A Psychophysiological Investigation of the Pelvic Floor. The Mechanism of Vaginism
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Citation for published version (APA):
van der Velde, J. (1999). A Psychophysiological Investigation of the Pelvic Floor. The Mechanism of Vaginism

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The mechanism of vaginismus; general discussion and concluding remarks
Chapter 8

Introduction

“Various advantages result even from the publication of opinions; for though we are very liable to error in formulating them, yet their promulgation, by exciting investigation, and pointing out the deficiencies of our information, cannot be otherwise than useful in the promotion of science” (Abernethy, 1809)

In the foregoing chapters, experiments were described investigating the mechanism underlying vaginismus, the mechanism of pelvic floor overactivity. In this chapter we will elaborate on these findings by discussing terminology, the defensive mechanism and the pathways to the pelvic floor.

Esperanto for the pelvic floor; facilitating multidisciplinary discussion

The term vaginismus refers to a dysfunction of the pelvic floor muscles. Although there may be the explicit wish to engage in intercourse, the pelvic floor muscle activity or the tonus is too high for penetration. Of the women with vaginismus who participated in the studies described in this thesis, 54% (N=37) showed besides vaginismus co-morbidity with symptoms of micturition and/or defecation problems related to pelvic floor function. For many years, this relationship between complaints of vaginismus and pelvic floor function has been acknowledged in the literature. For example, Reich (1972, p. 326) described that it is possible “to deaden any genital pleasure sensation by a chronic contracture of the pelvic musculature.” What’s new is a growing insight that different complaints related to the openings of the pelvic floor are linked (e.g. MacDonald, Shearer, Paterson & Finlay, 1991; Farthing, 1995; Brin & Vapnek, 1997; Monga, Marrero, Stanton, Lemieux & Maxwell, 1997). This connection between the different pelvic floor symptoms emphasizes the necessity of a multidisciplinary approach of pelvic floor function.

However, we are confronted with the heritage of terminology resulting from a period in which doctors and psychologists defined the symptoms of their patients in terms appropriate for their discipline (Walker, Gelfand, Gelfand, Green & Katon, 1996). The result is a variety in terminology used for description of more or less well-defined complaints related to pelvic floor function, some of them more or less referring to the same entity. Without suggesting to be complete, the following list of terms used in the recent literature (in alphabetic order) nicely illustrates the actual situation; anal hypertonia, anismus, anodyspareunia, chronic pelvic pain, coccydynia, constipation, constipation-related overflow incontinence, dysfunctional voiding, dyspareunia, focal vulvitis, functional fecal incontinence, hypertonic pelvic floor syndrome, irritable bowel syndrome (IBS), intercourse-related vaginal pain syndrome, levator ani syndrome, levator spasm, lower urinary tract symptoms (LUTS), overactive bladder, paradoxical puborectalis contraction, pelvic floor dyssynergia, penile pain, perineal pain, proctalgia fugax, proctodynia, prostatitis, prostatodynia, puborectalis syndrome (PRS), spastic pelvic floor syndrome, specific phobia of vaginal penetration, tension myalgia of the pelvic floor, urethral syndrome, urinary stress incontinence, urge incontinence, vaginismus, and vulvar vestibulitis syndrome.

Although not all definitions indicate a causal factor of pelvic floor function, in each of these terms pelvic floor function is supposed to play a role in the development
or the maintenance of the symptoms and some form of the pelvic floor treatment is implicated. To facilitate communication and to improve a multidisciplinary approach to pelvic floor problems it is mandatory to develop a basic system of pelvic floor classification and terminology.

Because of the large number of different complaints related to the pelvic floor, and the necessity to approach the pelvic floor as an entity, this terminology should be based on the functions of the pelvic floor. These basic functions are providing support and opening and closing of the openings in the pelvic floor. Problems arising from a deficiency in pelvic floor function may be described as related to underactivity or overactivity of the pelvic floor. As a consequence, the functioning of the pelvic floor should be described in terms of support, contraction, relaxation, volume, tonus and strength, emphasizing the different nature of these aspects. At this moment the Pelvic Floor Clinical Assessment group of the International Continence Society is working on such a classification system (Messelink, 1999).

Approaching vaginismus as a dysfunction of the pelvic floor, does not change the questions investigated in this thesis. The mechanism underlying a vaginistic reaction, which may also appear in spite of a conscious desire for intercourse, remains intriguing. The studies described in this thesis were conducted to provide answers to a few of the questions about this mechanism.

