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LITERATURE REVIEW

Pelvic floor muscle training for the treatment of female stress urinary incontinence: is group exercise effective?

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Abstract
Pelvic floor muscle training (PFMT) can play a key role in the treatment of female stress urinary incontinence (SUI), and is recommended as a first-line conservative treatment. The aims of this paper are: to review the current literature comparing group and individual PFMT delivered to this client group; and to consider the implications for clinical practice in the context of the delivery of cost-effective and clinically beneficial services. Ten key articles were identified, and comparisons were made regarding: the type, intensity and duration of the PFM exercises; the frequency of group attendance; and the outcome measures used to assess change. Because of the heterogeneity of the studies included, direct comparisons were difficult; however, group exercise for PFM rehabilitation in the management of SUI appears to be as effective as or more beneficial than one-to-one treatment. The authors conclude by identifying the changes made to service delivery at Homerton University Hospital, London, UK, in the light of this review.

Keywords: group exercise, pelvic floor, physical therapy, stress urinary incontinence.

Introduction

Haylen *et al.* (2010, p. 7) defined stress urinary incontinence (SUI) as the ''complaint of involuntary loss of urine on effort or physical exertion (e.g. sporting activities), or on sneezing or coughing''. Laycock *et al.* (2001, p. 12) identified SUI as ''the most common form of urinary incontinence [UI] in women under 50 years of age''. The condition affects many women worldwide, and can have a significant impact on an individual's lifestyle and quality of life (QoL) (Herbison *et al.* 2009; Donahoe-Fillmore *et al.* 2011).

In healthy subjects, a voluntary pelvic floor muscle (PFM) contraction produces co-activation of the external urethral sphincter, which maintains continence when there is an increase in intra-abdominal pressure, such as during coughing (Laycock *et al.* 2001; Bø 2004). The symptoms of SUI may be caused by weakness of the PFM supporting the urethral sphincter, or conversely, fascial or ligamentous damage following trauma; for example, childbirth (Laycock *et al.* 2001; Hung *et al.* 2011). Strengthening of PFMs can increase both urethral closure pressure and resistance to downward movement, and therefore, this plays a key role in the management of SUI (Bø 2004; Hung *et al.* 2011). Regular supervised PFM training (PFMT) has also been shown to be effective in the management of SUI (Dumoulin *et al.* 2004), as well as a cost-effective treatment for UI within the National Health Service (NHS) (Imamura *et al.* 2010).

Laycock *et al.* (2001) and Fellicissimo *et al.* (2010) reported that PFM hypertrophy, improved muscular recruitment and cortical awareness can all be gained from PFM strengthening and re-education. As a result of this, it has been suggested that PFMT can have a significant effect on this closure mechanism, and therefore, it is recommended as a first-line conservative

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treatment for women (Laycock *et al.* 2001; Dumoulin & Hay-Smith *et al.* 2010; NICE 2013).

Twenty-one trials were included in a review by Hay-Smith *et al.* (2011) that compared various approaches to PFMT for UI. The study investigated many different aspects of PFMT, including comparisons of group and individual treatment, and also regularity of attendance, healthcare professional contact and types of training. Hay-Smith *et al.* (2011) provided a good background for further study, and highlighted that further research is recommended.

The exploration of the current evidence in relation to optimal PFM strengthening and methods of doing this was considered appropriate in the context of: the ever-increasing requirements for evidence of the effectiveness of clinical interventions; the associated cost of NHS clinical interventions; and a local review of an existing exercise class targeting pelvic floor rehabilitation. The aims of the present paper are to review the current literature comparing group and individual PFMT in the management of SUI in women; and to consider the implications for clinical practice.

Materials and methods

A literature search was undertaken using key databases, i.e.: the Allied and Complementary Medicine Database (AMED); the Cumulative Index to Nursing and Allied Health Literature (CINAHL); Medical Literature Analysis and Retrieval System Online (MEDLINE); and the Cochrane Library. A 15-year inclusion period was applied (1998–2013), and the search was limited to literature published in the English language.

The search terms used were:

- ''physical therapy OR physical therapy services OR physical therapy practice OR physiotherapy'';
- ''pelvic floor OR Kegel exercises'';
- ''stress incontinence OR urinary incontinence'';
- ''group OR group exercise OR group support''; and
- ''group pelvic floor OR group training OR group sessions''.

