Predictors of long-term adherence to pelvic floor muscle exercise therapy among women with urinary incontinence

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Abstract

This study assessed predictors of long-term adherence to pelvic floor muscle exercise (PFME) therapy including a health education programme among women with urinary incontinence. Sequential multiple regression analyses revealed several significant predictors that predicted 50% of variance in long-term adherence behavior. Short-term adherence significantly predicted long-term adherence. Further, women with frequent weekly wet episodes before and 1 year after therapy were more likely to have high adherence levels 1 year after therapy than women with fewer weekly losses. Thus, women seemed to adapt long-term adherence behavior to their symptoms. Adherence to PFME therapy was very high. The protocol checklist for the PFME therapy developed to standardize treatment among physiotherapists had structured therapy content, which may have optimized adherence behavior in this study. Implementation of this protocol checklist in clinical guidelines is suggested.

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Introduction

Urinary incontinence (UI) is a major health problem affecting many community-dwelling adults, of whom 75% are women. Overall, the estimated prevalence of UI among adult (over 18 years) women living in the community is 25–30%, which is lower in younger age groups and higher in older age groups (Thomas *et al*., 1980; Holst and Wilson, 1988; Jolleys *et al*., 1988; Rekers *et al*., 1992; Hannestad *et al*., 2000). The high prevalence rates result in an enormous financial impact on the health care costs of countries. For example, in The Netherlands up to 80 million euros are spent yearly on incontinence pads alone, those used in residential homes not taken into account (Janssen and Miltenburg, 1998; Health Council, 2001). UI is associated with reduced physical, social and mental well-being caused by embarrassment, fear of offensive odor and loss of self-esteem (Wyman *et al*., 1990; Dugan *et al*., 2000; Van der Vaart *et al*., 2000).

Today, PFME therapy is recommended as first-choice treatment for women with stress, urge and mixed UI when other physical impairments causing UI have been excluded and possible urinary tract infections have been treated successfully (Bø, 1995a; Nygaard *et al*., 1996; Berghmans *et al*., 1998a, 2000; Wyman *et al*., 1998a,b; Hay-Smith *et al*., 2001). Directly after PFME therapy completion, up to 70% of the study population is dry or much improved (Lagro-Janssen *et al*., 1992; Burns *et al*., 1993; Bø, 1995a; Nygaard *et al*., 1996; Berghmans *et al*., 1998a), but symptom success rates decline during follow-up as adherence to PFME therapy recommendations deteriorates (Bø

and Talseth, 1996; Lagro-Janssen and Van Weel, 1998; Chen *et al.*, 1999).

The needs assessment conducted prior to this study (Alewijnse *et al.*, 2003a) revealed that many psychosocial and cognitive determinants may contribute strongly to adherence to exercise therapy. To categorize and conceptualize variables that are important in determining adherence behavior, we used the social cognition model called the Attitude–Social influence–self-Efficacy (ASE) model (De Vries *et al.*, 1988). According to the ASE model, behavioral change is best predicted by an individual's intention to perform that behavior. The ASE model assumes that behavioral intention is determined by three types of proximal cognitive factors: attitudes, social influences and self-efficacy expectations. Distal factors such as sociodemographic, psychological, sociocultural and medical variables are expected to influence behavioral intention through the proximal factors. Barriers and skills play a role when behavior is actually performed and this performance leads to a feedback process that, in turn, influences the three proximal factors (De Vries and Mudde, 1998; Lechner, 1998).

Proximal determinants found were positive and negative outcome expectations regarding adherence to PFME therapy, perceived social norms, modeling, social support, and self-efficacy expectations in terms of being able to adhere to PFME therapy even under various situations. Distal determinants were lay beliefs about incontinence, self-care strategies, illness representation, cultural norms and values, risk perception, prognosis, severity of symptoms, and symptom impact. Barriers were lack of discipline, time and energy, forgetting, stressful situations, (negative) associations with sex, sex education at school, perceiving the pelvic floor as an unfamiliar bodily area, difficulties with integrating exercises in daily life, fluctuations in effectiveness, muscle pain in the bladder, self-esteem, body esteem and oral feedback or reinforcement from others. Three aspects influence many of above determinants: knowledge, sex-specific aspects and motivation (Castleden *et al.*, 1984; Wilson *et al.*, 1987; Bø *et al.*, 1990;

