

Gans Sensory Organization Performance (SOP) Test ©

Introduction

Since 1992 the American Institute of Balance has administered postural stability tests (Romberg, CTSIB and Fukuda) to over 60,000 patients. This combined and integrated assessment has been termed the Gans Sensory Organization Performance (SOP) Test ©. The SOP test results have been correlated with caloric testing, MRI, and other available medical data to provide a qualitative pattern of responses. The normative data was based on a sample size of n=2,000.

The Gans SOP Test © is a simple clinical tool, which provides clinicians with an easily administered and cost effective method of balance function assessment, which is sensitive to vestibular deficits. The SOP may be used for screening purposes, as part of a diagnostic work up, or as a post-treatment outcome measure. The use of office based tests of postural stability and balance has been recommended as part of the clinical evaluation of all dizzy and balance patients (McFeely and Bojrab, 2001). These tests can provide valuable qualitative information about the patient's pattern of equilibrium maintenance by evaluating their use of various sensory inputs (vision, somatosensory and vestibular) to their postural stability. These often prove useful in the initial diagnosis, categorization of functional impairment, and documentation of vestibular rehabilitation therapy (VRT) outcomes. The component tests that comprise the Gans SOP Test © have existed for years, have been well documented, standardized, and require little or no special equipment.

Tests of postural stability and balance function provide information through a varied assessment of the following: static balance, dynamic balance with altered sensory input, and stability testing with movement. Three well-known and long established tests that fulfill these three functions are the Romberg Test (1846), the Modified Clinical Test for Sensory Integration of Balance (1986), and the Fukuda Stepping Test (1959). A review of these tests is provided at the conclusion of the instructions.

Administration and Scoring

The SOP Test has seven conditions. Condition one through four is the Romberg, conditions five and six is the CTSIB, and condition seven is the Fukuda.

The patient's safety is of critical importance. A patient having any physical limitation, which would contraindicate testing on a specific condition, should not be tested on that condition. As with any clinical or computerized test of postural stability, orthopedic, neuromuscular, or neurologic disorders may contraindicate the test or may adversely affect the results.

We have found it helpful to perform the test near a wall, or in a corner, so the patient has additional support especially for conditions four and five (standing on foam). A gait belt may also be helpful for some patients. If the patient's balance is so degraded that they cannot stand or ambulate independently, the test reliability is probably too poor to be of clinical value as an indicator of vestibular function.

The AIB Balance Foam used in the test is of high density-compression and quality and will support weights of up to 350 lbs, or 159 kg. It is covered in a kinesthetically transparent fabric (Nylon-Lycra) to reduce or remove any tactile cues. All normative data has been collected with the AIB Balance Foam. Results may not be reliable with other products or substitutes.

Each condition will be held or performed for 20 seconds. Patient performance on each condition will be rated with N=normal, S=sway, F=fall, R=right or L=left. Please refer to the scoring sheet for examples.

<u>Condition</u>	<u>Action</u>
One	Romberg open stance (feet shoulder width apart) with eyes open.
Two	Romberg open stance (feet shoulder width apart) with eyes closed.
Three	Tandem Romberg (not heel to toe) with eyes open.
Four	Tandem Romberg (not heel to toe) with eyes closed.
Five	Standing on foam (CTSIB) with eyes open.
Six	Standing on foam (CTSIB) with eyes closed.
Seven	Stepping Fukuda – patient marches (standing on floor) in place with eyes closed.

Patient Instructions

<u>Condition</u>	<u>Instruction</u>
One	Please stand quietly with your feet shoulder width apart with your eyes open. Please look straight ahead and place your hands at your side.
Two	Now I'd like you to continue to stand as you are but with your eyes closed.
Three	Now take a step forward with your right/left foot. <i>(You will need to establish if the patient has any orthopedic or other medical conditions, i.e. peripheral neuropathy that could affect the results. If so, the stronger leg should remain as the back leg. You may also repeat this alternating the right and left legs to see if that adversely affects their balance).</i>
Four	Now close your eyes. <i>(Patient is in the proper tandem position as described above).</i>
Five	Please step up on the foam block. <i>(You will need to be watchful of the patient and should hold them or let them place their hands on the wall for support). I want you to work to keep your balance as best you can. Please keep your hands at your side and look straight ahead.</i> <i>(We typically have the patient facing the wall with the foam block about 8-12 inches away from the wall).</i>

