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Original Article Knowledge of the pelvic floor in nulliparous women

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Abstract. [Purpose] Proper pelvic floor function is important to avoid serious dysfunctions including incontinence, prolapse, and sexual problems. The current study evaluated the knowledge of young nulliparous women about their pelvic floor and identified what additional information they wanted. [Subjects and Methods] In this cross-sectional survey, a validated, 36 item questionnaire was distributed to 212 nulliparous women. The questionnaire addressed demography, pelvic floor muscles, pelvic floor dysfunction, and possible information sources. Descriptive statistics were generated for all variables. Stability and validity testing were performed using Kappa statistics and intra class correlation coefficients to define agreement for each question. The study was approved by the ethics Committee (B300201318334). [Results] Using a VAS scale (0 to 10), the women rated their knowledge about the pelvic floor as a mean of 2.4 (SD 2.01). A total of 93% of the women were insufficiently informed and requested more information; 25% had concerns about developing urinary incontinence, and 14% about fecal incontinence. Many of the women were unaware what pelvic floor training meant. [Conclusion] There was a significant lack of knowledge about pelvic floor function among nulliparous women. The majority of nulliparous women expressed a need for education, which might offer a way to reduce dysfunction.

Key words: Knowledge, Nulliparity, Pelvic floor disorders

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INTRODUCTION

The pelvic floor (PF) is a well-defined muscular structure that plays a role in several important urological, gynecological, gastroenterological, and pulmonary functions^{1–5)}. Pelvic floor dysfunction (PFD) can lead to mild or even devastating consequences such as urinary incontinence (UI), fecal incontinence (FI), pelvic organ prolapse (POP) and sexual problems⁶⁾. The major known risk factors that contribute to PFD are pregnancy and childbirth, obesity, chronic obstructive pulmonary disease, and menopause^{1, 7–10}.

While pelvic floor training (PFT) is very effective to treat deficient pelvic floor muscles (PFM), clinicians should focus on the prevention of PFD^{11–13}. Research has suggested that knowledge about PF may be lacking in adult women⁹); therefore, we designed this study to assess women's knowledge. Improvement in knowledge is necessary to influence care-seeking behavior¹⁴ and can improve compliance with PFT treatment recommendations¹⁵). One study demonstrated that women who attended information sessions were more likely to execute routine pelvic floor muscle exercises¹⁶, which is known to be both

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the first line for the prevention of and treatment for PFD¹³).

The primary objective of this research was to evaluate the knowledge of pelvic floor function in young nulliparous women.

SUBJECTS AND METHODS

A descriptive cross-sectional design was used for this study. The study was conducted in a population of young nulliparous (NP) women. Inclusion criteria were women with Dutch proficiency, aged between 18 and 27 years of age, who had never been pregnant. Purposive sampling was performed¹⁷: participants were recruited from students of non-medical oriented bachelor educations and their friends. Data were recorded anonymously and written informed consent was obtained.

To develop our own questionnaire (Appendix 1), several physicians worked intensively on item generation, reduction, and sampling to redundancy¹⁸, according to 'the Delphi process'¹⁷, during five brainstorming sessions, which were inspired by individual interviews with patients.

The questionnaire consisted of 36 questions: 5 on demographic characteristics, 6 on PF structure and function, 12 on PFD and risk factors, 3 on sexual (dys)function, 4 on PFT, 5 on education and gathering of information, and 1 on concerns about PF. A rendering of a female body was included in order to evaluate the participants' topographical knowledge.

The questions were phrased in a socially and culturally sensitive manner, and complex terminology was avoided. Succinct and unbiased response formats, "open" (free text) as well as "closed" (structured)¹⁸), were used (depending on the information we intended to gather). In addition, indecisive response options (e.g., "I don't know" and "other") were included to enhance the response rates^{18, 19}). Five questions were open ended, in order to gather information and thoughts; these answers were divided into categories to report the information. Validity testing was performed through expert opinion from four involved experts (two urologists, one pelvic floor therapist, and one gynecologist), and three independent experts (a gynecologist, a gastroenterologist and a general practitioner) tested the questionnaire for content validity.

