Neuropsychological Assessment

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The burgeoning field of health psychology is rooted in the understanding and application of psychological theories and empirical findings to promote and maintain physical health (Friedman & Adler, 2011). With the growing interest and increasing understanding of the nuanced operations of the brain, the application of clinical neuropsychology to further understand aspects of physical health has become a topic of increasing interest. The practice of neuropsychological assessment involves creating a contextualized understanding of the cognitive profile of individuals, and studying the impact of such alterations in cognitive functioning on functional status and treatment prognosis. Thus, in contrast to the symptom-focused medical model used by physicians, neuropsychological assessment provides a framework for the understanding of cognitive decline and impairment within a person-centered context (Lezak, Howieson, & Loring, 2004).

In this chapter, our goal is to briefly introduce the field of neuropsychological assessment, specifically discussing its relevance for research and clinical practice in health psychology. We also introduce the various domains of functioning that comprise a comprehensive neuropsychological assessment. Much of this is presented using examples from the multiple sclerosis and breast cancer literatures, both of which provide substantial research-based evidence for the functional significance of cognitive impairment. The assessment of neuropsychological functioning, however, is also critical for several other chronic health conditions, such as in individuals with a variety of cardiovascular diseases, who show increased risk of cognitive impairment (Eggermont et al., 2012), resulting in poor management of the chronic disease and increased mortality rates (Zuccalà, Pedone, Cesari, Onder, Pahor, Marzetti et al., 2003).
Relevance of Neuropsychological Assessment to Health Psychology

Neuropsychological assessment, a major focus of assessment among health psychologists, is primarily employed for diagnostic and treatment planning purposes (Lezak et al., 2004). Broadly defined, the study and practice of neuropsychological assessment involves the use of standardized tests to understand the profile of cognitive deficits in individuals with various health conditions. Assessment data are then considered within the context of the patient’s health, disease, psychological, social, and behavioral factors in order to guide diagnostic hypotheses and aid in treatment planning.

For example, within multiple sclerosis (MS), a neurodegenerative disease of the central nervous system, approximately 43-70% of individuals suffer from cognitive impairments (Rao, Leo, Bernardin, & Unverzagt, 1991). Approximately 40-80% of MS patients become unemployed within 10 years of symptom onset (Kornblith, LaRocca, & Baum, 1986), and cognitive difficulties are the single largest predictor of unemployment in this population (LaRocca, 1995). Cognitive impairment has also been linked to functional status of MS patients (Kessler, Cohen, Lauer, & Kausch, 1992), such that those with cognitive impairment participate in fewer social activities, are more prone to psychiatric illnesses, and have significant troubles in carrying out everyday household activities (Rao, Leo, Ellington, et al., 1991). Differential deficits in cognition have also been associated with specific everyday limitations. For example, memory impairments are associated with difficulty in activities of daily living (Kessler et al., 1992). Similar associations between cognitive dysfunction and health-related quality of life have also been reported in individuals with breast cancer (Tchen et al., 2003), chronic heart failure (Pressler et al., 2010), and stroke (Tatemichi et al., 1994). Thus, cognitive function is a critical moderator of the influence of chronic disease on functional status.

Additionally, mounting evidence provides support for the role of cognitive impairment as an independent prognostic marker, influencing mortality rates (Goodwin, Samet, & Hunt, 1996; Zuccalà et al., 2003), treatment adherence (Stilley, Bender, Dunbar-Jacob, Sereika, & Ryan, 2010),
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and performance on activities of daily living (Rao, Leo, Ellington, et al., 1991). For example, cancer patients undergoing surgery, chemotherapy, radiation, and/or endocrine therapy often experience cognitive dysfunction (Ahles, Root, & Ryan, 2012), which appears to improve over time after patients have completed treatment (Jim et al., 2012). In a prospective population-based study of older cancer patients, those who were cognitively impaired following diagnosis had reduced 10-year survival rates compared to those who were not cognitively impaired (Goodwin et al., 1996). Preliminary evidence also suggests that cognitive impairment can decrease breast cancer survivors’ adherence to their prescribed medications (Stilley et al., 2010); with this association between cognitive function and adherence also extending to other chronic health conditions such as patients being treated for hyperlipidemia, and diabetic patients with co-morbid conditions (Stilley et al., 2010). Additionally, in cross-sectional analyses examining breast cancer survivors one year after taking medical leave for cancer treatment, those with poorer neuropsychological test performance were less likely to have returned to work than those with better performance (Nieuwenhuijsen, de Boer, Spelten, Sprangers, & Verbeek, 2009).

