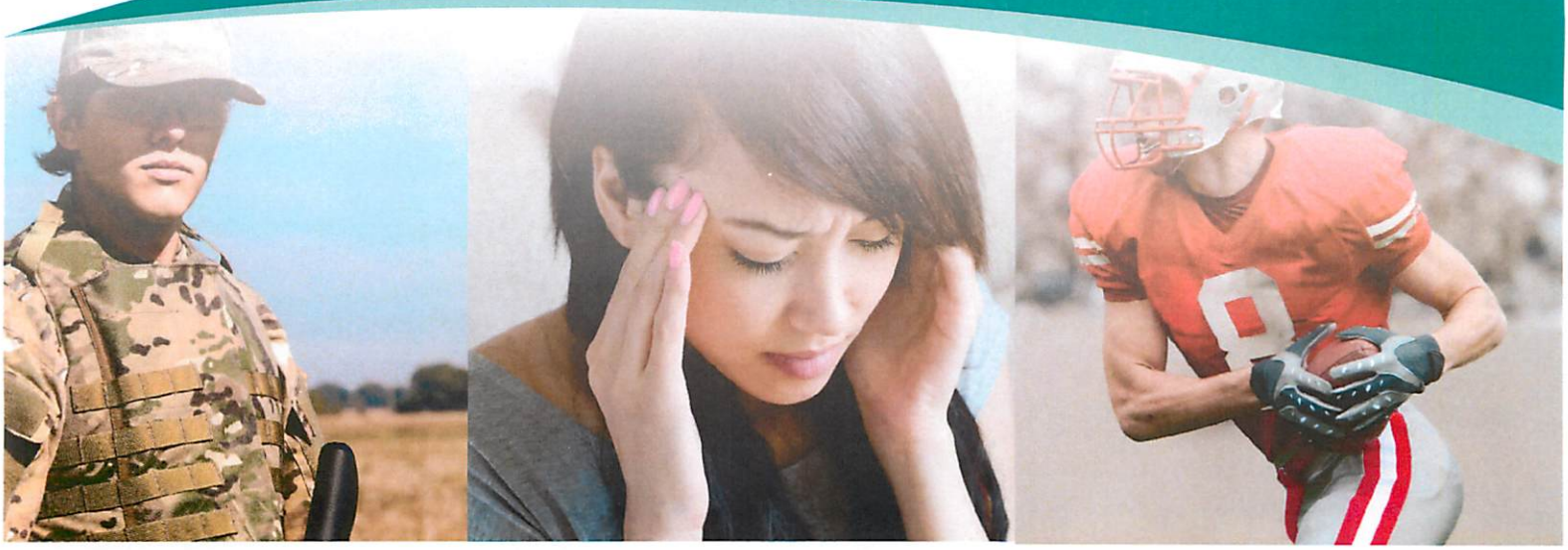
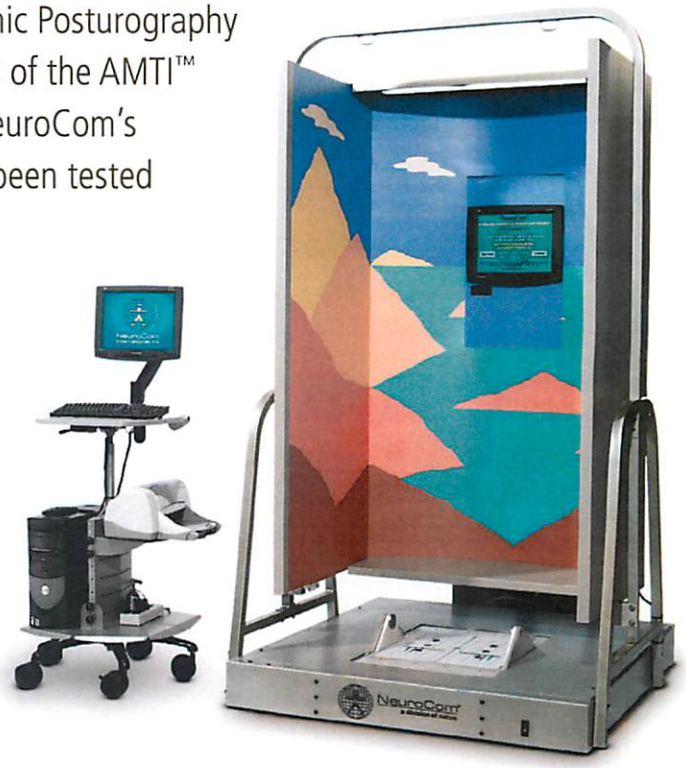
natus
balance & mobility