Kok and Bouter, 1990; Nygaard *et al.*, 1990, 1996; Cammu *et al.*, 1991; Mantle and Versi, 1991; Mouritsen *et al.*, 1991; Sluijs and Knibbe, 1991; Wall and Davidson, 1992; Ashworth and Hagan, 1993; Burns *et al.*, 1993; Dougherty *et al.*, 1993; Hahn *et al.*, 1993; Janetzky, 1993; O'Dowd, 1993; Sluijs *et al.*, 1993; Cammu and van Nylen, 1994; Knibbe and Wams, 1994; Lagro-Janssen *et al.*, 1994, 1995; Bø, 1995b; Gallo and Staskin, 1997; Lagro-Janssen and Van Weel, 1998; Wyman *et al.*, 1998a,b). Furthermore, education programmes supplementary to or incorporated in physiotherapeutic treatment addressing determinants of adherence behavior are expected to promote adherence and improve long-term therapy outcomes (Sluijs and Knibbe, 1991; Sluijs *et al.*, 1993).

There is a broad consensus among PFME therapists and researchers that long-term adherence to PFME therapy requires improvement. However, to date, no systematic analyses have been conducted on predictors of long-term adherence behavior to PFME therapy (Wells, 1990; Nygaard *et al.*, 1996; Gallo and Staskin, 1997; Lagro-Janssen and Van Weel, 1998). The purpose of this study was therefore to reveal predictors of long-term adherence among women with UI involved in PFME therapy.

Methods

PFME therapy

The content of PFME therapy and the operationalization of adherence advice as applied in this study were based on usual care in The Netherlands and recommendations of several authors (Bø *et al.*, 1990; Mouritsen *et al.*, 1991; Bø, 1995a; Lagro-Janssen *et al.*, 1995; Versprille-Fischer, 1995; Nygaard *et al.*, 1996; Berghmans *et al.*, 1998b, 2000; Miller *et al.*, 1998; Wyman *et al.*, 1998a,b; Payne, 2000). We recruited 28 female physiotherapists specialized in the field of PFME therapy with an outpatient physiotherapy practice in the residential area of the participating general practices. As the Dutch clinical practice guidelines

(Berghmans et al., 1998b; Messelink et al., 2000) were not yet available at the time of this study, a similar protocol for the individual PFME therapy was prepared in cooperation with the participating physiotherapists to provide a framework for therapy context. This written protocol checklist covered all treatment aspects that are usually applied in PFME therapy during diagnostic assessment activities, formulation of the treatment plan, the patient education usually given, treatment of exercise therapy and evaluation (Knibbe and Wams, 1994; Verhulst et al., 1994; Versprille-Fischer, 1995). This protocol represented usual care in a written form and details are described in Alewijnse et al. (Alewijnse et al., 2003b).

As part of an effect-evaluation study, a theory-driven health education programme to promote long-term adherence was developed (Alewijnse et al., 2003a) as a supplement to the usual patient education part of PFME therapy. The health education programme focused on influencing the determinants mentioned above. It was a self-help guide, in which the most important components were reminders, guidance of adherence as a self-management process and structured feedback. This self-help guide (Alewijnse, 1997) addressed facts and myths about UI, coping with UI, pelvic floor muscles, and contained tips to tackle all barriers hampering adherence behavior, stickers as reminders and relapse prevention strategies to support the self-management process.

Participants

The study was approved by both the Medical Ethical Committee of Maastricht University and the Maastricht University Hospital and the Review Committee of the Registration Network Family Practices [RegistratieNet Huisartspraktijken (RNH)] (Metsemakers et al., 1992). Participants were recruited from the RNH, which consists of 23 general practices with 55 general practitioners (GPs), covering a population of around 100 000 individuals, whose data on relevant chronic health problems and demographic variables are registered and continuously updated. Since many women do not seek medical treatment for UI (Shaw et al.,

2001), community-dwelling women over 17 years old with at least one of the following risk factors for UI were selected: vaginal delivery, medical history of gynecological operations, asthma, arthritis and obesity (Yarnell et al., 1982; Diokno et al., 1990; Snooks et al., 1990; Milsom et al., 1993). Detailed information about the recruitment procedure is published elsewhere (Alewijnse et al., 2001).

