

INFLUENCE OF A COGNITIVE REHABILITATION ON PELVIC FLOOR MUSCLE CONTRACTION

Hypothesis / aims of study

In continent women, we previously observed that mental distraction task (DT) altered reaction time (RT) between an order to contract pelvic floor muscles (PFM) and the onset of PFM contraction activation [1]. In the same way, during mental DT, the RT between the initiation of cough effort (activation of external intercostal (EIC) muscles) and the onset of the PFM contraction is delayed [2]. The aim of the current study was to evaluate whether a cognitive rehabilitation (dual task method) may prevent the effect of mental DT on the RT of PFM contraction.

Study design, materials and methods

The study group consisted in 39 healthy volunteer women. As the volunteers were expected to not suffer from uro-gynecological diseases, inclusion criteria were as follows: nulliparous, no diabetes, no heart rhythm disorder, no neurological disease, no pregnancy, no urinary symptoms (UDI-6 questionnaire score equal 0), no bowel symptom (Wexner questionnaire score equal 0), no problems in understanding the language used during the trials, no cognitive depletion or dementia (Mini Mental Status questionnaire (MMS) score equal 30).

Volunteers were initially evaluated with the same protocol process as we previously published [1-2]. EMG recordings evaluation consisted on recording external anal sphincter (EAS) electromyographic (EMG) activity during voluntary and involuntary PFM contraction with and without a distraction task (Paced Auditory Serial Addition Task (PASAT)). During voluntary PFM contraction, we mainly recorded latency between the order of PFM contraction and the onset of the EAS EMG activation (RT1). During involuntary PFM contraction, latency between the onset of the involuntary EAS EMG activation and the onset of the EIC EMG activation (RT3) was also measured.

Following randomization (ratio 1:2), thirteen of the volunteers participated at a cognitive rehabilitation program during 16 days (study group) whereas the others (n=26) were the control group. At the end of the protocol, every volunteer underwent a second EMG recordings session using the same methodology. Cognitive dual task rehabilitation program was the following: Rehabilitation program was provided on a computer support, which was lend to the 13 volunteers of the study group. Rehabilitation program consisted on a dual task intervention which included a cognitive task and a motor task. Cognitive task consisted on N-back test which is traditionally used in studies concerning working memory that involved executive function and activate regions of the prefrontal cortex. This task required a high attention load. Volunteers upgraded N-Back test difficulty every 4 days: (i) condition 0-Back (control condition): the subject pressed the space key when the target letter was presented (ii) condition 1-Back: the subject pressed the space key when the last number saw was the same than the second-to-last number (iii) condition 2-Back: the subject pressed the space key when the last number saw was the same than the third-to-last number (iv) condition 3-back: the subject pressed the space key when the letter presented was the same as occurred three positions before. Motor task consisted on PFM contractions. Volunteers have to contract their PFM when random auditory stimuli occurred (10 stimuli per session). Each session of rehabilitation lasted 3 minutes. Study group underwent the dual task rehabilitation twice a day during 16 days.

Results: Both groups had similar characteristics at the initial evaluation concerning RT3 and RT1 with and without distraction task. Compared to the initial evaluation, at the final evaluation (Day 16), in the study group (rehabilitation), RT1 in DT condition decreased from 461.11 msec [357.14-557.41] to 290.74 msec [262.96-308.88] (ratio 0.63, p=0.0063). In the control group RT1 in DT condition was not significantly different between the initial and final evaluation (369.97 msec [344.05-448.15] msec vs. 342.99 msec [274.54-403.24], (ratio 0.92, p=NS)). Compared to the initial evaluation, at the final evaluation (Day 16), in the study group (rehabilitation), RT3 without DT increased from -68.52 msec [-107.40 ; -40] to -127.78 msec [-163.06 ; -93.33] (ratio 1.86, p=0.0327). In case of DT condition, in the study group, RT3 increased from -42.59 msec [-52.09 ; -6.66] to -59.25 msec [-119.44 ; -44.44] (ratio 1.39, p = 0.0478). RT3 was not significantly different with or without DT, between both evaluation in the control group.

Interpretation of results

In the current study, we showed that a cognitive rehabilitation program improved the reaction time between cough and reflex PFM contraction. Following cognitive rehabilitation, RT3 was increased by 39%. In case of voluntary PFM contraction, cognitive rehabilitation allowed to reduced RT1 by 37%. We hypothesized that an increase of the reaction time needed to voluntary contract PFM, in case of unpredictable event in women who are not paying attention to their continence, could be responsible of urinary leakage. Authors, who focused on the temporal course of PFM activation during cough, have also showed that women suffering from stress UI did not anticipated PFM contraction (increase of RT3) whereas healthy women had pre activation of PFM. RT1 and RT3 are involved in urinary continence and their modification may lead to stress urinary incontinence. The current study is the first one, which objectively evaluated the influence of cognitive rehabilitation on these latter parameters. New approaches of rehabilitation, which take account of global individual, have been evaluated. Elliott et al. [3] evaluated a new rehabilitation program in 24 women suffering from mixed urinary incontinence. This method compiled Virtual Reality Rehabilitation (VRR) with a classical PFM training. The VRR consisted on dual task performance which combined two motor tasks: freeware dance game program (StepMania) and PFM contraction. Authors postulated that developing the ability to contract PFM during their daily life activity will allow women to improve UI symptoms. They showed an improvement in terms of symptoms and quality of life. Developing the skill to contract PFM during another activity has probably been inspired by the "knack maneuver". This training, which has only been evaluated following cough, consisted to contract PFM just before physical efforts, and to hold the contraction during all the

stress period. Using this kind of rehabilitation authors integrated the PFM training in women's daily life activity in order to assimilate PFM contraction as an automatic response to an effort.

Concluding message

The current study evaluated the influence of dual task rehabilitation which included cognitive and motor task. We showed that performance of PFM contraction motor task, which are disturbed by distraction task, can be corrected by means of a specific cognitive rehabilitation. We postulate that a cognitive rehabilitation program could be useful for women suffering from SUI, especially for those presenting an alteration of PFM contraction pattern (RT1 and RT3)

References

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Disclosures

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