

EFFECT OF DISTRACTION TASK ON THE PELVIC FLOOR MUSCLE CONTRACTION

Hypothesis / aims of study :

Attention might probably play a key role in the pelvic floor muscles contraction in stress situation and thus, mental distraction could be involved in urinary incontinence. In the current study, we assessed the impact of mental distraction task on the PFM contraction

Study design, materials and methods:

Informed consent was obtained from 20 healthy volunteers. Electromyographic (EMG) activity of external anal sphincter (EAS) had been recorded during voluntary contraction voluntarily elicited after a local stimulus. After bladder emptying, each woman was seated on a chair with arm support. They were asked to contract her anal sphincter when they feel a mechanical stimulus on their left arm. The stimulus was delivered by means, an electronic hammer allowing a gentle mechanical shock on the left arm in face of the median nerve. EMG recordings were made from a pair of pregelled disposable surface self-adhesive electrodes that were positioned on perineal skin, attached laterally to opposite sides of the EAS. EMG data were recorded by means of Biopac®, Acknowledge ©. Experimentation have been carried out twice: combined or not with a mental distraction task (Paced auditory serial additional test (PASAT)). The EMG signal were analysed with the Student Lab Pro® Software. The raw muscle activity measurements were first de-noised and calibrated (*figure 1*). Then for each perineal contraction, digital values were exported to be processed within an Excel© Microsoft spreadsheet. The latency between the stimulus and the onset of the external anal sphincter (EAS) EMG was measured, during each voluntary anal sphincter contraction. This measure corresponds to the reaction time (RT). The mean reaction time was calculated for each patient in each condition. Other parameters as the latency between the stimulus and the maximal EAS EMG activity, the maximal EAS EMG activity, the area under the curve of EAS EMG activity were measured.

Results:

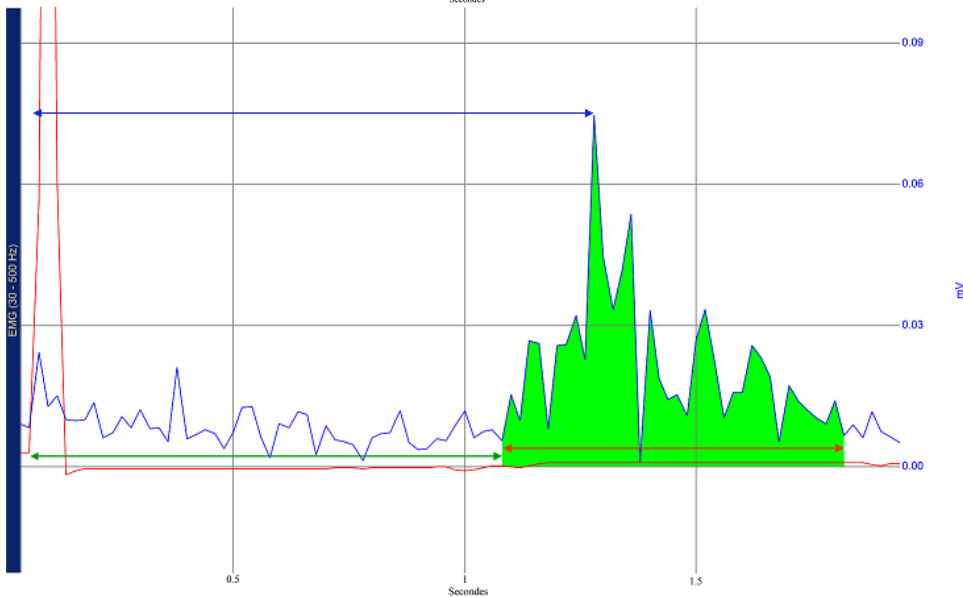
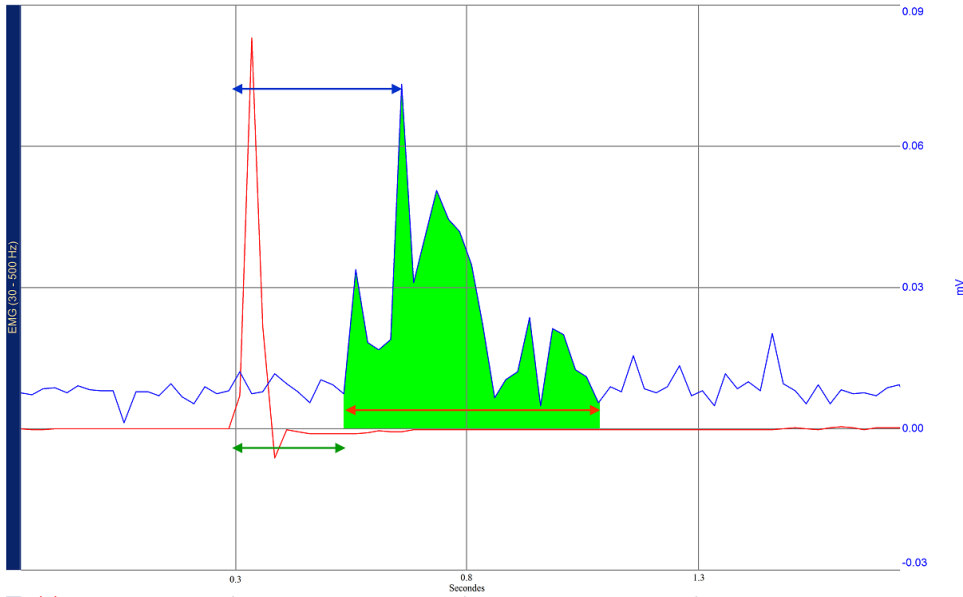
Mental distraction task led to a 3,98 times increased of reaction time (RT) ($p=0,00001$ wilcoxon's test). RT increased from 217 ms (IQR: 170-270) to 779 ms (IQR: 550-1025, $p<0,0001$) when contraction of the EAS was combined with PASAT. However, the maximal EAS EMG activity was weaker with PASAT than without mental distraction task: 0.0850 vs. 0.0701 mv, i.e. 1.21 times weaker ($p=0,00077$, Wilcoxon's test). Finally, comparing the two conditions (respectively with and without mental distraction task) we didn't find any significant difference concerning the area under the curve of EAS EMG activity (0.0157 vs. 0.0162 mv*s, Ratio 1.01, $p=0,52$)

