Pelvic Floor Issues: Incidence, Quality of Life, and Exercise
Pelvic pain, pelvic organ prolapse, urinary and colorectal distress incidence and relationship to quality of life and birth mode

Abstract

**Purpose:** To determine the incidence and impact of pelvic pain, pelvic organ prolapse, urinary and colorectal distress and quality of life by birth mode for women in the chronic postpartum period.

**Study design:** Cross-sectional correlational design utilizing purposive sampling of (n=21) female postpartum subjects ages 18-45.

**Background:** Caesarean Section (CS) incidence is reported at 32% nationwide, well above the recommended safe rate of 10% (WHO). Literature is not clear regarding role of birth mode in postpartum symptoms including: pelvic pain, colorectal distress, pelvic organ prolapse, and quality of life.

**Methods:** Data collection took place after IRB approval from Andrews University. Each subject who agreed to volunteer for the study and met the inclusion criteria completed (1) Health History Questionnaire, (2) SF-36, and (3) Pelvic Floor Distress Inventory.

**Result:** Incidence reports of UI were 80% in CS and 50% in the NVD group. The CS reported significantly higher mean scores for PFIQb, UDI, POPDI and CRADI. Age was negatively correlated with CRADI and pain (Chi-square=7.02, p=0.030). NVD reported a significantly higher quality of life (as measured by the SF-36) in general and mental health compared to published norms and CS (p<0.05). BMI showed a significant moderate correlation (r=0.682, p<0.001) with pelvic organ prolapse.

**Conclusion:** Our study found significant increased incidence and impact of UI, CRADI, POPDI and PFIQb symptoms and a decrease in QOL in CS compared to NVD. Age showed significant correlation with colorectal symptoms and BMI showed significant relationship to pelvic organ prolapse.

**Keywords:** Pelvic pain, postpartum, pelvic floor, incontinence, colorectal pain, birth mode, caesarean section, vaginal delivery, SF-36, PFDI

Introduction

In the past two decades, within the United States, there has been a substantial rise in the number of Caesarean sections (CS). Caesarean sections comprised 32% of all deliveries ranking the USA third in the world for the most CS only behind Italy and Portugal [1,2]. Previously this procedure was implemented to reduce adverse risks for the fetus, with the added risk of complications for the mother minimally considered [3]. However rising cesarean rates can be attributed to the maternal concern and prevention of pelvic floor damage as well as urinary incontinence (UI), which have been highlighted in medical practice and touted as common symptoms of post-vaginal delivery [1,4-7]. However, some of the literature reports natural vaginal delivery (NVD) as the best alternative to heal the female body [8]. According to the World Health Organization the countries with the lowest cesarean rates also experience the lowest perinatal and maternal mortality, with the recommended "safe" cesarean rates reported at 10% [9].

Despite advances in medical treatment, it remains uncertain whether birth mode has a clinically significant effect on postpartum symptoms [4] such as pelvic pain, pelvic organ prolapse, urinary and colorectal–anal distress, and quality of
life. Almeida et al., (2002) in a study of 199 women found that 67.2% of women experiencing chronic pelvic pain had a history of CS [10]. Fabris et al., (2011) concluded that chronic pelvic pain was more relevant after a CS compared to NVD, although pelvic pain is common with both [11]. And Beiring et al., (2011) reported that pelvic pain occurred most frequently in the second half of the gestational period and spontaneously disappeared in the postpartum period [12]. Pregnancy-related pelvic pain is not a readily understood concept, however it is suggested that strenuous work, smoking, prenatal low back pain and previous pregnancy-related pelvic pain are risk factors for pelvic pain in the postpartum period [13].

It is essential to assess the health related quality of life for women in the postpartum period to provide a standardized measurement for the effect of pelvic and colorectal distress on physical, mental, and social-emotional domains in physical therapy evaluation, examination, and interventions. Physical symptoms in the postpartum may include urinary stress, urge, overflow, or mixed incontinence, colorectal–anal distress, pelvic pain, and pelvic organ prolapse, which may compromise the health related quality of life for women living in their prime years of function. When comparing NVD and CS, Torkan et al., found those with NVD reported higher marks in all areas assessing quality of life except “satisfaction towards delivery”. They concluded that CS did not improve the quality of life for the mother postpartum [14].

A wide variety of physical symptoms may arise during the postpartum period, leading to decreased quality of life. Further information regarding the connection between specific postpartum symptoms and the birth mode is needed to direct evaluation, examination, and treatment for women in the chronic postpartum period. Cesarean deliveries are at an all-time high and exceeds the WHO (2010) recommended level of 15% [1,2,9]. Therefore, there is need for further research comparing CS to NVD and the effect that birth mode may have on the postpartum period. Women need to be informed of the effects of birth mode including risks for pelvic pain, pelvic organ prolapse, urinary and colorectal–anal distress and health related quality of life.

The purpose of this study was to determine the incidence and impact of pelvic pain (PP), pelvic organ prolapse (POPDI), urinary and colorectal distress (CRADI) and their relationship to quality of life (QOL) and birth mode in women during the chronic postpartum period. The secondary research questions of this study were as follows: (1) Is there a difference in Urinary Incontinence, Pelvic Pain, and HRQOL in postpartum women based on birth mode, socioeconomic status, education level and age? (2) Is there a difference in Urinary Distress Inventory, Colorectal–Anal Distress Inventory, and Pelvic Organ Prolapse Distress Inventory in the postpartum women based upon age? (3) Is there a correlation between multiparity and the severity of UI and Pelvic Pain in postpartum women? (4) Is there a relationship between the performance of exercise, during pregnancy, and UI, pelvic pain or QOL in the postpartum period? (5) Is there a relationship between iron deficiency and comorbidities and iron deficiency and quality of life? (6) Is there an influence of BMI (body mass index) and report of comorbidities in postpartum women?

Materials and methods
Subjects
This study used a purposive sampling of 21 female subjects recruited from daycare facilities in a local region. Each subject who volunteered, was a woman between the ages of 18 and 45 who had given birth one or more times by Caesarean Section or Natural Vaginal delivery in the past 36 months. Subjects were excluded from participation if they had history of physical therapy treatment for pelvic floor dysfunction/incontinence, history of surgery, systemic neurologic disease or trauma affecting bowel or bladder and have given birth to more than two offspring at a time.

Research design and variables
A cross-sectional, correlational research design was used for this study. The outcome measures were analyzed according to birth mode and included the quality of life as measured by SF-36 (version 2), pelvic pain, urinary and colorectal distress, pelvic organ prolapse, and urinary incontinence impact as measured by Pelvic Floor Distress Inventory and other comorbidities listed in the Health History Questionnaire. Other variables pertaining to the secondary research questions included age, ethnicity, socioeconomic status, education level, BMI (height/weight), exercise, and iron deficiency were included in the correlation analysis.

Procedures
Approval for this study was obtained from IRB in November 2012 and facility permission was obtained prior to the initiation of this study. Each subject who agreed to participate in this research study read and voluntarily signed the informed consent and were given three inventories to complete: a Health History Questionnaire (created by co-researchers), the SF-36 (version 2), and the Pelvic Floor Distress Inventory (PFDI), which included the Urinary Distress Inventory (UDI-6), Colorectal-Anal Distress (CRADI-8), Pelvic Organ Prolapse Distress Inventory (POPDI-6), and Pelvic Floor Impact Questionnaire (PFQI). These surveys were chosen to evaluate the quality of life relationship with urinary and colorectal distress, pelvic pain, pelvic organ prolapse, and other co-morbidities.

All data collected by the co-investigators were locked in a cabinet in the primary researcher’s office, with only the primary researcher having access to the key. Data were de-identified upon coding into SPSS, which was used for statistical analysis, and analyzed by co-investigators.

Instrumentation
The Pelvic Floor Distress Inventory measures the quality of life based upon pelvic floor symptoms such as pelvic floor pain
with an excellent test-retest reliability coefficient of \( r=0.86, p<0.001 \) [15]. Included in the Pelvic Floor Distress Inventory, is the urinary distress (UDI-6), with \( r=0.86 \), Colorectal-Anal Distress (CRADI-8), \( r=0.82 \), Pelvic Organ Prolapse Distress (POPDI-6), \( r=0.93 \), and Pelvic Floor Impact Questionnaire (PFIQ), \( r=0.0862 \) [15]. The SF-36 survey questionnaire, with a reliability coefficient of \( r=0.92 \), [16] measures the health perception of subjects as it relates to health related quality of life through physical and mental domain scores.

**Analysis**

All data were analyzed using the SPSS Statistical program, version 20.0. A Spearman Rho correlation was used to answer research questions dealing with correlations. A Mann Whitney U was used to find out the differences between two groups, Kruskal Wallis was utilized to analyze data concerning differences between more than two groups and One Way t-test was utilized to compare SF-36 health related quality of life norms to the sample for this study by age group.

**Results**

Although our study included 21 women from the ages of 18 to 45, the majority of the subject population came from women ages 30 to 39 (69.1%) with the most common age being 32 years old. Within the 21 subjects, 71.4% currently reported postpartum symptoms based upon their first child. 76.2% of the sample subjects were Caucasian. Seventy nine percent of the subjects had at least a four-year college degree and the majority (76.1%) of subjects reported a household income of 70k or greater. **Table 1** gives more demographic percentages as well as specific concerns regarding the presence of pelvic pain and urinary incontinence.

The caesarean section group reported a higher percentage of urinary incontinence (90%), as well as increased incidence of pelvic pain (CS–66.7%, NVD–23.1%, \( p<0.05 \)), compared to the natural delivery group (50%). (See **Figures 1 and 2**) In addition, the separate mean scores of the Urinary Distress Inventory, Colorectal–Anal Distress Inventory, and the Pelvic Organ Prolapse Distress Inventory were higher in the caesarean section group versus the natural vaginal delivery group (\( p<0.05 \)), see **Figures 3, 4 and 5**.

**Birth mode, socioeconomic status, education level and age**

No significant difference was found between the variables

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<th>Table 1. Demographic percentages on total sample.</th>
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<td>25-36 months</td>
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<td>Comorbidities</td>
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<td>Complications</td>
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</table>

![Figure 1. Percentages of pelvic pain by birth mode.](image1)

![Figure 2. Marginal means of colorectal-anal distress inventory by birth mode.](image2)

![Figure 3. Mean scores of PFIQ separated by birth mode.](image3)
according to socioeconomic status or education level. However, by birth mode, the CS group was found to have a significantly higher mean score of 14.90 in the Pelvic Floor Inventory Questionnaire, concerning bowel, compared to the NVD group mean score of 9.78 with a significance of \( p=0.31 \) (Figure 6). A significant difference was also found for the PFIQ total between the age groups (Chi-Square=3.78, df=20, \( p=0.31 \)), with the highest reporting score of symptoms being in the 35 to 45 year old age group.

