572

Tennfjord M[1], Hilde G[2], Ellstrøm-Engh M[3], Bø K[4]
1. *Norwegian School of Sport Sciences, Department of Sports Medicine/Akershus university hospital, Department of Obstetrics and Gynaecology,* ***2.*** *Akershus university hospital, Department of Obstetrics and Gynaecology,* ***3.*** *Akershus university hospital, Department of Obstetrics and Gynaecology/University of Oslo, Institute of Clinical Medicine,* ***4.*** *Norwegian School of Sport Sciences, Department of Sports Medicine*

AN INTRA –AND INTER-RATER RELIABILITY STUDY OF THE MEASUREMENT OF PELVIC FLOOR MUSCLE FUNCTION USING MANOMETRY.

Hypothesis / aims of study
Physical therapists working with the pelvic floor aim to prevent and treat pelvic floor dysfunction and in order to be able to implement treatment strategies and monitor progress, reliable and valid assessment methods of the pelvic floor muscles (PFM) are necessary. While squeeze pressure measurement using manometry has been established as a reliable and valid method to assess PFM strength [1,2] the measurement properties for vaginal resting pressure and muscular endurance are less investigated. The aim of the study was to evaluate the intra- and inter-rater reliability of vaginal resting pressure, PFM strength and endurance using manometry.

Study design, materials and methods
Twenty-three women were recruited from a physiotherapy center to participate in this test–retest study. The statistical advice was to include 20 women. Vaginal resting pressure, PFM strength and endurance were assessed by using a high precision pressure transducer connected to a vaginal balloon. The test procedure has previously shown to be reliable and valid for measurement of PFM strength when performed with a simultaneous observation of inward movement of the perineum during the assessment [1,2]. Two physiotherapists with thorough prior training performed the tests with exactly one week interval in-between the sessions. The participants were examined by the two assessors was in a random order. The assessors were blinded to the results from test one during test two. The participating women were taught how to perform a correct PFM contraction. Exclusion criterion was inability to understand instructions given in the native language and inability to contract the PFM correctly after thorough and repeated instructions. Vaginal resting pressure was measured as vaginal pressure with no voluntary PFM activity, PFM strength as the mean of three maximal contractions and endurance as a sustained maximum contraction during 10 seconds. Intra-rater and inter-rater reliability was analysed using the intra-class correlation coefficient (ICC, repeated measures) with 95% confidence interval (CI). ICC values under 0.20 were considered as poor, 0.21– 0.40 fair, 0.41–0.60 moderate, 0.61–0.80 good and 0.81–1.00 very good. Bland-Altman was used to assess for bias using the mean difference between measurements and 95% limits of agreement as the mean difference (1.96 SD).

Results
One woman had to be excluded due to inability to insert the probe and one woman did not meet for testing, leaving 21 women for analysis. Mean age 56.2 years (range 27-71), mean BMI 19.9 kg/m^2 (range 14.6-23.3, SD 2.2) and mean parity 1.7 (range 0-3). All participants reported doing pelvic floor exercises regularly. Two of the participants received treatment by physical therapist for urinary incontinence and two were pregnant with their second child. Table 1 and table 2 shows data from intra-tester and inter-tester analysis, respectively. There was very good agreement both from test one to test two (intra-rater) and between assessors (inter-rater). The Bland-Altman plot showed no systematic differences for any of the measurements, but one outlier explaining the relatively large SD and 95% CI for PFM strength and endurance in the intra-tester analysis and for endurance in the inter-tester analysis.

Table 1. Intra-rater reliability analysis for vaginal resting pressure (VRP), pelvic floor muscle strength (PFM strength) and endurance for assessor 1. N=21

	Test 1	Test 2	ICC (95% CI)	Bias	SD	Limits of agreement	
						Lower	Upper
VRP cmH_2O	24.78 (SD 9.45)	22.80 (SD 7.87)	0.91 (0.77, 0.96)	1.99	4.79	-7.41	11.38
PFM strength cmH_2O	21.90 (SD 13.04)	23.83 (SD 18.05)	0.88 (0.70, 0.95)	-1.93	10.57	-22.64	18.78
PFM Endurance cmH_2Osec	148.05 (SD 87.92)	154.10 (SD 105.90)	0.96 (0.90, 0.98)	-6.05	38.27	-81.06	68.96

Table 2. Inter-rater reliability analysis for vaginal resting pressure (VRP), pelvic floor muscle (PFM) strength and endurance. N=20

	Assessor 1	Assessor 2	ICC (95%CI)	Bias	SD	Limits of agreement	
						Lower	Upper
VRP cmH_2O	24.59 (SD 9.66)	26.29 (SD 12.04)	0.95 (0.87, 0.98)	-1.71	4.74	-11.00	7.59
PFM strength cmH_2O	22.06 (SD 13.36)	24.65 (SD 13.37)	0.96 (0.88, 0.99)	-2.59	4.73	-11.86	6.68
PFM Endurance cmH_2Osec	149.60 (SD 89.91)	169.75 (SD 97.51)	0.94 (0.84, 0.98)	-20.15	39.52	-97.60	57.30

Interpretation of results

We found that the use of manometry in the assessment of vaginal resting pressure, PFM strength and endurance showed very good agreement from test one to test two by the same assessor and also between assessors. There were no systematic differences in any of the measurements, but visual inspection of the data and outliers showed a slight tendency towards greater differences for the highest scores of PFM strength and endurance.

Concluding message

Manometry is a reliable method to assess all parameters of PFM function. Thorough practice and standardisation of the procedure, instructions to the patient, recording and analysing the measurements are of importance.

References

1. Bo K, Hagen R, Kvarstein B, Larsen S. Pelvic floor muscle exercise for the treatment of female stress urinary incontinence: I. Reliability of vaginal pressure measurements of pelvic muscle strength. Neurourol Urodyn. 1990;9(5):471-7.
2. Bo K, Hagen RR, Kvarstein B, Larsen S. Pelvic floor muscle exercise for the treatment of female stress urinary incontinence. II. Validity of vaginal pressure measurements of pelvic muscle strength and the necessity of supplementary methods for control of correct contraction. Neurourol Urodyn. 1990;9(5):479-87.

Disclosures

Funding: EXTRA funds from the Norwegian
Foundation for Health and Rehabilitation and the Norwegian
Women's Public Health Association. **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** The Regional Medical Ethics Committee (2014/1768) **Helsinki:** Yes **Informed Consent:** Yes