In total, 13 general practices with 36 GPs were involved in the selection of participants. Inclusion criteria were: ability to complete questionnaires, full understanding of the Dutch language and completion of the consent form. Excluded from the study were women (total $n = 47$) without symptoms of stress, urge or mixed UI ($n = 11$) based on their history (Lagro-Janssen et al., 1995), women suffering from neurological conditions such as multiple sclerosis, cerebrovascular accidents and spina bifida or suffering from venereal disease ($n = 5$), women with viral infections ($n = 4$), women using medication for UI or using medication that enhances/influences UI ($n = 1$), women who were pregnant or within 3 months after delivery or women who had been operated upon for UI ($n = 20$), and women with physical impairments making PFME therapy impossible ($n = 6$). The GP also evaluated the presence of prolapse and vaginal atrophy, and the ability to voluntarily contract the pelvic floor muscles through vaginal palpation. Women with urinary tract infection were treated and included when cured.

Design and procedures

A longitudinal prospective study was conducted in which participants were exposed to either PFME therapy alone or PFME therapy supplemented with the health education programme. The 133 eligible women were randomized in the group with or without self-help guide by the GP's assistants. Physiotherapists were also randomly allocated to treat women with either PFME therapy alone or PFME therapy with self-help guide. They filled out a treatment form for every patient to evaluate treatment goals. Each group of physiotherapists was given instructions on how to use the

standardized protocol checklist with or without self-help guide by the researcher.

Questionnaire and diary

All data were collected with self-administered questionnaires and 7-day diaries before (pre-test), immediately after (post-test), and at 3 and 12 months after therapy. Women received the pre-test survey from the GP's assistants before therapy and the post-test survey from the physiotherapists after the final PFME therapy session. The 3- and 12-month follow-up surveys were mailed to the participants. When women did not return the surveys within 3 weeks after sending, they were telephoned, and asked to complete the surveys and return them as soon as possible in the pre-paid envelope. Reasons for the delay and other aspects related to PFME therapy discussed in the call were recorded.

The questionnaire was pilot-tested for readability, comprehensibility and credibility among 25 women doing PFME therapy. Screening of the subscales of the questionnaire with factor analysis using principal component analysis confirmed that all subscales constituted a coherent set of items. The reliability of the subscales was checked with Cronbach's α, using the standardized item values (Tabachnick and Fidell, 2001). The proximal ASE and the distal variables addressing various aspects of adherence behavior were translated into measurable concepts. The assessment of adherence behavior and UI symptoms with the diary were both validated with several items in the questionnaire. The content of the diary and questionnaire is outlined in the sections following.

Diary and questionnaire on adherence behavior

The 7-day diary assessed adherence in terms of number of days per week women had followed the physiotherapist's behavioral advice at post-test and follow-ups. To minimize the risk of bias caused by social desirability, a five-point scale was used instead of a dichotomous scale in the diary question on adherence behavior, in which the first three options referred to reasons for non-adher-

ence, the fourth to moderate adherence and the fifth to optimal adherence. Three items on adherence behavior in the questionnaire were used as validation for the diary assessment (Kerssens *et al.*, 1996) that all correlated highly and significantly (r_s = 0.388–0.632, $P < 0.001$) with the diary item. These three items assessed how often women had adhered to the behavioral advice the day and the week before, and a self-evaluation score for adherence on a scale from 1 to 10.

Questionnaire on intention and proximal variables

Intention. The items 'Do you intend to follow the behavioral advice of your physiotherapist?' and 'Do you intend to exercise every day?' measured intention on seven-point scales (certainly not–yes, certainly; 1–7). The two items were summed to form one scale of intention ($r = 0.56$).

