Challenging the Testing Protocol of the BOD POD

Eric Shamus, PhD, DPT, CSCS, Sarah Bengtson, DPT, Sierra Griffin, DPT, CSCS
Ahmed Elloka, PhD, PT, FAACVPR, Liza Malley, BS

Department of Rehabilitation Sciences, Florida Gulf Coast University

Introduction

Air displacement plethysmography (ADP) is a method of assessing body composition utilizing air within the intrathoracic cavity. ADP uses gas laws to describe the inverse relationship between pressure and volume in two enclosed chambers. Based on density, it uses either the Siri or Sholl equation to calculate body composition via gas laws and the volume of air and pressure differences exerted within a confined space. Literature has shown that the BOD POD is a reliable tool within 1% of the gold standard, hydrostatic weighing, for assessing body composition.

Certain precautions are set in place to standardize the testing environment, as well as the tested subject. Upon testing day, clients are asked to refrain from eating, drinking, or exercising 3 to 4 hours before BOD POD testing, and are asked to use the restroom prior to testing to eliminate any waste within the body. During the testing session, a swim cap is worn.

It is important to consider whether these external factors affect the ability of the BOD POD to accurately measure body composition.

As per the protocol set forth by LMI, liquids should not be consumed 3 to 4 hours prior, as it may skew the body composition results. The question of how much liquid and by how much it will skew the results is still lacking in the literature and is yet to be determined.

Within the population at large, it may be unrealistic for some groups to refrain from water intake for more than 4 hours.

For this reason, it is necessary to challenge this aspect of the manufacturer’s protocol in order to make BOD-POD testing more feasible for a greater number of diverse clients.

Some studies have examined the effects of added content within the BOD PDP itself, via holding bottles of water and oil, but none have examined the physical consumption of water, or post urination and the effects these two variables can have on the end results of BOD PDP testing.

BOD POD Testing Protocol

• No eating, drinking, or exercising 3 to 4 hours prior to body composition testing
• Participants are to wear compression garments and a swim cap
• Remove all jewelry and eyeglasses

Additions to Protocol Specific to this study:
• Participants were asked to refrain from urinating 2 hours prior to testing

Research Design

Challenging the Testing Protocol of the BOD POD

Eric Shamus, PhD, DPT, CSCS, Sarah Bengtson, DPT, Sierra Griffin, DPT, CSCS
Ahmed Elloka, PhD, PT, FAACVPR, Liza Malley, BS

Department of Rehabilitation Sciences, Florida Gulf Coast University

Introduction

Air displacement plethysmography (ADP) is a method of assessing body composition utilized since the 1900’s. In roughly 5 to 10 minutes, the BOD-POD is capable of assessing body composition, fat mass versus fat free mass, and it can measure the lung volume within the intrathoracic cavity. ADP uses gas laws to describe the inverse relationship between pressure and volume in two enclosed chambers. Based on density, it uses either the Siri or Sholl equation to calculate body composition via gas laws and the volume of air and pressure differences exerted within a confined space. Literature has shown that the BOD-POD is a reliable tool within 1% of the gold standard, hydrostatic weighing, for assessing body composition.

Certain precautions are set in place to standardize the testing environment, as well as the tested subject. Upon testing day, clients are asked to refrain from eating, drinking, or exercising 3 to 4 hours before BOD POD testing, and are asked to use the restroom prior to testing to eliminate any waste within the body. During the testing session, a swim cap is worn.

It is important to consider whether these external factors affect the ability of the BOD-POD to accurately measure body composition.

As per the protocol set forth by LMI, liquids should not be consumed 3 to 4 hours prior, as it may skew the body composition results. The question of how much liquid and by how much it will skew the results is still lacking in the literature and is yet to be determined.

Within the population at large, it may be unrealistic for some groups to refrain from water intake for more than 4 hours.

For this reason, it is necessary to challenge this aspect of the manufacturer’s protocol in order to make BOD-POD testing more feasible for a greater number of diverse clients.

Some studies have examined the effects of added content within the BOD PDP itself, via holding bottles of water and oil, but none have examined the physical consumption of water, or post urination and the effects these two variables can have on the end results of BOD PDP testing.

BOD POD Testing Protocol

• No eating, drinking, or exercising 3 to 4 hours prior to body composition testing
• Participants are to wear compression garments and a swim cap
• Remove all jewelry and eyeglasses

Additions to Protocol Specific to this study:
• Participants were asked to refrain from urinating 2 hours prior to testing

Power Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample Size</th>
<th>Power</th>
<th>Correlation</th>
<th>Sig. Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>28.970</td>
<td>0.80</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Correlation</td>
<td>17</td>
<td>0.890</td>
<td>0.65</td>
<td>0.65</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pairwise Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition 1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
</tbody>
</table>

Discussion

It is thought that excess fluids in the body will be inappropriately categorized as fat mass when using the BOD-POD for body composition measurements. The LMI protocol requires participants to refrain prior to testing in attempts to remove any excess fluids that may skew the results of the fat mass versus fat free mass compositions. All participants in this study acknowledged that they followed the no urination for two hours prior to testing requirement.

The standard pretesting protocol set forth by LMI asks participants to refrain from drinking fluids four hours prior to BOD-POD measurements being taken.

• This study found there to be a highly statistically significant difference between the test-retest and the post water consumption conditions (p-values: 0.000 and 0.000 respectively).

Major findings of the Present Study

• Breaking protocol for BOD POD testing with the consumption of water resulted in a significant difference in body composition measurements

• Test-retesting did not have a significant difference (p = 0.522).

• Bladder contents do not play a significant role in body composition measurements

• No misappropriated as fat or fat free mass

• Compared with standard protocol testing, consumption of water provided significantly different results in body composition testing (p = 0.002)

• Consuming 30% of an individual’s body weight in fluid outside of water was found to have an over estimate of fat mass and an underestimation of fat free mass

• Difference between the test-retest fat mass percentages was 0.7% for males and 0.3% for females

• Male participants’ measurement of fat mass on average had a difference of 0.6% and female participants’ fat mass measurements on average had a difference of 1.4%

• Since reliability was verified between test-retest measures, this was found to be statistically significant

References

