Measuring Impairment with the Neuropsychological Impairment Scale

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14.1 Overview

The *Neuropsychological Impairment Scale* (NIS; 2009) is a screening instrument designed to serve as an "early warning system" (Lezak, 1983, p. 135), which can be used to identify areas of neuropsychological weakness, focus treatment efforts, or to determine service efficiency. Many times, and for a variety of reasons, individuals do not report symptoms or medical histories that may be diagnostically relevant. Further, the routine clinical examination may overlook or fail to elicit pertinent information pertaining to neuropsychological impairment. The structured, efficiently administered NIS inventory addresses both global impairment and the following specific symptom areas: attention, memory, and linguistic functioning (Robins, 1980).

The NIS consists of three forms: Self-Report form, Observer Report form, and Senior Interview form. When scored, the NIS provides three summary measures: the Global Measure of Impairment (GMI), the Total Items Circled (TIC), and the Symptom Intensity Measure (SIM). Additionally, subscale scores are provided in seven areas of impairment: Critical Items (CRIT), Cognitive Efficiency (COG), Attention (ATT), Memory (MEM), Frustration Tolerance (FRU), Learning-Verbal (L-V), and Academic Skills (ACD). Validity checks are also provided: Defensiveness (DEF), Affective Disturbance (AFF), and Response Inconsistency (INC). Finally, a Subjective Distortion Index (SDI) can be computed. All of these components of the NIS will be explained in depth in the Sect. 14.3 of this chapter.

Results on the NIS should always be viewed as subjective information and verified using objective information. While the NIS can be used as a single, efficient introductory measure of an individual's experience or neuropsychological symptoms, it should never be considered the final or definite estimate of neuropsychological impairment (O'Donnell, DeSoto, DeSoto, & Reynolds, 2009). As with any comprehensive

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assessment, a variety of measures should be used to obtain the most accurate measure of functioning. Consequently, in a clinical setting, the NIS is best used in combination with neuropsychological measures.

14.2 Normative Sample

The NIS was normed using a nonclinical standardization sample and a neuropsychological sample. The following presents a breakdown of the norming samples:

14.2.1 Nonclinical Standardization Sample

The nonclinical standardization sample consists of data obtained from 1000 community-dwelling adults representing 48 separate groups: Churches ($n=27$), Community Activities ($n=7$), Public Activities/Events ($n=7$), Schools ($n=4$), and Work Settings ($n=3$). Maryland was the primary location for data collection; data was collected in urban, suburban, and rural areas. In an effort to counteract systematic selection patterns arising from the migration of healthy older individuals, some of the 65-and-older sample was recruited from Florida. Participation was voluntary, and anonymous if desired.

The nonclinical sample is cross-stratified according to gender and age. The 1995 projections from the U.S. Bureau of the Census provided the basis for the stratification. The mean education for the sample, 13.5 years, is comparable to the national median educational level of 12.7 years for people 25 years and older (Bureau of the Census, 1988). Means and standard deviations of the NIS raw scores observed for each age grouping in the nonclinical standardization sample are provided in the testing manual (O'Donnell et al., 2009). Differences in responses to some specific items were found when comparing men to women. However, none of the differences were significant enough to warrant age- and gender-specific Profile Sheets.

14.2.2 Neuropsychological Sample

Several outpatient rehabilitation settings were used to collect neuropsychiatric data. The neuropsychiatric sample was made up of 534 participants. The sample is predominately male (318 males and 216 females) with an average age of 33.2 years (SD=11.8). The average education level of the neuropsychological sample is 12.0 (SD=2.1). Additionally, the sample includes the following patient categories: Neurological ($n=215$), Alcohol/Drug Abuse ($n=97$), Learning Disability ($n=43$), Psychiatric Disorder ($n=155$), and Physical Trauma ($n=24$). The neurological patients were well beyond the acute phase of illness (205 of the 215 neurological patients reported a mean length of 2.5 years (SD=2.2) since illness onset; the median time since illness onset was approximately 1.9 years (O'Donnell et al., 2009). Specific diagnoses for the neurological and psychiatric patients as well as means and standard deviations of NIS raw scores can be found within the testing manual.

