Neuropsychological evaluation in rehabilitation planning and evaluation of functional skills

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Abstract

This paper focuses on the benefits of neuropsychological assessment for evaluating a brain-injured person’s functional abilities and rehabilitation needs. The importance of early assessment in addressing these goals is discussed. Strengths and weaknesses of neuropsychological assessment for predicting a person’s ability to participate in normal activities of daily living are considered. Test data taken alone often lack ecological validity, but nevertheless, specific test findings can be used to predict functional skills. The ecological validity of neuropsychological testing can be extended by observing the patient’s approach to tasks in the assessment environment and by observing the patient in his or her normal activities. Evaluation information obtained by allied rehabilitation professionals, including occupational and speech and language therapies, can be integrated with neuropsychological test data to both extend the generalizability of our findings and to validate hypotheses generated from our test data. The use of neuropsychological test data in planning a cognitive rehabilitation program is also considered. © 2001 National Academy of Neuropsychology. Published by Elsevier Science Ltd.

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1. Neuropsychological assessment in rehabilitation planning and functional skills assessment

In this paper, the author will address limitations of the American Academy of Neurology (1996) paper as they relate to neuropsychological assessment in rehabilitation planning and the use of neuropsychological assessment in predicting outpatient functional skills and compe-
tency. Such assessment is critical as individuals are released from acute, inpatient rehabilitation settings much earlier than in the past. Consequently, there is a need to have available comprehensive outpatient rehabilitation programs. It is critical that professionals in those programs be able to predict rehabilitation needs, the ability of the patient to function independently, and the ability of the patient to resume normal activities of daily living whether it be managing a family, returning to work outside the home, or resuming school. Neuropsychological assessment has a great deal to offer the professional in meeting these needs.

The American Academy of Neurology (1996) article is beneficial to our field in that it rates our methodology as established. It is limiting to our field in several ways. This position paper portrays neuropsychological methodology as needing to be under the direction of a neurologist. It portrays neuropsychological assessment as having less power than is actually the case regarding diagnostic and ecological validity issues. Also, it promotes levels of performance analysis based on demographically adjusted norms. Basing an analysis on such norms has been strongly criticized in several recent articles (e.g., Reitan & Wolfson, 1995, 1996a, 1996b; Saykin et al., 1995). The proposed guideline indicating that neuropsychological reports should be brief suggests that our evaluations were only done to confirm the referring neurologist’s working hypothesis, which certainly is not the goal. In addition, a short report has the potential to eliminate two strengths of contemporary neuropsychological assessments: rehabilitation planning and predicting competency in functional skills.

The Neurology article argues against early assessment. True, people after stroke or traumatic brain injury are on a relatively fast recovery curve during the first 6 months, but how can we determine a person’s ability to return to live independently or resume normal activities without such early evaluations? Do we just let them fail or have a catastrophe at work? How do we determine rehabilitation needs to facilitate return to normal activities without such assessments? As a rehabilitation specialist, the present author is not attempting to determine evidence of permanent brain injury when conducting an early assessment, but rather, the goal is to determine what the patient’s needs and capabilities are at the time of the evaluation.

If one takes the view that assessment should be done only after the person’s recovery has plateaued, then the conclusion would have to be that the only thing neuropsychologists have to offer is to answer questions regarding permanency. Such is not the case, and in this paper, the power of neuropsychological assessment in collaboration with other assessments for rehabilitation planning and assessment of the ability to resume normal activities will be considered. I will also discuss what I believe are weaknesses in our methodology for assessing functional skills. Methods to increase the power of neuropsychological assessment by combining information from our evaluations with that obtained from other professionals will be considered.

2. Neuropsychological assessment in rehabilitation planning

2.1. The importance of early assessment and intervention

As Reitan and Wolfson (2001) indicate in their article in this issue of the Archives, a comprehensive neuropsychological assessment evaluating a full range of brain-behavior
relationships should be completed early. Completing a neuropsychological evaluation early in the recovery process, once the immediate acute recovery phase is over, allows the neuropsychologist to ascertain the patient’s cognitive strengths and weaknesses, the implications of his or her cognitive deficits for successfully re-engaging in normal activities of daily living, and consequently, the immediate rehabilitation needs of the patient. Knowledge of a patient’s relative strengths and weaknesses will allow neuropsychologists, by examining patterns of normal and impaired performance, to understand the bases of the patient’s cognitive complaints, and it will allow neuropsychologists and allied therapists to determine deficits that need to be addressed in rehabilitation while reinforcing and utilizing areas of cognitive strength.

