INTRODUCTION
The Nintendo Wii Balance Board (WBB) (Nintendo Inc., WA, USA) has recently had an increased presence in research, rehabilitation and exercise settings in place of force platforms (FP) which are typically used in biomechanics labs. The WBB measures force in the vertical direction, but not shear forces or moments. It is light and portable with a mass of 3.5 kg, and costs 0.5-1% of the price of a laboratory-grade force platform. Two studies to date investigated performance of the WBB with respect to underfoot centre of pressure (COP) accuracy [1,2]. The purpose of this study was to extend validation of WBB use by providing a thorough characterization of WBB specifications related to COP measures, and to assess the difference between COP outcomes collected on a WBB and a FP across three WBB battery life conditions.

METHODS
Part A – Olympic standard weights totaling 150 kg were loaded onto the surface of the WBB in different regions to determine the following loading characteristics: drift, linearity, hysteresis, weight accuracy and uniformity.

Part B – Ten healthy young adults performed quiet stance trials with eyes open and closed. Data during these trials were simultaneously recorded with a WBB placed on top of a force platform (AMTI, MA, USA). The eyes open task was performed with three different battery lives simulating 100%, 87.5% and 75% (point at which WBB does not collect). RMS COP location and mean velocity calculated from the WBB and FP data in the AP and ML directions. Average % differences across trials were calculated as the main outcome variable.

RESULTS
Part A – The system was linear across input ranges, demonstrated minimal drift and hysteresis, in addition to high total weight accuracy and uniformity across different loading regions (Table 1). Battery life did not affect the WBB output.

Part B – Figure 1 illustrates sample quiet stance COP vs. time traces from both the FP and WBB. On average, RMS COP and mean velocity showed less than 4% difference in the anterior-posterior direction and less than 13% difference in the medial-lateral direction for the using the WBB compared to FP data (Table 2). Battery life appeared to have no effect on the WBB-FP differences.

DISCUSSION & CONCLUSIONS
Based on these results, the Nintendo Wii Balance Board appears to be a reasonable alternative to a force platform for measuring underfoot COP in static tasks such as quiet stance. Battery life does not appear to affect WBB measurements. Further studies should assess WBB performance during dynamic tasks involving larger shear forces.

Table 1: WBB Characterization results averaged across battery lives

<table>
<thead>
<tr>
<th>Test</th>
<th>Drift</th>
<th>Linearity</th>
<th>Hysteresis</th>
<th>Weight Accuracy</th>
<th>Uniformity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
<td>&lt; 0.2%</td>
<td>R² = 1</td>
<td>% diff</td>
<td>% diff</td>
<td>% diff</td>
</tr>
</tbody>
</table>

REFERENCES