14.3 Scale Structure

The NIS is composed of 95 items; 80 describe neuropsychological symptoms, 10 measure affective disturbance, and 5 gauge test-taking attitudes. A five-point scale is utilized to rate each item, ranging from 0 (Not At All) to 4 (Extremely). The NIS can be completed in 15–20 min and is intended for use with individuals aged 18 and older, and who are able to read at a fifth-grade level or higher and cooperate with testing. The NIS can be administered by a trained technician; however, the interpretation of the resulting scores should be conducted by a professional with advanced clinical training. While the NIS can be used as a screening measure in nonclinical settings, the most optimal use within the clinical setting would be as an intake measure, or as a measure to supplement comprehensive psychological or neuropsychological assessment batteries (O'Donnell et al., 2009).

The NIS comprises three forms: Self-Report, Observer Report, and the Senior Interview Form. Each of the forms is described below:

- The *NIS Self-Report form* is composed of statements to which the individual is asked to indicate whether the statement describes their experience or applies to them. Items contained on the self-report refer to experiences during the past few days or weeks, while others refer to experiences at any time during the past.
- The *NIS Observer Report* form is a non-standardized way to allow family members or other individuals familiar with the patient to describe how they perceive him or her in terms of neuropsychological symptoms or cognitive impairment. Consisting of essentially the same items as those on the Self-Report form, the observer's perceptions can be directly compared to the patient's own report.
- The *NIS Senior Interview* form is available for use with older patients who experience difficulty completing the self-report form.

When scored, the NIS provides a variety of scores: three summary measures, seven subscale scores in seven areas of impairment, and validity checks. A brief description of each measure is presented below; however, more in-depth descriptions can be found within the NIS examiner's manual (O'Donnell et al., 2009).

14.4 Three Summary Measures

- *Global Measure of Impairment* (*GMI*): Made up of the total score (the sum of the responses to the 80 neuropsychological items on the NIS), is the best general index of neuropsychological functioning on the NIS. High GMI scores (above 70 T) indicate a strong likelihood of neuropsychological impairment, whereas excessively high GMI scores (above 80 T) suggest extreme neuropsychological impairment. Low GMI scores (below 60 T) indicate neuropsychological functioning in the normal range.
- *Total Items Circled* (*TIC*): Represents the number of neuropsychological items (excluding DEF and AFF items) with a nonzero score. TIC helps to distinguish between individuals who report many symptoms of low intensity from those who

report a few symptoms of high intensity. The TIC score is especially useful for comparing responses over repeated NIS administrations, since the number of endorsed items may remain the same, whereas the intensity rating of the items may change.

- *Symptoms Intensity Measure* (*SIM*): Represents the ratio of the GMI score divided by the TIC score. The SIM provides useful clinical information by reporting the average subjective severity of reported neuropsychological symptoms. Elevated SIM scores (above 70 T) along with high scores on the AFF and FRU may indicate an Organic Personality Disorder. Low SIM scale score (below 40 T) are often found for individuals with diminished affective experience (AFF), and especially for individuals with poor awareness of impairments. Further, low scores on SIM also suggest defensiveness due to a patient's reluctance to report symptoms at high levels.

14.5 Subscale Scores for Seven Areas of Impairment

- *Critical Items* (*CRIT*): Include items that are frequently associated with a history of neurological illness or injury. Results of CRIT indicate a history of neuropathology (e.g., head injury) or the residual symptoms of neuropathology (e.g., seizure disorder).
- *Cognitive Efficiency* (*COG*): Provides information about the number of general symptoms of neuropsychological impairment, such as slowness of mediation or praxis, fatigue, confusion, and mental efficiency. An obtained score on COG (above 60 T) is considered moderate whereas above 70 T is considered severe.
- *Attention* (*ATT*): Consists of items that indicate difficulty with attention and concentration.
- *Memory* (*MEM*): Includes items that reflect memory dysfunction which include long-term memory and memory for names and faces.
- *Frustration Tolerance* (*FRU*): Used to assist in identifying symptoms of Organic Personality Disorder, such as irritability, anger, or temper.
- *Learning-Verbal* (*L-V*): Consists of items which measure difficulty with learning and with expressive speech.
- *Academic Skills* (*ACD*): A measure of difficulties with academic skills such as making change, reading the newspaper, or spelling words.

