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INTRARATER RELIABILITY OF STRENGTH ASSESSMENT OF PELVIC FLOOR MUSCLES

Hypothesis / aims of study

The objective assessment of pelvic floor muscle's strength, which is highly recommended, is commonly measured by pressure perineometry or intra-vaginal dynamometry. However, there are several drawbacks in the perineometry measures (1), making the dynamometry a more feasible and sensible instrument for measuring pelvic floor resultant force. Our aim was to evaluate the intrarater reliability and systematic error of measurement of the most commonly used dynamometric variables for pelvic floor evaluation.

Study design, materials and methods

Ten nulliparous healthy women (27.6±5.0 years old) had their pelvic floor strength measured by a vaginal strain-gage dynamometer (EMG-system do Brasil 020653/2013 – São José dos Campos, SP / Brasil, 0-20kg) (Fig. 1). The women were in supine with their hip and knees flexed and feet positioned over the evaluation bed. An experienced physiotherapist trained them to perform correctly a pelvic floor muscle contraction (with a cranial lift of the perineum and without compensations of abdominus or gluteal muscles) before the experiment. Prior to the insertion, the dynamometer probe was covered with two condoms and appropriately lubricated with a hypoallergenic gel. The probe was inserted 7cm deeper than the hymenal caruncle and only correct contractions were considered for analysis. Subjects received visual feedback during the whole assessment. The participants came twice to the lab to perform the same measurement with four-weeks interval (Fig.1). In each time, three contractions of 10-sec with a 1-min rest period were recorded. Data was sampled at 100Hz, filtered with a low-pass of 8Hz and subtracted from the passive force (assessed after 1-min accommodation period following the vaginal probe insertion). The studied variables were passive force (after 1-min rest period) (N), maximum strength (N), first strength peak (N), strength peak rate (N/s), strength loss rate (calculated from linear fitting by least mean squares) (N/s), endurance (force-time integral of 8s window) (N.s), strength loss (complementary force-time integral of 8s window) (N.s). The variables were compared between trials and days (Fig.1) by repeated measures ANOVAs. The intraclass correlation coefficient (ICC) was calculated to assess reliability for trials (ICC3,1) and days (ICC3,k) (2). To determine the systematic error of the measurement process (intrarater reliability), we also calculated the standard error of measurement (SEM).

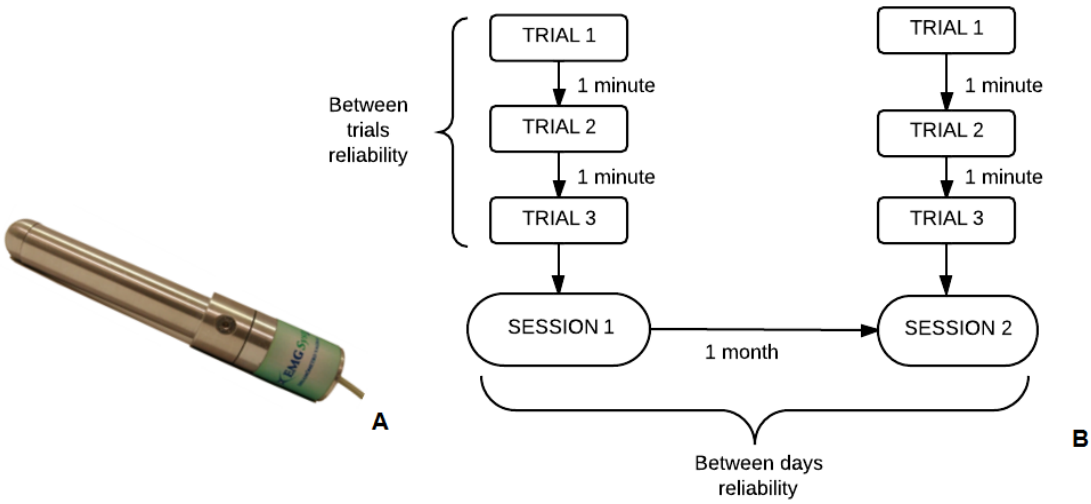

Figure 1. A. Vaginal *strain gauge* dynamometer probe (EMG-system do Brasil, Brazil. 0-20kgf). B. Study protocol, reliability between trials (the same session) and between days (in two sessions 4 weeks apart).