NeuroCom®
Clinical Research System (CRS)



Designed for the Clinical Researcher

Clinical Research Systems combine the clinical efficacy of NeuroCom EquiTest® and SMART EquiTest Computerized Dynamic Posturography (CDP) systems. Integrating the recording capabilities of the AMTI™ Dual Top Six Degrees of Freedom Force Plate with NeuroCom's dynamic software package, the NeuroCom CRS has been tested and proven in demanding gait and balance research labs worldwide.



- Standardized clinical test protocols
- Turn-key user-programmable operating system
- Used by leading researchers in balance & mobility programs worldwide

BUILT TO LAST

The NeuroCom Balance Manager System's robust, durable & low maintenance design delivers a true value-based solution for any clinical and/or research environment.

Vestibular Training Exercises with Postural Tasks

Additional clinically significant information can be measured when performing VOR rehabilitation training while maintaining balance on a NeuroCom static or dynamic Force Plate.

On a static balance system, the clinician can incorporate the use of rocker boards or foam on the Force Plate.

On a dynamic balance system, the surround and support can be put into dynamic training responsive, variable, or random mode. To add greater complexity, integrating a "busy" background pattern will trigger patient symptoms.

Additional features to inVision software, integrated with NeuroCom Balance Systems:

Dual Tasking — select the check box to allow the use of the Force Plate to collect balance data during vestibular exercise

Training Report — shows the sway trace based on the assigned task by the clinician; for example, having the patient move to four corners, walking in place, etc.

Patients coming back for follow-up visits receive *more* information with *in*Vision training instructions

InVision Configuration Options	
NCM-PORINV	*in*Vision Portable with Laptop
NCM-INV	*in*Vision with Desktop PC and ergonomic cart
NCM-INV-S	*in*Vision add-on to any NeuroCom Static Balance System
NCM-INV-D	*in*Vision add-on to any NeuroCom Dynamic Balance System

All configurations include an *in*Vision head tracker (InterSense InertiaCube™, 3-axis, integrating gyro mounted on a headband) with 100 disposable caps, Balance Manager *in*Vision Software, MS Windows 7 Operating System and a medical-grade isolation power supply. Minimum hardware footprint required is 36" x 60".

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For more information, please contact your local Natus District Sales Manager at 1-800-303-0306 or visit www.natus.com.

Visit our NERVE Center® education portal at nervecenter.natus.com

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P/N 014399A

Clinical Research System (CRS)

CRS systems provide objective documentation of the balance control functions (sensory as well as voluntary and reflexive motor) in the population to be studied, the ability to design complex sensory and motor challenges to emulate real world conditions, and full access to the detailed force & moments data from two independent Force Plates (Fx, Fy, Fz, Mx, My, Mz) to accurately demonstrate the impact of those challenges on human balance performance.

Research Software Package

User-programmable operating system for flexibility in designing research protocols. User can specify:

- Independent control of Force Plate and surround movements
  - Waveform
    - Mathematical function
    - Look-up tables
  - Step or ramp function
  - Sway referencing
  - Movement onset delay
- Maximum 10 minute trial duration
- Custom targets

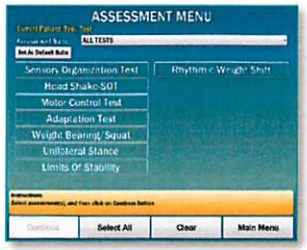
Data from the AMTI Force Plate and motor positions can be exported to a delimited text file for easy access by statistical packages.