14.5.1 NIS Observer Report Form

Obtaining information from patient relatives and other individuals familiar with the patient provides an additional snapshot of behaviors. Such information also provides additional perspectives on patient symptoms, resulting in a more comprehensive evaluation. The NIS Observer form consists of the NIS items, which are restated in the third person. After completing the NIS and NIS Observer form, results can be compared to determine if any discrepancies exist. Such discrepancies should be further investigated by the examiner.

14.6 Validity Check

The NIS has several informal techniques and formal scales that measure the validity of the scores obtained. Initially, item responses should be reviewed. Consider and investigate the number of items left unanswered (e.g., was it due to visual problems, forgetfulness, or general attitude towards testing). Also, when all responses have the same value (e.g., all 0's or all 4's), the individual's general attitude and approach to the test should be considered. The formal scales that should be considered include the following:

- *Defensiveness* (*DEF*) *Scale*: Provides an indication of test-taking attitude and distortion of social judgment. Unusually high and unusually low scores on this scale suggest an atypical test-taking attitude that may reflect personality issues, cultural background, or impaired social judgment. High scores (above 60 T) may suggest severe cognitive impairment or rigidly inflexible or moralistic in attitude. Low DEF scores (below 40 T) may reflect cynicism, independence, cultural differences, or a noncompliant approach to the test.
- *Affective Disturbance* (*AFF*) *Scale*: Provides an estimation of the presence of affective disturbance (e.g., anxiety, depression, or poor stress tolerance), often resulting from overreporting of neuropsychological symptoms. When a patient's AFF score exceeds 70 T, it should be assumed that there is an affective contribution to responses on the neuropsychological items. A low AFF scale score (below 40 T) is associated with the diminished affective range and expression is often described as "flat affect" or apathy.
- *Response Inconsistency* (*INC*) *Scale*: Provides a useful measure of the individual's ability to respond in a consistent, coherent manner. The INC is determined by using pairs of items in which the members of each pair have similar content and are expected to elicit responses that are usually highly correlated. A low INC scale score (40 T or below) indicates no difference between responses on the paired items. Whereas, a high score (above 70 T) on the INC scale reflects inconsistency that may be a result of inadequate orientation, inattention, a reading problem, or haphazard responding (results should be interpreted with caution).
- *Subject Distortion Index* (*SDI*): Provides a way of evaluating an individual's tendencies to exaggerate or downplay symptoms when responding to the NIS items. The SDI addresses the extent to which the obtained GMI score based on the individual's report of symptoms differs from the predicted GMI score based on his or her actual performance on other neuropsychological measures. If a patient's SDI is less than 40 T, the obtained GMI score is well below the predicted GMI score. This suggests the patient is underestimating the nature and extent of his or her cognitive deficits. This underestimation may be due to unawareness, general defensiveness, psychologically motivated denial, or depression. On the other hand, if the SDI is greater than 60 T, the patient's obtained GMI score is well above the predicted GMI, suggesting he or she is overestimating his or her cognitive deficiency. Such exaggeration of symptoms could be due to affective disturbance or poor personal judgment (O'Donnell et al., 2009).

14.7 Scoring

Administration and scoring of the NIS is straightforward and the procedures are the same regardless of whether the NIS Self-Report or the NIS Observer Report form is being administered. The Self-Report should be the primary tool used; the Observer Report should be used as a supplemental. The NIS Senior Interview form can be used with patients who have difficulty completing the written self-report form.