UDI, CRADI, POPDI and age
A significant difference was found between age groups for the CRADI (Chi-Square=7.02, \( p=0.030 \)). The subjects age was directly correlated to CRADI total scores, showing greater impact during the postpartum period for colorectal–anal distress as shown in Table 2 for women in the advanced age group. A significant difference was also found by age group in role of pain (Chi-Square=6.99, \( p=0.030 \)), one of the categories in the SF-36 dealing with quality of life in the postpartum period [17]. No other significant differences were found in POPDI or UDI by age group.

Health related quality of life
A significantly higher general health quality of life mean was reported compared to the published norms utilizing a one-way t-test for mean comparisons (\( Z=7.78 \), df=20, \( p=0.003 \)) utilizing the SF-36. As noted in Table 3, looking at the total sample and respective means for each SF-36 category, it was reported that the mean for the 21 subjects was significantly higher for mental health average compared to the norms with significance of (\( Z=5.58 \), df=20, \( p=0.003 \)). However, the total sample had a significantly lower social functioning mean as well as significantly lower role emotion (Social functioning–\( Z=1.25 \), df=20, \( p=0.023 \), Role emotion–\( Z=1.69 \), df=20, \( p=0.038 \)).
A significantly higher general health mean was reported by the NVD group compared to the published norms (Z = 1.77, df = 20, p = 0.002). The NVD also reported a significantly lower role emotion compared to published norms with significance of Z = 1.34, df = 20, p = 0.027. Lastly, the NVD reported a significantly higher mental health mean compared to the CS group (Z = 5.78, df = 20, p = 0.006).

Table 4. Mean scores of role emotion by exercise amount during prenatal period.

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<th>Exercise amount</th>
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<td>None</td>
<td>5.88</td>
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<tr>
<td>Once in a while (not regularly)</td>
<td>11.50</td>
</tr>
<tr>
<td>A few times a week</td>
<td>11.00</td>
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<tr>
<td>4-5 times a week</td>
<td>13.00</td>
</tr>
<tr>
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Multiparity
A Spearman-Rho correlation was calculated to analyze the relationship between multiparity and reported severity of UI and PP in postpartum women. A significant, but weak correlation was found between multiparity and UDI (r = 0.470, p = 0.032). In addition, a significant and moderate correlation was found between multiparity and POPDI (r = 0.517, p = 0.008). A significant, but weak correlation was found for the caesarean section group between POPDI and multiparity (r = 0.198, p = 0.014). One subject had 5 children. She reported increased co-morbidities as well as urinary incontinence, pelvic pain and decreased quality of life far greater than all other subjects.

Iron deficiency and exercise
A moderate and significant relationship was found between iron deficiency and comorbidities. Furthermore, a significant and moderate correlation was found between those subjects who exercised and reported having iron deficits in the prenatal period (r = 0.627, p = 0.022).

Body mass index
BMI (Body Mass Index) was calculated from the subject’s reported height and weight during the postpartum period. A significant and moderate correlation (r = 0.682, p = 0.001) was found between those who had a BMI greater than 25 (considered overweight by BMI classification from the World Health Organization [18]) and the Pelvic Organ Prolapse Distress Inventory. No significant difference was found between the groups CS and NVD.

Exercise
Our study found that exercise had a significant, but weak correlation with role emotion during the postpartum period (r = 0.479, p = 0.028). Table 4 shows those who exercised regularly during their prenatal period had a greater role emotion score on the SF-36 showing better control of their emotions during the postpartum period compared to those who did not exercise regularly.

Discussion
Pregnancy causes mechanical and hormonal changes to the maternal body that can lead to pelvic pain, pelvic organ prolapse, and urinary and colorectal–anal distress. Our study found increased incidence of UI and pelvic pain in subjects who reported CS compared with NVD. Some studies contrast our findings of occurrence of UI and pelvic pain in those who had a caesarean section compared to a NVD. In 2007, Press et al., found caesarean section reduced the risk for urinary incontinence from 16% to 9.8% in 6 different studies [4]. Andrews et al., found that UI was more than four times as common after a vaginal delivery then caesarean section [19]. Groutz et al., reported that UI was less common following elective CS with no trial of labor, compared to vaginal deliveries [5]. Hannah et al., found a decrease in UI of 4.5% from mothers who had a caesarean section compared to natural vaginal delivery [3]. Groutz and Hannah also propose that those who experienced a CS had higher risk for UI during the postpartum period due to pelvic floor injury on initial trial of labor. However, none of the studies sampled women in the chronic postpartum period, as was done in our study.

Similar findings to our study reported significant incidence of UI in the CS sample compared to NVD [20, 21]. Movahedi et al., found a 1% higher occurrence of UI in caesarean section versus vaginal delivery [22]. Another study concluded the protective effects of CS upon incontinence are complex, yet there seems to be a strong effect on the prevention of pelvic organ prolapse and elective caesarean section [23].

Our research found a significantly higher incidence of pelvic pain as well as pelvic distress, specifically in CRADI and PFIQ (bowel) compared to NVD, in the chronic postpartum period. Some of the literature reports 2-5% of mothers will still have pelvic pain at 3 to 12 months after delivery, continues to be a factor in their daily lives (more chronically) [12]. Our study reported 76.2% of pelvic pain in the chronic postpartum period (6 to 36 months).

Our study found that with an increase in age, over 35, came a significant increase in the impact and incidence of colorectal–anal distress as well as a decreased quality of life. Nevertheless, there are many factors that need to be accounted for such as age, body mass index, number of births, and presence of UI prepartum [5, 24]. The older the mother the greater potential of having UI postpartum as well as the presence of UI before the gestational period. Research alludes to decreased pelvic musculature strength as being one of the main reasons for increased postpartum symptoms as well as previous trauma to the pelvic organs [25]. The increased postpartum comorbidities may have a negative impact on the quality of life of the mother during her postpartum period. A study by Movahedi et al., (2013) found similar reports of a 3% increase in the occurrence of urinary incontinence and pelvic symptoms per
year of increased age of the mother [22].

Health related quality of life consists of broad constructs that cover various aspects of life including physical, mental, and general health and wellbeing. According to Torkan et al., assessment of the quality of one’s life is necessary in-order-to accurately assess their health system. Urinary incontinence, pelvic pain, hemorrhaging and infections are common post-partum maternal complications that are evaluated. However socio-economic status, marital status, education level, employment state, and total income level are factors that are often over looked and yet can greatly alter the mother’s quality of life, both physically and mentally [20].

Employment status and level of income have a great impact on the presence and amount of insurance the mother will have, which relates to the payment sources and coverage that the patient will have to pay after the birth, as well as the amount of medical services received. Cesarean sections are considered surgical and are therefore billed as such in the hospital. Monetary resources may also contribute to physiological stress on the mother [26] that may affect the quality of life during the postpartum period. The added stress of having to pay even more for a procedure (elective or non-elective) as well as the physical stress of recovery will impact the mother’s life in the acute postpartum period.

Although the current study did not find significant difference for variables by socioeconomic status, psychological stress as well as socioeconomic factors may have a role in the physical health of the mother in the postpartum period, all which affect the quality of life. Socioeconomic status was found to have a direct correlation with pelvic pain in one study [12]. It is common for women from low socioeconomic class to have limited health insurance coverage and lower disposable income to receive adequate physical care potentially causing and increasing pelvic pain occurrence or severity during the postpartum period [23]. However, the relationship between socioeconomic status and pelvic pain needs to be further explored.

The means for health related quality of life were found to be above the general population norms as measured by the SF-36V2 for the subjects in the current study with respect to specific sections of general health and mental health. This has interesting implications for our study, which showed mental and general health may be very high but mothers may still be experiencing significant amounts of physical symptoms including pain, pelvic distress and incontinence.

Social functioning was significantly lower in the current sample when compared to the published norms. This may indicate that urinary incontinence and pelvic distress can affect social norms during the postpartum period for the mother. In a study by Leroy and Lopes, it was found that social function scores were higher in those with UI [27]. Balci et al., reported that incontinence tends to increase feelings of shame, which in turn will decrease their confidence as well as social well being, concluding that individuals with UI have a lower quality of life [27,28].

The present study found a direct correlation between parity and UI, as well as between parity and POPDI. This is supported by research that reports mothers who have elective caesarean section had a higher risk for UI when compared to nulliparous women [9]. The number of births also plays a major role in the amount of injury to the pelvic floor. Despite the fact that the first vaginal delivery will cause the most harm to the pelvic floor, subsequent deliveries will also cause an increase in the risk of UI [9]. Multiparous women who had previous injury to the pelvic region are known to cause a delayed response in healing which may contain scar tissue from previous births, specifically with caesarean delivery [23].

This study found that there was a significant correlation with exercise during the prenatal period and iron deficiency in postpartum. Interestingly, research reports that individuals who have low iron in their blood or anemia will have altered ability to adequately exercise [22]. In addition, the literature reports loss of iron through sweat when performing strenuous activities [22]. Further research is needed to explore the overall effect of iron deficiency for women who exercise during the prenatal period and other complications and comorbidities.

The present study found that BMI had a significant, moderate correlation with increase in pelvic organ prolapse. Having a higher than normal BMI (>25) was related to higher pelvic organ prolapse in the postpartum period. A similar finding was reported that concluded for every 1 unit of BMI over the established health weight category (between 18.4–24.9) there was an 8% increase in risk for postpartum urinary incontinence [23]. Another study found that women who are overweight (BMI>24.9) are more prone to severe pelvic pain [12].