Attitude. Two scales were developed for *attitude*. The *pros* scale (eight items) referred to what women expected to gain by adhering to PFME therapy. These expectations were assessed on seven-point scales. For example: 'If I follow the behavioral advice, I can do my daily activities much better–much worse' (7–1; α = 0.83). The *cons* scale (five items) referred to the negative consequences of adherence to PFME therapy and was assessed on five-point scales. For example: 'If I follow the behavioral advice, I will become very tired–I don't know–not tired' (5–1; α = 0.55).

Social influence was measured with the concepts of perceived social norms, modeling, social support and social pressure. *Perceived social norms* were measured by six items on seven-point scales. For example: 'My friends think I should follow the therapist's advice'; I totally agree–I totally disagree (7–1). The items were summed to form one sumscore (scale 7–42). *Modeling* was assessed by one question asking the respondent how many persons out of 10 categories (mother, sister, neighbor, etc.) she knew who also had PFME therapy. The score ranged from 0 to 10. Similarly, two items assessing *social support* asked with whom women (yes–no; 0–1) discussed their incontinence and PFME therapy ($r = 0.78$). The

two items were summed to form one index score (0–35). *Social pressure* was measured by one item, asking 'Has anyone ever put pressure on you not to adhere to PFME therapy?'. As only two respondents had ever experienced any social pressure, this item was excluded from further analysis.

Self-efficacy expectations were measured as both 'difficulties' and 'abilities' on seven-point scales (Bandura, 1997). In the 'abilities' scale (nine items), women's expectations of their ability to follow the behavioral advice regardless of situational demands, were measured. For example: 'I certainly can–cannot follow the behavioral advice when I am very busy' (7–1; $\alpha = 0.78$). The 'difficulties' scale (nine items) referred to women's expectations of their skills regarding adherence to PFME therapy: 'Reminding myself every day to follow the behavioral advice is very easy–very difficult' (7–1; $\alpha = 0.87$).

Diary and questionnaire on distal variables

UI symptoms and perceived severity. The 7-day diary assessed weekly frequency of wet episodes (Wyman *et al.*, 1988a,b; Nygaard and Holcomb, 2000). In the questionnaire, these three aspects were also assessed on the basis of the PRAFAB score (Vierhout, 1990) for validation of the diary assessment. These three items correlated significantly with the diary assessment ($r_s = 0.551$–0.766, $P < 0.001$). Another three items in the questionnaire measured the duration of symptoms, the type of UI and daily voiding frequency. Symptom distress was assessed with the Incontinence Quality of Life scale [IQOL, scale 22–110 (Wagner *et al.*, 1996); 22 items; $\alpha = 0.92$] and symptom impact with the Incontinence Impact Questionnaire [IIQ-7, scale 0–15 (Uebersax *et al.*, 1995); seven items; $\alpha = 0.79$]. Higher IQOL scores indicate a better quality of life in relation to incontinence symptoms, whereas higher IIQ-7 scores indicate a larger impact of symptoms on daily life.

Self-esteem and body esteem. Self-esteem was measured using 12 items of one seven-point subscale of Bekker's Autonomy Questionnaire (Bekker, 1993). The subscale consisted of statements such as 'I usually know quite well what I like best'; totally agree–totally disagree (7–1; $\alpha = 0.79$). For the concept of *body esteem*, no existing scale suitable for women with UI was available, so a scale was developed based on the interviews and literature (Franzoi, 1994; Franzoi and Shields, 1984). A pilot-test was conducted among 15 male and 15 female university staff. Body esteem was assessed by 13 items on seven-point scales using statements like 'I feel ashamed about my body'; totally agree–totally disagree (1–7; $\alpha = 0.84$).

Sexual experiences were assessed by asking: 'Do you have any experience of sexual harassment, rape or incest before the age of 18' and a similar question focusing on the period after the age of 18. *Sex education* was assessed with two separate items: 'Did you have sex education at school' and 'Have you been raised with the image that women may enjoy sex?'.

Subjective general health was assessed in three ways. The abbreviated 'Inventory of Subjective Health' [VOEG (Sikkel, 1980)] assessed chronic physical complaints. The 13 items were summed to form one index score (0–13). Two items of the Dutch National Health Survey assessed women's perception of their health on a five-point scale from very bad to very good (1–5) and which chronic conditions they had other than UI (index 0–26) (Van den Berg, 1992).