Similarly, heart failure patients also represent a population at particularly high risk for cognitive impairment, with an odds ratio of 1.62:1 in favor of cognitive decline (Vogels, Scheltens, Schroeder-Tanka, & Weinstein, 2007). Within this population as well, the impact of cognitive dysfunction can also extend beyond quality of life outcomes to predict mortality. In a large sample of heart failure patients (n = 1113), cognitively impaired patients were almost five times as likely to die within one year of hospital admittance, compared to cognitively preserved patients, with a significant negative correlation between cognitive functioning and in-hospital mortality rates (Zuccala et al., 2003). Because cognitive status can directly impact medical treatment effectiveness and possibly lead to increases in mortality rates, assessments should optimally be conducted both before and during in-patient and out-patient treatment. Given the known associations between cognitive status and health outcomes, it is thus imperative that the practice and research of health
psychology include a thorough assessment of cognitive status.

**Considerations for neuropsychological assessment with health populations**

An essential element of psychological assessment is the integration of patient’s history and behavior with the test data, in order to address a clearly defined referral question (Graham & Naglieri, 2003). Likewise, neuropsychological assessment within clinical health psychology examines the interplay of contextual factors on cognitive test data, as well as the behavioral and psychological ramifications of such alterations in cognitive functioning.

Typical health-related, neuropsychological referral questions include whether cognitive impairment is a result of organic insult to the CNS or a product of secondary comorbidities such as anxiety or fatigue. Professionals may also want to know whether the individual’s functional cognitive status impacts outside duties, like returning to work, or receiving and tailoring occupational rehabilitation. Neuropsychological measures may also be included as primary or secondary outcomes in behavioral intervention research trials of patients with health conditions. For example, researchers who plan to longitudinally explore subtle illness-related cognitive changes should select measurements that can detect small performance differences without substantial practice effects (Wefel, Vardy, Ahles, & Schagen, 2011). In addition, researchers may want to consider the cognitive status of participants prior to their inclusion in research trials, as cognitive impairment could impede their ability to engage in intervention tasks.

In addition to traditional psychometric guidelines (American Psychological Association, 1999), the selection of assessment tools for use in health psychology often requires further considerations. Although construct validity can be assumed when the measure has been validated in healthy controls, internal consistency and test-retest reliability estimates should be verified in disease-specific samples before implementing the measure in a clinical setting. Below, we discuss estimates of validity and reliability in MS and cancer populations, as available, for broad and
domain-specific measurements. However, the health psychology assessment literature is limited by the lack of disease-specific psychometric data. Clinicians and researchers should revisit test properties for use with other medical populations not mentioned here.

Another critical issue in the selection of measures for neuropsychological assessment is the choice between fixed and flexible batteries. Comprehensive batteries, as opposed to domain-specific measurements, are appropriate for assessing fitness and progress in rehabilitation settings, progression of neurodegenerative disease, and interval testing in disorders that may present with a varying impairment pattern (Graham & Naglieri, 2003; Lezak et al., 2004). Although a flexible battery can be individually tailored, a fixed battery can ease interpretation, depending on the standardization sample available. Notably, standardized scoring for health populations is most widely available for the Wechsler assessment scales, such as the Wechsler Adult Intelligence Scale–IV (WAIS-IV) and Wechsler Memory Scale (WMS-IV). The WAIS-IV is reliable and valid in the MS population, with 65% sensitivity and 65% specificity for determining MS diagnosis using the processing speed index composite score (Ryan, Gontkovsky, Kreiner, & Tree, 2012). The use of composite scores may ease interpretation, but this method can also overlook more nuanced strengths and weaknesses within a sample. For instance, MS patients present with significantly lower processing speed index scores, but exhibit preserved verbal comprehension index scores, despite a lower overall full scale IQ (Ryan et al., 2012). Therefore, an assessment that only reports full-scale IQ may overlook nuanced aspects of cognitive decline. Clinicians are urged to utilize the WAIS-IV analyses of strengths and weaknesses to provide a thorough conceptualization of cognitive decline profiles.