There is conflicting research information as to whether exercise increases or decreases the fetal and maternal risk. The American College of Obstetricians and Gynecologists (ACOG) has changed their position statements over the years pertaining to the appropriate types, durations and intensities that are healthy for mother and baby. However over most recent years the ACOG recommends pregnant women with no complications should exercise, even those who were not active prior to conception [27]. Exercising has been found to decrease incidence of preeclampsia, gestational diabetes, low back pain, anxiety, nausea, heartburn, insomnia, leg cramps, excessive weight gain, and the necessity for caesarean section [28]. Miquelutti et al., found a significant reduction in the incidences of urinary incontinence in women who exercised during their pregnancy by 41%; In the Stafne et al., study they found an 11% decrease in urinary incontinence during the postpartum period [30]. In another study by Gaston et al., it was determined women who exercised during pregnancy at a moderate to vigorous level increased their quality of life, which agreed with our findings of increased role emotion during the postpartum period for those who moderately exercised prenatally [30]. Therefore exercise is one of the best self controlling factors during pregnancy that has shown to
improve the postpartum quality of life in multiple ways.

Conclusion
Authors in the current study found that cesarean section increased the risk of urinary incontinence, colorectal-anal distress and pelvic organ prolapse symptoms significantly compared to subjects who reported a vaginal delivery. Multiparity was associated with higher UDI and POPDI scores, particularly in those who had cesarean section. Age, 40-45 years, was associated with greater colorectal symptoms and pain compared to younger age groups. Exercise intensity and duration were directly related to iron deficiency during the postpartum period for this sample. Finally, increased BMI greater than 25, was associated with significant increase in pelvic organ prolapse. Future research should focus on evaluation, examination, and intervention in the chronic postpartum period and relationship to caesarean section postpartum dysfunction including pelvic pain, urinary and colorectal distress, pelvic organ prolapse.

Limitations
Limitations in the current study include a small cohort, missing data for some of the SF-36 (version 2), length of survey, lack of ethnic diversity, and limited geographical location.

Future research
Based upon the findings of our study, future research should focus on the role of colorectal–anal, pelvic organ prolapse and pelvic pain originating from bowel dysfunction for women with CS in the postpartum period. Physical Therapy treatment interventions to address colorectal–anal pain, urinary incontinence, and pelvic pain, with age and birth mode as additional factors, should be considered. Additionally, interventions to assist with postpartum reduction of BMI and its relationship to urinary and colorectal pelvic symptoms, as well as the relationship between iron deficiency and moderate to high levels of exercise in the prenatal and postpartum periods should be considered for future research.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions

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References


The Effect of Pelvic Muscle Exercises on Urinary Incontinency and Self-Esteem of Elderly Females With Stress Urinary Incontinency, 2013

Abstract

Introduction: Millions of women are afflicted with stress urinary incontinence. Urinary incontinence is mentioned as one of the geriatric syndromes, together with pressure ulcers, functional decline, falls, and low self-esteem. The aim of the present study was to determine the effect of pelvic muscle exercises on urinary incontinency and self-esteem of elderly females with stress urinary incontinency in Shiraz, Iran, 2013.

Material and Method: In this interventional study, 50 old females aged 60-74 years were chosen among the members of Jahandidegan center, and they were asked to sign the informed consent form and complete the demographic questionnaire. Then, Quid questionnaire was used for choosing the type of incontinence in the elderly females. Next, the participants completed the ICIQ and self-esteem questionnaires. Then, they were randomly assigned to case and control groups. Each participant took part in 8 training classes. Finally, the subjects filled the ICIQ and self-esteem questionnaires before and 2 months after the intervention.

Result: The results is shown that after the intervention, ICIQ score has a significant difference between the two groups (P=0.001). Also, after the treatment, self-esteem average scores of studied unit indicated a significant statistical difference in experimental group. In other words, the training sessions improved the score of self-esteem in the experimental group (P<0.001) versus control group (P=0.08).

Conclusion: Pelvic muscle exercises were an empowerment mechanism for incontinent women in improving their quality of life and self-esteem, so recommended that such these exercising programs be used in elderly health care centers as a factor to improve health promotion of elders/ies that are suffering from urinary incontinence.

Keywords: pelvic muscle exercises, urinary incontinency, self-esteem, elderly

1. Introduction

As population ages, the number of patients presenting to their primary care physicians with urologic problems are significantly increasing. Urologic issues are the third most common type of complaints in patients 65 year or older, accounting for at least a part of 47% of office visits (Dyche & Hollander, 2009). Urological symptoms are the major public health problems in the USA (Ho, Chan, Woo, Chong, & Sham, 2009). One of the most predominant urologic problems among the elderly is urinary incontinence (Dyche & Hollander, 2009). The International Continence Society (ICS) Standardization Committee defined urinary incontinence as “a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable (Mons, Chartier-Kastler, Hampel, Samsioe, & Hunskaar, 2007; Paick, Kim, Oh, & Ku, 2007).

Millions of women are afflicted with stress urinary incontinence (SUI). Stress urinary incontinence is involuntary loss of urine with sneezing, coughing and effort and is a frequent and bothersome symptom that is common in the elderly population (GHodsbin, Kargar, Jahanbin, & Sagheb, 2012).

Urinary incontinence (UI) impacts an estimated 15 to 35% of the adult ambulatory population 60 and older that
live in the community with prevalence rates for women being twice that of men (Thom, 2000). Urinary incontinence is a common condition with important social and psychological consequences (Bogner, Gallo, Swartz, & Ford, 2002).

Involuntary loss of urine has multiple implications for the sufferer. Incontinence also has been noted to be a major barrier to social interests, entertainment, or physical recreation (Shelton Broome, 2003). Significant urinary incontinence may cause shame and lead to withdrawal from social activities. Elderly outpatients describe their experience with incontinence as embarrassing, upsetting, and distressing (Bogner, Gallo, Swartz, & Ford, 2002). Persons with urinary incontinence may be anxious about not having ready access to a toilet and may worry about the possibility of a urinary accident in public (Ghodsbin, Kargar, Jahanbin, Sagheb, & Keshavarzi, 2012).

In the literature, UI is mentioned as one of the geriatric syndromes, together with pressure ulcers, functional decline, falls, and low self-esteem. Depression and low self-esteem have been suggested to co-occur in incontinent persons (Ruby, Hanlon, & Fillenbaum, 2005).

Previous studies in community-dwelling older people have suggested that the disability to perform activities of daily living (ADL) may be associated with new onset urinary incontinence in the older population (Coll-Planas, Denkinger, & Nikolaus, 2008; Jenkins & Fultz, 2005). Independence in ADL might cause reduced quality of life, self-esteem and social isolation (KO, Lin, & Salmon, 2005).

Current treatments for UI include behavioral (e.g., bladder training, fluid manipulation, scheduled toileting, pelvic floor muscle exercises (Sampselle, 2003). Behavioral techniques are now currently recommended as first-line therapy in the treatment of UI (Marcell, Ransel, Schiau, & Duffy, 2003). Behavioral interventions are usually relatively inexpensive and easy to implement, but their effectiveness depends chiefly on patient motivation and compliance (Dickson, 2008).

The use of pelvic floor muscle (PFM) exercises in the treatment of stress urinary incontinence is based on two functions of the pelvic floor muscles: support of the pelvic organs, and a contribution to the sphincter closure mechanism of the urethra (Kumari, Jain, Mandal, & Singh, 2008). A PFM program may be prescribed to increase strength, endurance, and coordination of muscle activity. Strength training decreases the frequency of SUI with time, and skill training immediately reduces the amount of leakage (Hay-Smith & Dumoulin, 2006). Pelvic floor rehabilitation is generally the first-line treatment for female patients with SUI (Jundt, Peschers, & Dimpfl, 2002).

The aim of the present study was to determine the effect of Pelvic floor muscle exercises on urinary incontinency and Self-Steam of elderly females with stress urinary incontinency, referring to jahandidegan center in Shiraz, Iran, 2013.

2. Methods and Materials

2.1 Setting

Jahandidegan center is a day-time center for older adults located in Kholdebarin Park in Shiraz, Iran.

2.2 Data Collection

The instruments used for the study were the Questionnaire for urinary incontinence diagnoses (QUID), International Consultation on Incontinence Questionnaire (ICIQ) and self-esteem questionnaires. Quid questionnaire was used for choosing the type of incontinence in the elderly females. Given the importance of urinary incontinence on quality of life, there is increasing interest in the use of well-constructed questionnaires. Stress and urge urinary incontinence, the most common conditions that cause female urinary incontinence symptoms, has different pathophysiologic mechanisms, epidemiologic characteristics, and treatments. Distinguishing between these types of urinary incontinence is important in clinical practice and for research purposes.

On the basis of previous research and expert clinical opinion, we used a QUID questionnaire to distinguish stress from urge incontinence that includes 6 questions and requires about 5 minute to complete. We believe that this is partly because national guidelines recommend an extended evaluation for classifying type of incontinence that is not practical in health care centers. The QUID questionnaire is a simple, quick, and reproducible test with acceptable accuracy for classifying urge, mix and stress incontinence among women who are appropriate for evaluation and treatment in health care centers.

In Ghodsbin's study, a preliminary pilot study was carried out to determine the validity and reliability of Quid questionnaire for Iranian elderly. The original questionnaire was translated into Persian by three professors of Nursing and Midwifery College in Shiraz University of Medical Sciences, and then it was back translated from
Persian into English. In the next step, as approved by Shiraz Welfare Organization, 25 females aged 60–74 years were chosen from Shiraz Jahandidegan Center to fill out the questionnaire twice with three weeks interval. Statistical analysis showed that the Cronbach $\alpha$ coefficient of the Quid questionnaire was 0.86 and the performed test-retest had an appropriate reliability (Ghodsbin, Karbar, Jahanbin, Sagheb, & Keshavarzi, 2012). In other study internal consistency and test-retest reliability estimates were good. Sensitivity and specificity were 85% (95% CI, 75%, 91%) and 71% (95% CI, 51%, 87%), respectively, for stress urinary incontinence and 79% (95% CI, 69%, 86%) and 79% (95% CI, 54%, 94%), respectively, for urge urinary incontinence (Bradley, Rovner, Morgan, Berlin, & Novi, 2005).

The second questionnaire includes the standard ICIQ questionnaire. It is a simple and brief questionnaire that can be self-administered contains 6 questions that the first two questions related to demographic variables and the next four questions related to urinary incontinence conditions. Sum of the questions’ scores 3 to 5 is the questionnaire average scores.

The third questionnaire was Rosenberg’s self-esteem evaluation. Rosenberg’s evaluation is a standard evaluation that includes 10 sentences or comments that shows the real feeling of each person about each sentence in one of four options: very agree, agree, disagree and very disagree determined by a cross in front of each sentence with 1 to 4 points and the total point is obtained by summing up the points for 10 questions. Thus, 10 and 40 points indicate the minimum and maximum of self-esteem.