In turn, early rehabilitation interventions as long practiced by our colleagues in occupational therapy, speech and language pathology, and physical therapy are clearly beneficial to the patient. Early neuropsychological rehabilitation interventions allow the rehabilitation process to take advantage of and essentially “piggy back” on the natural recovery curve. Early rehabilitation interventions also decrease the likelihood of the patient’s learning maladaptive responses as she or he (or family members) attempts to cope with cognitive impairments. Early neuropsychological rehabilitation also decreases the likelihood of a reactive depression developing consequent to feelings of helplessness and hopelessness.

2.1.1. Early assessment and “mild” brain injury

There is a belief in some quarters that individuals who, according to accident reports, received “mild” brain injuries should not receive any rehabilitation services until after all recovery has occurred or at least not for 6 months after an injury. Certainly, we would not want to begin interventions immediately, but does it make sense to withhold evaluation and rehabilitation services from a person who is unsuccessful in returning to normal activities following a seemingly “mild injury” and have the lack of intervention resulting from loss of job, failure in school, or significant disruption of her or his ability to meet the expectations of others? People should have the benefit of early evaluation and neuropsychological rehabilitation, after even what appears to be a mild brain injury, if such injury is felt to be significantly interfering with the patient’s ability to resume normal activities. If the problems are due to other factors such as pain, our evaluations can determine that as well and appropriately shift the focus of treatment to that issue.

It is interesting that the medical community including neuropsychologists accept the fact that on occasion individuals with apparent severe brain injury and protracted coma will emerge from coma, perform normally on neuropsychological tests, and successfully re-integrate into their normal activities without rehabilitation. Why do we have difficulty accepting the opposite finding that on occasion some individuals will suffer a brain injury accompanied by either no or a brief loss of consciousness and yet sustain significant cognitive difficulty? Certainly, it is true that there is a positive correlation based on group statistics between duration of loss of consciousness or duration of post-traumatic amnesia and degree of neuropsychological impairment. However, all neuropsychologists should know that correlative data could not be used to predict outcome on a case-by-case basis. Neuropsychologists have made classic design errors in their group outcome studies of individuals who have...
suffered traumatic brain injuries when they assume that subjects grouped on one variable (e.g., duration of loss of consciousness) are similar on all other variables (e.g., forces applied to the brain at the time of injury, post-injury neuroimaging findings, premorbid cognitive functioning, age, education, gender, etc.).

While a majority of individuals with a history of a single, uncomplicated mild brain injury have uneventful recoveries, others obviously do not. Examples of the latter are found in published studies by Reitan and Wolfson (1999), Varney and Varney (1995), and Yarnell and Rossi (1988). These authors have published data demonstrating persisting cognitive impairment in individuals with car accident-produced cervical whiplash injuries who sustained neither head impact nor a clear loss of consciousness. Such findings would never be predicted using group statistics. The forces required to produce a significant cervical whiplash injury are such that if one occurs, then the practitioner should be alert to the possibility that the same forces may have produced a mild brain injury (Sweeney, 1991). Three features of automobile accident mechanisms are associated with more severe symptoms following whiplash injury: an unprepared occupant, rear-end collision with or without subsequent frontal head impact, and rotated or inclined head position at the time of impact (Sturzenegger, DiStefano, Radanov, & Schnidrig, 1994).

2.2. Conclusions regarding the benefits of early assessment

In summary, there are significant benefits for the patient and the potential rehabilitation team from completing early neuropsychological evaluations even in the case of suspected mild brain injuries. Early evaluations enable the neuropsychologist to predict potential areas of difficulty for a patient as he or she attempts to re-engage in normal activities of daily living. Determining areas of potential difficulty in turn allows the neuropsychologist to specify cognitive deficits that need to be addressed in rehabilitation. Providing early rehabilitation allows the process of neuropsychological rehabilitation to take advantage of the natural recovery curve and decreases the likelihood of maladaptive strategies or a reactive depression developing. If the person’s complaints are determined by the assessment to be due to non-brain injury factors, then the focus of care can be directed away from the possibility of brain injury.

3. What does the neuropsychological evaluation tell us about functional skills?

Detailed neuropsychological testing does not, as the Neurology article suggests, “... tend to over identify cognitive impairments ... and will often provide an exaggerated estimate of the possibility of brain dysfunction” (p. 596). Indeed, detailed testing can in general facilitate our understanding of how a person’s brain injury or neurological condition is affecting functional activities of daily living. Limitations from the testing do arise however, and these are secondary to such factors as the sterility of the testing environment and a failure to consider qualitative behavioral observations along with quantitative data (test scores). These limitations serve to underestimate rather than overestimate the degree of actual neuropsychological impairment in our patient population.
3.1. Limitations of the assessment environment

One must remember, as Sbordone (1996) has emphasized, that the assessment environment is not the real world. The conditions of testing are set up in such a way as to optimize performance. The assessment environment is free from distractions. The environment and the tests are structured, and the examiner is directing the patient regarding what to do and not to do. Feedback is typically clear, immediate, and unambiguous. Time demands are minimized. Instructions are repeated and/or clarified to optimize performance, and prompts are given to facilitate success. The testing environment minimizes the impact of one’s emotional state, and because of the structure of the testing environment, problems with task initiation, organization, and follow-through are minimized. How different this is from the noise and distractions, time demands, lack of structure, and lack of direction and supervision that we typically experience in our homes, schools, workplaces, and communities! Indeed, these observations would suggest that neuropsychological testing data would tend to underestimate rather than overestimate the degree of cognitive impairment found in the neurological population, a direct contradiction to the conclusions reached by the authors of the Neurology article.