Social desirability was assessed using the Social Desirability scale [(Visser and Breemhaar, 1989); 10 items]. Items such as 'If I make a mistake, I will always be prepared to admit it' were measured on a VAS scale (true–false, 0–10) and summed to form a scale ranging from 0 to 100 ($\alpha = 0.63$).

Sociodemographic variables were assessed with questions about age, education level, insurance status, having a partner, number of children, and hours per week spent on (paid) labor, housekeeping, care for relatives or other persons, physical and other leisure activities.

Process evaluation. Experiences with the implementation of the protocol checklist in PFME therapy in general, were assessed among all physiotherapists with a questionnaire.

Analyses

Data were analyzed using SPSS version 9.0 and procedures for data screening were applied (Tabachnick and Fidell, 2001). Descriptive statistics were used to describe sociodemographic and other distal variables. Two-tailed tests on Spearman correlation coefficients (continuous and ordinal variables) and χ^2-tests (dichotomous variables) were used to check the relation of determinants with adherence behavior.

Longitudinal sequential multiple linear regression analyses were applied to determine significant predictors of long-term adherence to PFME therapy, incorporating only those determinants that significantly correlated with adherence at least at one of the three measurements, but not with each other. To determine whether the health education programme was a significant predictor, it was entered in the first block as 'with or without self-help guide'. The second block contained external variables and the third block only those proximal variables that significantly correlated with adherence: positive outcome expectation, social norms and self-efficacy abilities; the fourth block contained the intention to adhere to PFME therapy; and the fifth block contained previous adherence behavior assessed at post-test.

Results

Participants and non-response

Four women declined to complete the pre-test questionnaire and never started PFME therapy. Three of them had medical problems (symphiolysis, rheumatic complaints, severe tooth pain), were unable to do PFME therapy and should have been excluded before by the GP. One woman claimed that she wanted to complete the questionnaire and start therapy, but never did, regardless of reminder calls.

Loss to follow-up numbers were not significantly different between study groups. Twenty-six women (20% of 129) withdrew either before

therapy started ($n = 10$), during the treatment period ($n = 4$) or during the follow-up measurements ($n = 12$). Reasons or combinations of reasons for withdrawal included personal illness ($n = 12$) and/or an ill relative ($n = 3$), stressful life or busy schedule ($n = 8$), transportation problems ($n = 2$), symptoms not improved ($n = 2$), and lack of interest ($n = 7$). One women died after the 3-month follow-up and one woman found out that she went to the toilet only 3 times a day through completing the pre-test diary. Knowing this, she started to toilet more often and by doing so eliminated the UI symptoms and no longer needed PFME therapy.

The 26 women lost to follow-up differed from the women who completed the study on two variables at pre-test. The questionnaire data showed that the women lost to follow-up had more frequent ($U = 978.5$, $P = 0.029$) and more severe ($U = 1036.5$, $P = 0.045$) wet episodes. All analyses were performed with the 103 women who completed the 12-month follow-up measurements. Of those 103 women, the post-test of 15 women and the 3-month follow-up of two women were not returned due to unknown reasons.

Sociodemographic characteristics and other distal variables at pre-test of the 129 participants are presented in Table I.

Data on proximal variables are presented in Table II. Intention to adhere to PFME therapy was high at the onset of therapy. Women had slightly positive outcome expectations, but also had some negative outcome expectations towards following the behavioral advice. Many women were convinced that significant others would want them to follow the advice of the physiotherapist, but they knew few role models. Incontinence problems and PFME therapy were discussed with on average two to three people, mostly spouse, daughters and female family members or friends. Women were neutral about their self-efficacy expectations of skills regarding adherence to PFME therapy (difficulties) and had slightly positive self-efficacy expectations about following the behavioral advice under various situations, such as during weekends or when busy (abilities).

