An Investigation in Muscle Activation During Load Carrying

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INTRODUCTION

- Carrying items, making beds and moving items can all be considered activities of daily living (ADL) that can become difficult as aging progresses
- Chronic obstructive pulmonary disease is a pathology that may cause difficulty for older adults performing ADLs particularly with symptoms of limited airflow and muscle weakness and muscle fatigue
- Various muscles that help to control a load and assist walking may also control and assist with inhalation and exhalation especially in times of distress or fatigue
- Understanding fully how carrying something in each hand affects walking is essential to assisting the lives of those with breathing difficulties
- The purpose of this study was to examine the effect of two different bimanual loads, 5% and 10% body weight (BW), on self-selected gait measures

METHODS

- Healthy subjects (Table 1) underwent three conditions as described in Table 2 and seen in Figure 1
- Weights were distributed evenly between both wrists as seen in Figure 2

<table>
<thead>
<tr>
<th>Condition Description</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Baseline Walking</td>
<td>5:00 mins</td>
</tr>
<tr>
<td>2 Walking with 10% BW</td>
<td></td>
</tr>
<tr>
<td>3 Walking with 5% BW</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Demographics of subjects

<table>
<thead>
<tr>
<th>N</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Height (m)</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>23.21 ± 2.46</td>
<td>male = 8</td>
<td>1.76 ± 0.08</td>
<td>73.09 ± 8.12</td>
</tr>
</tbody>
</table>

Table 2: Description of Conditions: order of conditions started with the baseline with 5% and 10% trials being randomized

RESULTS

- Both mean step width and coefficient of variation (Figures 3 & 4) were significantly different between each condition (baseline compared to 10% BW, baseline compared to 5% BW, and 10% BW compared to 5% BW)
  - Mean step width was decreased significantly from baseline as additional weight was added
  - Coefficient of variation of step width increased significantly from baseline as additional weight was added
- No significant findings were found for the other measure of gait and or conditions

DISCUSSION

- With a minimal 2.5% body weight increase load to each hand, step width mean and CoV were different.
- Step width coefficient of variation can discriminate between healthy young and old subjects and has been associated with falls in older individuals. Including an older populations may yield more significant information about how a bimanual load might affect gait patterns.
- Step length did not show any differences. It is possible that as a population, healthy young are adaptable and the task may not have been difficult enough to elicit a change.
- In addition, step width has been shown to require additional active control during walking whereas, step length does not. The additional weight during each arm swing, may cause an increase in medial-lateral movement and momentum from the forward swing may not affect stride length. Therefore active control would be important to compensate for the weights.
- Additional data including postography and muscle activation is currently being processed.

REFERENCES


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