Face validity¹⁸) was assessed in a pilot study with 18 independent volunteers, in order to evaluate whether respondents interpreted questions in a consistent manner²⁰, to judge the appropriateness of each included question, and to record the time required to complete the questionnaire. Test-retest reliabilit and stability testing were performed within a span of 2–4 days to avoid having the subjects learn the answers. Criterion and construct validity were not assessed because no other scales exist with which this questionnaire could be compared.

Descriptive statistics were generated. Stability and validity testing were performed by using Kappa statistics and intra class correlation coefficients to define agreement for each question. SPSS 20.0 for Windows (SPSS Inc., Chicago, IL, USA) was used. Approval was granted by the local Ethics Committee (B300201318334).

RESULTS

Test–retest reliability: Fifteen participants completed the questionnaire two times. A total of 89% of the questions had a k>0.80, indicating perfect agreement, and 9% had a k value between 0.61 and 0.80, indicating substantial agreement. Only 2% of the questions had a k<0.40, indicating slight or fair agreement. For the items scored on a visual analogue scale, there was a high agreement (ICC=0.92) between test-retest answers.

The content-validity and face-validity of the questionnaire were assessed by the experts and untrained volunteers. They indicated that the questions were well interpreted, measured what they were intended to, and that the content assessed all fundamental aspects of PFM and PFD. All of the women included returned the questionnaire, for an actual response rate of 100%. The time required to complete the questionnaire ranged from 10 to 20 minutes.

Demographic characteristics of participants: A total of 212 NP women (mean age 21.6; range 18–27 years old) were included. The highest achieved degree of education was Elementary School in two (1%), High School in 106 (50%), and bachelor's or master's degree in 104 (49%). All women were of European nationality, 211 women were of Caucasian race, and one of black race. All had a gravidity and parity status of zero.

Pelvic floor structure and function: Almost all of the NP women (193 [93%]) knew that the PF contains muscles and almost all the women (187 [92%]) located the PF correctly on the figure of the female body. Seventeen (8%) located the PF in the abdomen or at the caput femoris.

Approximately 73% (155) of the participants knew at least one function of the PF, and 43% (91) knew more than one function. The closure function (115 [56%]) and the support function (91 [44%]) were the most widely known functions. Only 20 women (10%) knew about the role of the PF in sexual function.

Almost all participants (190 [90%]) were aware that PFM can be consciously contracted, and most (116 [57%]) answered that they make an inward lifting and/or a pinching movement to contract. Seventy-five NP women (37%) answered that the PFM also involves an outward pushing movement. A great proportion of the women (121 [58%]) did not know how many openings there are in the female PF. Only 13% (28) of the women correctly answered "three" and were able to name them.

The answers to the questions regarding the most important causes of PFD are shown in Table 1. The results of the questions about the knowledge of the pelvic floor, sexual (dys)function, pelvic floor therapy, and education are shown in Table 2. Only a few participants (6 women [3%]) had done PFT before. On a VAS scale from 0 to 10 (0: no knowledge; 10 expert in the domain), the women rated their general knowledge about the PF as a mean of 2.4 (SD 2.01; min 0; max 9.3). The results

on the educational levels of the participants and their interest in additional information are presented in Table 2. Most of the participants (168 [81%]) had never received information about the PF. The participants who had been educated about the PF were informed between the ages of 18 to 20, either at school or from relatives. A quarter of the women (50 [25%]) expressed a concern about urinary incontinence, and 28 (14%) about fecal incontinence.

Table 3 presents the results of the most expected consequences of pregnancy and delivery. Dividing those consequences into three categories—urinary, fecal and sexual—we found that only 9% (19) of the women expected consequences in all three categories. The majority of the participants (153 [89%]) knew that vaginal delivery, prolonged labor, and forceps delivery could be risk factors for PFD. Most of the participants (148 [86%]) thought that a perineal rupture could cause a more severe lesion of the PFM than an episiotomy. Most of the women answered that "the vagina" tears during a perineal tear. For the majority of the participants (158 [75%]) "pelvic organ prolapse" or "sagging in the little pelvis" was unknown. The participants were not aware which organs could descend into the pelvis.

DISCUSSION

The high prevalence rates of PFD in women are an important medical and socio-economical problem²¹). Women are reluctant to seek help even when they have PFD²¹). The present study evaluated the knowledge of nulliparous women about the PFM and their role in PFD, the possible treatment options, and the women's interest in specific education on the topic.

