week, each sexual stimulus they perceived. Men reported more sexual stimuli than women indicating greater availability of sexual incentives for men (Both & Laan, in preparation). However, it should be noted that these findings may also indicate stronger male sensitivity for sexual stimuli.

**Limitations and future directions**

In Chapter 1 we described the possible neurobiological mechanisms in sexual emotion and motivation, and discussed brain systems involved in emotion and motivation. A main limitation of the studies presented in this thesis is that they do not allow for conclusions about the involvement of specific systems in the brain. Although we may assume that the subjective and physiological responses we measured are the result of activity of the emotional systems in the brain, we did not concurrently measure brain activity and therefore do not know which brain systems were involved. Likewise, our data from the levodopa study do not allow for conclusions at the level of specific brain systems involved in the observed effect of levodopa.

A second limitation pertains to the proposed effect of dopamine on the wanting or arousal component of sexual motivation. Wanting and liking are proposed as components that can be manipulated and measured separately (Berridge, 1996). The levodopa study included T reflex modulation as a measure for the wanting or arousal component of sexual motivation, but lacked an objective measure for the liking or valence component. Subjective report may not be the most accurate measure for the liking component, since subjective experience does not necessarily reflect the underlying basic motivational process. Measures that are modulated by the valence of emotional states, like for example startle reflex modulation or facial EMG, should be included to allow for conclusions regarding influences on wanting versus liking components of sexual motivation.
In view of the hypothesized role of the mesolimbic dopaminergic system in appetitive motivation we propose that T reflex modulation may offer a tool to investigate reward signalling and the instigation of action tendencies in disorders in appetitive motivation, like hyper- or hypo-sexual desire disorder, or addiction. Wiers, van Woerden, Smulders, and de Jong (2002) found, using an implicit association task (Greenwald et al. 1998), stronger implicit arousal associations in heavy compared to light alcohol drinkers. They conclude that this may reflect a sensitized psychomotor-activating response to drug cues. Recently, in collaboration with Wiers, we started a pilot study in heavy drinkers in which implicit arousal associations, T reflex reactivity, and startle reactivity to alcohol stimuli are measured. We expect implicit arousal associations to be related to T reflex strength, and valence associations to startle responses. It may be interesting to investigate whether a general motivational system is involved in responses to different natural incentives and drug stimuli. We noted before that there is evidence that in drug addicts sexual stimuli activate similar brain systems as drug related stimuli (Garavan et al., 2000). A general component in motivational systems implicates interference between various motivational systems. Possibly, deprivation of one need may lead to a general potentiation of the reward system, and sensitisation to one class of responses may influence the reactivity to other responses (Spruijt, van den Bos, & Pijlman, 2001).

However, imaging studies are needed to test hypotheses regarding specific brain systems involved in the processing of sexual stimuli (Sumich, Kumari, & Sharma, 2003) and to investigate the role of dopamine systems in sexual motivation in humans. Recently, imaging studies in which dopamine concentrations were measured showed striatal dopamine release induced by incentive stimuli like food or the expectation of monetary gain (e.g., Pappata et al., 2002; Wang et al., 2004; Volkow et al., 2002a). Volkow et al (2002b) found that methylphenidate, which increases dopamine levels in the brain, amplifies changes in dopamine striatum in response to food stimuli. The increases in dopamine were correlated with self-reports of hunger and desire for food. Similar studies with sexual stimuli, investigating differences in dopamine release in response to these stimuli between men and women, or between individuals diagnosed as having hypoactive sexual desire.
disorder and individuals diagnosed as hypersexuals will be interesting. In addition, there is evidence for lower brain dopamine reactivity in obese individuals and drug abusers during withdrawal, indicating that a dopamine deficiency may perpetuate pathological motivation as a means to compensate for decreased activation in reward circuits (Volkow, Fowler, Wang, Goldstein, 2002; Wang et al, 2001). Interestingly, Kafka et al. (1998) found in a study of 60 men with paraphilias and nonparaphilic sexual impulsivity that 40% had a history of childhood attention deficit hyperactivity disorder (ADHD). A disorder in dopaminergic neurotransmission is currently hypothesized to play a role in ADHD. Possibly, in some individuals showing sexual impulsive behavior, sexual behavior is a means to compensate a dopamine deficiency.