3.2. Limitations due to lack of behavior observations

Another problem with simply examining test scores and another problem that the demographic norm approach has fostered is that it minimizes the importance of behavioral assessment as a valid approach toward evaluating the effects of a person’s brain injury on cognitive processes. Goldstein’s (1942) message is still important to heed. He strongly argued that only qualitative evaluations were valid. He argued that quantitative assessments with focus on test scores would confuse the issues since a normal and a brain-injured individual might obtain the same score but arrive at the score quite differently. Goldstein’s focus on the importance of behavioral observations is still important today. While this author would argue that test scores and behavioral observations are both critically important, nevertheless, neuropsychologists need to obtain not only test scores but also observe how the patient arrives at those test scores. If a person obtains a normal score but in a way that would never be successful in her or his activities of daily living, the person is still impaired neuropsychologically.

It is educational, with regard to this latter point, to consider a person’s test performance after completion of rehabilitation. The person may score normally on the tests in the sterile testing environment but still report mild difficulties in attention, memory, and organization during everyday activities especially when in a busy environment. Is such an individual perfectly normal? I do not believe so, but the improvements that have occurred during rehabilitation and strategies mastered to stay on task, remember, and stay organized may help such an individual compensate to the point where she or he does well on our tests.

For example, we re-evaluated a woman who has a persisting amnestic disorder due to carbon monoxide overexposure. She successfully completed the Wisconsin Card Sorting Test (WCST). All of the way through it, she kept overtly repeating the appropriate sorting principle to stay on task. Overt verbal rehearsal was a strategy she had learned in occupational
therapy to help her successfully stay on task when completing her activities of daily living. Does her normal performance indicate that her cerebral functions on which this task depends were normal? Certainly, it does not.

Issues regarding the ecological validity of neuropsychological testing are important (Sbordone & Long, 1996), and they will be discussed further in this paper. Nevertheless, patterns of cognitive strengths and weaknesses, as reflected by test scores obtained in a neuropsychological evaluation, can help us predict the types of problems a person might have in her or his activities of daily living. The neuropsychologist can then determine the predictive validity of test findings by evaluating the patient in the real world. Implications of deficits in neuropsychological test performance for predicting difficulties in activities of daily living have been discussed by Bennett (1988), Heaton and Pendleton (1981), Prigatano (1986), and others.

3.3. Implications of neuropsychological test deficits for activities of daily living

In discussing the implications on neuropsychological test deficits for one’s ability to function normally and meet the demands of home, career, and school, I will base my observations on the expanded Halstead–Reitan Neuropsychological Test Battery as did Heaton and Pendleton (1981) and Prigatano (1986). I will provide examples, but of course, there are many combinations and permutations when analyzing test score profiles, and it is critical that one integrate test scores across and between cognitive abilities in arriving at conclusions regarding a patient’s neuropsychological strengths, weaknesses, and capabilities.

3.3.1. Assessment of sensory and motor skills

In general, with the exception of visual field deficits or significantly reduced visual or auditory acuity, deficits on the Sensory-Perceptual Exam (unless severe) are not likely to influence significantly one’s everyday functioning.

The same can be said for fine motor speed as measured by the finger-tapping test. The Sensory-Perceptual Exam along with finger tapping is more diagnostic of lesion localization than functional ability. The exception would be in the case of jobs that require high levels of manual dexterity and sensory–motor integration.

Deficits in sensory abilities that may significantly affect everyday functioning include balance problems and visual tracking and accommodation problems secondary to or associated with traumatic brain injury. Neuropsychological testing does not specifically evaluate these problems. In our program, these complaints are screened by occupational therapy with subsequent referrals to specialists for further evaluation as appropriate.

3.3.2. Deficits on tests of attention and concentration

Attention and concentration are critical for higher level neuropsychological functioning, and deficits in attention and concentration are often the bases for reported deficits among brain-injured patients in learning and memory, communication, reading and writing, and executive functions. Basic attention skills can be evaluated with the Speech Sounds Perception Test and the Seashore Rhythm Test sustained attention by Digit Vigilance, alternating attention by Trails B, and sustained attention in the face of interference by
failures to maintain a correct set on the WCST. Individuals, who perform normally on Speech Sounds but poorly on Rhythm, can typically stay on task or track a conversation if the pace is slow, but they lose track of what is going on if the pace increases. People who make most of their errors on page 2 of Digit Vigilance have trouble processing information for more than a few minutes; they need information presented in small chunks. People whose basic attention skills are intact but have trouble maintaining a correct sorting principle on the WCST are particularly sensitive to outside interference as they go about their daily tasks. They need to work in a quiet, non-distracting environment. People who perform normally on Trails A but are impaired on Trails B have trouble alternating attention between simultaneous tasks; they need to do one task until it is completed before moving on to another activity.