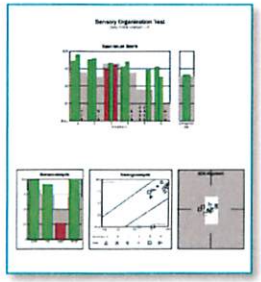
Clinical Software Package

User can select standardized assessment protocols and compare to normative data:

- Sensory Organization Test (SOT)
- Motor Control Test (MCT)
- Adaptation Test (ADT)
- Weight Bearing Squat (WBS)
- Unilateral Stance (US)
- Limits of Stability (LOS) (SMART EquiTest only)
- Rhythmic Weight Shift (RWS) (SMART EquiTest only)

The SMART EquiTest configuration includes Training Protocols: Sequence, Weight Bearing and Custom Training.





The most powerful balance research mode to date — Waveform

Waveform mode can be used to profile complex waveform movements via support for classic trigonometric functions (Figure1), intricate multi-ramp movements with varying speed and amplitudes (Figure 2), and VB scripts to articulate permutations of waveforms and ramps (Figure 3).

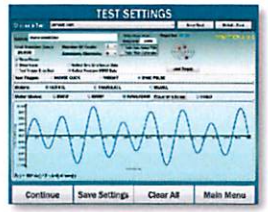


Figure 1

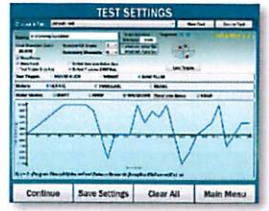


Figure 2

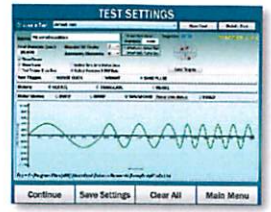


Figure 3

Configuration Options

EquiTest CRS

SMART EquiTest CRS

- Embedded LCD monitor
- Training software for rehabilitation
- Motor for translation of Force Plate
- Motor control test (MCT)

Setting the Standard in Balance & Mobility

Technical Specifications

Components Included

- EquiTest or SMART EquiTest clinical software configuration options
- Separate turn-key research user-programmable operating system
- Dynamic NeuroCom Dual Top Six Degrees of Freedom Force Plate from AMTI (rotate and translate)
- Dynamic visual surround with illumination
- Overhead support bar with patient harness set
- Windows-based desktop computer
- One flat panel 17" LCD operator monitor (EquiTest)
- Two flat panel 17" LCD monitors for operator and patient (SMART EquiTest)
- Medical-grade isolation power supply
- Color printer
- Wireless mouse
- Ergonomic point of care cart

Accessories Included

- B100012-00
  Harness Kit (Sizes: S/M/L)
- NCM-FOAM
  Foam pad: 18 x 18 x 5 in (46 x 46 x 13 cm)

(SMART EquiTest CRS Only)

- P102604-00 **Blocks for Prep kit includes:**

  Rocker board
  Step-up blocks: 4 in (10 cm) and 6 in (15 cm
  Leveling block: 2 in (5 cm)
  Heel/toe wedges: 6° and 12° A/P
  Inversion/eversion wedges: 3° and 6° M/L

Options

- NCM-LFP
  18" x 60" static force plate
- NCM-INV-D
  ***in*Vision software and head tracker**
  (PTT, DVA, GST & HS-SOT)
- NCM-GAMES
  NeuroGames

Electrical Characteristics

- **100-240V / 50-60 Hz / 1200 W**
- **Compliant with the latest medical standards**

Force Plate and/or surround movements and data acquisition can be initiated either under operator control or by an external synch pulse. A synch-out pulse is also available to synchronize external devices.

Physical Dimensions

	in	cm
Assembled dimensions	53 x 61* x 94	135 x 155* x 239
Base	53 x 61 x 6	135 x 155 x 15
System cart	25 x 24 x 44-57**	64 x 61 x 112-145**
Dual Force Plate	18 x 18	46 x 46
Step height	6	15
Visual surround	42 x 36 x 74	107 X 91 X 188
Maximum subject height	80	203

*Depth extends to 64 in (163 cm) with surround in resting position.