Although the WAIS-IV is a widely used battery that was originally developed for use in healthy adults, many batteries have been devised for use with specific health populations. Rao’s Brief Repeatable Battery (BRB) is a well-established battery in the MS literature (Rao, 1990). This 35-minute battery includes five sub-tests covering domains of attention and working memory,
verbal memory, spatial memory, and verbal fluency. Scores can be used to form a composite, but norms are also available for subtest comparison. The composite battery is reliable and valid, but some subtests, such as the Symbol Digit Modalities Test, are more prone to practice effects than others, such as the Paced Auditory Serial Addition Test (Portaccio et al., 2010). A recent randomized controlled trial to assess the effect of a strategy-based video-game intervention on cognitive functioning in a MS sample utilized the BRB as the main outcome measure (Janssen et al., in review). The BRB allowed for the assessment of overall intervention effectiveness on a composite score of cognitive functioning, and further analyses of individual sub-domain effects revealed a significant change in visuospatial memory performance. Utilization of such population-specific fixed batteries with reliable and valid norms represents an ideal confluence of domain-specific measurement within a structured format.

Neuropsychologists may also consider strengths and limitations of different administration methods. For example, computerized assessments often lend themselves to less labor-intensive administration, can be readily reproduced, and may overcome some issues present in paper-pencil tests, such as difficulty in measuring psychomotor slowing (Cheung, Tan, & Chan, 2012). However, new bias may be introduced when using tests with those who are not familiar with computers. Validation and comparison to traditional neuropsychological tools is necessary prior to use.

Obtaining a measure of the individual’s best performance is also essential to addressing the referral question (Lezak et al., 2004), so the impact of disease-related factors warrants careful consideration for those with chronic illnesses. A variety of common chronic health conditions can contribute to cognitive dysfunction, so the examiner should obtain medical reports about comorbid illnesses and medications, which can also affect cognition (Kelly & Doty, 1995). In addition, physical symptoms, such as pain (Hart, Martelli, & Zasler, 2000) and fatigue (Tchen et al., 2003) associated with one’s illness must also be considered when conducting a neuropsychological assessment. Patients should be tested when their pain and fatigue is well-managed (Hart et al., 2000), but
effects of both these variables and medication (e.g., sedatives, analgesics) must be taken into account during test interpretation.

Mood state can also impact cognitive function, and those with chronic illness often experience heightened distress compared to healthy adults. For example, about 25-50% individuals with multiple sclerosis meet criteria for major depression (Chwastiak et al., 2002). In a recent meta-analysis, depressed individuals had decreased executive function and slower processing speed than control participants (Snyder, 2013). Accordingly, neuropsychological testing is optimally accompanied by a thorough assessment of mood and psychopathology.

Assessment of Cognitive Domains

Below, we highlight the cognitive domains typically included in the neuropsychological study of health psychology. We provide a broad definition of each construct, followed by a discussion of commonly used measures that assess the domain of interest. Reliability and validity data are provided when available for the MS and breast cancer populations.

Gross Assessment of Cognitive Functioning

Neuropsychological screening tools may be useful for gauging general cognitive performance under time constraints. Short screening batteries are recommended for bedside differential diagnoses assessment, and can bluntly measure the presence or absence of impairment (Lezak et al., 2004; Graham & Naglieri, 2003). However, these screening tools do not typically provide domain-specific or differential diagnostic information.

