COP DISPLACEMENT RELIABILITY IN MEDIAL-LATERAL DIRECTION IN POSTMENOPAUSAL WOMEN

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Introduction
The center of pressure (COP) represents a weighted average of all pressure over the plantar surface area in contact with the ground. During normal and non-pathological walking, the COP undergoes specific displacements, both in anterior-posterior direction and in medial-lateral direction. Significant modifications of the pressure distribution pattern can produce abnormal loads on the foot, lead to the emergence of problems in the correct progression of gait and increase the risk factors for inversion sprains and appearance of functional instability. COP manipulation can be used to influence the muscle activation patterns of the legs, as in patients with knee osteoarthritis [Goryachev, 2011].

The woman postmenopausal period is characterized by the changes of estrogen levels and consequent deficiency of vitamin D. Such modifications cause the appearance of a set of syndromes like osteoporosis, osteoarthritis, muscle weakness and alterations on body sway and postural stability [Munir, 2008].

The purpose of this work was to investigate the reliability of the medial-lateral displacement of the COP trajectory in barefoot walking in postmenopausal women. For our knowledge, few studies have addressed the reliability of the medial-lateral displacement of the COP [Cock, 2008] and none in postmenopausal women.

Methods
The group understudy was constituted by 202 menopausal women (age, 57.4 ± 6.6 years; height, 155.1 ± 5.1 cm and weight, 69.2 ± 11.2 kg). Before testing, all subjects visited a physician for attaining a comprehensive injury history, in order to verify the inclusion criteria, and register some variables that must be under control of the investigator.

A Footscan® pressure plate (1 m x 0.4 m, 8192 sensors, 253 Hz, RSscan International, Belgium) was used to collect five valid trials for each woman. Two variables representing the displacement of the COP in medial-lateral direction relatively to the foot axis were studied: 1) the first (var1) was normalized by the toeless foot width and 2) the second (var2) by the width of the complete foot. Both variables were automatically computed, using a computational solution previously developed [Oliveira, 2011], in six phases of the stance: 0% (i.e. initial contact), 20%, 40%, 60%, 80% and 100% (i.e. push off). To evaluate the trial-to-trial consistency, intra class correlations (ICC) among the five trials were calculated in the whole group of women. Statistical analysis was accomplished using SPSS 16.0 (SPSS Inc., Chicago, Illinois).

Results
To protect against biased data, the correlation was initially assessed among the order of the trial and the variables values, and no correlation was found (|r| < 0.06). The ICC of both variables are indicated in Table 1.

<table>
<thead>
<tr>
<th>Stance phase</th>
<th>0%</th>
<th>20%</th>
<th>40%</th>
<th>60%</th>
<th>80%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICC - var1</td>
<td>0.82</td>
<td>0.65</td>
<td>0.49</td>
<td>0.54</td>
<td>0.69</td>
<td>0.88</td>
</tr>
<tr>
<td>ICC - var2</td>
<td>0.82</td>
<td>0.66</td>
<td>0.47</td>
<td>0.54</td>
<td>0.69</td>
<td>0.87</td>
</tr>
</tbody>
</table>

Table 1: ICC of var1 and var2 for the six stance phase instants studied.

Discussion
Results show no significant difference among the ICC of both variables. Both variables present a good trial-to-trial consistency in the initial and final instants of the stance phase, and a moderate consistency in the intermediate instants that can be explained by the alterations on body sway and postural stability that affect some postmenopausal women [Munir, 2008].

In consequence, special attention must be taken when studying the COP medial-lateral trajectory in postmenopausal women.

References