** Minimum-maximum monitor extension height.

Minimum footprint required	96 x 75	244 x 191
Minimum ceiling height	95	242
Total system weight	775 lb.	352 kg.

Performance Characteristics

Multiple servomotors provide smooth, accurate movements of the NeuroCom Dual Top Force Plate from AMTI and/or the surround. User can specify the waveforms to control the servomotors, which can be activated individually or in pairs.

Translations

- **±2.5" (6.35 cm) from center, for a maximum of 5" (12.7 cm) in the forward-backward direction**
- **Maximum velocity: 20 cm/s**

Rotation

- **± 10° from center, either toes-up or toes-down, for a maximum of 20°**
- **Maximum velocity: 50°/s**

Visual Surround Movement

- **± 10° from center**
- **Maximum velocity: 15°/s**

NeuroCom Dual Top Force Plate (per plate)

- **Fz Capacity, lb (N): 400 (1800)**
- **Fx, Fy Capacity, lb (N): 40 (180)**
- **Mz Capacity, in-lb (Nm): 300 (34)**
- **Mx Capacity, in-lb (Nm): 1200 (135)**
- **My Capacity, in-lb (Nm): 600 (68)**
- **Sampling rate: 100 Hz**

Specifications subject to change without notice.

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Visit our NERVE Center® education portal at nervecenter.natus.com

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P/N 014320A

Vestibular Rehabilitation Training of the VOR — NOW with Computerized Exercises*

The patient is tested using the *in*Vision DVA and GST protocols. The DVA and GST scores are used to determine the starting point for training. During VOR rehabilitation training exercises, the center target changes direction to record visual accuracy while the head moves at the target velocity. In training, the patient must move their head continuously for up to 2 minutes and call out the correct optotype direction. The operator can modify the training parameters by selecting the optotype size, target velocity and direction of head movement.

Objective Vestibular Training	Velocity of head movement and duration of training performance is tracked over time
Track Reponse Accuracy	Target (E optotype, picture or word) is identified by the patient based on their ability to see the target clearly at the target head movement velocity
Customize VOR Training	Training parameters are adjustable per the clinician's discretion

ADDITIONAL FEATURES

Built-in Metronome for VOR exercises to allow the patient to set metronome specifications for continued at-home exercises.

Patient Summary Report can be printed at the completion of the VOR X1 exercise. This report includes instructions for at-home exercises along with a sample size of the actual size optotype.

*in*Vision software is available for the following NeuroCom Balance Manager® Systems:

- VSR (Very Simple Rehab)/ VSR Sport
- BASIC Balance Master
- Balance Master
- SMART Balance Master
- EquiTest®
- SMART EquiTest
- EquiTest/SMART EquiTest
  CRS (Clinical Research System)

*VOR Rehab Training is available on MS Windows® 7 only.

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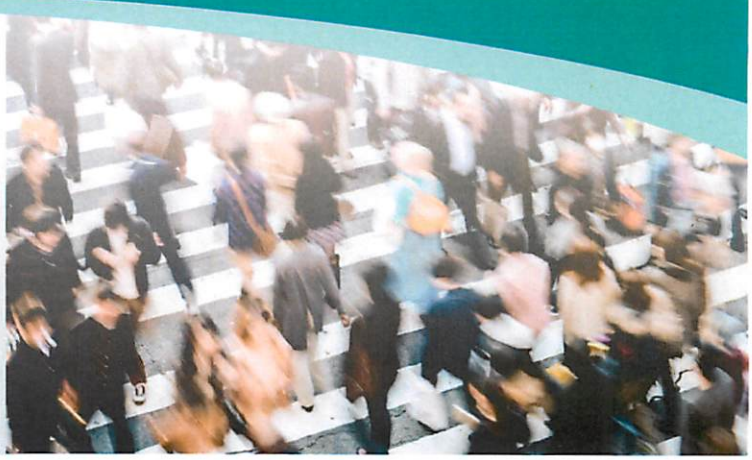
balance & mobility

NeuroCom®
*in*Vision Software Package



Holding steady — the importance of stable vision

Patients with balance problems often complain about problems with their vision, particularly blurring, jumpy vision or dizziness when moving or in busy environments such as the grocery store or shopping mall. Maintaining both visual clarity *and* balance is necessary to safely perform activities of daily living. This requires a stable gaze and a stable body while moving about, particularly when head movements are required. The complex process of assessing and rehabilitating the function of the Vestibulo-Ocular Reflex (VOR) can now be easily, reliably and objectively performed in clinic with NeuroCom's *in*Vision package.