Clinical implications

What are the implications of our conclusions for how to handle or treat problems concerning sexual motivation? Processing of a sexually competent stimulus results in arousal and in the tendency to engage in sexual activity, or even in full-blown sexual behavior. It is important to note that the step from action tendency to actual behavior is of course subject to regulation; whether action follows depends on the availability of a meaningful action repertoire, on the acceptability of the available actions, and on the importance of the emotional event (Frijda, 2004). The subjective experience of the expectation of reward and of the action tendency is what we call sexual desire. From this view it follows that arousal and desire are closely intertwined. Feelings of sexual desire increase as sexual arousal increases. As noted before, this view on sexual desire contrasts the dominant model of sexual response in which sexual desire is supposed to occur independent of, and to precede, sexual arousal. Based on incentive motivation models we have to conclude that not only sexual arousal, but also sexual desire does not just appear out of the blue. It is a response to a sexually competent stimulus. This suggests that there is no such thing as 'spontaneous sexual desire'. In order for the sexual system to be activated, which may cascade into the subjective experience of desire for sex, the brain has to have processed sexual information. The desire may feel as if it is
spontaneous, since one may not be aware of what the sexual stimulus was that generated desire, but in actual fact, it is not.

Recently, in agreement with our view, other authors have stated that sexual desire may emerge during sexual excitement, and proposed modifications of the dominant model of sexual response (Basson, 2000; Levin, 2001). Levin (2001) proposed two desire phases: a spontaneous desire phase created endogenously, and a second desire phase created by exogenous stimuli that can be positioned during the arousal phase. Regarding the supposed 'spontaneous desire phase', however, he notes that this must be initiated by for example previously experienced odours, fantasies, or thoughts. In other words, 'spontaneous desire' has to be initiated by actual or imagined stimuli that have acquired sexual meaning through conditioning. Levin recognizes that if these stimuli become activated by external stimuli, it would be inaccurate to call the resulting desire 'spontaneous'. Basson (2002) stated that to understand women's sexual response, one should move from a focus on spontaneous desire to an essentially responsive cycle, in which the seeking of, or receptivity to, sexual stimuli leads to feelings of arousal and desire. She argues that for women emotional intimacy is important in the willingness to experience arousal and desire. A consequence of the changed view on sexual desire for clinical practice is that persons who do not report so-called spontaneous sexual desire, and most of the time these are women, should not be considered dysfunctional.

Secondly, from an incentive motivation model it should be concluded that problems with sexual motivation like hypoactive sexual desire and hyperactive sexual desire are not manifestations of a malfunctioning instinct, but indications that the emotion-motivation mechanism is not activated or not adequately regulated. Such a view can be helpful in thinking about remedies that may work in problems with hyper- or hyposexualy. With regard to hypersexuality, and to sexual delinquency that may be related to hypersexuality, causes and remedies can be looked for both in the sensitivity of the sexual system and in stimuli in the environment that match this sensitivity. Reducing the supply of available stimuli can be an effective means to dampen sexual motivation. Our environment, though, offers many sexual cues and reducing the number of cues that are generated in our imagination requires conscious efforts and a strong motivation to stop these fantasies. Also, countless numbers
of cues can acquire sexual meaning through conditioning. However theoretically meaningful, reducing the supply of stimuli may not be the best way to treat hypersexuality. Another strategy is to have offenders inhibit their action tendencies by increasing empathy, enhancing their social skills, or by any conscious effort at inhibition (Marshall, 2001). Influencing the sensitivity of the sexual system by pharmacological treatments may be a fruitful approach in the treatment of hypersexuality and sexual coercion (Kafka, 2003). Interest in the application of pharmacological treatments in sexual offenders has recently returned. Anti-androgens can reduce the sensitivity of the sexual system, and decrease sexual fantasies, and sexual activity (Bradfort, 2001). In addition there is accumulating evidence for the efficacy of treatments with SSRIs (selective serotonin reuptake inhibitors) (Bradfort, 2001). A side-effect of SSRIs is decreased sexual motivation and impairment of ejaculation (Meston & Frohlich, 2000). Moreover, SSRIs are effective for the treatment of obsessive-compulsive disorder, and hypersexuality may have obsessive and compulsive aspects (Bradfort, 2001). Theoretically it is possible that influencing dopamine levels in the brain, perhaps in interaction with reduced androgen levels, may help. There is evidence that dopamine receptor blocking, by for example anti-psychotics, can reduce sexual behavior (Meston & Frohlich, 2000).