The Mini Mental Status Examination (MMSE) is widely used to rapidly screen for moderate to severe cognitive deficits, and can be performed bed-side in under 10 minutes, (Folstein, Folstein, & Mchugh, 1975). A cut-off score (e.g., 24 out of 30) is traditionally used to identify cognitive impairment. However, given that age and education level strongly influence MMSE scores, employing a set cut-off score for all populations is a limitation of the MMSE (Tombaugh & Mcintyre,
MMSE is not typically well-suited to detect the slight cognitive changes that are present in a population such as breast cancer and does not distinguish those with mild cognitive impairment from healthy controls (Mitchell, 2009).

Given the ceiling effects of the MMSE, the High Sensitivity Cognitive Screen (HSCS) was developed to assess mild cognitive impairment, or changes over time in higher-functioning patients (Fogel, 1991). In 20 to 30 minutes, patients complete paper-and-pencil tasks that assess memory, attention/concentration, language, visual/motor, spatial, and self-regulation and planning domains. Most items are adapted from other standardized tests, and a scoring algorithm classifies performance as normal, borderline, or abnormal (with mild, moderate, or severe impairment). The initial validation study reported good inter-rater reliability in a relatively small sample, but test-retest reliability was lower (< 0.8) for several items (Fogel, 1991). Despite its use in multiple cancer samples, HSCS reliability and validity data have not been consistently reported. Thus, researchers are advised to report HSCS test properties within medical samples, and to cautiously interpret data, as overestimation of deficits is possible.

**Domain-Specific Measurements**

We next describe domain-specific assessment tools, which can be utilized as stand-alone measures or included in comprehensive flexible assessment batteries. Although many clinical and laboratory measures exist, we discuss selected measures in this brief chapter (please see Lezak et al., 2004 for a more complete compilation).

**Executive functioning**

Executive functioning is a broad construct that subsumes a variety of sub-domains, with significant debate on its key facets and appropriate sub-domain measures. We will employ the framework outlined by Miyake and colleagues (2000), who suggest executive functioning includes three related, yet distinct sub-domains: mental set shifting, information updating, and monitoring
and inhibition of pre-potent responses (Miyake et al., 2000).

**Mental set-shifting** taps into the ability to hold multiple attentional sets simultaneously and efficiently maneuver back and forth between them. A classic paper-and-pencil test of set-shifting ability is the Trail Making Test (TMT; Reitan, 1955). The task has two conditions: Trails A requires individuals to sequentially connect numbered or lettered circles on a worksheet, whereas Trails B requires patients to alternate between the number and letter sequences. The subtraction score (Trails B – Trails A) represents a comparatively longer time to complete Trails B, relative to Trails A, and can indicate difficulty in executive switching. The subtraction score distinguishes set-shifting abilities from deficits in motor control, especially in populations with established motor impairments (e.g., MS patients), and increases construct validity for switching deficits, compared to Trails B alone (\(r^2 = 0.6\); Atkinson et al., 2010). Individuals with cancer and MS both appear to exhibit deficits on mental set shifting tasks (Grigsby, Kaye, & Busenbark, 1994; Wefel et al., 2011). Age and education can influence TMT test-retest reliability (Ernst, 1987), which is relatively susceptible to practice effects after 6 weeks (Stuss et al., 2001), but is less prone to carryover effects after 6 months (Abe et al., 2004). Several other measures for mental set-shifting exist. For example, the Wisconsin Card Sorting Test (WCST) requires patients to match a series of 120 target cards to a set of reference cards according to certain attributes ("rules"), which change throughout the testing session (Grant & Berg, 1948). The WCST, however, is a “one shot” test with significant practice effects, poor alternate form reliability in healthy controls (0.63 at best; Bowden et al., 1998), and poor internal validity, with a significant negative skew towards errors and perseverations (Bowden et al., 1998), so it is not particularly suitable for intervention research.