### 2.3 Intervention

In this interventional study, 50 old females aged 60–74 years were chosen among the members of Jahandidegan center, and they were asked to sign the informed consent form and complete the demographic questionnaire. Then, Quid questionnaire was used for choosing the type of incontinence in the elderly females. Next, the participants completed the ICIQ and self-esteem questionnaires. The inclusion criteria were age 60–74 years, having Quid score for incontinence type (stress score $\geq 4$, clinical symptoms of urinary incontinence within the last 6 months, and willing to participate in the study. The exclusion criteria were absence in more than two training sessions, suffering from central nervous system disease (e.g. multiple sclerosis, cerebrovascular accident or acute mental illness and dementia, recent urology surgery (for less than three months), history of genitourinary malignancy, current urinary infection, hysterectomy and diabetic mellitus. Then, they were randomly assigned to case and control groups. Each participant took part in 8 training classes. Participants were taught about the anatomy of the pelvic floor and lower urinary tract, physiology, and continence mechanisms by the trained nurse. All were taught to contract the pelvic floor muscles correctly. Participants were asked to conduct 8-12 high intensity (close to maximum) contractions three times a day at home with additional training in groups once a week for 45 minutes. Group training was performed in lying, standing and sitting positions with legs apart to emphasize specific strength training of the pelvic floor muscles and relaxation of other pelvic muscles. Participants aimed at holding each muscle contraction for 6-8 seconds, three or four fast contractions were then added. The rest period was about 6 seconds. A total of 8 to 12 contractions were completed in each position with maximal contraction effort encouraged. Body awareness, breathing, relaxation exercises, and strength training for the abdominal, back, and thigh muscles were performed to music between positions. The participants were encouraged to use their preferred position and perform equally intensive contractions at home. Finally, the subjects filled the ICIQ and self-esteem questionnaires before and 2 months after the intervention.

### 2.4 Data Analysis

The results were analyzed by SPSS version 16. The data were examined using percent, mean and standard deviation and independent t-test.

### 3. Result

Of the 60 women with urinary incontinence, 10 (16.7%) were excluded from the randomized controlled trial leaving 50 for randomization into the 2 groups. At the onset of the study, 1 woman in the study group refused; and 1 woman in the control group was lost to follow up during the trial (Figure 1).

In the present study, the participants were examined for urinary incontinence and self-esteem conditions in two experimental and control groups. The average age of studied samples in control group was $68.05\pm 9.10$ and in experimental group was $67.15\pm 8.36$. The average duration of urinary incontinence in the experimental group was $5.1\pm 2.3$ and in the control group $4.1\pm 2.6$ years that it wasn’t observed a statistically significant difference between two groups through using the statistical t-Test exam. Also, in other terms of demographic information, there was no difference between two groups and they were completely the same.
In assessing the urinary incontinence, 5 parameters were studied that include the following:

1. **The number of frequencies of leakage urine:** According to findings in experimental and control group, before and after the treatment, a significantly statistical difference was observed in the number of urinary incontinence frequencies. (The experimental group: \( p = 0.001 \) and the control group: \( p = 0.002 \)). In comparison, before the treatment, there was no difference between two groups (\( p = 0.2 \)) but after the treatment was observed a significant statistical difference (\( p = 0.04 \)). Therefore, it means that using the provided training made the experimental group be improved.

2. **The measurement of amount of leakage urine:** Based on findings in experimental and control group, before and after the treatment, a significant statistical difference was observed. (The experimental group: \( p = 0.001 \) and the control group: \( p = 0.003 \)). In comparison, before the treatment, there was no difference between two groups (\( p = 0.7 \)). But after the treatment a significant statistical difference (\( p = 0.001 \)) was observed.

3. **The impact of urinary incontinence on quality of life:** Based on findings in experimental and control group, before and after the treatment, a significant statistical difference was observed. (The experimental group: \( p = 0.04 \) and the control group: \( p = 0.01 \)). In comparison, before doing the treatment, the impact of urinary incontinence on life quality was no different between two groups (\( p = 0.1 \)) but after the treatment a significant statistical difference (\( p = 0.01 \)) was observed.

4. **Time of leakage urine:** According to findings a significantly statistical difference wasn’t observed before and after the treatment in both groups. (The experimental group: \( p = 0.9 \) and the control group: \( p = 0.4 \)). And also between the two groups wasn’t observed any differences; before the treatment (\( p = 0.1 \)) and after it (\( p = 0.6 \)).

5. **Total scores of questionnaire:** As shown in Table 1, the mean score for ICIQ questionnaire before the intervention in the two groups is almost the same (\( P = 0.3 \)). The results is shown that after the intervention, ICIQ score has a significant difference between the two groups (\( P = 0.001 \)). In other words, the training sessions improved the score in the experimental group versus control group.

In the present study, there was no significant difference between two experimental and control groups before the treatment in self-esteem scores. But after the treatment, self-esteem average scores of studied unit indicated a significant statistical difference in experimental group. In other words, the training sessions improved the score of self-esteem in the experimental group (\( P < 0.001 \)) versus control group (\( P = 0.08 \)).

---

**Figure 1. Participant flow through the study**

- Incontinence cases 60
- Eligible 50
- Control (25) (No intervention)
- Elapsed 10
- Excluded
- Cases (25) (Intervention group)
- Baseline
- 24
- 1Refused
- 2months
- 24
- 1Refused
- Control (25) (No intervention)
- Baseline
- 25
- 24
- 1Migrated
- 4Current urinary infection
- 6Refused

---
Table 1. Results of the study according to ICIQ questionnaires

<table>
<thead>
<tr>
<th>Group</th>
<th>Case</th>
<th>Control</th>
<th>P-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>2m later</td>
<td>Before</td>
<td>2m later</td>
</tr>
<tr>
<td>How often do you leak urine?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) About once a week or less often</td>
<td>3(10)</td>
<td>6(20)</td>
<td>0(0)</td>
<td>2(6.7)</td>
</tr>
<tr>
<td>(2) Two or three times a week</td>
<td>2(6.7)</td>
<td>10(33.3)</td>
<td>3(10)</td>
<td>20(66.7)</td>
</tr>
<tr>
<td>(3) About once a day</td>
<td>18(60)</td>
<td>1(3.3)</td>
<td>24(80)</td>
<td>3(10)</td>
</tr>
<tr>
<td>(4) Several times a day</td>
<td>1(3.3)</td>
<td>0(0)</td>
<td>2(6.7)</td>
<td>1(3.3)</td>
</tr>
<tr>
<td>(5) All the time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We would like to know how much urine you think leaks. How much urine do you usually leak (whether you wear protection or not)?

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th>Control</th>
<th>P-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>2m later</td>
<td>Before</td>
<td>2m later</td>
</tr>
<tr>
<td>(1) None or A small amount</td>
<td>15(50)</td>
<td>24(80)</td>
<td>10(33.3)</td>
<td>9(30)</td>
</tr>
<tr>
<td>(2) A moderate amount</td>
<td>10(33.3)</td>
<td>4(13.3)</td>
<td>5(16.7)</td>
<td>11(36.7)</td>
</tr>
<tr>
<td>(3) A large amount</td>
<td>5(16.7)</td>
<td>2(6.7)</td>
<td>15(50)</td>
<td>10(33.3)</td>
</tr>
</tbody>
</table>

Overall, how much does leaking urine interfere with your everyday life?

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th>Control</th>
<th>P-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>2m later</td>
<td>Before</td>
<td>2m later</td>
</tr>
<tr>
<td>(1-3) mild</td>
<td>3(10)</td>
<td>12(40)</td>
<td>2(6.7)</td>
<td>3(10)</td>
</tr>
<tr>
<td>(4-6) moderate</td>
<td>14(46.7)</td>
<td>15(50)</td>
<td>9(30)</td>
<td>12(40)</td>
</tr>
<tr>
<td>(7-9) severe</td>
<td>9(30)</td>
<td>2(6.7)</td>
<td>14(46.7)</td>
<td>15(50)</td>
</tr>
<tr>
<td>(10) very severe</td>
<td>4(13.3)</td>
<td>1(3.3)</td>
<td>5(16.7)</td>
<td>0(0)</td>
</tr>
</tbody>
</table>

When does urine leak?

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th>Control</th>
<th>P-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>2m later</td>
<td>Before</td>
<td>2m later</td>
</tr>
<tr>
<td>(1) Never – urine does not leak or Leaks before you can get to the toilet</td>
<td>15(50)</td>
<td>15(50)</td>
<td>14(46.7)</td>
<td>14(46.7)</td>
</tr>
<tr>
<td>(2) Leaks when you cough or sneeze</td>
<td>12(40)</td>
<td>12(40)</td>
<td>12(40)</td>
<td>12(40)</td>
</tr>
<tr>
<td>(3) Leaks when you are physically active/exercising and sleeping</td>
<td>1(3.3)</td>
<td>1(3.3)</td>
<td>0(0)</td>
<td>0(0)</td>
</tr>
<tr>
<td>(4) Leaks when you have finished urinating and are dressed and Leaks all the time</td>
<td>2(6.7)</td>
<td>2(6.7)</td>
<td>4(13.3)</td>
<td>4(13.3)</td>
</tr>
</tbody>
</table>

Sum of Scores | 10.78 | 9.07 | 13.93 | 12.30 | P=0.3 | P=0.001
Table 2. Comparison of mean of self-esteem score before and after the intervention in the two groups

<table>
<thead>
<tr>
<th>Time Group</th>
<th>Before</th>
<th>After</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>21.50±4.21</td>
<td>27.66±4</td>
<td>0.001</td>
</tr>
<tr>
<td>Control</td>
<td>22.88±4.75</td>
<td>22.38±5.04</td>
<td>0.08</td>
</tr>
</tbody>
</table>

4. Discussion

In investigating of urinary incontinence in 5 mentioned parameters, some changes were observed in two groups before and after the treatment. However, regarding to issues such as the women’s lifestyle in our society, from researcher point of view in Iran women’s society, and with considering the style of their living such as washing dishes and clothes in sitting position, using Iranian toilet, improper diet and etc. can be part of factors to influence more on these behavioral interferences.