Ten key articles were identified for critical review, including: three randomized comparative studies (Janssen *et al.* 2001; Oliveira Camargo *et al.* 2009; Felicíssimo *et al.* 2010); five randomized controlled trials (RCTs) (Bø *et al.* 1999; Demain *et al.* 2001; Zanetti *et al.* 2007; Lamb *et al.* 2009; Pereira *et al.* 2011); one interview study (Griffiths *et al.* 2009); and one randomized pilot study (Konstantinidou *et al.* 2007). All articles were accessed either from electronic journals or through inter-library loans, and are summarized in Table 1.

Results

Diagnosis and outcome measures

Direct comparison of the research was difficult because both the clinical diagnosis of SUI and the choice of outcome measures varied across the trials.

The majority of the studies selected patients by confirmation of SUI on urodynamic assessment in the absence of detrusor overactivity (Bø *et al.* 1999; Konstantinidou *et al.* 2007; Zanetti *et al.* 2007; Oliveira Camargo *et al.* 2009; Felicíssimo *et al.* 2010); others used patient self-report (Demain *et al.* 2001; Lamb *et al.* 2009; Pereira *et al.* 2011) or general practitioner diagnosis based on reports of symptoms (Janssen *et al.* 2001). In addition, Bø *et al.* (1999) also used a standard pad test to diagnose SUI, with a positive result being urine loss of >4 g following provocative activities, such as jumping, star jumps or coughing. Konstantinidou *et al.* (2007) included those with positive pad and stress tests, but the ways of identifying positive results and the methodologies of these tests were not documented.

Subjects in all studies were assessed vaginally at baseline to ensure that the correct PFM contraction technique was being employed. Konstantinidou *et al.* (2007), Oliveira Camargo *et al.* (2009) and Felicíssimo *et al.* (2010) used digital palpation to review PFM strength changes as an outcome measure at baseline and completion. Konstantinidou *et al.* (2007) also reassessed each individual every 4 weeks as required to review technique and progress in PFM exercise (PFME) intensity within group treatment and individual interventions. Bø *et al.* (1999) used digital vaginal palpation to assess PFM function and pressure biofeedback, or a vaginal balloon catheter to measure PFM pressure. The study by Pereira *et al.* (2011) was the only one to use the PERFECT scheme for both treatment arms. This system was originally designed by Laycock & Jerwood (2001) as a more specific way to grade PFM activation and make comparisons: (P) power (or pressure, a

Table 1. Summary of the papers included in the literature review: (RCT) randomized controlled trial; (PFM) pelvic floor muscle; (PFMT) PFM training; (PFME) pelvic floor muscle exercise; (IIQ) Incontinence Impact Questionnaire; (VAS) visual analogue scale; (OGS) Oxford Grading Scale; (ICIQ-SF) International Consultation on Incontinence Questionnaire – Short Form; (SUI) stress urinary incontinence; (UI) urinary incontinence; (N/A) not applicable; (PGI-I) Patient Global Impression of Improvement; (QoL) quality of life; (I-QoL) Incontinence Quality of Life Questionnaire; (NHS) National Health Service; (SSI) Symptom Severity Index; and (KHQ) King's Health Questionnaire

Reference	Study design	Sample	Methodology	Outcome measures	Results	Conclusion
Bø *et al.* (1999)	Single-blind RCT	Norway ($n=107$)	Random allocation to one of four study groups: (1) group exercise (2) electrical stimulation (3) vaginal cones (4) control (no treatment)	Standardized pad test Subjective assessment Three-day voiding diary Twenty-four-hour pad test Leakage index Social activity index	The PFM group showed an increase in PFM strength compared to the controls ($P<0.01$) A significant improvement in subjective cure in the PFM group compared to the others ($P<0.001$)	Group exercise is most beneficial at 6-month follow-up
Demain *et al.* (2001)	Pragmatic RCT and blinded assessment	UK ($n=44$)	Random allocation to two treatment arms (group and individual) Educational and practical component provided in both arms	Standardized pad test Bladder chart IIQ SSI VAS	A large effect in both treatment arms (group more so than individual, although not significant; $P<0.05$)	No significant difference between group and individual treatments at 14-week follow-up Larger trials required
Felicíssimo *et al.* (2010)	Randomized comparative trial	Brazil ($n=59$)	Randomized comparative trial ($P>0.05$)	Twenty-four-hour pad test ICIQ-SF OGS Subjective SUI	Pad test ($P=0.78$) ICIQ-SF ($P=0.57$) OGS score: 2–3/5 in both groups Subjective SUI ($P=0.145$)	Supervised PFMT is as effective as unsupervised PFMT at 8-week follow-up
Griffiths *et al.* (2009)	Interview study within RCT by Lamb *et al.* (2009)	UK ($n=22$)	Semi-structured one-to-one interviews at client's home 4 months after the group treatment was completed Patients who had initially requested one-to-one treatment were included	N/A	Thematic analysis: embarrassment was commonly noted, but there were overall benefits from attendance	Need to consider the embarrassment factor associated with group sessions, and give clear guidance about expectations prior to attendance
Janssen *et al.* (2001)	Randomized trial (no control)	The Netherlands ($n=414$)	Random allocation to one-to-one treatment or group intervention	Bladder diaries Patient satisfaction Compliance	$P<0.05$ Significant improvements in both groups ($P<0.001$) Satisfaction remained at 9/12 after treatment	Group and one-to-one treatment for UI is equally effective; 60% of participants had SUI Included intention-to-treat analysis Follow-up at 3 and 9 months