The world's first system for quantifying visual acuity & stable gaze

Unique *in*Vision protocols document the presence of VOR dysfunction

Practical Reliable objective data help clinicians develop targeted treatment and monitor patient progress

Specific Used by leading researchers in balance & mobility programs worldwide

VOR Assessment

Rigorous stimulus control, reliable DVA testing, and a new GST protocol come together to identify and quantify VOR performance deficits.

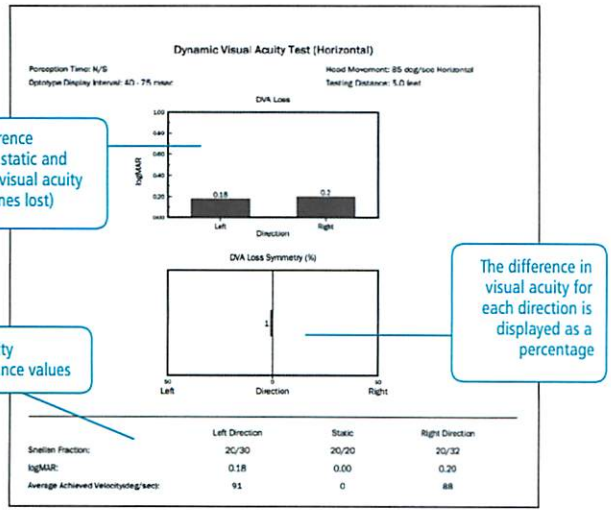
NEW! VOR Rehabilitation Training Exercises

Track direction of head movement and duration of training performance, capture accuracy of visual acuity at the point of retinal slip, and set parameters for target head movement velocity specific to the patient's GST results and customize to adjust at the clinician's discretion.

Assessment of VOR Function

Evaluation of the vestibular system is an important part of the examination of balance problems, and it can be the most challenging. The Vestibulo-Ocular Reflex (VOR) is responsible for stabilizing the visual field during high velocity head movements. The challenge is to first isolate VOR performance and then to understand how it is contributing to the balance problem. Identifying problems within the gaze stabilization system and quantifying their effect upon function with the Dynamic Visual Acuity (DVA) and the Gaze Stabilization Test (GST) protocols can provide the key to resolving these interactions.

Dynamic Visual Acuity Test

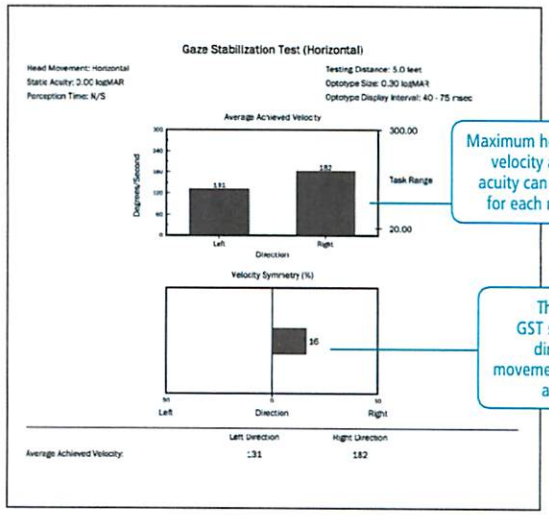


The difference between static and dynamic visual acuity scores (lines lost)

The difference in visual acuity for each direction is displayed as a percentage

Raw acuity performance values

Gaze Stabilization Test



Maximum head movement velocity at which visual acuity can be maintained for each movement axis

The difference in GST scores for each direction of head movement is displayed as a percentage

CLINICAL SIGNIFICANCE

PATIENT 24 year old male — post mild sports concussion without loss of consciousness. Complaining of blurring vision while driving and when attempting to return to play.

