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# A COMPARISON OF PELVIC FLOOR FUNCTION IN NULLIPAROUS ELITE ATHLETES AND NULLIPAROUS CONTROLS

Hypothesis / aims of study

There is preliminary evidence linking exercise history with poor performance in labour and increased incidence of stress incontinence which may be due to altered pelvic floor function and/or biomechanics. The investigation of pelvic floor function in athletes and controls is therefore of general interest in order to allow clinicians to better advise young women on the likely obstetric implications of high levels of exercise. We have previously shown that HIFIT (high impact, frequent intense training) athletes have an increased cross-sectional area of the levator ani muscle group visualized using magnetic resonance imaging (MRI)(1).The aim of this study was to characterize pelvic floor muscle function and pelvic organ descent in a nulliparous athletic population and compare it to matched healthy nulliparous controls, using 3D/4D pelvic floor ultrasound.

Study design, materials and methods

In this prospective study, translabial ultrasound was used to assess pelvic floor anatomy and function in fifty nulliparous female volunteers (aged 19-39 years). Twenty five of these were HIFIT and twenty five were age and BMI matched controls. All subjects were interviewed prior to the ultrasound to determine symptoms of incontinence, bowel dysfunction or prolapse. Additionally, the athletes were interviewed to determine if they fitted the criteria for 'HIFIT'. These included more than five years of participation in their particular sport, the sport had to involve a high level of impact (landing) and they had to have reached a national or international standard of competition. Imaging was performed using a GE Kretz Voluson 730/730 Expert with 7-4MHz transducer. All subjects were imaged supine, after voiding. Volume datasets were acquired at rest, on pelvic floor muscle contraction and on valsalva. The most effective of at least three manoeuvres was used for evaluation. Pelvic organ descent was assessed on Valsalva. Data acquisition and analysis was undertaken by two of the authors. Images were saved on DVD which allowed for later analysis performed with the software 4D View V 2.1 (GE Medical Kretztechnik, Zipf, Austria). Previously published parameters used to assess pelvic floor function and anatomy were used in both groups(2). Formal ethics approval was obtained from the institutional Ethics Committee.

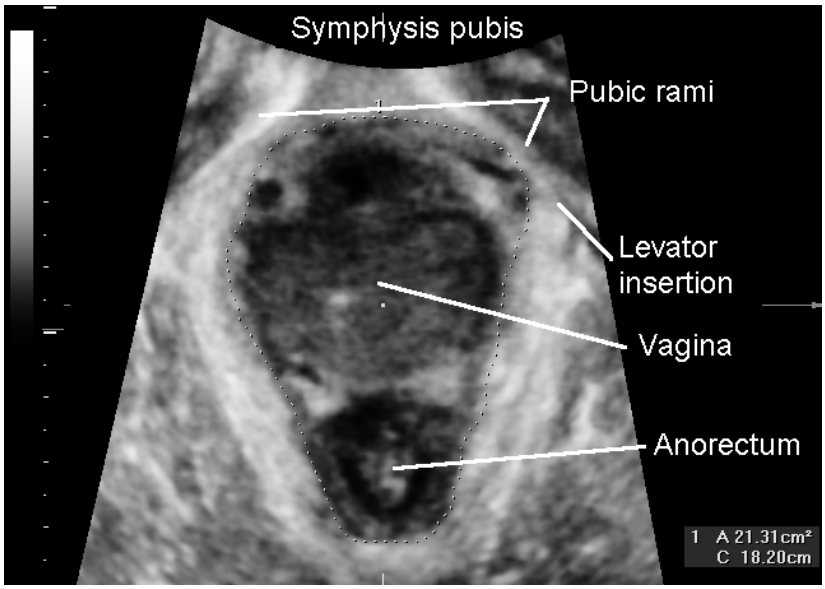


*Figure: Measuring minimal hiatal dimensions in the axial plane.*

Results

The mean age was 28.5 and 27.6 years and BMI 22.3, 23.2 for the HIFIT and control groups respectively. All the participants were asymptomatic for prolapse; three of the athletes reported stress incontinence and one urge incontinence more than once a month. In the control subjects two reported stress incontinence and two urge incontinence. None had a history of pelvic surgery. The results are summarized in the table below. Significant differences were demonstrated in the diameter of the pubovisceral muscle, bladder descent and hiatal area on valsalva. There were no significant differences in hiatal area at rest or on maximal voluntary contraction between the two groups.

| | ***HIFIT n=24*** | ***Controls n=22*** | ***P=*** |
|---|---|---|---|
| *Levator hiatal area at rest $cm^2$ (±SD)* | 12.71 (2.49) | 12.77 (2.43) | *0.72* |
| *Levator hiatal area on PFMC $cm^2$ (±SD)* | 10.59 (1.71) | 9.72 (2.11) | *0.2* |
| *Levator hiatal area on Valsalva $cm^2$ (±SD)* | 21.53 (9.98) | 14.91 (7.18) | *0.01** |
| *Pubovisceral muscle diameter cm* | *0.96* | *0.7* | *<0.01** |

| | | | |
|---|---|---|---|
| *Bladder descent on Valsalva (mm)* | *22.7(7.85)* | *15.1(10.2)* | *0.03** |
| *Uterine position on Valsalva (mm)* | *22.7(17.15)* | *28.7(16.9)* | *0.31* |
| *Rectal position on Valsalva (mm)* | *1.04(17.38)* | *5.37(11.36)* | *0.35* |

Table 1: Biometric indices of the levator hiatus, pelvic organ descent and the pubovisceral muscle

Interpretation of results

This study has shown that female athletes do differ from age matched nulliparous controls in several important aspects of pelvic floor function and anatomy. Results confirmed our previous MRI findings that the HIFIT group has significantly increased diameters of the levator ani muscle. Despite this however, HIFIT athletes were able to markedly increase the area of the levator hiatus during a voluntary valsalva manoeuvre, as imaged using 3D ultrasound.

There may be several explanations for this including a probable increased kinaesthetic awareness in the HIFIT group, and hence the ability to recruit task specific muscles, as well as an increased abdominal strength and the concomitant increase in intra-abdominal pressure(IAP) that high impact athletes are able to develop. However, the differences observed may also be due to differences in connective tissue or muscle biomechanics that may predate or be the consequence of high- impact training.

For this reason we are planning further studies using measures of pelvic floor muscle biomechanics obtained by elastometry. This study does not support a functional/anatomical explanation for the presumed poorer obstetric performance of athletes since indices of increased pelvic organ descent are associated with easier childbirth(3), not the opposite.

Concluding message

Nulliparous female athletes showed increased distensibility of the levator hiatus and higher degrees of pelvic organ descent when compared to matched controls. On the basis of pelvic floor ultrasound, our findings do not support the hypothesis that changes in pelvic floor anatomy and function may result in poorer obstetric performance in female athletes.

References

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**FUNDING: NONE**
**DISCLOSURES: NONE**
**HUMAN SUBJECTS: This study was approved by the University of Auckland Human Participants Ethics Commitee and followed the Declaration of Helsinki Informed consent was obtained from the patients.**