- Six **Now close your eyes and try to keep your balance. I will be sure you don't fall.** *(Be prepared to closely monitor their balance and provide support as needed). Please be careful as you step off the foam.* *(You may wish to support or hold the patient as they step off).*
- Seven **Now I want you to march in place.** *(Let them begin with their eyes open for a few seconds. You may occasionally need to demonstrate to the patient what you need them to do).* **Now, please close your eyes. Do the best you can, and I will be sure you don't fall.** *(It is important to monitor the patient's safety).*

Scoring and Interpretation

The Gans SOP Test is based on clinician observation. A simple scoring of the patient's performance will require some practice but is quite obvious with practice to a clinician's discerning eye. Computerized tests of balance performance provide a quantification of the patient's center of gravity (COG) sway and limits of stability (LOS). LOS is correlated to an individual's age and height. These established norms (up to age 79) have been included in the software algorithms of the computerized systems. Computerized analysis and printout will show if the patient's pattern falls inside the norms and what type of pattern they present.

N = Normal: The patient stands quietly or with minimal sway without needing any support or assistance.

S = Sway: The patient is able to maintain his/her balance without assistance but the degree of sway is greater than normal.

F = Fall: The patient cannot complete/perform the condition without support or assistance.

R = Right: Patient turns, drifts, and/or spins to the right.

L = Left: Patient turns, drifts, and/or spins to the left.

Conditions one through four (Romberg and Tandem Romberg) will be scored as a **Normal, Sway or Fall**. You may wish to further indicate a direction R or L, if the patient's performance is categorized as a **Fall**.

Conditions 5 and 6 (CTSIB) will be scored as a **Normal, Sway or Fall**.

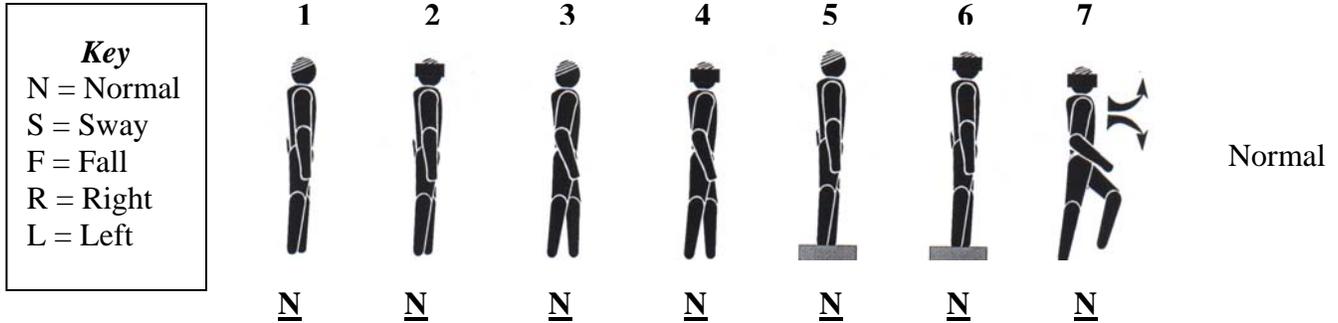
Condition 7 (Fukuda) will be scored as **Normal, Sway, Fall, Right or Left**.

Interpretation of Patterns

The Gans SOP Test is best used to look at overall patterns of balance performance through its combination of the Romberg, CTSIB and Stepping Fukuda Tests. Although no test of balance function can provide a specific diagnosis, there are well-established patterns of functional impairment that have been found to correlate with various vestibular function tests.

Normal Patterns

Normal individuals should perform or complete all conditions. Age effect has been shown to degrade balance function on Condition six by age 79.

