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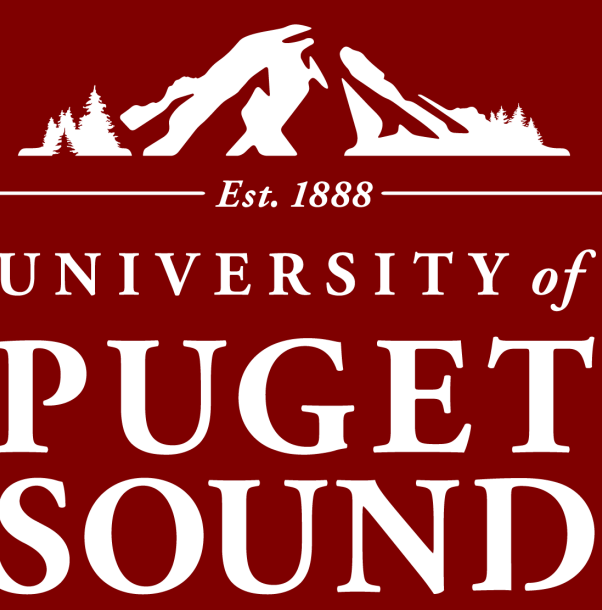
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Head-Shake Sensory Organization Test Performance in Concussed Military Service Members

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Introduction

- 383,947 US military service members incurred a concussion 2000-2018¹
- Service members who sustain a concussion often experience a myriad of physical and cognitive symptoms including dizziness and imbalance.² Symptoms can persist for more than six months following head injury³
- 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)

The views expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Department of Defense or the U.S. Government.

Table 1. Subject Characteristics

	Age (Mean)	# of Previous Concussions (Mean)	# of Concussions in past 2 years (Mean)	# of Headaches per week (Mean)
Total Sample (N=17)	32.47	2.53	1.12	2.71
DHI < 13 (N=7)	32.86	2.00	1.14	3.00
DHI \geq 13 (N=10)	32.20	2.90	1.10	2.50
Concussions < 3 (N=11)	31.45	1.27	1.18	2.82
Concussions \geq 3 (N=6)	34.33	4.83	1.00	2.50

Table 2. Clinical Characteristics

	DHI Score (Mean)	ABC Score (Mean)	SOT Composite Score (Mean)	HSSOT Condition 2 Equilibrium Score (Mean)	HSSOT Condition 5 Equilibrium Score (Mean)
Total Sample (N=17)	23.53	85.43	71.53	0.98	0.74
DHI < 13 (N=7)	5.14	98.57	78.43	0.98	0.80
DHI \geq 13 (N=10)	36.40	76.24	66.70	0.97	0.68
Concussions < 3 (N=11)	23.09	82.77	71.00	0.96	0.60*
Concussions \geq 3 (N=6)	24.33	90.32	72.50	1.01	1.02*