Table I. *Characteristics of participants, sociodemographic and other distal variables*, n = *129*

Variables	No. of women	Percentage of population	Mean (SD)
Age			55.6 (10.9)
Having a partner	107	82.9	
Having children	118	91.5	
Number of children			2.1 (1.2)
Having a paid job	45	34.9	
Hours of paid labor per week			22.0 (11.3)
Hours of care[a] per week			27.2 (15.4)
Hours of activities[b] per week	84	65.1	5.6 (4.8)
Hours of sport per week	58	45.0	3.1 (2.4)
Education level (*n* = 127)			
low[c]	96	75.6	
medium[d]	16	12.4	
high[e]	15	11.8	
Had sex education at school	43	33.3	
Social health insurance	98	76.0	
Recruitment phase 1995	69	53.5	
Recruitment phase 1998	60	46.5	
Body mass index			26.9 (4.8)
VOEG			7.2 (3.2)
General health status			
good	46	35.7	
moderate	52	40.3	
poor	31	24.0	
Other chronic conditions (0–26)			2.5 (1.9)
Sexual violence in youth	22	17.1	
Sexual violence in adult life	16	12.4	
Diagnosis of physiotherapist (*n* = 99)			
stress	48	37.2	
urge	11	8.5	
mixed	40	31.0	
missing	30	23.3	
Duration of symptoms (*n* = 127)			7.2 (6.7)
<2 years	11	8.7	
2–7 years	72	56.7	
>7 years	44	34.6	
Weekly frequency of wet episodes, 7-day diary (*n* = 125)			24.5 (25.0)
IQOL (*n* = 128)			83.9 (15.8)
IIQ-7			2.2 (2.7)
Self-esteem (*n* = 126)			60.0 (10.8)
Body esteem (*n* = 126)			62.2 (12)

[a]Care activities involved hours per week spent on household and caring for (ill) important persons.
[b]Activities involved hours per week spent on taking courses, or doing club or voluntary work.
[c]Low education level: completed primary school and vocational school.
[d]Medium education level: completed secondary (vocational) school.
[e]High education level: completed the highest level of secondary (vocational) school or university.

Table II. *Construct (number of women completing the items), number of items, mean scale scores with SD, item range and mean item scores at pre-test of intention and proximal variables*

Construct (number of women)	No. of items	Mean scale score (SD) pre-test	Item range	Mean item score pre-test
Intention ($n = 124$)	2	12.8 (1.5)	1–7	6.4
Attitude				
pros ($n = 127$)	8	41.4 (5.3)	1–7	4.6
cons ($n = 128$)	5	11.0 (2.6)	1–5	2.8
Social Influence				
social norms ($n = 128$)	6	32.6 (5.0)	1–7	5.4
modeling ($n = 127$)	1	0.3 (0.5)	0–10	0.3
social support ($n = 125$)	2	5.1 (3.5)	0–17	2.6
Self-efficacy expectations				
abilities ($n = 126$)	9	40.7 (6.4)	1–7	4.5
difficulties ($n = 125$)	9	35.0 (9.0)	1–7	3.9

Table III. *Sequential longitudinal multiple linear regression analyses with adherence behavior at 12-month follow-up (*n = 75*) as dependent variable and the independent variables from pre-test that significantly predicted adherence behavior; standardized coefficient,* P *values and explained variance for the final equation*

Independent variables	$R^2 = 0.05$, $R^2_{adj} = 0.04$		$R^2 = 0.29$, $R^2_{adj} = 0.24$		$R^2 = 0.36$, $R^2_{adj} = 0.28$		$R^2 = 0.36$, $R^2_{adj} = 0.28$		$R^2 = 0.50$, $R^2_{adj} = 0.42$	
	β	*P*	β	*P*	β	*P*	β	*P*	β	*P*
Block 1 (condition)										
self-help guide	–0.221	0.057	–0.036	0.743	–0.042	0.689	–0.038	0.725	0.057	0.570
Block 2 (distal)										
weekly wet episodes			0.325	0.005	0.361	0.002	0.362	0.002	0.276	0.010
weekly hours of care			0.098	0.362	0.090	0.401	0.079	0.477	0.044	0.663
sex education at school			–0.357	0.001	–0.358	0.001	–0.367	0.001	–0.458	0.000
negative sexual experiences in adult life			–0.050	0.632	–0.121	0.250	–0.123	0.246	–0.179	0.065
Block 3 (proximal)										
attitude: pros					–0.073	0.519	–0.063	0.593	–0.032	0.759
social norms					0.096	0.386	0.098	0.378	–0.006	0.955
self-efficacy abilities					0.258	0.016	0.274	0.018	0.188	0.074
Block 4										
intention							–0.047	0.686	–0.095	0.368
Block 5										
adherence behavior at post-test									0.428	0.000