Pregnancy and childbirth have been shown to be important risk factors for PFD in women^{1, 10)}. Three quarters of young NP women are well aware of at least one of these risk factors and answered that during the 6 months postpartum (PP), these problems would become less frequent than during the immediate PP period, which is realistic. Nevertheless, one out of three participants has no idea (or even a too negative idea) about the prognosis of PFD after childbirth, which is a large proportion. Other researchers have examined this aspect of knowledge about PFD in great deal^{22, 23)}. In this study, our questionnaire posed the question whether an episiotomy or perineal rupture would cause more damage and results in worse outcomes to the PFM. It appeared that 86% of the participants believed that a rupture has a more negative outcome compared to an episiotomy, which is clearly in contrast to the most recent research evidence^{22–24}.

Some of the questions were unanswered by a large proportion of the women, e.g. questions about the forceps/spoons, the vacuum delivery, or even prolapse. We suspect these data were missing because the women did not understand the question, as they have no first-hand knowledge of these topics.

Mellville et al. found an interesting relationship between knowledge and behavior; women who believe that the cause of their UI is out of their control (e.g. part of being female, due to childbirth) may believe that nothing can be done to treat it¹⁵⁾. They did not, however, investigate the influence of prevention. Hermansen et al. showed that 76% of women who experienced UI after delivery were convinced that they had become incontinent due to weakened PFM and because they had not performed sufficient PFM exercises²⁵⁾. One may assume that knowledge about PFM and PFD could positively affect care-seeking behavior. Our study shows that young NP women lack such knowledge. Therefore, education about PFM and PFD could be of major importance in NP women, before they become pregnant and deliver.

Our results show that most NP women expect that pregnancy and delivery will have a negative impact on women's sexuality. A great proportion of the women thought that UI and dyspareunia were normal. Most women acknowledged the role of the PFM in the sexual function. Previous research has revealed that women of all ages are not likely to discuss intimate problems such as sexual dysfunction or UI during intercourse²⁶. The overall prevalence of dyspareunia and other sexual disorders varies between 4% and 42%^{27–29}, depending on the source and on the applied definition. The prevalence of sexual dysfunction in women below 30 years was found to be elevated compared to women between 30 and 40 years³⁰. Approximately 60% of our participants believed occasional dyspareunia was normal, which is a very high number and indicates that correct health-related information is needed³¹. Nevertheless, we should be careful in our conclusions; the number of

Vaginal delivery	119 (57.2%)
Pregnancy	104 (50%)
Surgery on urinary tract, uterus or abdominal organs	98 (47.1%)
Obesity	88 (42.3%)
Pushing during voiding	72 (34.8%)
Heredity	57 (27.4%)
Constipation	31 (14.9%)
Abuse of alcohol	16 (7.7%)
Caesarean	11 (5.3%)
Smoking	6 (2.9%)
λ_{1}	

Table 1. Reply to the question "most important causes of pelvic floor dysfunction" N (%)

Number of participants=208 (4 missing).