**Inhibitory control** involves the selection of responses based on task demands, while ignoring task-irrelevant (often pre-potent or habitual) tendencies. The Stroop task is widely used to measure inhibitory control (Stroop, 1935), over and above deficits that might be associated with processing speed, color-blindness, and reading difficulties. The primary measure of interest is the number of
correct responses for the interference condition. Patients are presented with color words, printed in incongruent ink colors, and are required to name the color of the ink, thus over-riding the habitual tendency to respond to the semantic meaning of the word. Reliability in the MS population has been established (ICC = 0.89), and convergent validity was verified with a well-established battery of executive functioning ($R^2 = 0.78$, Portaccio et al., 2010).

*Working memory* refers to the capacity to monitor, update, and manipulate task-relevant information. Working memory can be assessed in research and clinical settings using widely available, reliable, and valid assessment tools. On the Digit-Span (Backward) task, individuals listen to digit sequences of increasing set-size, and report the numbers in reverse order. This test, which is included in the WAIS-IV and WMS-III, measures the construct of verbal working memory (Banken, 1985). Studies suggest good reliability and validity estimates for this measure (Wechsler, 1958). Another measure of working memory, commonly used in the MS literature, is the Paced Auditory Serial Addition Test (PASAT; Gronwall, 1977). This task requires patients to add a specified digit to the digit immediately preceding it. Patients complete 61 items, and digits are presented at two rates: one digit every three seconds and one digit every two seconds. The PASAT boasts well-established norms for the MS population, and is a recommended measure for clinical outcome trials (Boringa et al., 2001; Cutter et al., 1999). Although significant practice effects exist, intra-class correlation coefficients are acceptable (0.9-0.84; Portaccio et al., 2010) and sensitivity and specificity for predicting the presence of MS are robust (74% and 65%, respectively).

*Information processing speed*

Information processing speed, or the rate at which endogenous or exogenous stimuli can be processed, is a fundamental ability underlying various higher-order cognitive domains (Salthouse, 1996). The Symbol Digit Modalities Test (SDMT) is a commonly used processing speed measure (Smith, 1982). This task requires patients to view a decoding key, consisting of series of nine symbols paired with corresponding digits. Then, a sequence of unpaired symbols is presented at the
bottom of the page, and patients either write or voice the digit associated with each symbol as quickly as possible. When known visuo-motor impairments are present, the oral version might be preferable over the written format. For example, in individuals with MS, the oral SDMT is the most widely disseminated task of processing speed as it removes the variance associated with motor decrements (Drake et al., 2010). The SDMT has good test-retest reliability ($r = 0.98$) and better concurrent validity for diagnosis, course, and vocational status than the PASAT (Drake et al., 2010). Caution should be taken for interpretations of SDMT scores in the elderly, due to mental slowing (Salthouse, 1996).

**Attention**

Attention is a universal property of multiple systems (Chun, Golomb, & Turk-Browne, 2011), and thus should be considered as an influential factor on performance on most tasks. Neuropsychological tasks that tap into the broad domain of attention can be distinguished on the demands they make for divided, selective, or sustained attention processes (Chun et al., 2011).

*Divided attention*, or the processing of two attentional targets at once, can be measured using a variety of dual-task performance tests. These tests can consist of two simultaneous cognitive tasks, or a cognitive and motor task performed concurrently. For example, to assess dual-task fall risk in people with balance issues, patients are asked to walk while counting backwards (Kressig, Beauchet, & European GAITRite Network Group, 2006). Divided attention is measured by the difference in performance between the dual-task versus single task condition. Although this measure lacks MS-specific normative data, dual-task walking assessments are reliable (ICC = 0.84; Hars, Herrmann, & Trombetti, 2013) and valid prospective predictors of fall risk in older adults (Beauchet et al., 2009) and in individuals with MS (Hamilton et al., 2009). Dual-task performance can be particularly helpful in assessing functional status, which often guides decisions on return to independent living.