In a community based study that was done by Sharon et al. in Boston of Spain with the aim of the severity impact of micturition dribble on life quality of 3202 women and 2301 men with ages 30-79, 30 percent of women and 18 percent of men reported the micturition dribble that they were mostly mild to moderate. Women reported more severe micturition dribble than men (1.5 percent in contrast of 0.9 percent). Analyzing of some variables represented that simultaneously by increasing the intensity of micturition dribble; the life quality score is associated with more stagnation. This study showed that micturition dribble causes the disruption of life quality in both women and men (Sharon et al., 2010).

In a semi experimental study was done by Seyed Rasouly et al. in Tabriz (Iran), on 60 elderlies with the aim of applying principles of the evidence-based nursing care for urinary incontinence. The findings in studied samples of experimental and control group had a meaningful statistical difference in micturition dribble frequencies, micturition dribble rate, and the impact of micturition dribble rate on life quality before and after the treatment (p = 0.001) (Syed Rassouli, Valizadeh, & Haj Ebrahim, 2011). It included that incontinence makes a significant impact on a woman's Quality of Life (QOL). In our study on domain of the impact of urinary incontinence on quality of life a significant statistical difference was observed in experimental and control group before and after the treatment.

In a study that was done by Shah Ali at Shahid Akbar Abady hospital with the aim of the effect of kegel exercises on urinary incontinence, 50 women with ages between 25-54 who were suffering urinary incontinence and were qualified to enter the study, the results represented that the average score of life quality of urinary incontinence suffering women was 53.15 before doing kegel exercises and after the treatment was 73.82 that there was a significant difference between them (p=0.0001) (Shah Ali, Kashanian, & Azari, 2011).

In a study of Godey et al. in The United States, 2004, with the title of the effect of behavioral and medication interferences on urinary incontinence cure, two methods, the kegel muscles exercises and medication were compared for 3 months. The studied samples of women and men were 40 to 60 years old that were in two groups experimental and control (each group 15 persons). In experimental group the kegel exercises were taught face to face that lasted for 10 weeks and in control group two medicines Botanical and Oxybotin were used and the frequencies of urinary incontinence, micturition dribble rate and the impact of treatment on the life quality of both groups were checked before and after the treatment. Applied tools were ICIQ form and SF-38 standard questionnaire. By considering the frequencies of urinary incontinence, in experimental group, 73 percent of samples, their frequencies reduced from 5 times in a day to twice in a day and in control group, 63 percent of samples reduced from 5 times a day into 3 times in a day. The micturition dribble rate in 82 percent of experimental group and 56 percent of control group was reported a little bit or never. Considerable changes happened in physical and spiritual dimensions of the life quality of experimental group and were associated with improvement of their social interactions. Recent study shows that behavioral therapy with biofeedback or without it has useful clinical results and behavioral therapy should be used in a clinical environment in advanced (Goode, Burgio, Kenton, Litman, & Richter, 2011). Our findings are consistent with these studies. The frequencies of leakage urine and amount of leakage urine in experimental group were reduced after the intervention. It indicated that urinary incontinence is significantly improved by behavioral interventions.

In a study that was done on 30 hospitalized patients in Imam Reza and Gharazi hospitals of Sirjan city in Iran with the aim of the kegel exercises effect on urinary incontinence cure by Khalili and Mohammadi the results indicated that during 3 months the urinary incontinence frequencies reduced to less than 30 percent and kegel exercises can be used as an efficient method to cure the urinary incontinence (Baba Mohammadi & Khalili,
The result of our study showed the significant impact of exercises on urinary incontinence and increasing self-esteem of elderly females that is consistent to the results of some researches in this field. One possible explanation is that having SUI causes problems with self-esteem and doing kegel muscles exercises leads to increase the elderly’s life quality and enhance their self-esteem, for example McAuley and Elavssky reported that there is a positive correlation between the physical activities rate and accuracy of doing exercises with self-efficiency and self-esteem in elderlies (McAuley & Elavssky, 2005). Other study showed, although there’s no relationship between exercises rate, body satisfactory, and self-esteem among youths, but doing motivating sport activities, improve health and physical capabilities and increase self-esteem in elderlies (Tiggemann & Williamson, 2000).

In a study that was done by Thomas in England a group which attended in the aerobic exercises for 8 weeks the average scores of self-esteem had increased after the treatment (Thomas, 1999). Walter et al. in his study found out a regular exercising plan with moderate intense causes positive changes and enhance self-esteem (Walters & Martin, 2000). Our study extends this body of research which emphasizes the important psychosocial and physical health consequences of kegel muscles exercises on self-esteem and QOL of elderly females with SUI.

Limitations of the study were as following:

- Not doing the important points about lifestyle can put the treatment and their advantages under a question.
- Recognizing kegel muscles correctly and doing an effective contraction is a key point in determining of a useful treatment and in a case that the studied samples be not able to recognize the muscles, not only will it have positive effect but it will also a negative effect on urinary incontinence if abdomen muscles be contracted.

5. Conclusion

Pelvic Muscle Exercises were an empowerment mechanism for incontinent women in improving their quality of life and self-esteem, so recommended that such these exercising programs be used in elderly health care centers as a factor to improve health promotion of elderlies ’that are suffering from urinary incontinence.

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Quality of Life in Elderly Females with Urinary Incontinence, Refereeing to Jahandidegan Center in Shiraz-Iran. Gerontology & Geriatric Research, 1, 3.


There is not yet strong evidence that exercise regimens other than pelvic floor muscle training can reduce stress urinary incontinence in women: a systematic review

**Question:** What evidence is there for alternative exercises to specific pelvic floor muscle training for treatment of stress urinary incontinence in women? **Design:** A systematic review was conducted with searches of PubMed and PEDro to January 2013. The quality of randomised trials was evaluated using the PEDro scale. Each type of exercise was classified as being in a Development Phase, Testing Phase, or Refinement and Dissemination Phase. **Participants:** Women with stress or mixed urinary incontinence with predominantly stress urinary incontinence. **Intervention:** Exercise regimens other than pelvic floor muscle training. **Outcome measures:** The primary outcome was urinary leakage. **Results:** Seven randomised controlled trials were found: three on abdominal training, two on the Paula method, and two on Pilates exercise. The methodological quality score ranged between 4 and 8 with a mean of 5.7. There was no convincing evidence for the effect of these exercise regimens so they remain in the Testing Phase. Because no randomised trials were found for posture correction, breathing exercise, yoga, Tai Chi, and general fitness training, these were classified as being in the Development Phase. **Conclusion:** There is not yet strong evidence that alternative exercise regimens can reduce urinary leakage in women with stress urinary incontinence. Alternative exercise regimens should not yet be recommended for use in clinical practice for women with stress urinary incontinence.

**Key words:** Alternative, Exercise, Fitness, Pelvic floor, Stress urinary incontinence

**Introduction**

Urinary incontinence is a common complaint in women. Reported prevalence rates vary between 32% and 64% (Milsom et al 2009). The most common types of female urinary incontinence are stress urinary incontinence, defined as complaint of involuntary loss of urine on effort or physical exertion (eg, sporting activities), sneezing or coughing, and urgency urinary incontinence, defined as complaint of involuntary loss of urine associated with urgency (Haylen et al 2010). Many women also present with mixed urinary incontinence, which is a combination of the two. Urinary incontinence affects quality of life and participation in social activities, especially physical activity and exercise (Milsom et al 2009).

Kegel was the first to report the effect of regular, specific strength training of the pelvic floor muscles on female urinary incontinence and pelvic organ prolapse (Kegel 1948). He claimed that 84% of a series of gynaecological patients were cured of urinary incontinence after pelvic floor muscle training. Now many randomised controlled trials have evaluated the effects of pelvic floor muscle training for female urinary incontinence. These trials have compared the effect of pelvic floor muscle training to no treatment or to training regimens with and without biofeedback, electrical stimulation, or vaginal weighted cones (Dumoulin and Hay-Smith 2010, Herderschee et al 2011, Hay-Smith et al 2011). The broad findings of these trials are clear: supervised intensive pelvic floor muscle training reduces the risk of remaining incontinent. The absolute reduction in incidence proportion of women with incontinence reported in randomised trials comparing effects of pelvic floor muscle training and regular care varies greatly between studies (ARR 5–85%, NNT 1 to 20), but most studies report clinically important reductions in risk (Shamliliyan et al 2008). Training may be conducted in a variety of ways (for example, it may be supervised or unsupervised, with or without vaginal cones, biofeedback, or electrical stimulation). The best results are obtained with supervised individual training and close follow-up (Hay-Smith et al 2011). Systematic reviews of randomised controlled trials in the general female population conclude

**What is already known on this topic:** Urinary incontinence is common in women, affecting quality of life and participation in social activities. Extensive high-quality evidence confirms that specific pelvic floor muscle training reduces stress urinary incontinence and mixed urinary incontinence.

**What this study adds:** Abdominal training, the Paula method, and Pilates have each been examined as adjuncts or alternatives to pelvic floor muscle training in several randomised trials, but the data do not support their effectiveness. The efficacy of yoga, Tai Chi, breathing exercises, postural training and general fitness training in treating stress urinary incontinence has not been examined in any randomised trials.
that there is Level 1, Grade A evidence of the effectiveness of pelvic floor muscle training, and there is consensus that pelvic floor muscle training should be first-line treatment for stress urinary incontinence and mixed urinary incontinence (Dumoulin and Hay-Smith 2010).

In spite of the strong evidence of the effectiveness of pelvic floor muscle training for treatment of stress urinary incontinence and mixed urinary incontinence there seems to be increasing interest in using other exercise regimens to treat stress urinary incontinence (Sapsford 2004, Hay-Smith et al 2011). We will refer to these as ‘alternative exercises’. Alternative exercises include training of the deep abdominal muscles, contraction of the ring muscles of the mouth and eyes (the Paula method), Pilates exercise, yoga, Tai Chi, breathing exercises, posture correction, and general fitness training. The effectiveness of some alternative exercise regimens was also explored by Hay-Smith et al (2011), but these exercises were not the focus of that Cochrane review. A framework for this review is provided by our paper on how new therapies become incorporated into clinical practice (Bø and Herbert 2009). In that paper we presented a three-phase protocol for the introduction of new therapies into clinical practice (Box 1). The central idea is that the development phase for new therapies involves clinical observation, laboratory studies, clinical exploration, and pilot clinical trials. Once there are sufficient data from such studies to believe that the therapy could be effective, its effectiveness is tested with a randomised controlled trial. We argued, as have many before us (eg, Chalmers 1977), that new therapies should not be considered to have been shown to be effective, or be introduced into routine clinical practice, until they have been shown to have clinically important effects in properly conducted randomised controlled trials. Thus the testing phase involves the conduct of randomised trials. Lastly, once an intervention has been shown to be effective, usually with more than one randomised trial (Ferreira et al 2012), further trials may be conducted to examine how best to administer the therapy and to whom the therapy is best administered. This is the refinement and dissemination phase. It is only at this last phase that clinicians should be actively encouraged to adopt the new therapy. However, not all therapies thought to be effective in the first phase will be shown to be effective in clinical trials. We will classify alternative interventions for treatment of stress urinary incontinence or mixed urinary incontinence according to whether they are currently in the Development Phase, the Testing Phase, or the Refinement and Dissemination Phase.