Item/question	N (m)		Results	
-		n "I don't know"	n "Yes"	n "No"
		(%)	(%)	(%)
Knowledge of Pelvic Floor				
Is conscious control of PFM possible?	212 (0)	20 (9.4%)	190 (89.6%)	2 (0.9%)
Occasional leakage of urine?	211 (1)	28 (13.3%)	69 (32.7%)	114 (54.0%)
Urine leakage during sports?	210 (2)	45 (21.4%)	70 (33.3%)	95 (45.2%)
Precautionary use of a pad?	210 (2)	22 (10.5%)	121 (57.6%)	67 (31.9%)
PFM weakness after delivery?	212 (0)	34 (16%)	169 (79.7%)	9 (4.2%)
Pain after delivery?				
Immediately pp	212 (0)	56 (26.4%)	149 (70.3%)	7 (3.3%)
1 month pp	211 (1)	92 (43.6%)	71 (33.6%)	48 (22.7%)
6 months pp	211 (1)	80 (37.9%)	5 (2.4)	126 (59.7%)
UI after delivery?				
Immediately pp	212 (0)	44 (20.8%)	154 (72.6%)	14 (6.6%)
1 month pp	211 (1)	72 (34.1%)	73 (34.6%)	66 (31.3%)
6 months pp	211 (1)	69 (32.7%)	28 (13.3%)	114 (54.0%)
FI after delivery?				
Immediately pp	212 (0)	51 (24.1%)	76 (35.8%)	85 (40.1%)
1 month pp	212 (0)	52 (24.5%)	4 (1.9%)	156 (73.6%)
6 months pp	212 (0)	45 (21.2%)	2 (0.9%)	165 (77.8%)
Dyspareunia after delivery normal?				
1 month pp	210 (2)	61 (29.0%)	128 (61.0%)	21 (10.0%)
6 months pp	211 (1)	62 (29.4%)	23 (10.9%)	125 (59.2%)
Knowledge about the sexual (dys)function	of PFM			
Do the PFM play a role in orgasm?	210 (2)	57 (27.1%)	135 (64.3%)	18 (8.6%)
UI during sexual intercourse?	211 (1)	69 (32.7%)	27 (12.8%)	115 (54.5%)
Occasional dyspareunia?	211 (1)	35 (16.6%)	120 (56.9%)	56 (26.5%)
Continuous dyspareunia?	211 (1)	30 (14.2%)	13 (6.2%)	168 (79.6%)
Knowledge about pelvic floor therapy				
Is prenatal physiotherapy useful?	211 (1)	35 (16.6%)	166 (78.7%)	10 (4.7%)
Is postnatal physiotherapy useful?	211 (1)	17 (8.1%)	188 (89.1%)	6 (2.8%)
Do you know what PFT means?	207 (5)	0	15 (7.2%)	192 (92.8%)
Ever followed PFT?	208 (4)	0	6 (2.9%)	202 (97.1%)
Education and gathering of information at	out the topic			
Ever received information?	208 (4)	0	40 (19.2%)	168 (80 8%)
Ever searched for information?	205 (7)	0	8 (3 9%)	197 (96 1%)
Sufficiently informed?	205 (7)	0	15 (7.3%)	190 (92.7%)
Interested in more information?	206 (6)	0	191 (92.7%)	15 (7.3%)

Table 2. Reply to the questions about pelvic floor, sexual (dys)function, pelvic floor therapy and education

N: number of participants, m: missing items, n: number of answers, PFM: pelvic floor muscles, pp: postpartum, UI: urinary incontinence, FI: fecal incontinence, PFT: pelvic floor training

Table 3.	Reply	to the question	"consequences	of pregnar	ncy/delivery'	'N (%)
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Urinary incontinence	147 (80.2%)
Pain in the pelvic floor	109 (59.3%)
Pain during intercourse	94 (51.1%)
Gapping vagina	84 (45.9%)
Diminished orgasm during intercourse	39 (21.4%)
Stool problems	26 (14.3%)
Flatulence	18 (9.9%)

Number of participants=183 (29).

questions on sexual dysfunction could have been be too sparse in this survey to create a clear sight on the actual perceptions about this topic in young nulliparous women. In addition, we did not query for cultural and social influences.

Almost all of the women expressed the need for more information, and simultaneously acknowledged that they had not actively searched for information on their own. This might be explained, on one hand, by the small number of PFD that one could expect in such population, and on the other hand, as a sign of the existing taboo about discussing these concerns, which was mentioned above. To the best of our knowledge, no similar research has been performed in a large group of young NP women. However, previous research has revealed that 64% of pregnant women actively consulted at least one source of information about PFD¹⁶), and that information given by a doctor has a profound influence on knowledge and anxiety; women who received information about PFD from their doctor had better knowledge and less anxiety about PFD³²). In addition, it has been shown that information given verbally has a more profound influence than written information³²). Education about PFM and PFT was shown to enhance women's knowledge about this topic for longer periods^{2, 31, 33–35}). Unfortunately, no comparable information is available in NP women. Surprisingly, the NP women in our study expressed high thrust in pre and post-natal physiotherapy, and at the same time stated that they had very little knowledge about it.

Only a small percentage of the NP women expressed anxiety or fear about pelvic floor dysfunction. This might be a consequence of the lack of knowledge. Previous studies have shown that anxiety can lead to exacerbating complaints and make women more vulnerable to the experience of PFD³⁶. The low levels of anxiety among NP women may be reassuring, unless that such fear becomes more serious during actual pregnancy and delivery.

The strengths of our study are the large number of participants, high response rate, and use of an extended, psychometrically validated survey, with open and closed answers, as well as indecisive response options.