3.3.3. Deficits on tests of learning and memory

Difficulties “remembering” are the most common symptom reported among neurological patients with cognitive complaints. Most individuals will report intact memory for premorbid events, but they report difficulties with remembering events that have happened recently. Outside of the Tactual Performance Test and Subtest 7 of the Category Test, the Halstead–Reitan Battery does not directly evaluate memory deficits. Fortunately, there are instruments now available to evaluate learning and memory abilities that also have predictive ecological validity including the Memory Assessment Scales, the California Verbal Learning Test (CVLT), and the Rivermead Behavioural Memory Test (RBMT).

The RBMT is especially helpful in making predictions regarding one’s functional memory skills according to data published by Wilson, Cockburn, Baddeley, and Hiorns (1989). This is because the test items and conditions of learning are not highly structured and because the actual subtests are designed to be analogs of the types of memory challenges we face in our activities of daily living. Significant deficits on memory batteries that have ecological validity are good predictors as to whether a person will have functional memory deficits.

A strength of the CVLT is its ability to clarify the basis for an individual’s memory deficits and thereby provide helpful information regarding functional memory skills. By assessing memory skills and by defining the contribution of attention, consolidation, and/or recall deficits to a person’s functional memory, one can make recommendations regarding strategies to be used to remediate or compensate for the deficit, make predictions regarding the likely permanence of the memory deficit, and predict how a person will do with respect to functional skills. Some examples are as follows.

Some individuals have memory deficits that are solely related to attention problems. If attention is remediated and if distractions can be kept to a minimum, they will be able to consolidate information at a normal rate. On a long-term basis, such individuals rarely need more than a memory book system to demonstrate normal functional memory skills.

Some individuals after brain injury will learn information more slowly, but retention is normal following acquisition. Such individuals should be able to engage in regular educational or training programs with a reduced load. They will have to study more or have information repeated more often than will their fellow students or coworkers. These patients do not report as many problems in everyday forgetfulness as do individuals with acquired retention deficits.
Some patients demonstrate reasonably normal acquisition, but retention is impaired. Such individuals have significant problems with everyday forgetfulness as demonstrated by frequently forgetting where things have been placed, what they have been told by others, and what they need to do in the future. In patients with good attention, this is best dealt with by teaching them memory compensatory strategies that are routine and regimented.

Patients with both significant acquisition and retention deficits, such as occurs in hypoxic brain injury, cannot retain new information after their attention has been diverted elsewhere. If attention and executive function testing results are normal in such individuals, some such patients can be taught, with a great deal of effort and support, memory compensatory strategies that enable them to function independently in a highly structured and routine environment (e.g., Bennett & Moore, 1997). If not compensated for, such deficits render a person unable to work or live independently or to manage his or her own affairs. These suggestions point to the wealth of information regarding a neurological patient’s capabilities that may accrue following a comprehensive evaluation of learning and memory abilities.

3.3.4. Deficits on tests of language and communication

Some neuropsychologists comprehensively evaluate communication skills, but most only do a cursory evaluation. The Aphasia Screening Test from the Halstead–Reitan Battery is just a screening test, and one should not attempt to make significant conclusions based on it. It is designed to elicit pathognomonic signs of left vs. right hemisphere damage. The power of this test is in diagnosing the likelihood of brain injury and not in evaluating a person’s communication skills. Adding a test of verbal fluency or a test of naming objects does not add significantly to the Aphasia Screening Test. If a neuropsychologist suspects communication difficulties, then a referral should be made to a speech and language pathologist for evaluation of verbal and written expression, verbal and reading comprehension, fluency, articulation, word finding, etc.

3.3.5. Deficits on tests of executive functions

Executive cognitive functions include problem solving, sequencing, thinking prospectively and flexibly, making a plan, starting an activity, and completing a task. We are convinced that executive functions depend on the integrity of the frontal lobes, but the frontal lobes cannot self-monitor and plan unless information arriving from the posterior association areas has been properly analyzed and transmitted forward. This is why damage to any quadrant of the brain will disrupt performance on the Category Test.

One can make some general statements regarding impairment on tests of executive functions and one’s functional capabilities, but it must always be remembered that it is a long way from the testing room to real life, and some individuals who do very well in the structured testing environment will have very significant impairment of executive functions in their normal activities. Indeed, such a disparity is pathognomonic for frontal lobe dysfunction.