Results

Table 1. Mean (standard deviation), intraclass correlation coefficient (ICC) and standard error of measurements (SEM) between trials and days for all variables.

Dynamometric Variables	Between trials ICC 3,1 (n=10)	*SEM*	Between days ICC 3,K (n=5)	*SEM*
Passive Force (N)	1.00	-	0.98	0.2
Maximum strength (N)	0.97	1.2	0.99	1.0
First strength peak (N)	0.97	1.3	0.98	1.5
Strength loss (N.s)	0.75	3.9	0.73	11.1
Endurance (N.s)	0.98	7.6	0.99	6.6
Strength loss rate (N/s)	0.51	7.9	0.97	0.1
Strength peak rate (N/s)	0.89	0.2	0.97	2.7

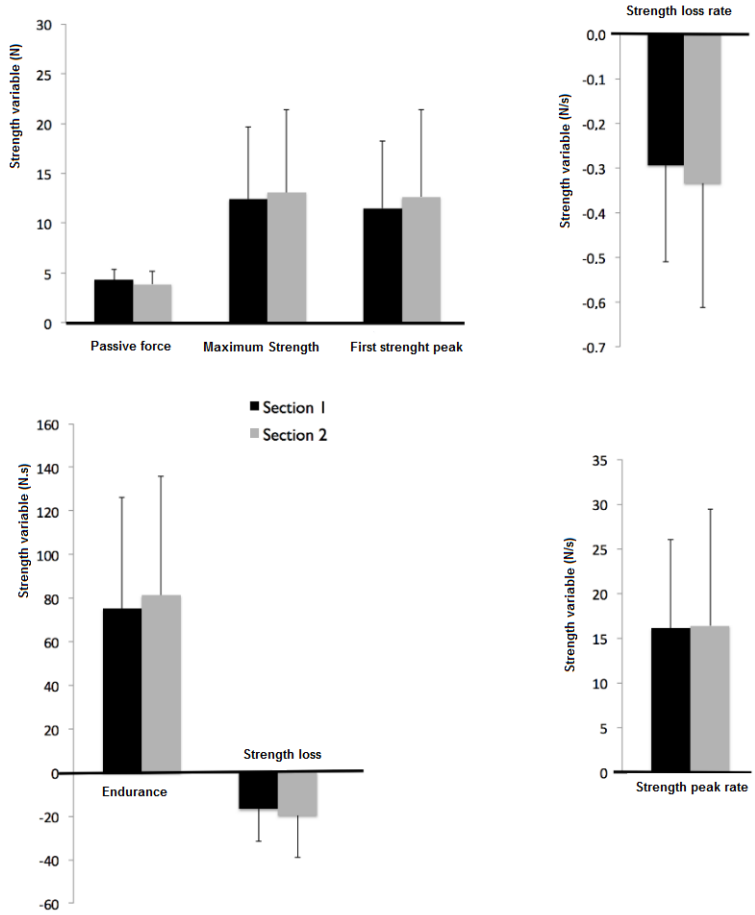

Figure 2. Pelvic floor strength variables (mean and standard variations) between days (session 1 and 2)

Interpretation of results

There were no significant differences between trials and days. Intrarater reliability values were good for almost all variables, excluding the strength loss and strength loss rate. It means that 3 trials are sufficient when analyzing dynamometric variables such as passive force, maximum strength, strength peak, endurance and strength peak rate, but not strength loss or strength loss rate.

Concluding message

Clinicians and researchers should consider adopting a minimum of three dynamometric assessments of the female pelvic floor as a reliable measurement to classify and evaluate the treatment efficacy of the female pelvic floor strength and endurance.

References

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Disclosures

Funding: São Paulo Research Foundation (FAPESP 2013/19610-3) National Council for Scientific and Technological Development (CNPq 478332/2013-0) **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Comitê de Ética em Pesquisa da Faculdade de Medicina da Universidade de São Paulo Research Ethics Committee of School of Medicine, University of São Paulo **Helsinki:** Yes **Informed Consent:** Yes