Interpretation of results: To our knowledge, no previous study have focused on the role of attention on PFM contraction. We demonstrated that mental distraction generate a longer reaction time to contract PFM (mean RT of EAS muscle activity is 3.98 times longer during distraction task ($p<0,0001$)), and thus, supposed that it could be responsible of urinary leakage. Indeed, in the daily life, women experienced urinary leakage when they have to cope with an unpredictable event and they didn't paid attention to their continence. It would be interesting to assess whether these neuromuscular abnormalities, such as increased reaction time of contraction of PFM, may be cured after cognitive rehabilitation. PFM training may probably improve the speed at which PFM can be generated through strengthening the neural pathway and improving the efficiency of the contraction.

Concluding message:

Mental distraction task altered voluntary pelvic floor muscles contraction.

Figure 1: De-noised and recalibrated curve of one contraction of external sphincter anal recorded by means of Student Lab Pro Software



Top: Experimentation without distraction task; Red wave: Stimulus; Blue wave: EAS EMG activity; Green arrow: reaction time (ms); Red arrow: Duration of contraction (ms); Blue arrow: Latency between the Stimulus and the maximal EAS EMG activity (ms); Green area: Area under the curve of EAS EMG activity (mv^*s).

Bottom: Experimentation with distraction task; Red wave: Stimulus; Blue wave: EAS EMG activity; Green arrow: reaction time (ms); Red arrow: Duration of contraction (ms); Blue arrow: Latency between the Stimulus and the maximal EAS EMG activity (ms); Green area: Area under the curve of EAS EMG activity (mv^*s).

Abbreviations: EAS, external anal sphincter, EMG, electromyographic

Disclosures

Funding: none **Clinical Trial:** Yes **Public Registry:** No **RCT:** No **Subjects:** HUMAN **Ethics Committee:** This research was found to be in agreement with the laws and regulation of the country in which the research experiment was performed (Approval number: ID-RCB: 2011-A01690-41). **Helsinki:** Yes **Informed Consent:** Yes