Also for hypo-sexual desire, causes and remedies can be looked for both in the sensitivity of the sexual system and in stimuli in the environment that match this sensitivity. We think it is important, especially nowadays with a strong focus on pharmacological treatments for sexual disorders, to recognize that in some cases hypoactive sexual desire may be caused by a lack of sensitivity of the sexual system, but that in most cases the cause will be the absence of attractive stimuli (Everaerd & Both, 2000). Previously, Laan and Everaerd (1998) stated that lack of adequate sexual stimulation is probably underlying sexual arousal problems. As we reasoned earlier, sexual desire and sexual arousal are strongly related, which is supported by the high co-morbidity of sexual desire and sexual arousal disorders (Segraves & Segraves, 1991). Recently, in a psychophysiological study that compared medically healthy women with sexual arousal and desire problems to women without sexual problems, it was observed that the women with arousal and desire problems did not show a weaker genital response to explicit
sexual stimuli, but that they did report less feelings of sexual arousal, less positive affect, and more negative affect than the control women (Laan, van Driel, & van Lunsen, 2003). Thus, in healthy women with sexual arousal and desire problems the cause does not seem to be a lack of responsiveness of the sexual system, at least when it regards genital responsiveness to explicit sexual stimuli. These women, however, seem to experience less positive and more negative feelings in response to sexual stimulation.

Especially in women, as was maintained earlier, feelings of desire and arousal seem to depend more on the meaning of the sexual situation than on their bodily responses. An incentive motivation view emphasizes the importance of the evaluation of the stimulus. Meanings may be determined by sexually rewarding or unrewarding experiences in the past. These past experiences will, to a large degree, be decisive in what kinds of sexual feelings a woman will have. When a patient has little or no experience with sexual rewards there will be no, or possibly only a few, stimuli that can elicit sexual feelings. And when a woman has a mainly negative sexual or relational history, a sexual context or partner may elicit primarily negative or ambivalent feelings. In cases where there is a lack of positive, or mainly negative sexual experiences, pharmacological enhancement of the sensitivity of the sexual system (be it with androgens, dopamine, or other pro-sexual drugs) will not facilitate sexual desire. Pharmacological enhancement sexual responsiveness may only be useful when there are positive representations of sex in memory. When there are no, or only a few positive sexual experiences, in treatment one can try to help patients find these experiences.

Sexual desire, as a property of a sexual process, will by definition change over time (Everaerard & Laan, 1998). The strong desire of a beginning relationship will wane in the course of the relationship. Sexual desire may decline due to habituation, to changes in the relationship, or to changes in the rewarding properties of sexual interactions, through which stimuli that were once desirable lose their attractiveness. Diminishing sexual desire in long-term relationships seems to be a normal phenomenon in women. Klusmann (2002) observed in a healthy student population, that in women sexual desire declined with partner duration while their desire for tenderness increased, whereas in men sexual desire remained while their desire for tenderness declined. Beside
this normal and seemingly inevitable decline of desire in a long-term relationship, diminished sexual arousal and desire can be an understandable and adaptive reaction to stress, tiredness, or to an inappropriate or negative interaction with the partner (Bancroft, 2002). When patients seek help for a lack of sexual desire, treatment may focus on the restoration of circumstances that allow for the experience of sexual feelings. However, creating optimal personal and relational circumstances will in itself not elicit sexual feelings. For sexual feelings sexual stimulation is needed. When there is a wish for the experience of sexual desire and arousal, one has to search for stimuli that may elicit these feelings. In fact Kaplan was aware of that, since an important part of her treatment for hypoactive sexual desire consisted of what she called: “Libido enhancing sexual homework assignments: fantasy and friction” (Kaplan, 1995, p. 6). That homework could be sexual fantasy, explicit erotic material, masturbation, or other methods of erotic stimulation. Thus, although this is certainly not a very romantic view, we have to conclude that when desire has waned, and one has the desire to restore sexual desire, the only option is to actively mobilize it.