ORGANIZATION NEWS

Highlights From the Rehabilitation Measures Database

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Measurement Characteristics and Clinical Utility of the Clinical Test of Sensory Interaction on Balance (CTSIB) and Modified CTSIB in Individuals With Vestibular Dysfunction

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Vestibular dysfunction resulting from peripheral vestibular disorders, head trauma, and other central nervous system disorders can lead to imbalance and falls.[1-3] Balance impairment can have a significant impact on an individual's ability to perform activities of daily living or participate in work and leisure activities. A thorough assessment of balance includes examination of the sensory systems that contribute to postural control. The Clinical Test of Sensory Interaction on Balance (CTSIB) was developed to assess the contribution of the visual, somatosensory, and vestibular systems to postural control.[4] The original test evaluates static postural stability in 6 distinct standing conditions with eyes open, with eyes closed, and with the use of a dome to alter visual input on both firm and foam surfaces. This test has been modified to include eyes open and eyes closed on both firm and foam surfaces, given the finding that altered visual inputs from the dome were not different from those in the eyes closed condition.[5] This test can be administered in less than 15 minutes with minimal equipment (stopwatch and foam pad). The CTSIB and modified CTSIB have excellent reliability and validity in adults with vestibular disorders and can be easily administered in all clinical settings.

This Rehabilitation Measures Database summary provides a review of the psychometric properties of the CTSIB and modified CTSIB in adults with vestibular dysfunction. A full review of the CTSIB and modified CTSIB as well as reviews of more than 100 other instruments can be found at www.rehabmeasures.org.

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BIBLIOGRAPHY

1. Pothula VB, Chew F, Lesser TH, Sharma AK. Falls and vestibular impairment. Clin Otolaryngol Allied Sci 2004;29:179-182.
2. Franke LM, Walker WC, Cifu DX, Ochs AL, Lew HL. Sensor integrative dysfunction underlying vestibular disorders after traumatic brain injury: a review. J Rehabil Res Dev 2012;49:985-994.
3. Liston MB, Bamiou DE, Martin F, et al. Peripheral vestibular dysfunction in older adults experiencing multiple non-syncopal falls versus age-matched non-fallers: a pilot study. Age Ageing 2014;43:38-43.
4. Shumway-Cook A, Horak FB. Assessing the influence of sensory interaction on balance: suggestion from the field. Phys Ther 1986;66:1548-1550.
5. Cohen H, Blatchly CA, Gombash LL. A study of the clinical test of sensory interaction and balance. Phys Ther 1993;73:346-351.
6. El-Kashlan HK, Shepard NT, Asher AM, Smith-Wheelock M, Telian SA. Evaluation of clinical measures of equilibrium. Laryngoscope 1998;108:311-319.
7. Whitney SL, Wrisley DM. The influence of footwear on timed balance scores of the modified clinical test of sensory interaction and balance. Arch Phys Med Rehabil 2004;85:439-443.
8. Wrisley DM, Whitney SL. The effect of foot position on the modified clinical test of sensory interaction and balance. Arch Phys Med Rehabil 2004;85:335-338.

Rehabilitation MEASURES	**Measure Name:**	**Acronym:**
	(Modified) Clinical Test of Sensory Interaction on Balance	CTSIB/mCTSIB

Summary Author:	**Population Reviewed:**	**Admin Time:**	**Items:**
Horn L, Rice T, Stoskus J, Lambert K, Dannenbaum L, Scherer M	Vestibular Dysfunction	30 seconds/trial	CTSIB: 6 mCTSIB: 4

Purpose and Administration Instructions:

- Assess the contribution of the visual, somatosensory, and vestibular systems to postural control in standing
- All conditions tested without upper extremity support

Validity:

- Criterion Validity: *Adequate to excellent* for the CTSIB depending on time period tested during rehabilitation[6]
- Construct Validity: Scores on the CTSIB were significantly lower in individuals with vestibular disorders compared to healthy adults[5]

Required Equipment:

- Stop watch; foam pad (medium density viscoelastic foam); visual conflict dome for CTSIB (modified Japanese lantern not required for mCTSIB)

Reliability:

- Not established in individuals with vestibular dysfunction

Scoring Instructions:

- Each condition tested up to 30 seconds, 3 trials of each condition
- Average score is calculated for each condition[5] or add average for all conditions (maximum score=180 seconds)[6]

Scoring Interpretation:

Average of 3 trials[5]

	Foam, Eyes Open (sec)	**Foam, Eyes Closed (sec)**	**Foam, Visual Conflict Dome (sec)**
25-44 y/o	30.00 (0)	30.00 (0)	30.00 (0)
45-64 y/o	30.00 (0)	30.00 (0)	28.1-30.00 (0-7.7)
65-84 y/o	29.5-30.00 (0-2.1)	12.5-18.5 (11.7-13.1)	18.3-24.2 (10.6-13.3)

Range of 3 trials in normal adults, standard deviation in parentheses
Total of average of all conditions[6]

	20-49 y/o	**50-59 y/o**	**60-69 y/o**	**70-79 y/o**
Mean	179.7	180	179.9	177.4
SD	1.6	0	0.5	8.7
5 percentile	176.5	180	178	151.3

5th percentile used to define the lower limit of normal function
A composite score < 260 seconds (summing all 3, 30sec trials for each of 6 conditions) has specificity of 90% and sensitivity of 44% for identifying fallers.
If average score below 81 seconds in compliant surface conditions, relative risk of falling is 8.67 (age adjusted odds ratio)

Considerations:

- CTSIB: The original test was performed with shoes off, but there is no significant difference when the test is performed with shoes on[7]
- MCTSIB: The original test was performed with feet together, but there is no significant difference when performed with feet apart[8]

Abbreviations:

Cut-off Criteria:		
	r	ICC
Excellent	≥ 0.6	≥ 0.75
Adequate	0.31-0.59	0.40-0.74
Poor	≤ 0.3	< 0.4