

SUPERFICIAL AND DEEP PELVIC FLOOR MUSCLES ACTIVATION IS INFLUENCED BY DIFFERENT VERBAL INSTRUCTIONS TO ACHIEVE A VOLUNTARY CONTRACTION

Hypothesis / aims of study

Pelvic floor muscles (PFM) are composed of superficial and deeper layers that are believed to work as a functional unit. There is some evidence that these layers behave differently in women with urinary incontinence [1]. Clinicians often use different verbal cues in an attempt to modify the pattern of activation of pelvic floor muscles, but it is unknown if the relative activation of the different muscle layers can be modified by instruction in healthy women. Instructions are rarely reported in the literature and are not standardized due to difference in language, culture and individual preference. We hypothesised that different verbal instructions would influence the relative activity of the deep and superficial layers of pelvic floor muscles.

Study design, materials and methods

Twelve English-speaking healthy females with no history of urological disease participated. Surface electromyography (sEMG) was recorded from the PFM using a custom-made intra-vaginal EMG electrode that included four pairs of recording surfaces orientated to record bilateral activity of the superficial and deep PFM. Participants sat upright against a back support reclined to approximately 60 degrees. Three repetitions of maximum voluntary contraction (MVC) were performed and used to calculate a 25%MVC target for one of the four channels (Right side/Deep PFM). Participants then performed voluntary PFM contractions in response to seven different verbal instructions while matching the contraction intensity target. Instructions included: (i) "contract all of your PFM", (ii) "squeeze around the anus without lifting", (iii) "squeeze around the vagina without lifting", (iv) "squeeze and lift from the back", (v) "tighten around the urethra", (vi) "purse your lips", (vii) "draw your clitoris posteriorly". A repeated measures analysis of variance (ANOVA) was used to investigate the SIDE (LEFT/RIGHT) x MUSCLE (SUPERFICIAL/DEEP) x INSTRUCTION interaction. Post hoc testing was performed using Duncan's multiple range test.

Results

Two participants were unable to match the contraction intensity at 25%MVC and one participant was excluded on the basis of missing data. In the remaining nine participants, there was a significant SIDE x MUSCLE x INSTRUCTION interaction (Main effect: $P=0.003$). As participants contracted their PFM to the visual target, activation of the left and right superficial PFM was significantly higher than the left and right deep PFM for all instructions ($P<0.05$). When activation of the superficial PFM (right) muscle was considered individually, data show it was decreased in response to "squeeze and lift from the back" compared to five of the six other instructions ($P<0.05$). Comparison between left and right SIDE highlighted asymmetrical activation, with left-sided activity exceeding that on the right for the "tighten around the urethra" and "purse your lips" tasks ($P<0.05$).

Interpretation of results

These data show that the coordination of the PFM is affected by the instructions used to cue the contraction. We made three major observations. First, the superficial PFM are activated to a greater percentage of their MVC across the instructions tested. Second, some instructions induce asymmetry of contraction of the pelvic floor muscles. Third, the instruction to "squeeze and lift from the back" induced less superficial activation on the right than almost all other instructions and may be beneficial if less activation of the superficial muscles is an objective.

Concluding message

Our data show that the coordination between the superficial and deep PFM can be affected by instruction, which supports our hypothesis. Future studies using a similar method are required to study different clinical populations and PFM rehabilitation programs to understand whether different instructions can affect clinical outcomes of rehabilitation.

References

1. Devreese, A., Staes, F., Janssens, L., Penninckx, F., Vereecken, R., & De Weerd, W. (2007). Incontinent women have altered pelvic floor muscle contraction patterns. *The Journal of Urology*, 178(2), 558-562. doi:10.1016/j.juro.2007.03.097

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