Predictors of adherence behavior

Longitudinal sequential regression analyses were conducted to identify which determinants assessed at pre-test, predicted adherence behavior 1 year after therapy (long-term), when taking into account the order of input as determined by the theory of the ASE model. First assumptions were checked. Adherence behavior was slightly negatively skewed without transformation, but positively with it; thus it was not transformed. With the use of a $P < 0.001$ criterion for Mahalanobis distance,

several multivariate outliers among the independent variables were identified. However, analyses with and without these outliers revealed the same results, thus these women were not excluded from the analyses. Five women were significant univariate outliers on the dependent variable of adherence behavior, having too large standardized residuals, and were left out of the regression analyses because they significantly altered results. Possible interaction terms of independent variables were checked and no significant interactions were found.

Results are presented in Table III. One year after therapy, the final step of the analyses showed a significant contribution of post-test adherence behavior to variability in long-term adherence over and above proximal variables and the self-help guide, and a significant contribution of the distal variables of weekly frequency of wet episodes and sex education at school, R^2 change = 0.133, $P < 0.001$. These results suggest that women who had frequent wet episodes at the onset of therapy and women who adhered well at post-test continued to adhere well 1 year after therapy, and that women who had no sex education at school also had high long-term adherence scores. Short-term adherence appeared to be an important predictor of long-term adherence behavior. This final model predicted 50% (adjusted 42%) of the variance in adherence behavior 1 year after therapy.

Adherence behavior was very high. One year after therapy, still 67% of the women followed the behavioral advice of the physiotherapist 4–7 days per week. Women followed the behavioral advice on average 6.2 days per week (SD 1.2) at post-test, 5.5 days per week (SD 2.0) at the 3-month follow-up and on average 4.8 days per week (SD 2.4) 1 year after therapy.

Discussion

This study is the first to assess predictors of long-term adherence to PFME therapy among women with UI. Total explained variance of long-term adherence behavior 1 year after PFME therapy was fairly high. The prediction of long-term adherence with pre-test data yielded an $R^2 = 0.50$ (adjusted $R^2 = 0.42$). The reason why we used adjusted R^2 was that the number of independent variables included in the regression analyses was relatively large compared to the number of observations and adjusted R^2 corrects for this situation. Clearly, other concepts not measured in this study play a role in the prediction of the variance in adherence behavior, warranting further research on this topic.

An important finding was that, in contrast to the theoretical assumption of the ASE model (De Vries *et al*., 1988), the longitudinal analysis revealed that intention at pre-test did not significantly predict long-term adherence behavior. An explanation might be that most women had a very positive intention to adhere to PFME therapy before the therapy had started, which is often the case with desirable behavior. As a consequence, intention data were positively skewed and standard deviations were very small. This situation statistically hinders a relation between adherence and intention. As expected, short-term adherence significantly predicted long-term adherence, and probably mediated the influence of intention. Ajzen (www-unix.oit.umass.edu/~aizen) states that

> ...although the TPB [Theory of Planned Behavior] from which the ASE model is derived, generally assumes reasoned process underlying attitudes and action, there is in contrast an unmediated link between prior and later behavior. This implies habituation in a process that bypasses intentions.

In two studies, past behavior was also found to be a strong predictor of subsequent behavior, besides proximal ASE variables and intention. One study analyzed screening behavior for breast cancer (Lechner *et al*., 1997), and the other study investigated correlates of paying attention to cancer symptoms and help-seeking behavior (De Nooijer, 2001). Recently, the important role of past behavior as an independent predictor for future health behaviors such as exercise has been discussed in

relation to the influence of social cognitive variables on behavior (Norman and Conner, 1995).