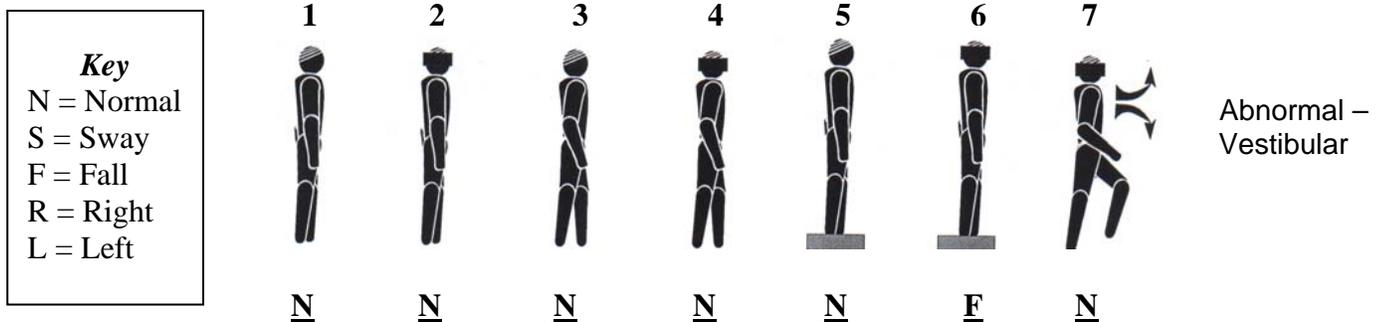
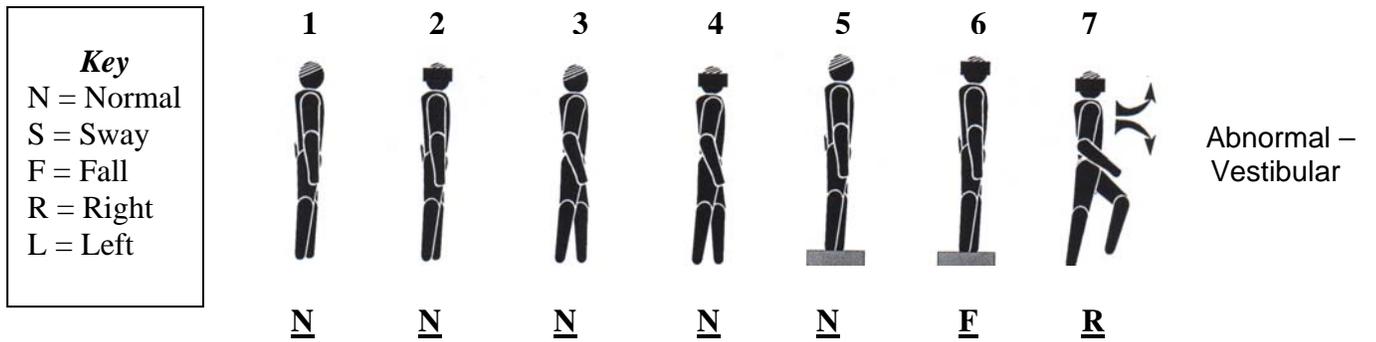


Vestibular Patterns

Fall on Condition 6 (CTSIB foam with eyes closed) has the greatest predictive value of an uncompensated peripheral vestibulopathy on any single condition. There is a **75%** correlation with a caloric weakness (>25%) on VNG/ENG test.

Right/Left (turn, drift, spin > 30 degrees) or a **Fall on Condition 7** (Stepping Fukuda) has a **50%** correlation with a caloric weakness (>25%) on VNG/ENG test.

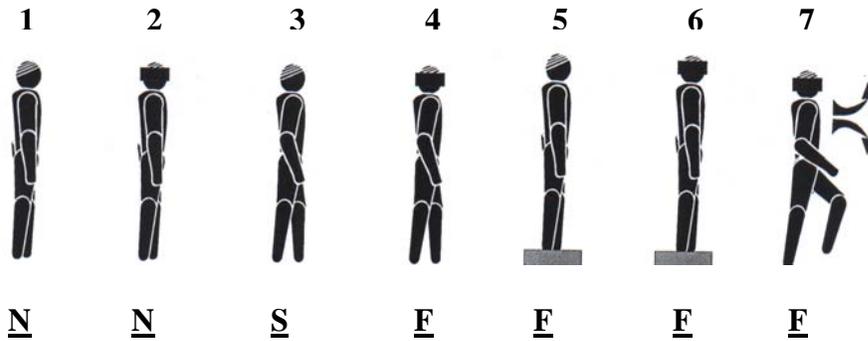
When the patient has both a **Fall on Condition six** and a turn, drift or spin on **Condition seven** there is a **95%** correlation with caloric weakness.



CNS-Multifactorial

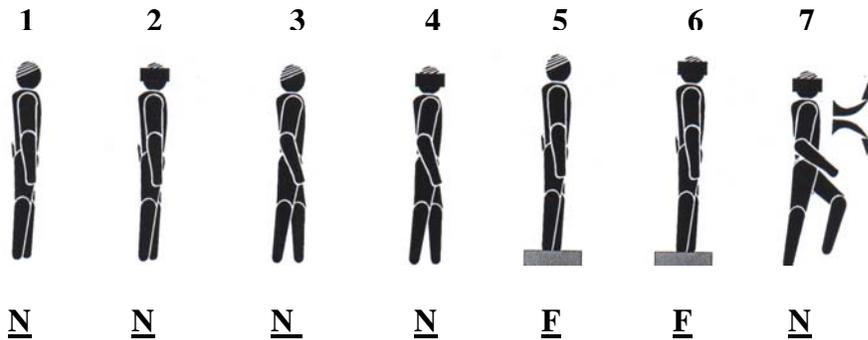
The progression of conditions one through seven progresses from easy to difficult with conditions six and seven most sensitive to vestibular deficits. Patients with cerebellar, descending motor track, and peripheral neuropathy will show abnormalities on all three components (Romberg, CTSIB, and Fukuda) and will demonstrate difficulty on condition five (CTSIB with eyes open). This pattern will vary greatly from a patient with only an uncompensated peripheral vestibulopathy.