Continued/

Table 1. (*Continued*)

Reference	Study design	Sample	Methodology	Outcome measures	Results	Conclusion
Konstantinidou *et al.* (2007)	Randomized pilot study	Greece ($n=22$)	Supervised group or unsupervised allocation ($P<0.05$)	PGI-I Number of episodes of UI OGS Pad test (>4 g in 24 h) QoL index	PGI-I: $P=0.000$) Significant improvement in OGS score for group exercise ($P=0.001$)	Significant improvement in the supervised PFMT group at 12 weeks Small sample size
Lamb *et al.* (2009)	Multicentred RCT	UK ($n=158$)	Allocation to a two-armed intervention, although 28 participants were selected to receive one-to-one rather than group treatment because of the timing of class	SSI I-QoL NHS costs Patient satisfaction	SSI: $P<0.05$ Benefits in terms of I-QoL and SSI scores not statistically significant in either groups; however, group treatment more cost-effective	Benefits to QoL in both group and individual treatments at 6 weeks and 5 months Group treatment can aid with cost-effective service provision
Oliveira Camargo *et al.* (2009)	Randomized comparative study	Brazil ($n=60$; age 30–75 years)	Randomized comparative trial ($P>0.01$)	Twenty-four-hour pad test Voiding diaries OGS KHQ Subjective satisfaction	Both groups significantly improved in terms of all outcome measures No significant difference between the groups	At 3-month follow-up, group and individual PFMT are as effective as each other
Pereira *et al.* (2011)	RCT	Greece ($n=49$)	Random allocation to group sessions, individual PFMT or a control group	One-hour pad test (provocative movements) KHQ PFM strength (manometry and digital examination) Patient satisfaction	Significant improvement in PFM strength in the control and individual PFMT groups ($P=0.0001$ and $P<0.0001$, respectively) No effect between treatment groups Improvements in all areas of the KHQ in both the control and individual PFMT groups	At 6-week follow-up, Group and individual PFMEs are equally effective in the management of SUI
Zanetti *et al.* (2007)	Prospective RCT	Brazil ($n=44$)	Supervised PFMT versus unsupervised PFMT for SUI (two sessions per week) Sessions compared to home exercise with a monthly one-to-one review	Bladder diary One-hour pad test I-QoL Patient satisfaction (self-reported measure)	Significance level of $P<0.05$ Supervised PFMT $P<0.001$ for pad test, I-QoL and micturitions per day	At 12-week follow-up, supervised PFMT more effective than unsupervised PFMT Some methodological information lacking Small sample size

measure of strength using a manometric perineometer); (E) endurance; (R) repetitions; (F) fast contractions; and finally, (ECT) every contraction timed. The variations in PFM strength assessment between the trials affect comparison of the studies. The PERFECT tool was later refined by Laycock (2008). It is not clear why Pereira *et al.* (2011) used the original version of PERFECT (Laycock & Jerwood 2001); however, it should be noted that the newer version (Laycock 2008) has not been tested for reliability and validity.