In the first place, we wondered about the role of voluntary control over the pelvic floor muscles. The literature suggests that women with vaginismus have a lack of voluntary control (Hall, 1952; Stanley, 1981), and physiotherapy focussing on relaxation and increased control is one of the important aspects of nowadays therapy. There is no evidence from the literature that awareness of pelvic floor activity in combination with the ability to voluntarily relax the pelvic floor muscles contribute to neutralize the involuntary muscle activity.

Two main conclusions with regard of voluntary control over pelvic floor muscle can be drawn from the results of our studies. First, there is an enormous variability in women with and without vaginismus in their ability to relax and contract their pelvic floor muscles. However, voluntary control is not the differentiating characteristic of women with vaginismus. This also followed from the women who underwent the physiological examination. Of the 14 women with pelvic floor dysfunction, 8 showed good control during the examination (57%). The second conclusion that follows from these findings is that although increase of voluntary control may be an effective part of treatment for some women, the treatment of vaginismus should not be limited to this aspect.

A second aim of our research was to evoke involuntary pelvic floor muscle activity in an experimental situation, to increase the understanding of this phenomenon. We succeeded in creating emotional situations with the use of emotion inducing film excerpts. In these situations women reacted with increased pelvic floor muscle activity to the threatening and sexual threatening excerpts. This response occurred in both women with and without vaginismus, indicating a general mechanism underlying this reaction. Since vaginismus is considered a sexual dysfunction, it was important to find that the increase of muscle activity was not elicited by the sexual content of the films but by the threatening aspect. The reactions were not restricted to the pelvic floor area, but were also recorded in the trapezius muscle region, which we included as an example of a postural muscle group.
We were able to replicate the pelvic floor findings in a second experiment. The implication of these findings is far-reaching. The mechanism underlying the involuntary activity of the pelvic floor muscles seems to be a general defensive reaction. This raises the question why in some women this reaction expands to such extend that penetration is impossible. We will focus on this question shortly. The fact that the reaction is not restricted to the pelvic floor area and not evoked by the sexual content of the situation, makes the definition of vaginismus as sexual dysfunction subject for debate. Although nobody will deny that vaginismus constitutes a sexual dysfunction insofar as it interferes with a subjectively experienced functional sex life, there is no reason to classify the occurrence of increased pelvic floor activity as a sexual dysfunction by itself. By focussing on the sexual aspect of the complaint, mainly sexual causal factors like for example lack of sexual education, influences from religion, problems in the relationship and negative sexual experiences are assumed responsible. From a pelvic floor point of view, several possible sources may be recognized and may help a woman in understanding the increased muscle activity. Since referral is based on the presentation of the symptoms when visiting a family practitioner, the anamnesis is of invaluable importance. A multidisciplinary or multifactorial treatment seems a logical continuation.

Finally, we were interested in the relationship between physiological changes and subjective experience. Vaginismus has been described in multiple ways, ranging from a sign of conversion to a conditioned response (e.g. Freud, 1894/1975; Wesselman, Burnett & Heinberg, 1997). These different approaches imply different subjective response patterns. It is not surprising that only the pelvic floor symptoms related to female sexuality are described as a result from a hysterical personality or as symptoms of conversion disorder. Micturition problems like hesitation in men are approached as the result from learned behavior, like for example in truck drivers, who have no opportunity to void when they have to and have to void when they are at a truck stop. Furthermore, in the case of anismus, retraining with the use of biofeedback is preferred, indicating a behavioral approach (Kamm, Lennard-Jones & Pemberton, 1992). In the study described in chapter 6, we investigated the relationship between (changes in) experienced threat and muscle activity and the relationship between the changes in pelvic floor muscle EMG and the awareness of these changes. The group results showed that women with vaginismus reported changes in experienced threat and these changes were related to the changes in pelvic floor muscle activity. The agreement between experienced threat and changes in muscle activity and the automatic occurrence of the reaction seems to indicate conditioning rather than conversion as basis of the reaction. Awareness of muscle activity is, like in sexual arousal, not purely based on perception of physical cues. The most obvious example was the reported muscle activity during the erotic excerpt. Women seem to use situational information or knowledge about the situation for subjective report.

Although the influence of negative sexual experiences on pelvic floor function is often stressed, the percentage of women with negative sexual experiences in our studies did not differ from the percentage in the control group. The same findings are reported in studies on dyspareunia (Meana, Binik, Khalifi & Cohen, 1997).