We conducted a systematic review to examine evidence of the effectiveness of these alternative exercise regimens. The aim was to critically appraise the current evidence of the effectiveness of alternatives to pelvic floor muscle training for treatment of stress urinary incontinence or mixed urinary incontinence to answer the following question:

What evidence is there for alternative exercises to specific pelvic floor muscle training for treatment of female stress urinary incontinence?

Method

Identification and selection of studies

We searched specifically for trials investigating one of eight alternative exercise regimens (training of the deep abdominal muscles, the Paula method, Pilates exercise, yoga, Tai Chi, breathing exercises, posture correction, or general fitness training for other parts of the body not including specific pelvic floor muscle contractions) for women with stress urinary incontinence or mixed urinary incontinence with predominantly stress urinary incontinence. A computerised search was conducted of the PubMed database using the search terms: (urinary AND incontinence*) OR pelvic floor) AND (Yoga OR Tai Chi OR Pilates OR breathing OR posture OR transversus abdominis OR fitness). The advanced search on PEDro used the terms ‘incontinence’ and ‘clinical trial’. In PubMed the search was limited to randomised controlled trials reported in the English, Scandinavian, or German languages. The final searches were conducted on 4 January 2013.

Studies were included in the review if they were randomised controlled trials investigating the effectiveness of exercise regimens other than specific pelvic floor muscle training. Pelvic floor muscle training could be carried out with or without biofeedback, electrical stimulation, vaginal cones, and resistance devices (Dumoulin and Hay-Smith 2010, Hay-Smith et al 2011, Herderschee et al 2011, Parsons et al 2012). The inclusion criteria for the review are presented in more detail in Box 2. Exclusion criteria were: studies on women with other forms of urinary incontinence or lower urinary tract symptoms, studies on women with neurological diseases, and studies on bladder training.

Assessment of characteristics of studies

The included trials were classified according to preset criteria: type of alternative exercise regimens, comparison intervention, participants and diagnoses, interventions, primary outcome measures, and results. We considered methodological limitations of each of the trials. The PEDro scale for rating quality of randomised controlled trials was used to score methodological quality (Maher et al 2003). Two researchers classified and scored each trial independently. Disagreements were resolved by discussion.

The results are presented in the following way. Each alternative exercise regimen is considered in turn. First we provide a brief description of the theoretical justification for the therapy. Then the evidence supporting the intervention is presented, beginning with the evidence from laboratory studies and observational (epidemiological) studies and

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**Box 1. A six-stage protocol for the introduction of new therapies into clinical practice.**

| Stage 1: Clinical observation or laboratory studies | Development Phase |
| Stage 2: Clinical exploration | |
| Stage 3: Pilot studies | |
| Stage 4: Randomised clinical trials | Testing Phase |
| Stage 5: Refinement | Refinement and Dissemination Phase |
| Stage 6: Active dissemination | |

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concluding with randomised trials. We did not attempt to systematically search for laboratory or epidemiological studies as this would have been very difficult and the focus was on randomised trials. We finish the presentation of each therapy with a statement about where, in the process of development and testing, the therapy can be considered to be (Bø and Herbert 2009).

Results

Flow of studies through the review

Electronic searching identified 447 studies, among which seven eligible trials were found. The flow of studies through the review and the reasons for exclusion of studies are presented in Figure 1.

Description of studies. Among the seven randomised controlled trials that were included, three assessed abdominal training, two assessed the Paula method, and two assessed Pilates exercise. A summary of each study is presented in Table 1.

Quality. The methodological quality score of the included trials ranged between 4 and 8 with a mean of 5.8. The criteria met by each of the included trials are presented in Table 2.

Abdominal muscle training

Sapsford has claimed that ‘Abdominal muscle training to rehabilitate the pelvic floor muscles may be useful in treating urinary and fecal incontinence’ and that ‘exercise of the abdominal muscles may be beneficial in maintaining pelvic floor muscle co-ordination, support, endurance and strength’ (Sapsford and Hodges 2001).

Theory: Deep abdominal muscle contraction will make the pelvic floor muscles co-contract and co-ordination of pelvic floor muscle contraction with deep abdominal muscle contraction is more effective than specific strength training of the pelvic floor muscles to enhance continence (Sapsford 2001, Sapsford 2004).

Non-randomised studies: Five laboratory studies, using surface, wire, and concentric needle electromyography (EMG), have shown co-contraction of the pelvic floor muscles during abdominal contraction (Bø and Stien 1994, Sapsford et al. 2001, Sapsford et al. 1998, Sapsford and Hodges 2001, Neumann and Gill 2002). These studies were conducted in continent women, in whom co-contraction is expected (Jones et al. 2006, Peng et al. 2007); it is possible that different responses might be observed in incontinent women. Two newer laboratory studies, also conducted on continent women, used suprapubic and perineal ultrasound to show that in some women contraction of the transversalis abdominis muscle presses the pelvic floor downwards (Bø et al. 2003) or opens up the levator hiatus instead of lifting and constricting the pelvic openings (Bø et al. 2009).

Jones et al. (2006) found that both continent women and women with stress urinary incontinence demonstrated co-contraction of the pelvic floor muscles during deep abdominal contractions, but in another study they found that

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Box 2. Inclusion criteria.

<table>
<thead>
<tr>
<th>Design</th>
<th>Randomised trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>Females</td>
</tr>
<tr>
<td></td>
<td>Stress urinary incontinence</td>
</tr>
<tr>
<td>Intervention</td>
<td>Abdominal muscle training</td>
</tr>
<tr>
<td></td>
<td>Paula method</td>
</tr>
<tr>
<td></td>
<td>Pilates exercise</td>
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<tr>
<td></td>
<td>Yoga</td>
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<td></td>
<td>Tai Chi</td>
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<tr>
<td></td>
<td>Breathing exercises</td>
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<tr>
<td></td>
<td>Posture correction</td>
</tr>
<tr>
<td></td>
<td>General fitness training</td>
</tr>
<tr>
<td></td>
<td>Any other exercise regimen that is a possible alternative to specific pelvic floor muscle training</td>
</tr>
</tbody>
</table>

Outcome measures

- Presence or absence of urinary leakage
- Urinary leakage reported as a continuous variable (e.g., pad test)
- Urinary incontinence included in questionnaires on pelvic floor dysfunction

Comparisons

- Intervention versus control
- Intervention versus specific pelvic floor muscle training
- Intervention plus specific pelvic floor muscle training versus specific pelvic floor muscle training alone

*Specific pelvic floor muscle training can be performed with or without biofeedback, electrical stimulation, vaginal cones, or resistance devices.

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Figure 1. Identification and selection of studies.
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Intervention</th>
<th>Primary outcome</th>
<th>Results</th>
</tr>
</thead>
</table>
| Dumoulin (2004)<sup>a</sup> | Women with SUI at least 3 months post-partum | Exp = 23 Con = 20 (1 dropout) | 8 weeks intervention, 1 day/wk with PT, 5 days/wk at home | Exp = PFMT, electrical stimulation and TrA muscle training  
Con = PFMT, electrical stimulation | Modified 20-min pad test with standardised bladder volume, with cure defined as < 2 g | Absolute reduction in risk of not being cured = 4% (95% CI –22% to 30%) in favour of Exp |
| Hung (2010)           | Women with SUI or MUI                            | Exp = 31 (4 dropouts) Con = 33 (2 dropouts) | 4 months intervention following vaginal palpation | Exp = 8 visits with PT, including diaphragmatic breathing, tonic activation of TrA and PFM, strengthening of TrA/PMF/IO, functional expiratory exercises (eg, cough), impact activities (eg, jump)  
Con = Oral instruction and usual information on UI, PFMT, and bladder hygiene | Self-reported improvement | Absolute reduction in risk of remaining the same or getting worse = 30% (95% CI 11% to 47%) in favour of Exp |
| Sriboonreung (2011)<sup>a</sup> | Women with SUI                                   | Exp = 21 (2 dropouts) Con = 19 (3 dropouts) | 12 weeks intervention, 3 days/wk | Exp = PFMT and abdominal training  
Con = PFMT | 1-hr pad test after drinking 500 ml of water | Mean difference = 1 g (95% CI 0 to 2) in favour of Exp |
| Liebergal-Wischnitzer (2005) | Women with SUI or MUI                          | Exp = 30 (2 dropouts) Con = 31 (2 dropouts) | Exp = Paula method: individual therapy 45 min/wk including PFMT and daily 15–45 min at home for 12 wks | Exp = Group PFMT 30 min/wk for 4 wks and daily 15 min at home and phoned by PT every second wk  
Con = PFMT | 1-hr pad test after drinking 500 ml of water | Mean difference = 4 g (95% CI –3 to 11) in favour of Con |
Con = PFMT | 1-hr pad test after drinking 500 ml of water | Mean difference = 1 g (95% CI 1 to 2) in favour of Con |
| Savage (2005)         | Women with SUI and an Oxford grading of ≥ 2     | Exp = 6 Con = 5 (1 dropout) | 12 weeks intervention, 6 individual PT sessions of 30–45 min | Exp = Pilates, with co-contraction of PFM and abdominals, breathing and contraction during limb lifting and 10–15 min home exercise every second day  
Con = PFMT individualised and ‘knack’, no holding time | Kings Health Symptom severity score questionnaire | Insufficient data supplied |
| Culligan (2010)       | Women with or without SUI                        | Exp = 28 (2 dropouts) Con = 24 (8 dropouts) | 12 weeks intervention, 6 individual PT sessions of 30–45 min | Exp = Pilates including PFM contractions  
Con = PFMT ‘with biofeedback, vaginal manipulation, massage, neuromuscular re-education, manual therapy focussing strictly on the pelvic floor’ | PFM strength.  
Secondary: PFDI-20, PFQ-7 | PFDI-20 improvement:  
Exp: 48%, Con: 53%  
PFQ-7 improvement:  
Exp: 44%, Con: 55% |

<sup>a</sup>This trial had an additional randomised group that is not described here as the data were not relevant to this review. Con = control = pelvic floor muscle training, Exp = experimental = alternative exercise for pelvic floor muscle, IO = internal oblique, MUI = mixed urinary incontinence, PFDI-20 = pelvic floor stress inventory short form, PFQ-7 = pelvic floor impact questionnaire, PFM = pelvic floor muscles, PFMT = pelvic floor muscle training, PT = physiotherapist, SUI = stress urinary incontinence, TrA = transversus abdominis.
the response of the pelvic floor muscles was more delayed during cough in women with stress urinary incontinence compared to women who were continent (Peng et al 2007). Arab and Chehrrehrazi (2011) did not find any difference in co-contraction of abdominal muscles during pelvic floor muscle contraction between women with stress urinary incontinence and continent women.