The pad test was one of the most widely used primary outcome measures for assessing changes in SUI before and after treatment in both individual and group allocations. Felicíssimo *et al.* (2010) used a 24-h pad test, for which a negative result was <2 g in weight. Oliveira Camargo *et al.* (2009) and Pereira *et al.* (2011) used a 1-h pad test, and asked participants to undertake provocative activities such as jumping, step-ups and forward bending; urine loss of <2 g was considered insignificant, and therefore, a negative result. Bø *et al.* (1999) used a standardized stress pad test with 200 mL of saline inserted into the bladder with a catheter, and then 30 s of running on the spot followed by 30 s of ''jumping jacks'' (i.e. star jumps); this was in addition to a 24-h pad test. Demain *et al.* (2001) also used a standardized pad test and considered urine loss of <2 g insignificant loss; activity included 30 min of walking, climbing a flight of stairs, 1 min of running on the spot, moving from sitting to standing and vigorous coughing. There are obvious differences between studies in the ways in which the pad test was used and urine loss was measured, the provocation of symptoms, and the definitions of a positive result. This raises questions about the standardization of the test and its reliability as an outcome measure (Dumoulin & Hay-Smith 2010).

Janssen *et al.* (2001) and Lamb *et al.* (2009) were the only authors to use primary subjective outcome measures. Janssen *et al.* (2001) recorded symptom frequency, severity and nocturia in diary format, and Lamb *et al.* (2009) employed Symptom Severity Index (SSI) and QoL measures to identify improvements after treatment. This way of analysing change is commonly used clinically, and can highlight perceived changes relevant to the individual, such as the impact on QoL, rather than objective improvement, which may be less important to the patient (Herbison *et al.* 2009).

Interventions

Clinical interventions varied between studies, and included the type of treatment, the frequency of clinician contact, and the intensity, duration and progression of PFMEs. The frequency of group attendance ranged from 2 h attendance once a week (Janssen *et al.* 2001) to bi-weekly 50-min sessions (Felicíssimo *et al.* 2010) to 45 min once a week (Bø *et al.* 1999). The length of training programmes also varied from 6 weeks (Pereira *et al.* 2011) to 12 weeks (Konstantinidou *et al.* 2007; Zanetti *et al.* 2007; Oliveira Camargo *et al.* 2009) to 6 months (Bø *et al.* 1999). The PFME programme was not documented in all studies. Where recorded, the number of PFM repetitions varied across the studies with regard to both group and individual treatments (see Table 2). Only two studies included a control group in which the participants were asked to do no active PFMEs (Bø *et al.* 1999; Pereira *et al.* 2011). Five studies included an additional intervention group involving individual treatment, but not an inactive control (Demain *et al.* 2001; Janssen *et al.* 2001; Konstantinidou *et al.* 2007; Zanetti *et al.* 2007; Lamb *et al.* 2009). Therefore, when comparing results, this inactive control arm made conclusions drawn about the intervention groups more reflective of the clinical effects of these treatments.

Oliveira Camargo *et al.* (2009) compared standardized group PFMT to individual exercise prescription according to the PERFECT score following assessment. As recorded by digital palpation, PFM strength significantly improved in the individual treatment allocation (PFMT according to PERFECT) by an average of 2.2 to 4.3, as compared to group training, which rose from 2.6 to 3.6 ($P<0.0003$). Interestingly, this did not correlate with patient satisfaction or QoL because both treatment arms improved. The results showed no significant differences between groups at follow-up in any other outcomes measures, including the 1-h pad test, a voiding diary (recording leakage episodes over a 7-day period) and the King's Health Questionnaire. These findings highlight the significance of patient satisfaction, and indicate that factors other than PFM strength, such as education, group attendance, support and motivation, may influence improvements in SUI (Janssen *et al.* 2001).

Power values were used to identify the sample sizes required to show statistical significance in the majority of studies (Konstantinidou *et al.*

Table 2. Frequency and duration of the classes, and pelvic floor muscle exercise (PFME) prescription