We should acknowledge that the results gathered by this study only deliver observational information about the knowledge of these women. For approximately ten questions, a correct answer reflected good knowledge, but for the remaining questions, no clear right or wrong answer existed. We did not collect prospective data about these women. We have reviewed the current literature about possible preventive measures, but with these results, we cannot yet validate the proposed ways of prevention. Therefore, we believe that future research on this topic is necessary to study the best ways to educate NP women, and to determine whether educational campaigns have the intended impact on preventing PFD in women of all ages.

We believe that better general education on this topic is mandatory, preferably given earlier in life (during school), or before women are exposed to PFD risk factors such as pregnancy and delivery (pre-pregnancy education). The main purpose should be to make information easily available and accessible to all.

One shortcoming of this study may be that the participants were almost all highly-educated and medium-educated young women of Belgian ethnicity. Although recent research has revealed that general education is not correlated with good health literacy and disease understanding³⁷, more research in women with different demographic characteristics would help determine how generalizable our findings are.

This survey in nulliparous women showed poor knowledge and considerable concerns about PF-related function/dysfunction. The vast majority of the women surveyed expressed the need for more information. We believe that women should be better educated in order to promote the implementation of pelvic floor muscle exercises to prevent dysfunctions. Future research should be conducted to assess the most effective ways to deliver education and promote these preventive measures.

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Appendix 1. Questionnaire

Remark for researchers and physicians: The survey's translation provided in English is for information only and has not been tested. Literal translation of the original Dutch version may not convey the meanings intended. To obtain the original psychometrically validated questionnaire please contact the authors.

Dear Madam,

The purpose of this study is to improve the prevention and the treatment of pelvic floor disorders. Through the questionnaire below, we try to explore the current knowledge of women (who have never been pregnant before) about the pelvis and pelvic floor muscles. Therefore we would like you to respond spontaneously to these questions without searching for the correct answers in books or on the Internet. This survey is completely anonymous and was approved by the Ethics Committee(B300201318334). Completion takes about 20 minutes of your time. We thank you for your cooperation.

Occasionally we will ask you some open answer questions. Please fill in the thoughts that first come into your mind.

1) 2)	How old are you? years Mark your highest degree of education: Elementary School	마	ligh School	ΠU	niversity/ College
3)	What is your current occupation (profes	sion)?	•••••	
4)	Nationality: Mark to which group you be	long			
	Belgian		Moroccan		Polish
	Dutch		Turkish		Others:
5)	Origin: Indicate your native origin:				
	🗖 Belgian		Moroccan		Polish
	Dutch		Turkish		Others:
6)	What is included in the pelvic floor? Mu	ltiple	e answers are possible.		
	Muscles		Tendons and ligaments		Abdominal organs:
	Skin and fat		Arteries and nerves		Uterus, bladder, bowel,
	Bone and joints		Other:		kidneys

7) Where can you localize the pelvic floor muscles? Please mark on this graph.

AF A
$\left(\right) \left(\right)$

8) What do the pelvic floor muscles do?				🗌 l don't kn	w	
	Why do we need them?			🗆 l don't kn	 ow	
					•••••	
9)	Is a healthy woman able to con	itrol (contrac	t and relax) th No	e pelvic floor m	uscles w	vhenever she wants? I don't know
10)	Which movement do the pelvic Pinching movement Inwards lifting movem	e floor muscle ient	es make? Pleas	se mark, multipl D Outward No consci	e answe pushing ous con	ers are possible. movement trol possible
11)	How many openings do women	n have in the	pelvic floor?	🗆 I don't kn	W	
	Which are they?					🗆 l don't know
		••••••			•••••	
12)	Which are the possible causes	of bad functiv	oning of the n	alvic floor musc		aso mark the three most
12)	common causes.		oning of the p	ervic noor muse		
	Pregnancy		Surgery of to	o the		Caesarean delivery
	Heredity		urinary tract	, uterus or		Constipation (blockage
	Vaginal delivery		abdomen			of the bowels)
	□ Straining during peein	g 🛛	Drinking Alco	ohol		Others:
4.01	Overweight (obesity)		Smoking			
13)	Does a healthy person occasion	nally loses uri	ine?			l don't know
11)	Doos a healthy person loses un	ino during ov	NO orciso or offor	t such as inton		rts2
14)			No	t, such as intens		I don't know
15)	Do you find it normal if women	ı dailv use a p	precautionary	pad to control u	irine lea	kage?
,	☐ Yes		No			l don't know
16)	Are the pelvic floor muscles no	t as strong as	s before, after	childbirth?		
	Yes		No			I don't know
	If yes, mark which consequence	es after child	birth are norm	hal, multiple ans	wers ar	e possible:
	Gapping vagina			Pain in the	e pelvic	floor
	(Involuntary) loss of u	rine		Pain durir	ng intero	course
	Stool problems (block	age, diarrhea	<i>,</i> etc.)	D Diminishe	ed orgas	m during intercourse
17)	LI Flatulence		the nelvie flee	"		
17)	Immediately after delivery		the pervic hoc			🗖 I don't know
	1 month after delivery					
	Concerting after delivery					
101	o months after delivery					Li i don t know
18)	Does a nearry woman occasio	nally loses ur	ine?			🗖 I don't know
	1 month often delivery					
	1 month after delivery	ы Yes				
	6 months after delivery	Ц Yes		LI NO		LI I don't know

