Pelvic floor muscle exercises are often taught in isolation as a treatment for stress urinary incontinence in women. Jeanette Haslam asks whether they should be practiced with co-contraction of other muscles.

**KEY WORDS**
- Stress incontinence
- Breathing re-education
- Muscle co-activation

### REFERENCES


### Figure 1. Abdomino-Pelvic Cavity Muscles

- **Transversus abdominis**
- **Diaphragm**
- **Multifidus**
- Pelvic floor muscles without orifices

The ICS Standardisation Committee (Abrams et al, 2002) defines the symptom of stress urinary incontinence as the complaint of involuntary leakage on effort or exertion, or on sneezing or coughing. Genuine stress incontinence (now known as urodynamically proven stress incontinence) is the involuntary loss of urine occurring when, in the absence of a detrusor contraction, the intravesical pressure exceeds the maximal urethral pressure. These definitions tend to look at the urinary mechanism in isolation, and many clinicians now advocate that a more holistic view should be taken of this problem.

The abdomino-pelvic cavity muscles comprise:
- The diaphragm as its upper boundary;
- The deepest layer of the back extensors (multifidus) as its posterior boundary;
- The deepest layer of the abdominal muscles (transversus abdominis) as the anterior boundary;
- The pelvic floor muscles (PFM) as its inferior boundary (Fig 1).

There is an increase in intra-urethral pressure caused by an anticipatory voluntary or reflex contraction of the PFM before a cough in healthy women. This reflex has been harnessed by clinicians who teach the knack of a voluntary PFM pre-contraction before a cough in women with mild stress urinary incontinence (Miller et al, 1998).

PFM are essential for urinary and faecal continence and for organ support, and the brain perceives overall movement of the muscles, not individual muscle activity. Therefore all the boundaries of the abdomino-pelvic cavity should be considered when attempting a holistic rehabilitation of a person experiencing stress urinary incontinence.

In many parts of the world isolationist pelvic floor exercises have become the method of choice. For example, in the UK Laycock (1992) warned against using extraneous muscles such as the abdominals, glutei or thigh adductors. In the USA, Dougherty (1994) recommended isolation of the PFM during exercise, warning against tightening of the abdomen, buttocks and thighs and the requirement to exercise in the recumbent position.

However, experts are now debating whether PFM exercise should be taught in isolation or practised with co-contraction of other muscle groups.

**Basic principles** It is clear that the basic exercise principles of overload, specificity, maintenance and reversibility should be observed when teaching pelvic floor muscle exercises (Table 1). Individual patient assessment and examination is necessary, patient compliance is essential to successful outcomes and both exercises taught in individually or in groups are of value (Bo, 1994).

**PFM exercise** It is agreed by expert opinion that PFM re-education and other conservative therapies should be the initial intervention in the management of urinary incontinence in women (Department of Health, 2000; Wilson et al, 2001). There is strong evidence to support PFM exercise as being effective in reducing the symptoms of stress urinary incontinence (Berghmans et al, 1998).

A vaginal examination and continence assessment should be carried out before an appropriate exercise regimen is taught (Bo et al, 1988.). The PERFECT assessment technique for the PFM has been validated and described by Laycock and Jerwood (2001), and inter-tester reliability of digital vaginal assessment after appropriate training has been established (Jeyaseelan et al, 2001). Muscle training principles of strength, power, endurance, repetitions necessary and fatigue should also be considered when teaching PFM exercises (Haslam, 2002).

Small studies have shown that the PFM can be activated in a variety of ways. A pilot study showed that extension, adduction, lateral rotation hip patterns of movement using proprioceptive neuromuscular facilitation (PNF) assisted in PFM activation (Haslam, 1997). PNF is a technique aiming to stimulate the maximum numbers of motor units into activity by using
three dimensional patterns of movements — for example, a movement in a straight diagonal line with a rotary component.

There is growing evidence that muscles other than the PFM can assist in rehabilitating the continence mechanism. Sapsford (2001) proposed that a PFM rehabilitation programme should involve the restoration of the automatic recruitment timing of the deep abdominal muscles as well as PFM endurance and strength to optimise rehabilitation outcomes. Efficient human movement depends on having core stability of the lumbo-pelvic region. To have good core stability the recruitment of abdominal muscles starts with the deepest layer of muscle (transversus abdominus), and the aim is to have this happen automatically.

**Lower abdominal muscles** In the late 1990s a group of Australian researchers considered co-activation of the PFM with the lower abdominal muscles (Sapsford et al, 1997). They carried out a small study of a healthy population and found co-contraction of the lower abdominal muscles during a maximal PFM contraction.

Further work by the same group showed co-activation of the lower abdominal muscles and PFM during voluntary exercise (Sapsford et al, 2001). This study also showed an increase in electromyographic (EMG) activity in the PFM in response to contraction of the transversus abdominis. However, Peschers et al (2001) could not demonstrate increase in PFM readings with co-contraction of the lower abdominal muscles but showed significant increase in PFM activity with co-contraction of the glutei.

This conflicting opinion caused a small group of UK researchers to investigate if transversus abdominis contractions could be shown to affect PFM activity, using widely available clinic-based equipment (Laycock et al, 2001). They showed that five out of six subjects demonstrated a statistically significant increase in EMG activity of the PFM with a co-contraction of the lower abdominal muscles. The authors concluded that appropriate co-contraction of the lower abdominals may be taught as an additional motivator and can assist PFM re-education.

**The diaphragm** Many physiotherapists believe that breathing should be evaluated and any dysfunction treated appropriately in those presenting with continence disorders (Carrière, 2002). The principle underlying this is that during inhalation the diaphragm moves down, causing the abdomen to widen and the PFM to move slightly downwards; then, during exhalation, the abdominals move back to start position, with the PFM contracting upwards, assisted by contraction of the transversus abdominis. Breathing exercises, including some with forced expiratory techniques, have been successfully used over many years for PFM activation, but with little research evidence to prove their efficacy.

**Multifidus** Multifidus is the deepest layer of the extensors of the spine. The lumbar multifidus is thought to work as a force coupled with the PFM to stabilise the sacrum. There are specific methods of facilitating the activity of multifidus (Jones et al, 2002), and this is practised by experienced physiotherapists.

**Conclusions** It must be ensured that the PFM are capable of contracting before starting a rehabilitation programme. If they cannot be voluntarily activated, appropriate neuromuscular stimulation may be necessary. The PFM should be exercised at a level appropriate to the individual in functional positions.

As the body works in patterns of movement it is sensible to exercise in patterns of movement, incorporating evaluation of breathing dysfunction and other relevant muscle groups, including the transversus abdominis in particular. This means that breathing and other relevant muscle groups must be specifically evaluated and appropriate action taken.

Techniques using vaginal cones, biofeedback, PNF, exercise balls and balance boards have varying degrees of evidence to support their use, but can all be harnessed to increase proprioception and hence patient knowledge and compliance to exercise.

The early pioneers of PFM rehabilitation were successful in their time, but more recent research has offered more specific guidance as to the appropriate delivery of rehabilitation techniques for the PFM. There is a need for further research concerning optimum exercise regimens and the evaluation of other facilitatory techniques.

### Table 1. Basic Principles of Muscle

<table>
<thead>
<tr>
<th>Overload</th>
<th>Exercising at a level above normal</th>
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<tr>
<td>Specificity</td>
<td>Functional exercise as similar as possible to the desired activity</td>
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<tr>
<td>Maintenance</td>
<td>To maintain improvement, exercise needs to be continued on a regular basis</td>
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<tr>
<td>Reversibility</td>
<td>Detraining occurs rapidly when</td>
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