**Randomised trials:** No trials compared abdominal muscle training with no treatment. Three trials incorporated abdominal muscle training in one of the interventions, as presented in Table 1. Dumoulin et al (2004) reported that adding transversus abdominis training to pelvic floor muscle training did not have a statistically significant effect on risk of remaining incontinent after 8 weeks of training (absolute risk reduction 4%). However the confidence interval for the effect was very wide (95% CI –22 to 30) so these data do not clearly rule out clinically important effects. Hung et al (2010) compared the effect of supervised abdominal muscle training and pelvic floor muscle training with unsupervised pelvic floor training alone and found that abdominal muscle training was associated with a large absolute reduction in risk of self-reported lack of improvement of 30% (95% CI 11 to 47). However this study has several serious limitations including that, while participants in the control group were instructed in pelvic floor muscle training on one occasion, it appears that they did not receive ongoing supervision or feedback so the control intervention was not best practice. In addition, more than half the participants had no leakage on a pad test at baseline. Sriboonreung et al (2011) did not find any additional effect of adding abdominal training to pelvic floor muscle training on incontinence, and the confidence interval for this effect (mean difference in pad test result of –1 g, 95% CI –2 to 0) was sufficiently narrow to rule out the possibility that abdominal training conferred clinically significant benefits. In our opinion the evidence from randomised trials is currently ambivalent and does not provide strong support for the effectiveness of abdominal muscle training.

**Phase:** Testing phase.

**Paula method**

**Theory:** All sphincters in the body work simultaneously, so exercising the ring muscles of the mouth, eyes, or nose will result in co-contraction and strengthening of the pelvic floor muscles (Liebergall-Wischnitzer et al 2005).

**Non-randomised studies:** Two research groups assessed whether contraction of the muscles around the mouth and eyes results in co-contraction of the pelvic floor muscles (Bø et al 2011, Resende et al 2011). Bø et al (2011) used perineal ultrasound to measure constriction of the levator hiatus and Resende et al (2011) used surface EMG to measure activation of the pelvic floor muscles during the Paula method. Neither research group found any co-contraction of the pelvic floor muscles during contraction of the mouth or eyes.

**Randomised trials:** No trials compared the Paula method with no treatment. Two trials, one a pilot study of 59 women and the other a large trial of 245 women, have been conducted by one group of researchers (Liebergall-Wischnitzer et al 2005, Liebergall-Wischnitzer et al 2009). In both trials, participants randomised to the group receiving Paula therapy attended up to 9 hours of individualised instruction and practised the Paula method including additional pelvic

### Table 2. PEDro Scale criteria and ratings for the included studies (n = 7).

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>Random allocation</th>
<th>Concealed allocation</th>
<th>Groups similar at baseline</th>
<th>Participant blinding</th>
<th>Therapist blinding</th>
<th>Assessor blinding</th>
<th>Follow-up &gt; 85%</th>
<th>Between-group difference reported</th>
<th>Point estimate and variability reported</th>
<th>Intention-to-treat analysis</th>
<th>Between-group difference reported</th>
<th>Point estimate and variability reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dumoulin (2004)</td>
<td>Abdominal training</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Hung (2010)</td>
<td>Abdominal training</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Sriboonreung (2005)</td>
<td>Abdominal training</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Liebergall-Wischnitzer (2009)</td>
<td>Paula method</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Liebergall-Wischnitzer (2005)</td>
<td>Paula method</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Savage (2005)</td>
<td>Pilates exercise</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Culligan (2010)</td>
<td>Pilates exercise</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

Y = yes, N = no.
floor muscle contractions for up to 63 hours at home. Control group participants attended up to 3 hours of group classes and practised pelvic floor muscle exercise for up to 21 hours at home. The outcomes slightly favoured pelvic floor muscle training in both trials. Mean difference in change in leakage with a one-hour pad test was 4.1 g (95% CI 2.6 to 10.8) in the 2005 trial and 1.0 g (95% CI 0.5 to 1.5) in the 2009 trial. Interpretation of these trials is complicated by the fact that the pelvic floor muscle training was far from optimal. In addition, there was a very high loss to follow-up (28%) in the 2009 trial. These randomised trials provide no evidence of a clinically worthwhile effect of the Paula method and suggest the intervention is not effective.

Phase: Testing phase.

Pilates exercise
Modern Pilates exercise programs incorporate exercises that involve breathing and contraction of pelvic floor muscles. The pelvic floor muscles are not specifically trained, but pelvic floor muscles are trained incidentally during exercise and movement.

Theory: The co-contraction of pelvic floor muscles that occurs incidentally during Pilates exercises will counteract increases in intra-abdominal pressure that occur during exercise, preventing leakage and strengthening pelvic floor muscles (Lately 2002).

Non-randomised studies: One ultrasound study by Baessler and Junginger (2010) found that both yoga and Pilates exercise without pre-contraction of the pelvic floor muscles descended the bladder neck by 0 to 17 mm. In five of the 10 subjects there was no lift when precontraction was added to the exercises.

Randomised trials: No trials compared Pilates with no treatment. Two trials have compared the effects of Pilates exercise to other interventions, as presented in Table 1. One was a pilot study of 10 participants (Savage 2005). Insufficient data were provided to permit between-group statistical comparisons. A second study (Culligan et al 2010) compared changes in pelvic floor muscle strength and pelvic floor symptoms in 62 women assigned either to Pilates exercise or pelvic floor muscle training. The mean strength gains experienced by the two groups were similar, with a mean difference 0.4 cmH2O favouring pelvic floor muscle training (95% CI –3.7 to 4.6). These women had ‘no or little pelvic floor muscle dysfunction’, and it is not reported how many of them had pelvic floor dysfunction. Consequently this study does not provide information about the effectiveness of Pilates training for treating urinary incontinence.

Phase: Testing phase.

Yoga

Theory: Yoga emerged from ancient Indian spiritual beliefs, but in western countries has evolved into various programs for stretching, breathing, balance, and strengthening exercise; sometimes associated with meditation. Some yoga programs involve contraction of the anal sphincter and the pelvic floor muscles (Teasdill 2000, Kaminoff 2007).

Non-randomised studies: No studies were found.

Randomised trials: No randomised trials of yoga for treatment of urinary incontinence were found.

Phase: Development phase.

Tai Chi

Theory: Tai Chi is an ancient exercise regimen originating from China and has widespread use as exercise for general health in China. Chang (1986) describes an exercise called ‘the dear’ involving contraction of the anal sphincter. The exercise is recommended for both men and women for conditions related to the pelvic area.

Non-randomised studies: No studies were found.

Randomised trials: No randomised trials on the effect of Tai Chi on female stress urinary incontinence were found.

Phase: Development phase.

Breathing exercises

Theory: The pelvic floor works in co-ordination with breathing. Holding the breath may increase intra-abdominal pressure and thus cause descent, stretching, and weakness of the pelvic floor muscles. Lee et al (2008) suggested that ‘non-optimal strategies for posture, movement and/or breathing create failed load transfer which can lead to pain, incontinence and/or breathing disorders’. Caufriez (1997) has developed a technique called the abdominal hypopressive technique, which combines a special respiration technique with abdominal indrawing. He hypothesizes that it ‘relaxes the diaphragm, decreases intra-abdominal pressure and may activate the abdominal and pelvic floor muscles simultaneously’.

Non-randomised studies: In a laboratory study of six healthy continent women, Hodges et al (2007) assessed the responses of pelvic floor muscles during arm movements and different respiratory tasks using anal and vaginal surface EMG. They found that all but one woman had greater vaginal EMG activity during expiration than in inspiration. During breathing with increased dead space for 90 sec, pelvic floor muscle EMG increased during both respiratory phases compared to quiet breathing, but was greater during expiration. Intra-abdominal pressure increased during inspiration, and during hypercapnia intra-abdominal pressure increased more during inspiration. However, vaginal EMG was greater during expiration, which the authors attributed to a response of the pelvic floor muscles to contraction of the abdominal muscles. Lee et al (2008) used these data to suggest that ‘development of pelvic floor dysfunction is also related to other disorders such as low back pain and breathing disorders’.

Stüpp et al (2011) found that the abdominal hypopressive technique was significantly less effective than voluntary pelvic floor muscle contraction alone in activating the pelvic floor muscles measured with vaginal surface EMG and there was no additional effect of adding the hypopressive technique to the pelvic floor muscle contraction.

A laboratory study of 12 healthy women with mean age 31 (range 20 to 51) measured vaginal pressure in the posterior fornix during cough and different exercises with and without conscious breathing (O’Dell et al 2007). In contrast to the previous findings, these authors did not find any difference in intra-abdominal pressure with breath-holding or expiration.
Randomised trials: No randomised trials have compared incontinence outcomes in women allocated to receive breathing exercise with pelvic floor muscle training or allocated to pelvic floor muscle training with and without breathing exercises during pelvic floor muscle contraction.

Phase: Development phase.

Posture correction

Theory: Carriere (2006) has claimed that ‘poor posture’ can lead to pain and dysfunction in the pelvic floor. Lee et al (2008, p 333) stated that ‘optimal strategies for transferring loads will balance control of movement while maintaining optimal joint axes, maintain sufficient intra-abdominal pressure without compromising the organs (preserve continence, prevent prolapse or herniation) and support respiration. Non-optimal strategies for posture, movement and/or breathing create failed load transfer which can lead to pain, incontinence and breathing disorders’.