Because of its dependency on alternating attention, brain-injured individuals who are impaired on Trails B (but do relatively better on Trails A) often have trouble “thinking on their feet.” They have difficulty ordering and sequencing information and success-
fully engaging in activities that require sequential responding. Performance on the Category Test can reflect, in a general way, a person’s ability to cope with the complexities of a normal environment. Patients who are only mildly impaired on the Category Test can usually perform adequately in routine daily activities. These same individuals would, however, have difficulty understanding abstract information they would have dealt with adequately before their brain injury, and they would have trouble making decisions about matters that were complicated or out of the ordinary. Students who have even mild deficits on the Category Test will report problems with synthesizing and analyzing new information presented in the classroom or in readings. Patients who are severely impaired on the Category Test typically should not be making decisions on their behalf nor live alone. Even routine decisions cannot be made in a reliable fashion by such individuals.

Perseverative responding, as reflected by poor performance on this measure from the WCST, can further reduce the adaptive ability of patients with deficits in sequential thinking, logical analysis, and problem solving ability. Patients with high perseverative response scores on the WCST are, in general, inflexible in their thinking. If they start out with an ineffective approach to a new problem or situation, they will continue with that approach long after most people would try alternative strategies. They have trouble inhibiting an action before it is needed or after it should be stopped. They have trouble learning from mistakes as well as from successes.

As discussed earlier in this paper, the neuropsychological assessment environment is not the real world, and in our assessment procedures, we typically do not create real world situations. While neuropsychological assessment has been criticized for being too sensitive, in reality it is often not sensitive enough to detect deficits that follow brain injury. This is particularly true for executive functions where we typically use highly structured tests such as Trails B, the Category Test, and the WCST, although the WCST is less structured and probably more sensitive to frontal lobe dysfunction than the other two.

The use of such highly structured tests may render it difficult, if not impossible, for our assessments to adequately evaluate the integrity of the executive control system because the very process of formally testing executive functions may mask an existing impairment (Sbordone, 1996; Ylvisaker & Szekeres, 1989). This is because the structure provided by the testing environment and the guidance provided by the examiner can serve as a prosthesis for deficits the brain-injured individual normally has with respect to task planning, initiation, maintenance, and completion. The examiner typically tells the patient what to do, when to begin, and how to be successful; once things are started, the examiner keeps the patient on task until it is completed. Formal testing can thus reduce or eliminate deficits in executive functioning that the patient normally experiences.

A test battery with improved ecological validity for predicting executive functions, Behavioural Assessment of the Dysexecutive Syndrome, has recently been published (Wilson, Alderman, Burgess, Emslie, & Evans, 1996). This test should add to our ability to accurately assess executive cognitive functions typically ascribed to the frontal lobes. In addition to using less structured assessment protocols, executive functions also should be evaluated through observations of the patient in his or her normal activities (Bewick, Raymond, Malia, & Bennett, 1995; Kay & Silver, 1989; Sbordone, 1996).
3.4. Conclusions regarding the use of neuropsychological test data in predicting functional skills

Thus, in contrast to the position of the Neurology article, there is evidence to indicate that neuropsychological test performance can be used to predict functional capacity in activities of daily living, occupational competence, and success in returning to school. Indeed, if the neuropsychologist does not discuss the implications of test data for the patient’s normal activities then the neuropsychologist has contributed little to patient care by completing an assessment. A section devoted to implications of the test data for activities of daily living should be included in every neuropsychological report, and it should be detailed. Global statements such as “this patient’s performance is within the range of people who typically can/cannot return to work” are not adequate. Specific statements regarding cognitive strengths and weaknesses reflected by constellations of test scores and how these patterns would be reflected in a patient’s activities of daily living must be made. Otherwise, our assessments are of little value to the referring physician.

After the neuropsychologist has made predictions regarding the problems a person might have in his or her daily activities, the neuropsychologist then can validate (or modify) those predictions by collecting information through his or her own observations, by obtaining collateral information from other treating rehabilitation specialists, and/or by obtaining information from the patient’s family, teachers, supervisors, coworkers, or others. In my own work, input based on evaluations by occupational therapy and speech and language pathology has increased the ecological validity of neuropsychological assessment.

4. Improving the ecological validity of neuropsychological assessment by interfacing with allied rehabilitation professionals

We have developed the transdisciplinary outpatient Center for Neurorehabilitation Services in Fort Collins, CO over the past 20 years. This program allows individuals recovering from traumatic brain injury or other neurological conditions and who have good family or significant others support systems to return to and live in their community while accessing supervision and structure through continued rehabilitation. An interesting feature of this outpatient rehabilitation program is that while it includes a variety of professionals (neuropsychology, neurology, physical and occupational therapies, speech and language pathology, psychological services, and vocational and/or school re-entry), neuropsychology is the primary focus at the point of entry into the program. The neuropsychologist provides a triage of all symptoms, makes recommendations regarding which disciplines will participate in the initial assessment process, and subsequently integrates the information obtained from each discipline’s evaluation to design an individual’s rehabilitation program. Features of the program are described by Bennett, Dittmar, and Ho (1997).

