Higher Body Weight Influences Functional Mobility in Older Adults

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Introduction

• The prevalence of obesity has increased among all ages within the population (Flegal et al., 1998).

• Obesity is correlated with declines in functional mobility as well as future disabilities in older adults (Zamboni et al., 2005).

• Older adults who experience difficulty walking, are at a twofold risk for mortality and admittance into an assisted living institution (Guralnik et al., 1994)
Introduction

• Obese persons are typically more sedentary than normal-weight persons (Rantanen et al., 1997).

• A sedentary lifestyle has a negative effect on muscle strength, aerobic capacity, and ultimately functional mobility (Rantanen, 1997 & Wilson, 2000).
Purpose

To determine if higher body weight status influences functional mobility in older adults.
Hypothesis

Individuals with a higher Body Mass Index (BMI) would have a reduced functional mobility:

- Slower habitual gait speed
- Poor balance
- Slower repeated chair rise time
- Lower walking energy expenditure
- Higher heart rate
- Higher Rating of Perceived Exertion (RPE)
Gait Time

• Measured the time it took for subjects to walk 4 meters at a normal walking pace
Balance Test

Subjects attempted to perform three consecutive balance tests.

Points were based on how long each balance stance could be held.

Highest possible score is 4 (good balance)

Lowest possible score is 0 (poor balance)

Table 1. Scoring used for balance tests.
Repeated Chair Test

• Subjects attempted to complete 5 complete chair stands as quickly as possible.

• The time that it took to complete the chair stands was measured.
Walking Energy Expenditure

• Subjects walked in a straight line on hard floor for 5 minutes

• COSMED Metabolic System measured energy expenditure

• Energy expenditure was measured in Kcal/hr

• Energy expenditure was then calculated relative to body mass (kg)
Rating of Perceived Exertion (RPE)

- Subjects indicated level of perceived exertion immediately following 5 minute walk
- Used Borg Rating of Perceived Exertion (RPE) scale
- Scale ranges from:
  - 6 (extremely light exertion)
  - to 20 (maximum exertion)
BMI Groups

Determining BMI Groups:

<table>
<thead>
<tr>
<th>BMI Status</th>
<th>BMI Range (kg · m⁻²)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>18.5 - 24.9</td>
<td>8</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0 – 29.9</td>
<td>7</td>
</tr>
<tr>
<td>Obese</td>
<td>30.0 +</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 3. Body mass index ranges used to classify subjects
Statistics

• MANOVA
• Least significant difference Post Hoc Test
• Significance $p < 0.05$
## Participant Characteristics

Males and females ages 65 - 85 years, n=22

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td>70.25</td>
<td>70.71</td>
<td>73.29</td>
<td>0.518</td>
</tr>
<tr>
<td><strong>Height (cm)</strong></td>
<td>167.52</td>
<td>168.00</td>
<td>172.16</td>
<td>0.586</td>
</tr>
<tr>
<td><strong>Mass (kg)</strong></td>
<td>61.06</td>
<td>80.26</td>
<td>102.49</td>
<td>*0.00</td>
</tr>
<tr>
<td><strong>BMI (kg . m⁻²)</strong></td>
<td>21.62</td>
<td>28.44</td>
<td>34.27</td>
<td>*0.00</td>
</tr>
</tbody>
</table>

Values are mean ± SD; *=difference between groups, P <0.05
**Figure 1.** Differences in average gait speeds among weight classes.

**Figure 2.** Differences in average balance times among weight statuses

**Figure 3.** Differences in chair rise time among weight classes.
Figure 4. Energy expenditure differences relative to weight classes.

Figure 5. Differences in heart rate between weight classes.

Figure 6. Differences in RPE ratings for weight classes.
Loss of Muscle Strength

• Age related loss of muscle strength is due in part to fat infiltration in the muscles (Goodpaster, 2006).

• Accumulation of fat within muscle creates a lower quality muscle less capable of generating strength (Marks, 2007).

• Reductions in lower extremity muscle strength make it more difficult to support higher body weight (Vincent, 2010).

• As we age, strength to weight ratio decreases.

Images courtesy of Summer Cook, Ph.D.
Take Home Message

• Increased adiposity combined with reduced muscle strength may increase the risk of functional mobility impairment (Vincent, 2010).

• Increased body weight is linked to:
  – Slower gait speed
  – Reduced balance
  – Slower chair rise time
  – Lower energy expenditure relative to body mass
What Can Be Done

• Prevent excess weight gain over life span.

• Monitor muscle strength in obese older patients to assess risk of functional decline (Stenholm et al., 2009).

• Reduce excess body weight in moderation.
Acknowledgments

A special thank you to Dain P. LaRoche Ph. D, Summer B. Cook Ph. D, Timothy Quinn Ph.D, and Erik E. Swartz Ph.D for allowing me to conduct this study with them over the course of my Winter break.

An extended thank you to my research advisor Dain P. LaRoche for helping me complete this presentation.