Study	Frequency of group attendance	Duration of class	Pelvic floor muscle exercise prescription
Bø *et al.* (1999)	Weekly over 6 months	45 min	Slow: 6–8 s (6-s rest) Fast: three to four repetitions Eight to 12 contractions in each position, and abdominal, gluteal and back strengthening exercises
Demain *et al.* (2001)	Three educational and PFME sessions	1 h	Slow: five (10 times a day to fatigue) Fast: five
Felicíssimo *et al.* (2010)	Biweekly for 8 weeks	50 min	Week 1: 90 contractions Next 7 weeks: 180 contractions Timing: 6-s hold and 12-s recovery Various positions
Janssen *et al.* (2001)	Nine sessions	2 h	Not documented: ''standard detailed protocol'' (p. 202) Specific programme/prescription
Konstantinidou *et al.* (2007)	Once a week	Not documented	Individual training programme as per vaginal assessment of strength in individual treatment group Fast: three sets of contractions Slow: three to four sets of contractions
Lamb *et al.* (2009)	Three weekly educational and PFME classes	1 h	Not documented, just ''slow'' and ''fast''
Oliveira Camargo *et al.* (2009)	Biweekly for 12 weeks	45 min	Ten times 5 s (5-s recovery) Twenty times 1 s (1-s recovery) Three times 10 s (5-s recovery) Ten times ''The Knack'' (1 min between sets)
Pereira *et al.* (2011)	Biweekly over 6 weeks	1 h	Fast: 3 s (6-s rest) Slow: 5–10 s (10–20-s rest) Increased by 1 s per week up to 10 s
Zanetti *et al.* (2007)	Biweekly for 12 weeks	45 min	Ten times 5 s (5-s rest) Twenty times 2 s (2-s rest) Twenty times 1 s (10-s rest) Ten times ''The Knack'' (1 min between sets)

2007; Lamb *et al.* 2009; Oliveira Camargo *et al.* 2009; Felicíssimo *et al.* 2010). However, these were not always documented, and therefore, optimal sample size could not be determined to identify the significance of the results on the completion of some studies (Demain *et al.* 2001; Janssen *et al.* 2001; Zanetti *et al.* 2007; Pereira *et al.* 2011). Statistical significance was set at 5% in all studies except for that of Griffiths *et al.* (2009), since this was an interview-based study.

Findings

Primary and secondary outcome measures in both group and individual treatments improved following intervention in all studies. Konstantinidou *et al.* (2007) identified a significant improvement in several outcomes when comparing group intervention with individual treatment. These included patient satisfaction ($P=0.000$), PFM endurance and repetition ($P=0.006$ and $P=0.004$), and frequency of UI ($P=0.002$). However, the sample size of this pilot study was small ($n=22$), and a minimal sample size in order for it to be of adequate power had been identified before the start of the trial ($n=30$). Therefore, this diminishes the impact of the study and the reliability of the results. Zanetti *et al.* (2007) also reported a significant improvement in outcome measure scores in the PFME group, although the same clinicians undertook outcome measure assessment and treatment, which could have influenced blinding and has the potential for bias. Bø *et al.* (1999) identified significant improvements ($P=0.03$) in PFM strength within the group treatment arm when compared with the other treatment arms, and in pad test ($P=0.02$), 3-day leakage and social activity index ($P<0.01$) results when com-

pared to the control group. It should be noted that the alternative treatment arm in this trial comprised electrical stimulation or use of vaginal cones, rather than an individual or home PFME arm.

Janssen *et al.* (2001) included the largest sample size ($n=530$) and completion number ($n=414$), and intention-to-treat analysis was used. The results again showed improvements in both treatment arms that were significant in terms of patient satisfaction, frequency of urine loss and nocturia at 9-month follow-up, but there was no significant difference between the treatment arms. Demain *et al.* (2001), Oliveira Camargo *et al.* (2009), Felicíssimo *et al.* (2010) and Pereira *et al.* (2011) also reported improvements in both individual and group treatments for all outcome measures, but no significant differences between the treatment arms were found. However, the sample sizes were small, varying between 39 and 80 participants, and one could argue that, if larger sample sizes had been used, it would have enhanced the power of this study.

Griffiths *et al.* (2009) undertook a qualitative study exploring the experiences of women attending three group sessions related to their UI symptoms; the participants were recruited from a larger RCT (Lamb *et al.* 2009). The findings demonstrated that patients were anxious prior to the commencement of the class because of they did not know what to expect, and embarrassment was also a major concern because of the sensitive nature of their problems. Feedback was generally positive, and some women felt relief when they realized that their problem was not uncommon, that they could share their experiences and that they received good information. However, the results were only drawn from those who attended the group sessions, and it could be concluded that they were likely to be more positive in comparison to those who chose not to go. It should also be noted that the group programme was primarily educational in nature and an opportunity for the sharing of information, although PFMEs were taught and encouraged in different starting positions over the course of 2 weeks.

