Influence of walking speed and sex in pelvis and center of gravity movement

María Gomez Jimenez *, Cristina López de Subijana Hernández

Technical University of Madrid, Madrid, Spain

Introduction: The pelvic obliquity and center of gravity (CG) displacement were defined as the most critical discriminators between male and female gaits during normal speed [1,2]. As a low walking speed is spontaneously chosen by many patients [3], some previous studies described the influence of walking speed in these kinematic gait parameters [4,5].

Research question: Would the critical discriminators between sexes in normal gait be maintained with a decreased walking speed?

Materials and methods: Twenty-nine healthy women (26.10 ± 8.18 years old; 55.88 ± 4.97 kg and 165.30 ± 4.96 cm) and thirty-three healthy men (24.00 ± 4.37 years old; 72.15 ± 6.84 kg and 177.42 ± 6.07 cm) were asked to walk barefoot at self-selected and very low walking speed (0.25 m/s). Left and right gait cycles were recorded using a Vicon system with six cameras (120 Hz). The marker Plug in Gait model was used with 19 reflective markers attached to anatomical landmarks.

Results: Kinematic parameters of pelvis and CG were compared between self-selected and low speed in men and women separately. The side-to-side movement of CG increased 2.5 times during low speed in men and women, while the vertical movement of CG decreased 60% in low speed in both sexes. The pelvic obliquity presented a decrease of 26% in men and 36% in women during low walking speed (Table 1).

Discussion: Both sexes presented a decrease of pelvic obliquity around 9° during low speed due to the lack of need of controlling the vertical displacement of CG during single limb support what decreased in the same proportion in men and women [6]. Moreover, hip and knee reduced the flexion and extension range of motion what also smoothed the sinusoidal curve that describes the CG [4,7]. In addition, the lateral displacement of CG increased in both sexes during low speed because of the greater step width to maintain the dynamic balance during gait. These findings show how the critical discriminators, pelvis and CG movements, are modified in the same way during low speed in men and women maintaining the differences presented in self-selected speed.

References


<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
</tr>
<tr>
<td><strong>Self-selected</strong></td>
</tr>
<tr>
<td>CG side-to-side (cm)**</td>
</tr>
<tr>
<td>CG vertical (cm)**</td>
</tr>
<tr>
<td>Pelvic obliquity (°)**</td>
</tr>
</tbody>
</table>

Mean ± SD; **p < 0.001; * p < 0.05.

* Corresponding author.
E-mail address: maria.gomez@upm.es (M. Gomez Jimenez).