The general rehabilitation procedure that is used across disciplines includes the redevelopment of previous skills (remedial training) as well as instructing a patient to develop new skills to compensate for his or her cognitive deficits. Following the learning of new strategies, the patient has the opportunity to try them in simulated or real life environments (home, work,
or community). For the person with severe deficits, therapy services are initially provided in
the home or community to ensure direct generalization as much as possible, then moved to
the clinic for more specialized interventions, and lastly, the focus becomes one of providing
services in the community to promote generalization to normal activities of daily living. For
the mild to moderately impaired patient, therapy is initially provided in the clinic and home,
and again as therapy progresses, we will focus therapy more in the community. For patients
with mild brain injuries who are still able to work to some extent, we will go into the
workplace and provide services there.

Resulting benefits for the neuropsychologist’s assessment process in such a program
include the ability to validate hypotheses generated in testing by evaluating their ecological
validity as the patient meets typical challenges in his or her activities of daily living. Because
of the well-integrated team approach that exists in both the assessment and treatment phases
of the program, the neuropsychologist also can increase the breadth and ecological validity of
the assessment process by including testing results and observations obtained by allied
professionals such as occupational therapy and speech and language pathology. Evaluations
by professionals in these latter two disciplines are different from our own in that they
combine subjective assessments and behavioral assessment of normal activities of daily living
with standardized assessment procedures (tests).

4.1. Occupational therapy

Occupational therapy assessment and treatment is “occupational” in nature because it
addresses difficulties in activities that “occupy” a patient’s time and activity. Occupational
therapy, by emphasizing task analysis of functional skills, can evaluate the impact of
cognitive difficulties on activities of daily living (e.g., problems in speed and efficiency of
information processing, attention/concentration, learning and memory, sequencing, problem
solving, strategic thinking, and flexibility of thinking). A variety of behavior checklists,
interviews, and structured and unstructured behavior observations, as well as formal testing
procedures to evaluate sensory, motor, sensory–motor integration, balance, and visual-
perceptual and -motor problems, are utilized to determine the impact of brain injury on a
person’s life. Major areas that are evaluated, in addition to the sensory and motor difficulties,
include the following.

Occupational therapy assessment of one’s ability to re-engage in normal activities of daily
living utilizes interview and/or observations of activities such as personal care, driving or
transportation, community interactive skills, cooking, house cleaning, grocery shopping,
organization and decision making in the home, and ability to maintain and engage in leisure
activities. Assessments are completed at the clinic, in a person’s home, and in the community.
Return-to-work assessment includes an evaluation of work readiness, a work-site analysis,
and a determination of environmental modifications needed to enable a person to return to
productive employment and to maintain his or her productivity.

Functional cognitive assessment will evaluate how a person’s cognitive deficits are
impacting activities of daily living and determine the types of compensatory strategies that
need to be developed to reduce the impact. Functional cognitive assessment can be completed
in the clinic, in the person’s home, at work, or in the community. What better way could there
be to assess the impact of attention deficits on functional skills than to directly observe how attention/concentration problems are affecting the person when she or he tries to purchase food at a grocery store, find and purchase a shirt at a department store, or stay on task and be productive at work? This information can then be used to validate (or reject) predictions based on the neuropsychological testing. The neuropsychologist can thereby develop confidence in the predictive validity of her or his data with respect to meaningful, functional abilities. Information from the occupational therapy evaluation can also aid us in determining how factors such as fatigue, balance problems, motor deficits, and visual motor and perceptual difficulties are interacting with brain injury-related cognitive impairments to influence our patients’ functional abilities.

4.2. Speech and language pathology

A speech and language pathology assessment is completed to address several areas of functional communication that are typically not directly addressed through a neuropsychological evaluation. In addition and from a functional evaluation standpoint, specific cognitive difficulties (e.g., speed of processing, attention and concentration, learning and memory, sequencing, and problem solving) may be directly observed through reduced functional communication skills. The communication skills that we assess through a speech and language assessment include auditory comprehension, reading comprehension, verbal expression, written language, and math.

