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 \(^1,2\)
- 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 \(^3\)
- 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

<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 1: Demographics of subjects

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

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

RESULTS

- There were significant differences between all conditions: between baseline and 10% (p<.001), baseline and 5% (p=.002), and between 5% and 10% (p=.014)
- 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 \(^4\) and has been associated with falls in older individuals \(^5\). 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 \(^6\). The additional weight during each arm swing, may cause an increase in medial-lateral movement yet 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