* p < 0.05

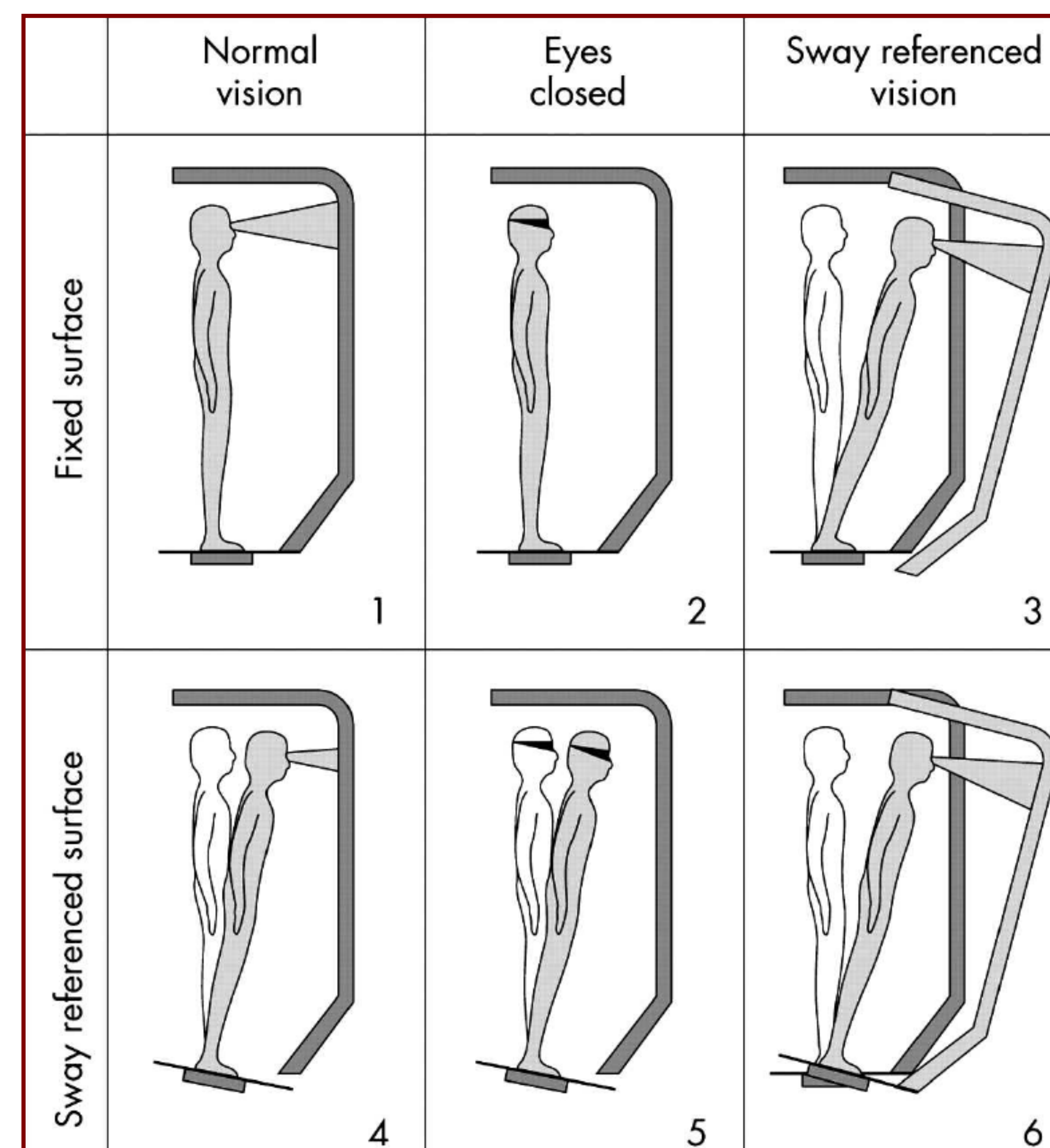


Figure 1. SOT Conditions

Condition 1: Normal vision, fixed support. Condition 2: Absent vision, fixed support. Condition 3: Sway-referenced vision, fixed support. Condition 4: Normal vision, sway-referenced support. Condition 5: Absent vision, sway-referenced support. Condition 6: sway-referenced vision, sway-referenced support.

Image courtesy of Natus Medical Incorporated.

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

Discussion

- This study sought to objectify the subjective reports of dizziness and impaired balance using the SOT and HS-SOT in order to better track the recovery process post concussion
- Individuals in this sample with 3 or more concussions performed better on HS-SOT condition 5
- Confounding variables (small sample size, uneven distribution of subjects with 3 or more concussions) may have influenced the results
- These results support previous research that the SOT may not be the most appropriate test for measuring balance deficits post concussion, as balance has been shown to normalize 5 days post concussion^{4,5}
- No significance was found in balance performance on the SOT composite, HS-SOT condition 2 and condition 5 equilibrium ratio scores between groups when stratified by a DHI cutoff score

Conclusion

- 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

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