Discussion

It is difficult to conclude whether the improvements reported were a result of the known benefits of group attendance, including peer motivation, sharing experiences and reassurance (Demain *et al.* 2001; Janssen *et al.* 2001; Haslam 2008), or whether more frequent contact with a healthcare professional and regular supervised training helped individuals (Hay-Smith *et al.* 2011).

Lamb *et al.* (2009) looked into the impact of group and individual PFM treatments on symptom reporting and QoL, as well as the cost implications for health service providers. This multicentred British RCT used subjective outcome measures to identify change over a 5-month follow-up period. The intervention consisted of three group sessions with educational and PFM strengthening components, and an individual treatment allocation in which patients received the same advice and teaching, but on a one-to-one basis. According to the Incontinence Quality of Life Questionnaire and SSI scores, which are primary outcome measures for the impact on QoL, improvements were noted in both groups, although these were not statistically significant from baseline to the 5-month follow-up. The sample size was estimated *a priori* ($n=140$), and the actual completion number was 158, which gave sufficient power to the study. The above authors concluded that there were no differences in group or individual outcomes at follow-up.

When considering the financial implications for the NHS, the average costs were £7.73 per group attendance and £53.37 per individual treatment appointment (Lamb *et al.* 2009). Therefore, the cost implications for weekly physiotherapy interventions are significantly less with regular group attendance on a weekly basis than one-to-one appointments. While the figures relate to the NHS departments in which the study was undertaken, these could be generalized, with caution, to wider NHS provision. This information is useful when considering treatment provision, particularly if outcomes and patient satisfaction are as clinically effective in both modes of treatment delivery (Lamb *et al.* 2009).

As previously discussed, the type, intensity and duration of PFMEs was not standardized within the studies reviewed. The National Institute for Health and Care Excellence (NICE) recommendation is that a PFMT programme should compromise at least eight contractions performed three times per day (NICE 2013). Previous work by Laycock *et al.* (2001) suggested that there is a need to ensure that contractions are of maximal effort to enhance strength, and that slow and fast contractions are under-

taken in a variety of positions. Working on this basis, group exercise programmes could involve PFMEs in supine, sitting and weight-bearing positions, as well as the introduction of functional activities tailored specifically to individual requirements (Bø 1999; Konstantinidou *et al.* 2007; Pereira *et al.* 2011). Optimal supervised training should be undertaken for a minimum of 3 months in order to develop muscle hypertrophy (Laycock *et al.* 2001; Dumoulin & Hay-Smith 2010; NICE 2013).

Poor motivation is a known factor for non-adherence to regular PFMEs (Freeman 2004). For some women, group treatment can be way of overcoming such issues and result in the effective management of SUI. However, the exact reasons for successful resolution and the long-term benefits are currently unknown (Hay-Smith *et al.* 2011).

Implications for practice

Prior to the present review, a weekly class was being delivered at Homerton University Hospital, London, UK. This course comprised of PFMEs in addition to mat-based, Pilates-style exercises. The class ran for 1 h per week over an 8-week rolling programme. Women were referred to the class by their continence specialists, who would be either a nurse or a physiotherapist. The group was used as an additional resource to maximize an individual's pelvic floor strength and symptom management. Patients did not always receive written information about the format of the class and what they should expect. It is thought that this was likely to have impacted negatively on attendance rates and reduced programme completion. The class had no consistent structure, although the PFMEs were generally undertaken in crook-lying or standing; the pelvic floor programme varied in terms of the number and duration of exercises. The format had been guided previously by the clinical experience of the lead physiotherapist, and had evolved over time. Additionally, no specific outcome measures were used to assess subjective and objective changes following group attendance.

Following the present review, changes to local practice were implemented. Patients now receive an information leaflet explaining: the specific format of the class, including the gymnasium environment; its location; contact details; and types of exercises, including specific pelvic floor and functionally based exercises. This has enhanced patient expectations prior to attendance, and improved follow-up attendance, including the proportion of women completing the programme. This is consistent with the findings of Alewijnse *et al.* (2001). Because of wide variations in the recommended amount of specific PFMEs within the studies discussed (see Table 2), patients are encouraged to perform muscular contractions for up to 10 s with eight repetitions, in addition to eight fast contractions; this is also in line with the NICE (2013) guidelines. Pelvic floor muscle exercises are now taught and practised in various functional positions, such as standing and kneeling, in order to rehabilitate the pelvic floor, as recommended by Bø *et al.* (1999) and Felicíssimo *et al.* (2010). Additional functional activation of PFM contraction has also been implemented, including sitting to standing, squatting and walking. It is recommended that the correct PFM technique is confirmed prior to group commencement, and this should be assessed and corrected by their referrer to maximize attendance at the exercise class. This is consistent with the approach taken by the studies included within the present review.

