Sensory Organization Test (SOT)

The SOT test protocol for NeuroCom Balance Manager systems is a six-condition assessment that identifies abnormalities in the patient’s use of the three systems that contribute to postural control: somatosensory, visual, and vestibular. During the assessment, inaccurate information is delivered to the patient’s eyes, feet and joints through sway referencing of the visual surround and/or the support surface.

Since the test results are displayed in real time, the operator can easily identify potential problems with the patient’s performance or note inconsistencies in the data across trials, thereby enhancing accurate assessment and analysis.
SOT Comprehensive Report

EQUILIBRIUM SCORE

The equilibrium score quantifies postural stability during each of the three trials of six sensory conditions. The equilibrium score compares the patient’s anterior/posterior (AP) sway during each trial to the theoretical sway stability limit of 12.5 degrees. A patient swaying to the limits of stability will receive a very low score. A score close to 100 indicates good stability and minimum sway. A score of 0 is automatically assigned to all falls or stopped trials.

Each bar represents results from a single trial of a given condition. If the patient falls, the operator stopped the trial and marked the data as a fall. The lighter shaded bars represent normative data matched by age.

The composite score is calculated by:

- Independently averaging the score for conditions 1 and 2;
- Adding these two scores to the equilibrium scores from each trial of sensory conditions 3, 4, 5, and 6; and
- Dividing that sum by the total number of trials.

SENSORY ANALYSIS

The sensory analysis graph reflects the sensory ratios computed from the average equilibrium scores obtained on specific pairs of sensory test conditions, as follows:

- **SOM**: Condition 2/Condition 1
  - Patient’s ability to use input from somatosensory system to maintain balance
- **VIS**: Condition 4/Condition 1
  - Patient’s ability to use input from visual system to maintain balance
- **VEST**: Condition 5/Condition 1
  - Patient’s ability to use input from vestibular system to maintain balance
- **PREF**: Condition 3+6/Condition 2+5
  - Degree to which patient relies on visual information to maintain balance, even when the information is incorrect
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STRATEGY ANALYSIS
The strategy analysis quantifies the relative amount of movement about the ankles (ankle strategy) and about the hips (hip strategy) used by the patient to maintain balance during each trial. Normal individuals move primarily about the ankle joints when the surface is stable and shift to hip movements as they become less stable.

COG ALIGNMENT
This reflects the patient’s COG position relative to the center of the base of support at the start of each SOT trial. Individuals with normal performance maintain their COG near the center of the support base.

SHADED AREA
The shaded area on each graph represents the normative data range. Green bars indicate performance within the normal range; red bars indicate performance outside the normal range.

FUNCTIONAL IMPLICATIONS
Accurate organization of sensory information is critical to maintaining balance within the variety of environments encountered in daily life. An inability to utilize sensory information appropriately can result in instability in environments where visual cues are diminished (darkness, lack of contrast/depth cues), the surface is unstable or compliant (sandy beach, gravel driveway, boat deck), or when conflicting visual stimuli are present (busy shopping mall, large moving objects such as nearby bus). Inability to appropriately organize sensory information can lead to or be exacerbated by impairments in COG alignment and/or selection of movement strategies.
Normal Response (indicated by green): Performance within normative ranges is indicative of: 1. Effective central organization of sensory information and use of the three sensory inputs to balance; 2. The ability to select the appropriate movement strategy for the amount of stability present; and 3. Execution of an effective balance control response.

Abnormal Response (indicated by red): Performance is compared against age-matched normative measures (indicated by grey). Abnormal performance may be related to pathology with the indicated sensory system or that the patient is failing to effectively use the sense. The presence of a sensor balance impairment may or may not correlate directly with site-of-lesion findings.

Clinical Significance: Provides information regarding the impairments underlying a balance control problem and a specific path to treatment, as well as an objective measure to document improvement through treatment. Patients with sensory organization problems have difficulty safely navigating in environments of low lighting, visual movement, or surface changes/irregularities.