Can you train the pelvic floor muscles by contracting other related muscles?
Kruger, J., Budgett, D., Goodman, J., Bo, K.

October 2019
Elizabeth Lewis

Introduction: Although there is level 1 evidence and grade A recommendation for PFMT to be used as first line treatment for SUI/MUI in women, more than 30% of women may not be able to perform a correct PFM contraction on assessment or then learn how to train the PFM. It has been hypothesized that women who can’t specifically contract their PFM could possibly activate it by contracting other muscles such as RA, TrA, hip adductors or hip external rotators. SUI by definition implies increased IAP may cause leakage. Although other studies have measured IAP, none have measured pressures along the length of the vagina and including IAP and pressures from surrounding (mostly pelvic floor), muscles.

Aim: First, to assess whether contraction of other muscles sufficiently activate the PFM to provide a training effect and secondly to assess efficacy of this group’s novel intravaginal pressure (Fem Fit) sensor to measure simultaneously: PFM contraction and IAP during all exercises.

Methods: Cross-sectional study using FemFit: a prototype sensor array designed to fit the length of the vagina. It is 80 mm long (slightly over 3”), and ranges from 4 mm to 24 mm (less than 1/8” to slightly less than 1”), in width. It has 8 evenly spaced, isolated pressure sensors, all encapsulated in medical grade silicone. It is flat and compliant to enable conforming to the vagina and to the normal movement of the vaginal walls. The ultrasound image of the FemFit in Situ illustrates how it sits and deforms (Figure 2). Sensors 1-6 measure the activation of mostly PFM and 7 and 8, in the posterior fornix, measure IAP. The sensor

Convenience sample was of 21 experienced PF and WH PT volunteers. Exclusion: inability to contract the PF, pregnancy, being less than 12 months postpartum, >Stage 2 prolapse and SUI>1x/week.

All participants inserted the FemFit with instruction to insert as a tampon with sensors facing posterior vaginal wall and then ability to contract the PFM was observed visually at the perineum, of in-drawing of the FemFit. The procedure involved first a 30 sec. relaxation, then 3 maximal PFM contractions. After that, a random order of contractions was measured of IR of the hips, ER of the hips, Adduction of the hips, Abduction of the hips, a Gluteal contraction, a pelvic tilt (primarily Rectus Abdominus), abdominal crunch (also primarily RA), in-drawing (primarily TrA), deep inspiration and deep expiration, then a 30 second relaxation followed by a double cough. All done in supine. Maximal pressures were determined and then averaged over 3 repetitions, for each sensor and for each exercise, after subtracting the baseline pressures, (before exercises). The sensor
measuring the highest pressure during PFM contractions was deemed to represent the PFM location. Sensor 8 represented IAP.

**Data analysis:** Wilcoxon paired tests were used to determine differences in PFM pressure between exercises and for differences between the PFM sensor and the abdominal sensor for each exercise. Bonferroni correction was applied setting at alpha .005.

**Results:** Data from 19 women was used and all but two reportedly co-contract their PFM during everyday activities (functional training). Mean PFM contraction pressure was 16.3 (+or- 12.2) mmHg. PFM region contraction pressure was significantly higher during a targeted PFM contraction than with any other exercises, except cough or curl-up, (Table 1), (where the IAP was also significantly higher). During curl-up, only 5 subjects had higher PFM pressures, the other 14 had lower pressures than during a PFM contraction. Fig 4 indicates a significantly higher PFM pressure than IAP for a PFM contraction, internal rotators and gluteals, (but internal rotators and gluteals generated approximately only a 30% PFM contraction)

**Discussion:** The greatest difference between PFM pressure and IAP was during a PFM contraction, vs any other exercise (P<.0001). The highest PFM pressure mean was with a cough, (but with an even higher IAP). There may be an increase of PFM pressure as a co-contraction during a curl-up, but that increase is a trivial difference in PFM pressure as compared to an isolated PFM contraction (pressure difference). A previous study by Bo et al also indicated that PFM region pressures were higher with a targeted PFM contraction vs other exercises, but their tool couldn’t differentiate PFM co-contraction vs IAP related pressure increases.

Curl-ups generated a 50% of a PFM co-contraction pressure increase, other muscles only a 30% increase. Even targeted muscle (vs co-contraction) training studies recommend training from 60-80% of the 1RM for an effect. One study of women unable to contract their PFM indicated improvement in sx of UI with self vaginal palpation, another study of prenatal to 12 months post-partum women indicated only 4% couldn’t contract their PFM at gestational week 21. They infer that possibly the inability to contract the PFM is a smaller problem than thought earlier. They say that use of manometers to assess PFM strength thru a pressure rise during a PFM contraction has been criticized due to inability to distinguish cause of pressure rise: IAP vs PFM contraction. This study confirmed efficacy of FemFit to distinguish and simultaneously measure PFM contraction and IAP. It could enable more info on influence of IAP and PFM co-contraction during exercises.

Their results of IAP as compared to previous studies, indicated lower IAP during curl-up (8.8 vs 27, mm Hg) and expiration (6.12 vs 36, mm Hg), but similar with a cough (40.99 vs 46, mm Hg). This suggests previous measurements may have included both PFM activation and abdominal pressure measurements. All measures had higher IAP vs PFM during curl up, cough and expiration. Due to that, curl-ups and coughs can’t be recommended as effective PFM training, especially in women w/o co-contraction of the PFM.

More than ½ of sample had a very weak PFM contraction, (12 subjects), comparable to PFM dysfunction or to 6 wks post-partum. The authors report that functional training of the PFM (performing the knack during coughs or other ADL’s) is commonly taught/used by PTs. They conclude that the significant weakness of this group indicates that functional training is not
effective in increasing PFM strength, due to the low percentage of 1 RM used. They report that studies show that loads of > 60% 1 RM can be effective in building muscle strength and potentially mass, but when comparing 20% to 80% loads, there was a 20-25% greater hypertrophy and strength change with the 80% load. They quote Neels et al. (2018) which indicates that contracting other muscles decreased PFM contraction ability post-partum, but that this could be unlearned easily with visual/verbal feedback.

**Strengths:** this is the first time vaginal pressures have been measured simultaneous to IAP during exercises and indicates that targeted PFM contractions develop higher pressures in PFM region than other exercises (except curl-ups) and that the Fem Fit was comfortable and exercises were doable.

**Limitations:** relatively small sample size, with non-randomized group, so be cautious with interpretation for general public. However, ½ of group had a weak PFM, which reinforces need for targeted PFM training.

**Conclusion:** Co-contractions of the PFM during contractions of other muscle groups are minor. As with other published data, PFM contractions should continue to be recommended for PFM training. Fem-Fit was useful to distinguish pressures from IAP vs pelvic floor muscle region.

**Questions:**
1) Knowing that these were PF and WH PTs who did functional training, yet nearly half the sample had weak PFM contractions, (but none had SUI >1x/week): what do you think you might teach your patients regarding the role of functional training in their rehab?
2) Do you try to measure for a 1 RM with your patients? If so, how do you do that?