*Selective attention* directs our limited processing capacity to salient aspects of the
environment, while ignoring other goal-irrelevant stimuli. The Eriksen flanker task (Eriksen & Eriksen, 1974), a commonly used selective attention task, requires individuals to selectively attend to the direction of a target arrow, while ignoring the direction of the two flanking arrows on either side. Larger reaction time values for incongruent, relative to congruent trials, indicate poorer selective attention performance (though see Lavie, 2005 for an alternative and compelling interpretation of incongruency effects in the case of the Eriksen flanker task). In a neuroimaging study, post-treatment breast cancer patients who received high-dose chemotherapy made significantly more Flanker task errors than those who did not receive chemotherapy (de Ruiter et al., 2011). A recent NIH initiative to provide widely disseminable research tools (NIH Toolbox) has established reliability (ICC = 0.95), convergent validity (r = -0.48; p < 0.001), and divergent validity (5 = 0.15; p < 0.01) of this task in a sample of over 300 individuals ages 8-85 (Weintraub et al., 2013).

Sustained attention involves continuously attending to and detecting stimuli over extended periods of time. For example, the visual Continuous Performance Test (CPT; Conners & Staff, 2000) requires individuals to respond when letters (targets) appear on the screen, except for the letter X (non-target). Measures of commission (responding to non-target stimuli) and omission (failing to respond to target stimuli) can be calculated. The manual version has been widely used for the assessment of Attention-Deficit Hyperactivity Disorder, with well-established norms, reliability, and validity estimates (Conners & Staff, 2000). Notably, both breast cancer and MS patients exhibit preserved sustained attention capacity (Paul, Beatty, Schneider, Blanco, & Hames, 1998; Tchen et al., 2003).

Memory and Learning

Subjective memory complaints are often reported as the primary reason for referral to neuropsychological assessment (Lezak et al., 2004). Memory deficits can occur at any of three memory stages: encoding, the initial transformation of a stimulus; storage, the long-term maintenance of successfully encoded information; or retrieval, the ability to locate and bring to
present awareness information from memory storage (Squire & Knowlton, 2000). Retrieval can be assessed through either free recall of encoded information, or recognition, which utilizes cues to trigger the retrieval of information from storage, thus requiring less cognitive effort. Because information retention is the goal of memory assessment, these measures are especially prone to practice effects. When choosing a memory measure, the examiner should take special caution to verify test-retest reliability and use alternate test forms. A commonly used fixed battery for memory assessment with alternate form reliability is the Wechsler Memory Scale (WMS; Wechsler, 1945). Comprising of seven subtests, WMS assesses auditory memory, visual memory, visual working memory, immediate memory and delayed memory. Although we are unable to cover the breadth of WMS tasks in this short chapter, the use of such a comprehensive battery for thorough memory assessment is encouraged when referral questions require discrimination between types of memory dysfunction.

Differentiation of memory encoding versus retrieval failure can often be accomplished using multi-trial learning paradigms, such as Buschke’s Selective Reminding Task, (SRT; Buschke & Fuld, 1974). This task requires patients to memorize a list of 12 orally presented words over 6 repeated trials, while being selectively reminded of forgotten items after each trial or until all words are remembered correctly. A delayed recall trial occurs 11 minutes later. Early implementations of the SRT in MS patients implicated primary retrieval failure, because of impaired performance on recall, relative to recognition measures. However, an altered assessment application of the SRT using 12 recall trials (instead of 6) revealed primary encoding decrements on initial trials, and preserved retrieval functioning on later trials due to decreased processing load (DeLuca, Barbieri-berger, & Johnson, 1994). The test-retest reliability is fairly robust (0.62-0.73, varying by form), and construct validity and norms are well-established in the MS population (Boringa et al., 2001). Another commonly used measure within health psychology is the California Verbal Learning Test (CVLT; Delis, Kramer, Kaplan, & Ober, 2000, Woods, Delis, Scott, Kramer, & Holdnack, 2006). Test-retest
reliability has been determined for a healthy sample (r = 0.80-0.84; Woods et al., 2006). Cancer survivors who received chemotherapy exhibited significantly greater impairment on the CVLT compared to survivors that did not receive such treatment, suggesting that chemotherapy treatment may affect verbal memory (Ahles et al., 2002).