Prior to administration, establish rapport with the patient. Ensure the testing environment is comfortable and quiet, free from distractions. To complete the assessment, the patient should be provided with the appropriate report form and a pencil. The administrator should review the directions with the patient to ensure understanding and answer any questions. For completion of the Self-Report and the Observer Report forms, the individual completing the form is instructed to read each item and circle the response that best corresponds with his/her answer, ranging from 0 (Not at all) to 4 (Extremely). For completion of the NIS Senior Interview form, the examiner should read each item aloud to the patient. The examiner should instruct the patient to rate each item using the following rating scale: 0 (Not at All) to 2 (Quite a Bit).

Scoring of the NIS may be conducted by hand or using the scoring CD. If the examiner is going to hand score the test, the examiner should remove the perforated strip from the side of the report form and discard it along with the carbonized tissue insert. Inside the AutoScore™ form, the examiner will find the NIS Profile Sheet, a scoring page, and reproductions for Tables 2, 3, and 4. Additional step-by-step scoring instructions are provided within the form (O'Donnell et al., 2009). To score using the scoring CD, scores should be entered into the scoring system and the system will compute the scores.

14.8 Reliability

Reliability of the NIS is examined through an analysis of split-half reliability, internal consistency, test–retest reliability, and profile stability. Results of the reliability analysis are presented below:

- *Split-Half Reliability* for the NIS was conducted by comparing the first 40 with the last 40 neuropsychological items. The correlation between the first and second half was .87; when corrected for attenuation, the resulting correlation was .93.
- *Internal Consistency* alpha coefficients for the NIS scales were conducted for nonclinical and neuropsychiatric patient samples. The alpha values of the two samples are high, with median values of .79 and .86 for each group, respectively.
- *Test–Retest Reliability* was examined across four groups of individuals:
  - *25 College students*: The average test–retest correlation for this group's obtained NIS scores was .90 and ranged from .64 for DEF scores and .98 for GMI scores.

  - *25 Outpatient Rehabilitation Patients*: The average retest correlation for this group's obtained NIS scores was .91 and ranged from .78 for DEF scores to .97 for TIC and CRIT scores.
  - *25 Neurological Patients*: The average retest correlation for this group was .84.
  - *25 Outpatient Rehabilitation Patients*: The average test–retest correlation observed for the NIS subscale scores was .83 and ranged from .72 for SIM scores to .88 for COG and GMI scores.
- *Profile Stability*: Determined by analyzing the consistency of high point elevations over time. Comparisons were made in scores obtained between the first and second administrations of the test–retest sessions; results found that 19 subjects (76%) had the same high point, and 11 subjects (44%) had the same first and second high points. Results demonstrate that the high point elevation for the NIS profile is fairly stable over time.

14.9 Validity

Validity of the NIS is examined through the investigation of questions relating to construct validity (internal structure), its concurrent validity, its effectiveness as a screening device, and its ability to discriminate between clinical groups. Results of the validity studies are presented below:

- *Construct Validity*: Detailed construct validity information is provided in the NIS Examiner's Manual (O'Donnell et al., 2009). Construct validity analysis was conducted for nonclinical and neuropsychiatric standardization samples. The patterns of relationships are similar for both groups. The GMI correlates highest with most of the remaining scores for both groups. For the clinical scales, COG correlates highest with GMI for both groups. Refer to chapter 5 of the NIS Examiner's Manual for a list of detailed validity correlates.
- *Criterion Validity*: Several investigations of criterion validity were conducted by comparing the NIS to convergent measures, determine screening effectiveness, and discriminant analysis. A complete list of correlations is presented in chapter 5 of the NIS Examiner's Manual (O'Donnell et al., 2009).

14.10 Conclusion

The *Neuropsychological Impairment Scale* (NIS) is a screening instrument that provides a quick, accurate picture of neuropsychological symptoms, by eliciting relevant diagnostic information that might otherwise go unreported. The NIS consists of a Self-Report form, an Observer Report form, and a Senior Interview form. Administration and scoring of the instrument is easy. Scoring can be conducted by hand or via a scoring software program. Seven areas of impairment can be identified through the use of the NIS. Reliability and validity studies have been conducted and detailed results are presented in the NIS Examiner's Manual. Results of the NIS should be used with other neuropsychological assessments to plan treatment.

References

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