The analyses elucidated two significant predictors of long-term adherence to PFME therapy of the distal variables: UI symptoms and sex education at school. Women with more frequent weekly wet episodes before and 1 year after therapy were more likely to retain a higher adherence level 1 year after therapy than women with less frequent losses. These women experienced that PFME therapy helps when their adherence is good and strived for maintaining or even improving the results (Alewijnse *et al.*, 2003b). A similar pattern was found in the study by Burns *et al.* (Burns *et al.*, 1993), who argued that women with mild symptoms may not perceive their incontinence as a problem warranting sustained effort, while women with many daily losses recognize it as an ongoing problem and make a persistent effort as a positive response occurs. That not having had sex education at school was a significant predictor of long-term adherence may be explained by its relation with lower educational level, implying less years of education, if this means that physiotherapists' advice are more easily taken for granted and followed.

This study offered the advantage of presenting data related to theoretical constructs and results from longitudinal analyses, but it was also limited by several factors. A Hawthorne effect may have biased our findings (Cook and Campbell, 1979). All therapists in our study knew that they were in a study assessing predictors of adherence behavior. They may unintentionally have given more and structured attention to the regular patient education part of their therapies. Social desirability may also have played a role, but this was not assessed among physiotherapists. Among the women in this study, social desirability scores were high (80%), which might explain the reporting of high adherence levels. Moreover, an attempt was made to minimize social desirability by using a five-point scale in the diary question on adherence behavior. Another possibility is that the measurement of adherence itself could have functioned as a reminder for adherence behavior (Beurskens

et al., 1992; Windsor *et al.*, 1994; Myers and Midence, 1998), thereby significantly raising adherence levels. If so, then it may be expected that the reminder phone calls for sending back the measurements would also have raised adherence levels (Burns *et al.*, 1993; Nygaard *et al.*, 1996). However, this was checked, and no significant correlation was found between the number of calls per person and adherence behavior. Memory bias is not likely to have played a role in this study, because diaries are expected to prevent memory bias (Windsor *et al.*, 1994).

Implications for practice

The amount of variance in long-term adherence to PFME therapy we were able to explain in this study was high. It is remarkable that, based on theory and empirical data, many possible determinants of adherence had been identified in the previous needs assessment, while only a few appeared to be significant predictors of adherence behavior. Our results further suggest that a health education programme addressing the cognitive proximal and distal variables revealed as relevant in the needs assessment has no additional impact to optimal usual care.

Long-term adherence behavior of the women in this study was higher than found in other studies during a 1-year follow-up (Ferguson *et al.*, 1990; Lagro-Janssen *et al.*, 1992, 1998; Bø and Talseth, 1996; Chen *et al.*, 1999; Janssen *et al.*, 2001). An interesting finding was revealed in the process evaluation. According to the remarks of the physiotherapists, working with the standardized protocol checklist for PFME therapy had structured the content of their therapy sessions compared to their treatment behavior in the past. Together with the fact that physiotherapists had to fill in a treatment form for every woman to evaluate treatment goals, it may be expected that evaluation moments and concurrent feedback during therapy have been structured as well. Our results thus suggest that having a standardized protocol checklist for PFME therapy covering all treatment aspects and evaluation moments, which is intensively guided by enthusiastic physiotherapists,

seems most important for realizing optimal adherence behavior. In our study, every woman had such intensive oral guidance during PFME therapy. This might explain why the self-help guide was not a significant predictor.

In addition, to reveal whether a structured therapy protocol such as used in our study really optimizes usual care, a randomized controlled trial should be conducted to compare PFME therapy with protocol checklist to a control condition of PFME therapy without this protocol. However, now that good clinical practice guidelines for physiotherapeutic PFME therapy are available [see, e.g. (Berghmans *et al.*, 1998a; Messelink *et al.*, 2000)], further implementation in practice of these well worked out guidelines should be promoted. The strongest argument in favor of considering adding a protocol checklist, consisting of a list of all treatment aspects and evaluation moments of the guideline, in existing practice guidelines for physiotherapeutic PFME therapy is that applying such a protocol checklist requires little investment, is easy to use and provides good insight into the activities of the physiotherapist. Therapists in our study claimed that this summary of the guideline (the checklist used) made their therapy sessions more efficient because they could see at a glance what aspects of treatment patients had already received. The use of guidelines with protocol checklists can easily be trained in the follow-up courses on pelvic floor dysfunctions.

Acknowledgements

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