

## INCREASE IN FORCE MAINTENANCE OF THE PELVIC FLOOR WHEN ASSOCIATED WITH HIP ABDUCTION

### Hypothesis / aims of study

The strength and coordination of the pelvic floor (PF) muscles are related to the severity of urinary incontinence and sexual satisfaction (1). Clinicians intending to facilitate the PF treatment commonly associate classical PF strengthening exercises with hip adduction/abduction activity, but to this date the benefits of this combination are still unknown. The levator ani muscle inserts into the obturator internal fascia (2), and then if its tension increases by lateral rotation and/or abduction of the hip, one may improve the quality of PF contraction. Our aim was to investigate the effect of the hip adduction and abduction while contracting the PF muscles in the resultant force in the vaginal cavity.

### Study design, materials and methods

Nine healthy nulliparous women (25.4±5.3 years old, 65.4±9.5kg, 1.6±0.1m) had their pelvic floor resultant force measured by an instrumented vaginal probe (strain gage 0-20kg). The women were asked to perform the maximum pelvic floor muscles' contraction simultaneously with (i) hip adduction, (ii) hip abduction (both 50 and 30% of woman's maximal voluntary contraction) and (iii) isolated pelvic floor contraction keeping the hips in a neutral position. We used a second custom-made dynamometer ring-like attached between their knees to measure the hip add/abduction force (tension and compression strain gage 0-100kg). The women were in supine position with their knees flexed and 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 of the hip force during the whole assessment to guide them achieving the required percentage of their maximal hip force. The force assessment was performed in a randomized order (i, ii, iii) in two different sessions four weeks apart. In each session, the participant performed either a 30% or a 50% of the maximal voluntary hip contraction that was also randomly chosen. In each session, three contractions of 10-sec with a 1-min rest period were recorded for each condition. Vaginal dynamometer data were sampled at 100Hz, filtered with a low-pass of 8Hz and subtracted from the passive force (assessed after one-minute accommodation period following the vaginal probe insertion). For each trial, maximum strength (N), strength loss rate (calculated from linear fitting by least mean squares) (N/s), and endurance (force-time integral of 8s window) (N.s), were calculated in a custom-written MATLAB function. Repeated measure 2-way ANOVAs were used to compare three conditions and two sessions.

### Results

There were differences among conditions within the sessions (30 and 50%), but there were no differences between sessions for all evaluated conditions (Table 1). When comparing adduction and abduction conditions, the maximum strength and strength loss rate of the pelvic floor was significantly impaired when associated to 30% of the hip adduction force, and improved when associated to 30% of the hip abduction force (Table 1).

Table 1. Mean (standard deviations) of pelvic floor strength variables in both studied conditions.

30% of hip maximal force			
	Isolated pelvic floor	With hip abduction	With hip adduction
Maximum strength (N)	10.0 (4.0)	9.1 (3.1)	8.2 (3.7) *
Endurance (N.s)	62.9 (28.1) *	54.0 (23.2)	47.8 (22.8)
Strength loss rate (N/s)	-0.24 (0.23) #	0.03 (0.18) #	-0.08 (0.21) #
50% of hip maximal force			
	Isolated pelvic floor	With hip abduction	With hip adduction
Maximum strength (N)	10.7 (7.0) *	8.0 (4.7)	7.0 (3.8)
Endurance (N.s)	63.9 (42.2) *	44.2 (30.2)	40.2 (23.9)
Strength loss rate (N/s)	-0.25 (0.45) *	0.03 (0.28)	-0.03 (0.2)

2-way ANOVA repeated measures  $p < 0.05$ . Comparison between isolated pelvic floor contraction and associated to hip adductors and abductors for each session (30 and 50% of the hip maximal voluntary contraction). #All conditions are significantly different among them. \*Represents the significantly different condition from others.

### Interpretation of results

In both sessions (30 and 50% maximal hip muscles contraction), the volunteers presented better maximum strength and endurance during the isolated pelvic floor contraction, but with a smaller strength loss rate. It means that the dual-task exercises impairs the maximum pelvic floor force development, even though it improved the force maintenance (strength loss rate). Interestingly, in the lower hip force condition (30%), a worse maximum strength was observed while performing hip adduction, and a better strength loss rate with a great maximum strength was observed while performing hip abduction. Therefore, the

simultaneous contraction of the pelvic floor muscles and the hip abductors (30% of the maximal hip force) might improve the pelvic floor efficiency and function.

#### Concluding message

Contracting the pelvic floor muscles together with hip abductors results in similar contraction strength magnitude when compared with the isolated contraction of the former structure, but with better strength maintenance, which can be beneficial for sustained contraction practices and daily function. Clinicians should know that, when the amount of force is adequate (around 30% of maximal strength), the association of pelvic floor exercises with hip abduction seems to be more effective than with hip adduction during the pelvic floor strengthening practice.

#### References

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#### Disclosures

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