Neurocognitive Function and Psychological Health

Examining the Internal Construct Validity of the NSI Using Rasch Model Analysis

The primary aim of this study is to assess the internal construct validity of the NSI (Cicerone & Kalmar, 1995), a 22-item self-report measure of post-concussive symptoms in a sample of OEF/OIF Veterans with a history deployment related TBI using Rasch model analysis. The NSI is the most widely used patient reported outcome measure of post-concussive symptoms among Veterans and military personnel. Psychometric analysis of the NSI has relied on traditional approaches, which are limited because they do not meet the fundamentals of measurement, e.g. unidimensionality of scale or hypothesized subscales are not explicitly tested, summation of raw ordinal scores are erroneously treated as interval data, and all items are given the same weight. Evaluation of NSI using modern psychometric approaches is crucial to attaining conjoint measurement, a prerequisite for calculating change scores. Collaborators of the Program include the Department of the Army, Department of the Navy (Marine Corps), Department of the Air Force, and VA. The study was a retrospective analysis of NSI data collected from the VA National Comprehensive TBI Evaluation database for FY08 and FY09. Cases were included that met one of the America Congress of Rehabilitation Medicine criteria for mTBI. Included cases were randomly assigned to either an evaluation or validation sample. Analyses were conducted on 9,679 cases from the evaluation sample. The study examined the dimensionality of the NSI using both factor and Rasch analysis. The Rasch measurement properties of NSI symptom domains were also examined for model fit, person separation and reliability, dimensionality, item hierarchy, rating scale structure, and item invariance by gender and PTSD. The initial Rasch analysis with all 22 items of the NSI (9,679 OEF/OIF Veterans; 94.2 percent males; mean age= 30.7 years) indicated that the NSI is multidimensional (1st contrast eigenvalue = 3.1; exceeds the criteria of < 2). Principal Component Analysis of Rasch residuals for symptom domains confirmed unidimensionality of vestibular-sensory, cognitive and mood-behavioral symptoms scales but not the cognitive symptoms scale (1st contrast eigenvalue = 2.1). Examination of contrasts revealed that cognitive symptoms were clustered together providing more support for this three-factor solution. In conclusion, the NSI Total Score is not valid and should not be used as a clinical outcome. However, a three-factor solution comprised of vestibular-sensory, cognitive and mood-behavioral symptoms appears to represent unidimensional domains and acceptable Rasch properties. Hearing loss demonstrated significant differential item functioning by gender (on

average much harder to endorse for women). There was no differential item functioning for items in any of the symptom domains compared by PTSD status.