As with the occupational therapy evaluation, the speech and language evaluation uses standardized testing procedures along with subjective assessment (e.g., interview and observational data). Take the case of auditory comprehension as an example. Auditory comprehension translates into how well we can understand what others tell us. Auditory comprehension skills are assessed in our program by standardized measures to identify possible problems in the areas of understanding and recalling vocabulary concepts, main ideas, details, and sequential information. A more subjective assessment is conducted via interview to assess a person’s understanding and memory of these parameters during interpersonal communication (e.g., conversation, classroom lectures, understanding information communicated over the phone, and understanding information presented in group conversation). Other aspects of auditory comprehension are addressed during the assessment such as the patient’s ability to understand and remember language if there is background noise present, if there are distractions present, or if a person can stay on track and listen while doing another activity. Taken together, the results of standardized testing and the subjective interview can be used to describe one’s functional auditory comprehension skills.

Similar procedures are used to evaluate other functional communication skills. Care is taken in formulating a rehabilitation program to determine what a patient’s functional communication skills were like before the brain injury and the level of ability that is required for his or her normal activities. A lawyer, for example, must have a much higher level of verbal expression skills than an over-the-road truck driver.

Deficits observed by the speech and language pathologist thus not only provide information regarding specific communication difficulties but also provide greater insight into how these communication deficits are affecting our patients’ activities of daily living. In addition,
they can demonstrate how brain injury-produced cognitive impairments are affecting one of our most important functional skills, the ability to communicate with others. Like the occupational therapy evaluation, the speech and language pathology evaluation can be an extension of the neuropsychological assessment. Of greatest benefit is the fact that these evaluations by allied rehabilitation professionals can extend the ecological validity of our own investigations.

4.3. Conclusions regarding the benefits for neuropsychology that result from multidisciplinary evaluations

The neuropsychologist can improve the ecological validity of the assessment process by including test results and observations made by allied health professionals. In many rehabilitation settings, each professional does their own assessment for the referring physician, and then the referring physician interprets the overall findings. Neuropsychologists can strengthen their role and become a more important influence in their positions if they take the lead and write integrative reports based on multidisciplinary evaluations. In addition, the neuropsychologist can use subjective assessment and behavior observations obtained by speech and language and occupational therapists to test hypothesis generated by the neuropsychological test data regarding functional skills and rehabilitation needs. Finally, the patient’s ability to re-engage in normal activities of daily living, as reflected in the evaluations and observations made by these other rehabilitation specialists, can be combined retrospectively with neuropsychological testing data to extend the neuropsychologist’s ability to make ecologically relevant predictions.

5. Utilizing neuropsychological assessment findings in planning a cognitively focused outpatient rehabilitation program

Before providing some general statements regarding the value of neuropsychological test data in planning an outpatient rehabilitation program, some important principles regarding the cognitive rehabilitation process will be discussed. Cognitive or neuropsychological rehabilitation is the process by which an individual’s acquired cognitive deficits, secondary to brain trauma or neurological disease, are ameliorated. It is widely agreed that treatment must be tailored to each individual case (Raskin & Gordon, 1992).

Many methods have been developed to address acquired cognitive deficits including (1) process-specific rehabilitation such as attention process training (Sohlberg & Mateer, 1989a), (2) skill-based training such as prospective memory training (Mayer, Keating, & Rapp, 1986), (3) compensatory strategy training such as use of a memory book system (Sohlberg & Mateer, 1989a, 1989b), and (4) metacognitive training such as providing rehabilitation interventions to improve a person’s awareness of deficits and ability to self-monitor (Bewick et al., 1995).

In general, for each patient, combining cognitive rehabilitation methods is the most effective treatment approach. Regardless of what approaches and materials are used in cognitive rehabilitation, the therapist must plan, from the beginning, ways to ensure that generalization of skills acquired during therapy will transfer to real world activities.
Sohlberg and Raskin (1996) describe five principles that they believe will promote generalization including the following: (1) actively plan for and program generalization from the beginning of the treatment process, (2) identify naturally occurring reinforcers in the person’s normal environment that will maintain the newly acquired (or reacquired) cognitive skill or process, (3) utilize training situations that are common to both the training environment and the real world, (4) use sufficient examples when conducting therapy, and (5) select methods for measuring generalization from the clinic to the real world to evaluate efficacy of the therapy procedures.

Using this framework in our own program, we generally divide a cognitive rehabilitation session into thirds. The first part of the session is devoted to metacognitive training, the next portion of the session addresses skill-based training and compensatory strategies, and the last part of the session involves process-specific rehabilitation. When conducted appropriately, cognitive rehabilitation does facilitate recovery. As should be apparent to the reader, “conducted appropriately” is far removed from lining people up in front of computers where the patient’s task is to complete repetitive drills. While the efficacy of cognitive rehabilitation will continue to be debated (as has been the value of rehabilitation in general), a number of published reports have demonstrated the benefits of this therapeutic intervention (e.g., Ben-Yishay & Diller, 1993; Ho & Bennett, 1997; Sohlberg & Mateer, 1987).