IMPAIRMENTS **Sensory Organization Test (SOT)** revealed mild impairments in postural control and **Gaze Stabilization Test (GST)** also highlighted a deficit in Dynamic Visual Acuity during higher velocity activities.

Although **Dynamic Visual Acuity (DVA)** test revealed no significant loss or asymmetry in the VOR component of dynamic vision, the **Gaze Stabilization Test (GST)** revealed a loss of visual acuity at velocities greater than 105 deg/sec (adequate for basic function, but inadequate for sports performance). Of greater concern was the 24% asymmetry, with better visual acuity in rightward head movements than in left.

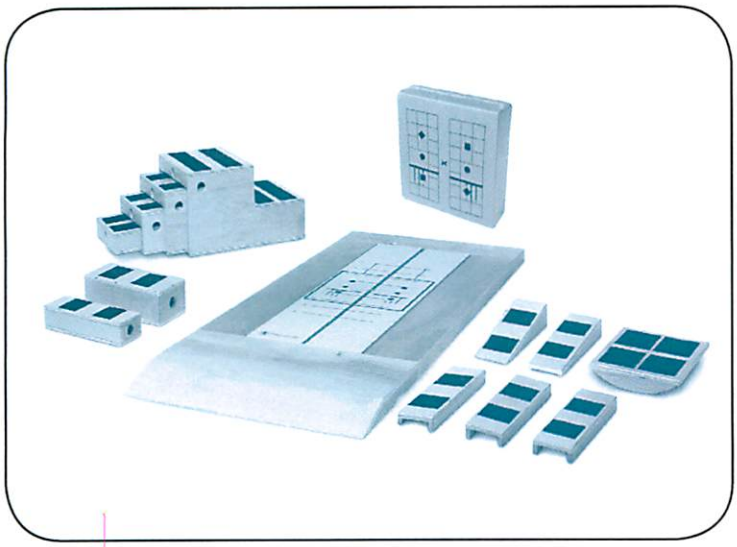
PLAN Patient was referred to physical therapy for a VOR exercise program customized to include visual exercises between 105 and 120 deg/sec, stressing leftward head movements and accurate target recognition.

PROGNOSIS Good for safe function assuming medically stable vestibular and central motor systems.

NeuroCom inVision gives you further insight into your patient's balance and vision problems.

NeuroCom®
Balance Manager®

Static Long Force Plate Option



Physical Dimensions:

	in (W x D x H)	cm
Dual force plate	18 x 60 x 2	46 x 152 x 5
Apron:		
Side piece	8 x 60 x 2	20 x 152 x 5
Entry end piece	35 x 32 x 2	89 x 81 x 5
Exit end piece	35 x 23 x 2	89 x 58 x 5
Alternate exit end	35 x 8 x 2	89 x 20 x 5
Assembled dimensions	35 x 95-115* x 2	89 x 231-292* x 5

*Minimum-maximum depth depending on exit end piece used.

Maximum patient weight	500 lb	227 kg
Minimum footprint required	58 x 105	148 x 267
Total weight	200 lb	90 kg

Components:

- NeuroCom® Balance Manager® software
- 60" static dual force plate
- Force plate apron

Accessories Included (if not already supplied with base system):

- Rocker board
- Step-up blocks: 4 in (10 cm) and 6 in (15 cm)
- Leveling block: 2 in (5 cm)
- Heel/toe wedges: 6° and 12° A/P
- Inversion/eversion wedges: 3° and 6° M/L
- Foam pad: 18 x 18 x 5 in (46 x 46 x 13 cm)
- Four piece step/stair set:

Low step	4 in (10 cm)
Medium step	8 in (20 cm)
High step	12 in (31 cm)
Two-step stair	8 in (20 cm)

Electrical Characteristics:

- 100-240 VAC / 50-60 Hz / 500 W
- ETL listed to UL60601-1
- ETL listed to CAN/CSA No. 601.1
- Compliant to CE standards CE ETL

System Requirements:

The Static Long Force Plate option requires one of the following Balance Manager® systems running software Version 8.0 or higher:

- PRO Balance Master®
- SMART Balance Master®
- EquiTest®
- SMART EquiTest®
- EquiTest® - CRS
- SMART EquiTest® - CRS

Specifications subject to change without notice.