The importance of maintaining patient dignity and preventing individual feelings of embarrassment is paramount. The regular recording of patient satisfaction is now undertaken at programme completion, and regular reviews in response to feedback will help the service to evolve in the future. Furthermore, QoL and condition-specific outcome measures (Janssen *et al.* 2001; Griffiths *et al.* 2009) have now been implemented, which has enabled individual patient outcomes to be monitored and compared with the treatment provided to others on an individual basis. This is important in terms of the audit and adaptation of service provision to meet the needs of patients most successfully, and if required, as evidence for clinical efficiency.

Conclusions

Because of variations in study methodology, including the use of different outcome measures, training programmes and a lack of control in some trials, direct comparisons cannot be made regarding the optimal training programmes and types of group provision. However, the overall results show a trend in favour of group training for PFM strengthening, in that it is as or more effective than individual training. It has not been possible to determine whether that is because of regular supervision by healthcare professionals, the general benefits of group attendance or some other reason.

The results of the present review demonstrate that group exercise can be effective in rehabilitating pelvic floor strength for the management of SUI and that it has been successfully implemented clinically. The future consideration of an educational component may also be useful in enhancing patient understanding and long-term adherence to PFMEs, and the continued use of subjective and objective outcome measure to assess effectiveness is also recommended.

Future research is required in order to assess the most cost-effective and clinically beneficial form of delivery of group exercise for PFM strengthening in the management of the symptoms of SUI. Large-scale RCTs over longer time periods are required; for example, a 5–10-year follow-up with control groups. The standardization of treatment interventions and outcome measures is essential, and subjective primary outcome measures, such as QoL and condition-specific measures to detect impacts on lifestyle, should also be used (Herbison *et al.* 2009; Hay-Smith *et al.* 2011).

References

Alewijnse D., Mester I., Metsemakers J., Adriaans J. & van den Borne B. (2001) Predictors of intention to adhere to physiotherapy among women with urinary incontinence. *Health Education Research* **16** (2), 173–186.

Bø K. (2004) Pelvic floor muscle training is effective in treatment of female stress urinary incontinence, but how does it work? *International Urogynecology Journal and Pelvic Floor Dysfunction* **15** (2), 76–84.

Bø K., Talseth T. & Holme I. (1999) Single blind, randomised controlled trial of pelvic floor exercises, electrical stimulation, vaginal cones, and no treatment in management of genuine stress incontinence in women. *BMJ* **318** (7182), 487–493.

Demain S., Fereday Smith J., Hillier L. & Dziedzic K. (2001) Comparison of group and individual physiotherapy for female urinary incontinence in primary care. *Physiotherapy* **87** (5), 235–242.

Donahoe-Fillmore B., Chorny W., Brahler J., *et al.* (2011) A comparison of two pelvic floor muscle training programs in females with stress urinary incontinence: a pilot study. *The Journal of Applied Research* **11** (2), 73–83.

Dumoulin C., Lemieux M.-C., Bourbonnais D., *et al.* (2004) Physiotherapy for persistent postnatal stress urinary incontinence: a randomized controlled trial. *Obstetrics and Gynecology* **104** (3), 504–510.

Dumoulin C. & Hay-Smith J. (2010) Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. *Cochrane Database of Systematic Reviews*, Issue 1. Art. No.: CD005654. DOI: 10.1002/14651858.CD005654.pub2.

Felicíssimo M. F., Carneiro M. M., Saleme C. S., *et al.* (2010) Intensive supervised versus unsupervised pelvic floor muscle training for the treatment of stress urinary incontinence: a randomised comparative trial. *International Urogynecology Journal* **21** (7), 835–840.

Freeman R. M. (2004) The role of pelvic floor muscle training in urinary incontinence. *BJOG: An International Journal of Obstetrics and Gynaecology* **111** (Suppl. 1), 37–40.