Neuropsychological assessment data, in collaboration with the assessment findings obtained by allied professionals, can be used to design a cognitively focused outpatient rehabilitation program. Following our multidisciplinary assessment at the Center for Neurorehabilitation Services, an integrated rehabilitation program with projections regarding duration of treatment in each type of therapy is developed by the neuropsychologist. Interventions could include cognitive rehabilitation, speech and language and occupational therapies, psychological counseling, work readiness training, and return to school interventions. In our program, cognitive rehabilitation is provided by speech and language or occupational therapists. It is conducted either conjointly or separately from therapy activities normally provided by these disciplines. Whether separate cognitive rehabilitation sessions are scheduled depends on a number of factors including the patient’s overall neuropsychological impairment, the patient’s neuropsychological test profile of strengths and weaknesses, and the types of cognitive demands the patient must meet in her or his activities of daily living.

The strength of neuropsychological assessment in planning a formal rehabilitation program is that test results can be used to specify the nature of the acquired cognitive impairments that are the bases for the patient’s complaints. This can be illustrated by two cases of patients with a presenting complaint of being unable to remember recent events. For example, a client with mild-moderate overall cognitive impairment due to a traumatic brain injury may complain of problems with everyday forgetfulness. Assessment findings could indicate normal consolidation and retrieval abilities yet significantly impaired attention and concentration skills. In this situation, the memory problems are not primary, and improvements in everyday memory functions will be realized if the patient is provided therapy to improve awareness of deficits and situations where memory problems occur (metacognitive training), strategies to remember what needs to be done each day (prospective memory skill-based training), remediation therapy to improve attention/concentration skills (attention process training), and a memory book system (compensatory strategy training).
A different patient who suffered brain injury due to anoxia might similarly complain of everyday forgetfulness, but in this case, the client could demonstrate normal performance on tests of attention and concentration but severely impaired ability with respect to adding new information to memory. During testing, it could be observed on the CVLT that the person’s trial-to-trial performance never improved, and recall after each trial was never greater than one’s predicted working memory span. Recall of the list after interference was negligible. Such a person has a primary memory deficit. Focus of therapy in this latter case would focus on metacognitive and skill-based trainings, and especially compensatory strategies.

Skill-based and compensatory strategy trainings vary greatly depending on the typical demands that a client must face in returning to normal activities of daily living. For example, a receptionist would need to learn skills to filter out distractions in the work environment, stay on task until an activity is completed, double-check the accuracy of messages, and improve organization. A student, in contrast, would need to learn strategies to improve taking notes during lectures and reading assignments, study skills, and test taking. For students, strategies can be provided to teachers regarding modifications to normal classroom activities so that the student’s ability to meet the demands of the academic environment is enhanced. For the college student, we have had the University Disabled Students Office provide note takers, record textbooks on audio tape, and provide a quiet, non-distracting environment with a reader for the student taking an exam. The neuropsychological test data can be used to verify the student’s complaints and provide justification for such support. Making such recommendations is dependent on the neuropsychologist being able to predict the ecological significance of the neuropsychological testing results.

When therapy goals are primarily addressed through speech and language therapy due to acquired communication deficits, the neuropsychologist can recommend metacognitive, process, and skill-based treatments to facilitate speed and efficiency of processing, attention, and self-monitoring. Combined with speech and language therapy, these interventions will promote recovery in areas such as word-finding, tracking conversations, understanding what is read, verbal expression, and one’s ability to write in an organized, sequential, and cohesive fashion.

When therapy goals are predominantly being met by occupational therapy, similar neuropsychological assessment-based cognitive interventions will facilitate return to normal activities of daily living. For example, improvements in attention and concentration can facilitate the use and effectiveness of compensatory strategies acquired in occupational therapy for improving home organization, maintaining one’s checkbook, staying with a task until it is completed, cooking, grocery shopping, driving, and employment-related activities.

5.1. Conclusions regarding neuropsychological assessment and rehabilitation

In general, for cognitive rehabilitation to be successful, it must be based on the knowledge of the patient’s cognitive strengths and weaknesses. Such knowledge can only be acquired through comprehensive neuropsychological evaluation that evaluates a wide spectrum of cognitive abilities. In addition, cognitive rehabilitation therapy must be practiced systematically, and steps must be taken to promote generalization to the real world. Methodology
with demonstrated efficacy must be utilized, and major cognitive rehabilitation methods include process-specific rehabilitation and skill-based, compensatory strategy, and metacognitive trainings. Combining these treatment approaches with each patient is the most effective treatment approach. In the end, cognitive rehabilitation must be functional and ecologically valid. This means that neuropsychologists must be very knowledgeable regarding the strengths and weaknesses of our assessment procedures as well as the validity of our assessment methodology for predicting patients’ abilities to function adequately in their activities of daily living. This will require expansion and elaboration of the INS-APA Division 40 training guidelines for the practice of neuropsychology (Reports of the INS-Division 40, 1987) as discussed by Johnstone and Farmer (1997).

References


