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RELATIONSHIP BETWEEN FOOT INVERSION AND EVERSION AND PELVIC FLOOR MUSCLE ACTIVITY : PRELIMINARY RESULTS FROM A PILOT STUDY USING ADAPTABLE REMOVABLE INSOLES IN CONTINENT WOMEN

Hypothesis / aims of study

Previous studies suggested that, although in upright standing an ankles dorsi-flexion might improve the resting pelvic floor muscle activity (PFMa), a plantar flexion would seem the best position to facilitate maximal PFM contractions in both in incontinent women. No data are available of the impact of different shoe heels on female PFMa. We carried out this study in order to assess the relationship between PFMa and the use of different removable insoles able to create foot inversion and eversion at different heel height both in standing position and during walking in a group of healthy young female volunteers.

Study design, materials and methods

Thirty healthy young continent women, ranging in age from 18 and 28 years participated in testing of PFMa changes (measured in μV) in upright position and during walking using specific removable insoles within suitable shoes, allowing either ankles dorsiflexion or plantar-flexion at 5° and 10° and/or foot inversion or eversion at 5°. An electromyographic (EMG) biofeedback instrument using surface EMG electrodes has been employed to measure changes in PFMa in standing position and during 5 Km/h walking for 3 minutes with and without pelvic floor muscle (PFM) contractions. Statistical analysis was performed with the Statistical Package for Social Sciences analytical software (version 12.0). The results are shown as median values and interquartile range (IQR). The Wilcoxon signed-ranks test was used to perform pair-wise comparison of the different procedures conducted on each subject. The level of statistical significance was set at p=0.05.

Results

In all cases but in plantar flexion at 5° (see table) PFMa, both at rest and during maximal contraction, was significantly greater during walking than in standing up position (p<0.0001). In static condition (upright standing) resting PFMa was significantly higher wearing both 5° and 10° plantar-flexion insoles than without (p=0.022 and p=0.035, respectively).

Table. Comparison of median resting and maximal PFMa between static and dynamic conditions according to the different insole inclination without foot inversion/eversion

Insole inclination	**Resting PFMa (IQR) μV in static position**	**Resting PFMa (IQR) μV in dynamic position**	**p value**
10° dorsiflexion (DF10)	75.48 (43.77-148.59)	118.49 (88.34-162.64)	0.003
5° DF (DF5)	77.32 (10.16-142.02)	150.56 (92.62-199.79)	0.002
Without insoles (WI)	76.05 (35.43-116.97)	132.48 (96.17-163.92)	<0.0001
10° plantar flexion (PF10)	85.32 (41.11-144.65)	124.67 (87.89-184.57)	0.006
5° PF (PF5)	74.90 (41.63-184.05)	145.43 (78.66-190.25)	0.022
Insole inclination	**Maximal PFMa (IQR) μV in static position**	**Maximal PFMa (IQR) μV in dynamic position**	**p value**
DF10	187.19 (85.52-367.68)	225.56 (153.89-501,68)	0.003
DF5	166.91 (79.34-358.84)	285.32 (203.88-427.19)	0.010
WI	182.21 (79.20-315.60)	306.76 (199.76-411.23)	<0.0001
PF10	202.27 (82.74-372.15)	305.26 (173.95-459.30)	0.007
PF5	186.81 (95.35-418.63)	371.06 (169.34-498.84)	0.086

Interpretation of results

In dynamic conditions, using removable insoles having different plantar inclinations, neither an ankle plantar/dorsal flexion up to 10° nor a foot inversion/eversion up to 5° would seem to significantly affect pelvic floor muscle activity in healthy young continent women.

Concluding message

A plantar flexion at 10° (such as with a 4.4 cm high heel) may significantly affect PFM tone only in static condition.

Specify source of funding or grant	**no source of founding or grant**
Is this a clinical trial?	**No**
What were the subjects in the study?	**HUMAN**
Was this study approved by an ethics committee?	**No**
This study did not require eithics committee approval because	**Because it was carried out within the usual rehabilitation iter**
Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**