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NeuroCom®
Balance Manager®

Static Long Force Plate Option

Standardized Assessment Protocols:

Limits of Stability (LOS) The LOS is an assessment of the voluntary motor system that quantifies impairments in ability to intentionally displace the COG to the patient's stability limits without losing balance. The patient performs the task while viewing a real-time display of their COG position in relation to targets placed at the center of the base of support and at the stability limits. For each of eight directions, the test measures movement reaction time, movement velocity, movement distance, and movement directional control.

modified Clinical Test of Sensory Interaction on Balance (mCTSIB) The mCTSIB is a modification of the original CTSIB that provides information about the patient's ability to maintain postural stability under eyes open firm surface, eyes closed firm surface, eyes open on foam, and eyes closed on foam surface conditions. The mCTSIB enhances an observational test also known as the "Foam and Dome" test by providing an objective measure of patient sway velocity for each of the four task conditions.

Rhythmic Weight Shift (RWS) The RWS quantifies the patient's ability to perform rhythmic movements of their COG from left to right and forward to backward at three distinct paces. During performance of each task, the patient views a real time display of their COG position relative to a target moving at the desired pace and amplitude. For each direction and pace, the RWS measures movement velocity and directional control.

Weight Bearing Squat (WBS) The WBS quantifies the patient's ability to perform squats with the knees flexed at 0°, 30°, 60°, and 90°, while maintaining equal weight on the two legs.

Unilateral Stance (US) The US is a performance test quantifying the patient's ability to maintain postural stability while standing on one leg at a time with the eyes open and closed. The US enhances the observational testing of single leg stance performance by providing an objective measure of patient sway velocity for each of the four task conditions.

Sit-To-Stand (STS) The STS is a performance test quantifying the patient's ability, on command, to quickly rise from a seated to a standing position. The STS quantifies time required to transfer weight from the buttock to the feet (weight transfer time), the strength of the rise (rising index), the symmetry of the rising effort between the left and right legs (weight symmetry), and the COG sway velocity in the standing position.

Walk Across (WA) The WA is a performance test that quantifies the patient's steady state gait while walking across the force plate. The WA enhances observational testing of gait by measuring the average width and length of the patient's steps on the force plate, the symmetry of left and right leg step lengths, and the patient's gait speed across the force plate.

Tandem Walk (TW) The TW is a performance test that quantifies the stability and speed of the patient's gait while placing one foot directly in front of the other. The patient is instructed to walk heel to toe from one end of the force plate to the other as quickly as possible and then stop. The TW measures the average width of the patient's steps on the force plate, the speed of the gait, and the patient's COG sway velocity following termination of the gait.

Step-Quick-Turn (SQT) The SQT is a performance test that quantifies turn performance characteristics. The patient is instructed to take two forward steps on command, and then quickly turn 180° to either the left or right and return to the starting point. The SQT enhances commonly used observational tests for turn stability by measuring separately for each direction of turning, the time required to execute the turn, and the velocity of COG sway during the turn.

Step-Up-and-Over (SUO) The SUO is a performance test that quantifies the patient's ability to control their body weight and postural stability while stepping up and down over a curb. The patient is instructed to step up onto a curb on command with one foot, swing the other foot over the curb while lifting the body through an erect standing position as quickly as possible, and then lower the body weight to land the swing leg as gently as possible. The SUO measures, for each leg, the strength of the rise (lift-up index), the movement time, and the impact of the swing leg landing (impact index).

Forward Lunge (FL) The FL is a performance test that quantifies the patient's ability to control body weight while lunging forward with one leg. The patient is instructed to, on command, lunge/step forward onto one leg, then push backward with that leg to the original standing position. The FL measures separately for each leg, the distance of the lunge as well as the profile of the vertical force exerted by the lunging leg (force impulse) during the landing and push off phases of the maneuver.

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