19) Does a healthy woman occasion	ally loses stool?			
Immediately after delivery	□ Yes		C	🗆 I don't know
1 month after delivery	□ Yes		C	🗖 I don't know
6 months after delivery	🗆 Yes		C	🛛 I don't know
20) D				
20) Does an average women experi	ences pain during	Intercourse?	2	
I month after delivery			-	
6 months after delivery			D	
21) <u>Circle per line</u> which way of del muscles:	ivery may have th	e most negative	consequences	for the pelvic floor
Caesarean Section		OR	vaginal deliv	very
 Fast vaginal delivery 		OR	vaginal deliv	very that takes longer
 Vaginal delivery with e 	pisiotomy (cut)	OR	vaginal deliv	very with rupture (tear)
 Vaginal delivery with s 	poons / forceps	OR	vaginal deliv	very with vacuum
22) What can be cut or tear during	vaginal delivery?			🗆 I don't know
23) What does the term "prolapse/	sagging in the sma	all basin" means	for you?	🗆 I don't know
What can prolapse/sag/descent	d in the small basi	n?		🗖 don't know
			••••••	
24) Do pelvic floor muscles play a re	ole in getting a sev	(ual orgasm?	-	l don't know
25) Does a healthy woman frequen	tly experiences pa	in during sexual	intercourse?	I don t know
		in during sexual		l don't know
26) Does a healthy woman leaks a l	ittle bit urine duri	ng sexual interco	urse?	r don t know
□ Yes		15 Sexual Interes		l don't know
27) Do you think that prenatal phys	iotherapy (during	pregnancy, befo	ore deliverv) is	useful?
☐ Yes	D No			l don't know
28) Do you think that postnatal phy	siotherapy (after	delivery) is usefu	ıl?	
Yes	🗖 No			l don't know
29) Do you know the therapy that is	s given to women	with pelvic floor	problems?	Yes / No
30) Did you ever receive pelvic floo	r therapy?			Yes / No
11 yC3, W11y:			-	
31) How much do you know about absolutely nothing and ten is ex line.	the pelvic floor mi pert in the domai	uscles on a scale n? Mark your kn	from zero to t owledge with	en, whereas zero is a cross on the horizontal

0 ------ 10

32) Did you If yes:	ever receive information about When?	the	pelvic floor muscles? Yes /	No		
	For which reason?					
	From who/what? - multiple	ans	wers or possible -			
	Gynecologist Friends/family Physiotherapist		Nurse Midwife School		General Informat Others:	practitioner tion Evening
33) Did you If yes:	ever search for information abo Through which source? - m Books Internet Gynecologist Physiotherapist	ut th ultip D D	nis topic on your own initiative le answers are possible - Friends/family General practitioner Others:	?	Yes / N	lo
34) Do you	find yourself good enough inform	ed a	bout the pelvic floor muscles?	Yes / N	0	
35) Do you	want more information about the	e pel	vic floor muscles?		Yes / No	
36) Which is 	s your biggest anxiety or fear abo	ut th	e pelvic floor?	🗆 l do	n't know	□ None
				Thank	s for your	cooperation!