Griffiths F., Pepper J., Jørstad-Stein E. C., *et al.* (2009) Group versus individual sessions delivered by a physiotherapist for female urinary incontinence: an interview study with women attending group sessions nested within a randomised controlled trial. *BMC Women's Health* **9:** 25. DOI: 10.1186/1472-6874-9-25.

Haslam J. (2008) Pelvic floor muscle exercise in the treatment of urinary incontinence. In: *Therapeutic Management of Incontinence and Pelvic Pain: Pelvic Organ Disorders*, 2nd edn (eds J. Haslam & J. Laycock), pp. 89–94. Springer-Verlag, Berlin.

Haylen B. T., de Ridder D., Freeman R. M., *et al.* (2010) An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *International Urogynecology Journal* **21** (1), 5–26.

Hay-Smith E. J. C., Herderschee R., Dumoulin C. & Herbison G. P. (2011) Comparisons of approaches to pelvic floor muscle training for urinary incontinence in women. *Cochrane Database of Systematic Reviews*, Issue 12. Art. No.: CD009508. DOI: 10.1002/14651858.CD009508.

Herbison P., Hay-Smith J., Paterson H., Ellis G. & Wilson D. (2009) Research priorities in urinary incontinence: results from citizens' juries. *BJOG: An International Journal of Obstetrics and Gynaecology* **116** (5), 713–718.

Hung H.-C., Hsiao S.-M., Chih S.-Y., Lin H.-H. & Tsauo J.-Y. (2011) Effect of pelvic-floor muscle strengthening on bladder neck mobility: a clinical trial. *Physical Therapy* **91** (7), 1030–1038.

Imamura M., Abrams P., Bain C., *et al.* (2010) Systematic review and economic modelling of the effectiveness and cost-effectiveness of non-surgical treatments for women with stress urinary incontinence. *Health Technology Assessment* **14** (40), 1–188, iii–iv.

Janssen C. C. M., Lagro-Janssen A. L. M. & Felling A. J. A. (2001) The effects of physiotherapy for female urinary incontinence: individual compared with group treatment. *BJU International* **87** (3), 201–206.

Konstantinidou E., Apostolidis A., Kondelidis N., *et al.* (2007) Short-term efficacy of group pelvic floor training under intensive supervision versus unsupervised home training for female stress urinary incontinence: a randomized pilot study. *Neurourology and Urodynamics* **26** (4), 486–491.

Lamb S. E., Pepper J., Lall R., *et al.* (2009) Group treatments for sensitive health care problems: a randomised controlled trial of group versus individual physiotherapy sessions for female urinary incontinence. *BMC Women's Health* **9:** 26. DOI: 10.1186/1472-6874-9-26.

Laycock J. (2008) Vaginal examination. In: *Therapeutic Management of Incontinence and Pelvic Pain: Pelvic Organ Disorders*, 2nd edn (eds J. Haslam & J. Laycock), pp. 61–63. Springer-Verlag, Berlin.

Laycock J., Standley A., Crothers E., *et al.* (2001) *Clinical Guidelines for the Physiotherapy Management of Females Aged 16–65 with Stress Urinary Incontinence.* Chartered Society of Physiotherapy, London.

Laycock J. & Jerwood D. (2001) Pelvic floor muscle assessment: the PERFECT scheme. *Physiotherapy* **87** (12), 631–642.

National Institute for Health and Care Excellence (NICE) (2013) *Urinary Incontinence: The Management of Urinary Incontinence in Women.* NICE Clinical Guideline 171. National Institute for Health and Care Excellence, London.

Oliveira Camargo F. de, Rodrigues A. M., Arruda R. M., *et al.* (2009) Pelvic floor muscle training in female stress urinary incontinence: comparison between group training and individual treatment using PERFECT assessment scheme. *International Urogynecology Journal and Pelvic Floor Dysfunction* **20** (12), 1455–1462.

Pereira V. S., Correia G. N. & Driusso P. (2011) Individual and group pelvic floor muscle training versus no treatment in female stress urinary incontinence: a randomised controlled pilot study. *European Journal of Obstetrics and Gynecology, and Reproductive Biology* **159** (2), 465–471.

Zanetti M. R. D., Aqino Castro R. de, Rotta A. L., *et al.* (2007) Impact of supervised physiotherapeutic pelvic floor exercises for treating female stress urinary incontinence. *São Paulo Medical Journal* **125** (5), 265–269.

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