Head-Shake Sensory Organization Test Performance in Concussed Military Service Members.

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Introduction

- Service members who sustain a concussion often experience a myriad of physical and cognitive symptoms including dizziness and imbalance.
- Symptoms can persist for more than six months following head injury.
- The Head-Shake Sensory Organization Test (HS-SOT) measures the ability to utilize vestibular inputs for balance while simultaneously moving the head.
- The primary purpose of the study is to quantify how military service members with concussions perform on a dynamic balance task requiring head on body decoupling with and without somatosensory input.

Methods

- 17 Military Service Members with a history of concussion within the last 24 months completed the Dizziness Handicap Inventory (DHI) and Activities-specific Balance Confidence scale (ABC).
- Computerized Dynamic Posturography testing consisted of the Sensory Organization Test (SOT) (See Figure 1) and the Head-Shake (HS-SOT).
- For the HS-SOT, subjects repeated SOT conditions 2 (eyes closed, fixed surface) and 5 (eyes closed, sway-referenced surface) while performing rhythmic head movement in the yaw axis (left to right) at approximately 85 degrees per second at an amplitude of approximately 30 degrees in each direction.
- Separate Mann-Whitney U-test analyses were performed with subjects divided into groups based on concussion history (>3), and DHI score (≥13).

Table 1. Subject Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Total Sample</th>
<th>DHI &lt; 13 (N=7)</th>
<th>DHI ≥ 13 (N=10)</th>
<th>Concussions &lt; 3 (N=11)</th>
<th>Concussions ≥ 3 (N=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Mean)</td>
<td>32.47</td>
<td>32.86</td>
<td>32.20</td>
<td>31.45</td>
<td>34.33</td>
</tr>
<tr>
<td>No of Previous Concussions (Mean)</td>
<td>2.53</td>
<td>2.00</td>
<td>2.90</td>
<td>1.27</td>
<td>4.83</td>
</tr>
<tr>
<td>No of Concussions in Past 2 years (Mean)</td>
<td>1.12</td>
<td>1.14</td>
<td>1.10</td>
<td>1.18</td>
<td>1.00</td>
</tr>
<tr>
<td>No of Headaches per week (Mean)</td>
<td>2.71</td>
<td>3.00</td>
<td>2.50</td>
<td>2.62</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Table 2. Clinical Characteristics

<table>
<thead>
<tr>
<th></th>
<th>DHI Score (Mean)</th>
<th>ABC Score (Mean)</th>
<th>SOT Composite Score (Mean)</th>
<th>HSSOT Condition 2 Equilibrium Score (Mean)</th>
<th>HSSOT Condition 5 Equilibrium Score (Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>23.53</td>
<td>85.43</td>
<td>71.53</td>
<td>0.98</td>
<td>0.74</td>
</tr>
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<td>DHI &lt; 13</td>
<td>5.14</td>
<td>98.57</td>
<td>78.43</td>
<td>0.98</td>
<td>0.80</td>
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<td>DHI &gt; 13</td>
<td>36.40</td>
<td>76.24</td>
<td>66.70</td>
<td>0.97</td>
<td>0.68</td>
</tr>
<tr>
<td>Concussions &lt; 3</td>
<td>23.09</td>
<td>82.77</td>
<td>71.00</td>
<td>0.96</td>
<td>0.60*</td>
</tr>
<tr>
<td>Concussions ≥ 3</td>
<td>24.33</td>
<td>90.32</td>
<td>72.50</td>
<td>1.01</td>
<td>1.02*</td>
</tr>
</tbody>
</table>

Clinical Relevance

- SOT composite scores may not be sensitive enough to measure balance deficits following concussion in this population despite evidence of imbalance and dizziness on reliable and valid patient-report measures.
- Further research is needed to determine whether the HS-SOT is a valid performance-based measure to guide clinical decision-making.

Conclusions

- Despite evidence of imbalance and dizziness on validated patient-reported outcome measures, the SOT and HS-SOT did not detect differences in balance performance.
- These results highlight the need to explore objective performance-based measures to quantify post-concussive balance deficits.

References