However, in the study presented in chapter 6, we found a difference in reaction to the film excerpts. Woman with negative sexual experiences showed more pelvic floor muscle activity during the erotic and the sexual-threatening excerpt compared to the control women. They also rated the erotic excerpt as less arousing. These findings are in
agreement with the findings in sexual arousal studies (Laan & Everaerd, 1995). Although the importance to ask about negative sexual experiences during anamnesis cannot be overstated, the impression of an inevitable causal relationship between pelvic floor complaints and negative sexual experiences must be avoided. Several women who participated in our studies reported a way of questioning by therapists that left them with the feeling that although they could not remember it, something must have happened. Two women even reported to have experienced sexual abuse in an earlier life.

A defense mechanism; what makes the pelvic floor react this way?

The involuntary reaction of the pelvic floor muscles is a response to a threatening situation. There is evidence from the literature for the emotional effect on reflexes, and on muscle activity in general. Startle reflexes are described as protective reflexes that are primed or facilitated in negative affective contexts (Lang, Bradley & Cuthbert, 1990). An aversive context leads to priming of the defensive system, resulting in a reflex in which the eyes close and the limbs and body contract in a posture of defensiveness (Bonnet, Bradley, Lang & Requin, 1995). This is in accordance with Frijda (1987) who defined emotions as action dispositions, that is, a tendency to do something. According to Lang et al. (1990), reflexes are modified by emotion in a way that relates the function of the reflex to the existing affective state. This emotion may be either based on actual perception or on an imaginary situation. The reflex reaction is augmented in the context of an ongoing aversive emotion (Lang, et al., 1990).

With regard to changes in muscle activity, Masterson and Crawford (1982) described behavior during negative emotions to be organized into a 'defense motivation system'. This system may prime a set of defense reactions that include fleeing, freezing, fighting and defensive burying. This approach assumes that activation of the motivation system makes relevant response patterns more likely to occur (Gallistel, 1980).

Activation of the defense system occurs either when the stimulus context is unfamiliar, or when it has become associated, through past experience, with danger. As a result of activation, all defense responses are 'excited', that is, primed or readied for rapid execution. An excited defense response will not occur as long as the necessary supporting stimuli are absent. However, the state of excitation primes the defense response so that it may occur very rapidly once the supporting stimuli become present. The defense response that actually occurs depends on the degree to which the supporting stimuli of the defense responses are present in the current stimuli situation. A defense response will only occur if its supporting stimuli match the current stimulus input to a degree that both exceeds an absolute criterion of 'adequate match' and is greater than the degree of match for any other defense response. If none of the supporting stimuli meet the absolute criterion, then none of the defense responses will occur. However, they will remain in an 'excited' state as long as the defense system stays activated (Masterson & Crawford, 1982).

Evolutionary considerations suggest that the defense system activation is highly volatile in the sense that it occurs at the slightest hint of potential threat. As a consequence, the defense system is not only activated whenever the animal is certain to be hurt. The possibility of threat is enough to activate the system. Likewise, evolutionary considerations suggest that the defense system should be highly
conservative: Once activated, it should be slow to deactivate and, once conditioned, it should be slow to extinguish (Masterson & Crawford, 1982).

One of the properties of the defense system is high resistance to extinction. To the extent that danger is correlated with particular stimuli, it will be expedient for the defense system to become conditioned to these stimuli on a permanent basis. As Rozin and Kalat (1971) also suggested, the high resistance of avoidance conditioning to extinction probably has adaptive value. The defense system should be activated whenever there is even a slight chance that the animal is in danger (Masterson & Crawford, 1982).

A related property of defense system activation is that it need not be accompanied by intense negative affect. Such affect accompanies alarm reactions that occur only when traumatic outcomes are certain or highly likely. Because of its volatility and slow extinction properties, defense system activation will occur in many situations where trauma has occurred very infrequently, if at all. In these cases, the correlated affect might be best described as ‘wariness’ - that is, a cautious alertness combined with defense response priming (Masterson & Crawford, 1982). According to Lang (1994) emotion networks include direct connections to the brain's primary motivational system. They direct the general mobilization of the organism and the development of primitive approach and withdrawal behaviors. It is this same system that mediates the formation of conditioned associations based on primary reinforcement. Development of a new connection does not involve the formation of new neural pathways in the brain. Rather, local changes are induced in existing circuits, by altering the neurochemistry of cells and changing the probabilities of synaptic firing (Lang, 1994).