Non-randomised studies: Carriere (2006) and Lee et al (2008) support their claims by citing a cross-sectional study by Smith et al (2006). However the study by Smith and colleagues did not incorporate any data on posture. Pool-Goudzwaard et al (2004) use data from an in vitro cadaver study to suggest that the pelvic floor muscles stabilise the pelvic girdle. Contradictory results have been found by others (Fitzgerald and Mallinson 2012, Stuge et al 2006).

A non-randomised controlled trial of 52 women with stress urinary incontinence found that ‘global postural re-education’ was more effective than pelvic floor muscle training, with an absolute difference in cure rate of 16% (Fozzatti et al 2010).

Randomised trials: There have been no randomised trials of the effects of postural correction on urinary incontinence.

Phase: Development phase.

General fitness training

Theory: It has been suggested that the co-contraction of the pelvic floor muscles and increase in intra-abdominal pressure expected to occur during general movements will act as a training stimulus and that those who are physically active therefore have less stress incontinence (Bø 2004, Kikuchi et al 2007).

Non-randomised studies: No interventional studies were found. Several prevalence studies show high prevalences of stress urinary incontinence among elite athletes and sports participants (Bø 2004). Other cross-sectional studies found that physically active women have less urinary incontinence (Hannestad et al 2003, Kikuchi et al 2007).

Randomised trials: No trials were found comparing general fitness training or exercise programs without pelvic floor muscle training to pelvic floor muscle training alone, other methods or no treatment of stress urinary incontinence.

Phase: Development phase.

Discussion

Seven randomised trials were found investigating the effects of alternative methods for treatment of stress urinary incontinence. None of them compared the effect of the alternative exercise regimens with no treatment. The methodological quality of these trials varied between 4 and 8 on the PEDro scale. Given that it is not possible to blind the participants or the trainers in complex interventions, 8 would be the highest possible score in these trials. To date there is no evidence from high quality randomised controlled trials to support use of alternative exercise regimens to reduce stress urinary incontinence symptoms.

A limitation of the current review is that, while we systematically reviewed randomised controlled trials of the effects of the various interventions, no attempt was made to systematically review the non-randomised and pre-clinical (laboratory studies). It would be difficult or impossible to conduct a comprehensive search of this literature, or to systematically evaluate the quality of the laboratory studies. However the primary conclusions of the review are necessarily based on the findings of randomised trials, so the failure to conduct a systematic review of non-randomised and pre-clinical studies should not have biased the conclusions of the review.

A systematic review of trials investigating the effects of deep abdominal training on urinary incontinence concluded that there was no evidence this intervention is more effective than pelvic floor muscle training (Bø et al 2009). However a new randomised controlled trial (Hung et al 2010), conducted by the researchers who first advocated deep abdominal training for treatment of urinary incontinence, has been published since the former review. In that trial the focus was on respiration in co-ordination with transversus abdominis and pelvic floor muscle training (Hung et al 2010). However, the trial has several important limitations: most importantly there was no actual leakage (medians of 0 leakage volume and 0 episodes of leakage) in most subjects in either group at baseline, and the control group did not receive a structured pelvic floor muscle training program. In addition, there was a large baseline imbalance in the type of incontinence with significantly (27%) more participants in the alternative group reporting urgency. Another randomised trial (Sriboonreung et al 2011) confirmed that there was no additional effect of adding abdominal training to pelvic floor muscle training. There is, therefore, still no robust evidence to support the practice of adding deep abdominal training to pelvic floor muscle training for stress urinary incontinence or mixed urinary incontinence.

The Paula method is derived from a similar theoretical framework to abdominal training because it is based on the idea that a co-contraction of other muscles (in this case contraction of ring muscles of the mouth and eyes) can train the pelvic floor muscles (Liebergall-Wischnitzer et al 2005). However, two independent research groups did not find any co-contraction of the pelvic floor muscles during contraction of ring muscles of the mouth and eyes, so it would appear unlikely on the basis of these laboratory studies that there would be any effect of a training regimen applying the Paula method (Bø et al 2011, Resende et al 2011). The two randomised trials suggest that the Paula method has similar effects to, or is slightly less effective than, a very poorly implemented program of pelvic floor muscle training.

Theoretically non-specific exercises could strengthen pelvic floor muscles. It has been claimed that Pilates exercises and yoga include contractions of the pelvic floor muscles that
could strengthen them and treat stress urinary incontinence/mixed urinary incontinence. The challenge is that several studies have shown more than 30% of women with pelvic floor dysfunction are not able to contract the pelvic floor muscles correctly even after thorough individual teaching and feedback (Benvenuti et al 1987, Bump et al 1991, Bø et al 1988). The most common errors are to bear down or to use hip adductor, gluteal, or abdominal muscles instead of the pelvic floor muscles (Bump et al 1991, Bø et al 1988).

Group training of pelvic floor muscles has been shown in several randomised controlled trials to be effective, but these programs included individual instruction and feedback of the contraction (Bø et al 1990, Bø et al 1999, Mørkved and Bø 1997, Mørkved et al 2003). It is not yet known whether it is possible to teach women participating in a general group-based exercise class to contract the pelvic floor muscles. Culligan et al (2010) concluded, on the basis of their finding that Pilates training produced similar strength gains to pelvic floor muscle training, that their results may ‘lead to widespread use of Pilates-based exercise programs to treat and prevent pelvic floor dysfunction’. In our opinion that conclusion is premature because no randomised trials have demonstrated beneficial effects of Pilates exercise on clinically important outcomes (continence) in a sample of incontinent women. Indeed, observational data suggest that this is not the case: a study on group fitness instructors showed that the prevalence of incontinence was the same amongst female yoga and Pilates instructors as in the general population, suggesting that the exercises did not provide a beneficial effect (Bø et al 2011).

The suggestion of an association or causal link between breathing, posture, and pelvic floor muscle dysfunction should be tested in case-control or cohort studies with blinded assessors. A large cross-sectional study found associations between incontinence, low back pain, and respiratory disease (Smith et al 2006), but it is quite possible the associations were confounded, so that while participants had multiple complaints at the same time the conditions were not causally related. Cross-sectional studies usually provide weak evidence of causality.

There are two contradictory hypotheses on the effect of general exercise on the pelvic floor, previously described by Bø (2004). One hypothesis holds that general exercise makes pelvic floor muscles co-contract, and thus strengthens pelvic floor muscles and prevents stress urinary incontinence. The other hypothesis is that repetitive or heavy impact on the pelvic floor muscles co-contract, and thus strengthens pelvic floor muscles. Culligan et al (2010) concluded, on the basis of their finding that Pilates training produced similar strength gains to pelvic floor muscle training, that their results may ‘lead to widespread use of Pilates-based exercise programs to treat and prevent pelvic floor dysfunction’. In our opinion that conclusion is premature because no randomised trials have demonstrated beneficial effects of Pilates exercise on clinically important outcomes (continence) in a sample of incontinent women. Indeed, observational data suggest that this is not the case: a study on group fitness instructors showed that the prevalence of incontinence was the same amongst female yoga and Pilates instructors as in the general population, suggesting that the exercises did not provide a beneficial effect (Bø et al 2011).

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There are two contradictory hypotheses on the effect of general exercise on the pelvic floor, previously described by Bø (2004). One hypothesis holds that general exercise makes pelvic floor muscles co-contract, and thus strengthens pelvic floor muscles and prevents stress urinary incontinence. The other hypothesis is that repetitive or heavy impact on the pelvic floor, such as is caused by heavy lifting or marathon running, may fatigue, stretch, and weaken the muscles. There is some evidence that bouts of strenuous exercise may weaken the pelvic floor muscles immediately after the intervention (Ree et al 2007), and new symptoms of pelvic floor dysfunction have been seen to emerge after 6 weeks of strenuous exercise (Larsen and Yavorek 2007). It is difficult to establish whether habitual physical activity increases or decreases the risk of incontinence using observational studies because women with stress urinary incontinence often discontinue physical activity. The issue can only be properly resolved with randomised controlled trials.

Systematic reviews on the effect of pelvic floor muscle training on stress urinary incontinence/mixed urinary incontinence have concluded that intensive supervised training can produce clinically important effects (Dumoulin and Hay-Smith 2010, Hay-Smith et al 2011, Herderschee et al 2011, Parsons et al 2012). This systematic review has demonstrated that the alternative methods of exercising pelvic floor muscles have not been convincingly shown to be effective with high quality randomised controlled trials. Thus these interventions should be considered to be in a Development or Testing phase. Accordingly, these alternative methods should not yet be used routinely, or recommended for routine use, in clinical practice (Bø and Herbert 2009).

Several alternative interventions are still in the development phase (yoga, Tai Chi, breathing exercises, posture correction, and fitness training). It will be necessary to conduct further laboratory studies investigating potential mechanisms of these interventions. Promising laboratory studies might justify further uncontrolled clinical exploration and pilot randomised studies. The patients in these studies should be fully informed of the exploratory and experimental nature of the treatment.

When laboratory studies and uncontrolled clinical observations or pilot studies suggest a clinically important effect of the new alternative method, it might be appropriate to commence the Testing phase and conduct high quality randomised controlled trials. Three of the alternative interventions (abdominal muscle training, the Paula method, and Pilates exercise) have been subjected to randomised controlled trials and are therefore currently in the Testing phase. Arguably, however, the Development phase for these interventions has been insufficiently rigorous. There is not yet convincing evidence from high quality randomised trials of a clinically important effect of these interventions, so they should not yet be used routinely, or recommended for routine use, in clinical practice.

As we have acknowledged before (Bø and Herbert 2009), many clinicians will feel that strict adherence to a model in which new interventions are not routinely practised until they have been demonstrated to have clinically important effects in randomised controlled trials will stifle innovation, ideas, and further development (Crosbie 2013). We argue that patients have a right to expect they will be treated with interventions that have been shown to be effective. In general, patients do not want to waste time and money on ineffective treatments, and patients generally trust that the interventions they are offered are effective.

In summary, no trials were found comparing alternative exercises to no treatment. It has not yet been conclusively demonstrated that abdominal training, the Paula method, Pilates, yoga, Tai Chi, breathing exercises, postural training, or general fitness training is effective for the prevention or treatment of stress urinary incontinence either as an alternative or an adjunct to pelvic floor muscle training. Further development and testing, ultimately with randomised controlled trials, is needed before these alternative interventions become routine clinical practice.

References

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