Assessment of Balance and Postural Control

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Balance or postural control is a complex, multifactorial task that most of us unconsciously perform continuously and in an error free manner throughout the day. However, for many individuals with movement, motor control, pain, sensory or cognitive impairments, postural control may no longer be a safe, reliable, or automatic activity. For elderly individuals or those with osteoporosis a loss of balance may result in a serious injury or even death.

Balance or postural control is a rather ambiguous term that is difficult to define. For the purpose of this presentation postural control is defined as “The integration of sensory and motor systems (sensorimotor skill) in an organism to counteract the internal and external forces acting on the body to maintain static and dynamic upright postural orientation by maintaining the center of mass over the base of support to produce coordinated body equilibrium to prevent falling.” It is difficult to arrive at a consensus on how to define postural control independent of discussing how to measure it. This raises the question “Is balance an outcome or a process or both? What will you measure (outcome) and under what condition (process)?”

Although there are numerous clinical balance assessment tools; few help the physical therapist identify the underlying postural control system responsible for the patients balance deficit. Identification of the specific balance system responsible for the postural control dysfunction aids the physical therapist in developing the most appropriate intervention for that specific patient. This presentation will compare various balance assessment tools including the NeuroCom Balance Master, the Balance Evaluation System Test (BESTest), and classic clinical assessment tools such as the Berg Balance Test as well as “exergaming” such as the Nintendo Wii Fit.

The NeuroCom systems are considered the “gold standard” of balance impairment assessment; however, even this reliable equipment only tests one system per test such as the Sensory Organization Test (SOT) or the Limit of Stability (LOS) test (motor control system). The limitation of some posturography tests is that they test static posture stability during quiet stance; however, these findings are often not consistently or strongly correlated with balance recovery. The newly developed BESTest has been designed to minimize numerous shortfalls of current balance assessment tools. The BESTest does not rely on a single assessment but rather divides balance assessment into 6 subcategories consisting of a total of 36 items. The BESTest evaluates impairments of the following systems: 1) Biomechanical constraints, 2) Stability limits/verticality, 3) Anticipatory postural adjustments, 4) Postural responses, 5) Sensory orientation, and 6) Stability in gait. The 36 test items are an amalgamation of “tried and true” reliable and valid clinical assessment tools such as the Timed “Get Up and Go” test as well as new tests that have face validity. Although early in the concurrent and construct validity process, the BESTest has established excellent inter-tester reliability (ICC = .91).

Balance dysfunctions will also be discussed in the context of the World Health Organization’s (WHO), International Classification of Functioning (ICF), Disability, and Health including real world environmental factors such as dimmed light, clutter, pets and psychological factors such as fear of falling. Sensory organization (vestibular, visual, and somatosensory systems) and motor control impairments in the context of the ICF model will be discussed. Strengths and limitations of this disablement model as it relates to impaired balance systems will also be discussed.

General parameters of balance will be discussed concisely throughout this presentation. These parameters include such factors as steadiness, symmetry, dynamic stability, sway, sway velocity, center of mass (COM) alignment, center of pressure (COP), COM-COP inclination angle, base of support (BOS), strategies, perturbations, change in visual surround, change in support, slip/trip recovery, posturography, limits of stability (LOS), and Clinical Test of Sensory Integration for Balance (CTSIB) will be discussed.