Key
 N = Normal
 S = Sway
 F = Fall
 R = Right
 L = Left



Abnormal –
 CNS –
 Multifactorial

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Abnormal –
 CNS –
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Coding and Billing Considerations

The CPT code 97750 and its description below best reflect the Gans SOP Test ©. This code has been used for other tests such as the Modified CTSIB. It is a physical medicine category code and therefore the billing provider and/or third party payer may affect its reimbursement.

97750 (one unit) Physical Performance Test or Measurement (e.g., musculoskeletal functional capacity) with written report, each 15 minutes. It is advisable to complete a report form for each time the test is administered and/or billed and placed in the patient’s records. Please review current AMA CPT coding manuals to stay up to date of any changes.

Historical Perspective: Review of Romberg, CTSIB and Fukuda Tests

Romberg introduced the oldest and most commonly used static balance test in 1846. The Romberg test was originally noted to be sensitive for *tabes dorsalis*. Today it is primarily used as an indicator of proprioception and vestibular function. In the Romberg Test the patient is asked to stand with their feet close together, first with their eyes open then closed. The patient keeps their hands by their side. The sharpened or tandem variation has the patient stand heel to toe, again first with their eyes open then closed. Both variations have the patient stand in each condition for at least ten (10) seconds. Although this test is often conducted as part of a patient's physical exam, it has been shown not to be especially sensitive to unilateral or non-acute vestibular deficits. Furthermore, there are no age norms for individuals 60 years and older. Since many patients with vestibular and balance patients are older, the test's specificity may be poor for these reasons.

Horak and Shumway-Cook published **The Modified Clinical Test for Sensory Integration of Balance** in 1986. It was originally referred to as a "foam and dome" test. The patient's sway and performance is evaluated under four (4) conditions. Condition one is standing on a regular-firm surface with their eyes open. Condition two is the same stance on a regular-firm surface but with eyes closed. Condition three progresses to standing on a dynamic surface (foam) with eyes open, which alters only somatosensory information by reducing its predictability. Finally, in condition four, the patient stands on foam with eyes closed. The patient is allowed three trials on all four conditions and an average of their performance on each condition is taken.

Condition four; standing on foam without vision (eyes closed) is the most challenging to the vestibular system. We have altered one sensory modality and removed the other. The burden is now placed almost entirely on the vestibular system to maintain balance. The patient's inability to maintain postural stability under dynamic conditions without vision suggests an impaired vestibular system.

Horak and Shumway-Cook's theory of sensory integration was really at the beginning of modern thinking about equilibrium function and vestibular rehabilitation. This concept has been applied in sophisticated computerized dynamic posturography (CDP) systems such as Neurocom's Equitest. Several studies have reported comparisons of the sensitivity and specificity of the modified CTSIB compared to CDP. Reports indicate that CTSIB was as accurate as CDP in identifying major patterns of abnormalities. CDP was, however, better at identifying subtle abnormalities and controlling false positives. Weber and Cass reported high correlations and high sensitivity and specificity for the modified CTSIB and CDP.

The Fukuda Stepping Test introduced in 1959 is a variation of the stepping test of Unterberger (1938). The basic premise of the test is to help identify a vestibular weakness by watching a person's spatial orientation while stepping in place with their eyes closed. Fukuda reported that with 50 steps, if the patient rotated more than 30 degrees, it was positive for a vestibular weakness on the side of their turn. Normal individuals will not turn more than 30 degrees or move forward more than about four feet. The test has shown to have a sensitivity of approximately 50% and does not have a high test retest reliability. The direction of the turn may also be affected by the nature of the

vestibular deficit. The nature of the patient's turn may vary, ranging from a drift to a spin like turn of 180 degrees.

Summary

The Gans SOP Test is best utilized, as all balance assessment tools, within the framework of an established diagnostic and/or rehabilitation set of protocols. A single assessment protocol cannot provide a specific diagnosis or exclude other medical or physical conditions. The test should however, offer clinicians insight into the diagnostic and treatment triage of patients with vestibular and balance disorders. Vestibular rehabilitation efficacy may also be documented with pre- and post-therapy measurements.

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