Multi-trial learning can also be applied to assess visuospatial memory using the 10/36 spatial recall test; an adaptation of Malec’s original visual spatial learning test (Malec, Ivnik, & Hinkeldey, 1991). The task requires patients to replicate a visual pattern of 10 circles on a 6 x 6 checkerboard (36 squares) over the course of 3 trials, with a delayed recall component 11 minutes later. Both original and adapted versions of this visual spatial learning task are reliable and valid in aging and MS populations (Boringa et al., 2001; Malec et al., 1991).

**Motor Control**

Thorough assessment of neuropsychological functioning includes measuring various facets of motor control. Motor speed, or the ability to complete movements at an efficient pace, can influence performance on computer tasks that measure reaction time. A commonly used test of motor speed in the MS literature is the finger-tapping task (Halstead, 1947), which requires patients to tap a key as quickly as possible for 10 seconds followed by a brief rest period, for a total of 5 blocks for each hand. Test-retest reliability estimates are robust in clinical and non-clinical populations (r = 0.77; Dikmen, Heaton, Grant, & Temkin, 1999), but can be influenced by practice (Teng et al., 1989). Additional measures of inter-tap variability and response variability can also be calculated, and can differentiate presence and levels of cognitive impairment in heart failure patients, despite no significant difference between patients and controls on overall tapping speed (Sauve, Lewis, Blankenbiller, Rickabaugh, & Pressler, 2009).

In contrast, poor performance on paper-and-pencil tasks may be influenced by decrements in fine motor control, or the coordination of small muscle movements with visual input. Deficits in fine (movement of the fingers) and gross (movement of the limbs) motor movements can influence
performance on tasks requiring motor control, over and above motor speed, such as paper-and-pencil tasks commonly employed to assess other domains of cognitive functioning. An example of a fine motor task is the 9-hole-peg test (Kellor, Frost, Silberberg, Iversen, & Cummings, 1971). Patients are asked to place nine pegs, one at a time, into nine holes on a board, and subsequently remove them, one at a time, as fast as possible, without losing control of the pegs or board. The time to completion is the primary dependent variable, and the task is repeated for right and left hands independently. It boasts reliable and valid norms in the MS population (Drake et al., 2010) and is included as one of the measures on the Multiple Sclerosis Functional Composite Scale (MSFC), which is a battery designed to assess progression of disease severity in individuals with MS and often used as an outcome measure for clinical trials in the MS literature (Cutter et al., 1999).

The MSFC, also includes the timed 25-foot walk test as a measure of gross motor control. Gross motor control measures limb coordination involved in major body movement such as walking, balance, jumping or reaching. In the timed 25-foot walk test, patients are asked to walk as quickly and safely as possible for 25 feet, gaining speed before the start line and continuing through the finish line, to ensure times are not affected by working up to maximum speed or slowing to stop. The composite MSFC score, which includes the PASAT, 9-hole-peg test, and timed 25-foot walk tests, exhibits significant concurrent validity with other disease severity measures, and is predictive of diagnosis, disease course and work disability, underscoring the importance of motor functioning as a marker of functional status in MS (Drake et al., 2010).

Conclusions

Neuropsychological assessment fulfills an increasingly important role within health psychology, as cognitive status can influence quality of life, vocational status, and treatment adherence. This chapter has provided a brief overview of many available instruments and considerations for neuropsychological assessment within health psychology. In examining functional status, one should also consider the ecological validity, or real-world applicability, of the
selected task(s), and thus employing batteries like the Everyday Cognition Battery (Allaire & Marsiske, 1999) assess cognitive functioning within the context of everyday tasks such as balancing a checkbook or remembering calendar events can be helpful. Future directions in the field of neuropsychological assessment aim to increase ecological validity. The compilation and availability of validated and normed assessments (NIH toolbox; Weintraub et al., 2013) and the creation of virtual environment simulation tasks are important steps in this direction, while maintaining domain specificity. These advances can then spur the development of more applicable and targeted prevention and intervention strategies, in order to reduce the individual and societal burden of cognitive decline.
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