Pathways to the pelvic floor

Although different models for neuronal control of the micturition cycle have been proposed (see Kinder, Bastiaanssen, Janknegt & Marani, 1995), the studies of Blok and colleagues (e.g. Blok, & Holstege, 1994; Blok, Sturms & Holstege, 1997; Blok, Willemsen & Holstege, 1997) are most explicit about pelvic floor function.

In humans, the motor cortex is crucial in voluntary motor control, but other areas in the brain are involved in motor activities related to emotional behavior. These areas form the so-called emotional motor system (Blok, Sturms, & Holstege, 1997). Micturition is an example of a motor activity that is strongly influenced by this emotional motor system. During micturition the coordination of the detrusor muscle of the bladder and its external sphincter take place in the so-called pontine micturition center in the pons instead of in the sacral spinal cord or in the cerebral cortex but. The pontine micturition center, in turn, is not under control of the motor cortex but of structures belonging to the emotional motor system, such as the peri-aqueductal gray (PAG) and the dorsolateral part of the preoptic area of the hypothalamus. The results of the research by Blok and colleagues suggest that the PAG functions as a major 'receiving' station for ascending sacral projections to the brainstem. The PAG might activate the M-region in order to produce voiding. Rostally located limbic structures as the preoptic areas, might control this reflex and possibly determine, in respect to the safety of the individual, the beginning of the act of micturition. This projection, thus,
might serve as a 'safe signal', i.e. allows micturition only when the individual finds itself in a safe situation (Blok & Holstege, 1994).

The pelvic floor not only takes part in micturition and defecation, but also in sexual behavior, another component of the emotional motor system. A cortical pelvic floor motor area is located close to the ‘hip motor area’ between the arm and leg motor areas in the superior precentral gyrus. Bilateral destruction of this area resulted in urine retention due to a hyperreflexia of the pelvic floor musculature, causing inability of bladder relaxation. This area may be important in the mechanism underlying overactivity of the pelvic floor. The so-called L-region or pontine storage center, is also activated during involuntary and possibly also tonic contraction of the pelvic floor (Blok, Sturms, & Holstege, 1997).

Voluntary control seems to be affected by the superomedial part of the precentral gyrus. This cortical area is important for conscious withholding of urine and subsequent suppression of the micturition reflex (Blok, Sturms, & Holstege, 1997).

This line of research offers interesting possibilities for the study of different aspects of the pelvic floor.

In conclusion

The emphasis on the sexual aspect of pelvic floor overactivity in women with a diagnosis of vaginismus, follows from the moment of discovery of the problem. This is often related to the use of menstrual tampons, a gynecological exam or sexual intercourse. However, it seems more appropriate to approach the complaints related to the diagnosis of vaginismus as complaints related to the functioning of the pelvic floor. This does justice to the symptoms women have, which are often not restricted to the vaginal area, and allows a broader perspective for understanding the mechanism underlying pelvic floor overactivity. Overactivity of the pelvic floor may be viewed as the outcome of a multifactorial process. "...and this [...] is the reason why the cure of many diseases is unknown to the physicians of Hellas, because they disregard the whole, which ought to be studied also; for the part can never be well unless the whole is well" (Socrates in Plato’s Charmides; Jowett, 1953).
In humans, the motor cortex is crucial in voluntary motor control. Many areas in the brain are involved in motor activities related to emotional behavior. These areas form the so-called emotional motor system (Blok, Storms, & Holstege, 1997).

Misuritation is an example of a motor activity that is strongly influenced by this emotional motor system. During misuritation, the contribution of the detrusor muscle of the bladder and its external sphincter take place in the so-called pontine misuritation center in the pons lateral to the sacral spinal cord or in the cerebellar cortex. The pontine misuritation center, in turn, is under control of the motor cortex but of structures belonging to the emotional motor system, such as the periaqueductal gray (PAG) and the reticular part of the propositus area of the hypothalamus. The results of the research by Blok and colleagues suggest that the PAG functions as a major receiving station for ascending sacral projections to the brainstem. The PAG might activate the nucleus in order to produce voiding. Ruptured located lateral structures as the propositus area might control this reflex and possibly determine, to respect the safety of the individual, the beginning of the act of misuritation. This projection, thus,