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The Relationships Among Rehabilitation Staff Members' Reports of Cognitive Dysfunction and Neuropsychological Assessment in an Acute Rehabilitation Population

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Purpose/Objective: To examine the relationships among rehabilitation staff members' observations of the extent to which attention and memory functioning interfered with participants' rehabilitation progress and the relationship between these observations and neuropsychological testing. ***Research Method/Design:*** Participants were 39 adults admitted to a Commission on Accreditation of Rehabilitation Facilities-accredited, acute physical medicine rehabilitation unit who were referred for neuropsychological assessment. For study purposes, participants were administered the Mental Control subtest of the Wechsler Memory Scale—Third Edition (D. Wechsler, 1997) and the Neuropsychological Assessment Battery (R. A. Stern & T. White, 2003). Occupational therapists, physical therapists, and nurses were asked to rate the extent to which participants' attention/concentration and memory interfered with their progress in rehabilitation. ***Results:*** Staff ratings of participants' attention or memory functioning interfering with rehabilitation progress were strongly and most closely related to their own ratings of the other cognitive domain. Objective attention and memory test performance were weakly and nonsignificantly correlated with each other. Relationships between staff observations and test data were also weak. ***Conclusions/Implications:*** Rehabilitation staff members may be viewing cognition as a unitary construct rather than identifying the independent contributions of different cognitive domains as they apply to rehabilitation performance and progress.

Keywords: cognition, therapists' ratings, rehabilitation, neuropsychological testing

Cognitive impairments have significant adverse effects on the functional outcome and quality of life of rehabilitation patients (Hershkovitz, Kalandariov, Hermush, Weiss, & Brill, 2007; Heruti et al., 2002; Nys et al., 2007, 2006; Patel, Coshall, Rudd, & Wolfe, 2002; Patel, Coshall, Rudd, & Wolfe, 2003). These cognitive deficits in persons admitted to acute physical medicine and rehabilitation units are generally identified in four basic ways: self-report by the patient, identification by the patient's family, therapists' observations and assessment, and neuropsychological or cognitive evaluation. Relying on patient self-report will often result in an underestimation of deficits, particularly in patients with frontal (Eslinger & Chakara, 2004) and right-hemisphere (Hartman-Maeir, Soroker, Ring, & Katz, 2002; Mesulam, 2000; Pia, Neppi-Modona, Ricci, & Berti, 2004) dysfunction and for patients with dementia (Harwood, Sultzer, & Wheatley, 2000; O'Keeffe et al., 2007; Vogel, Hasselbalch, Gade, Ziebell, & Waldemar, 2005). Research has consistently shown that brain injury frequently affects accurate self-appraisal of cognitive functioning (Flashman, Amador, & McAllister, 2005; Giacino & Cicerone, 1998). Decreased insight into functioning may range from complete unawareness (anosognosia) to an acknowledgement of an impairment but a denial of its effect on the person's functioning (Flashman, Amador, & McAllister, 2005).

Family members typically report greater cognitive deficits than do the patients themselves (Cusick, Gerhart, & Mellick, 2000; Hochstenbach, Prigatano, & Mulder, 2005; Magaziner, Zimmerman, Gruber-Baldini, Hebel, & Fox, 1997; Visser-Keizer, Meyboom-de Jong, Deelman, Berg, & Gerritsen, 2002), although relatives may also underestimate or be unaware of a patient's mental status impairments, particularly early in the patient's rehabilitation, for several reasons. First, acute cognitive changes are likely accompanied by other impairments (e.g., sensory, motor, activities of daily living), which may be the focus of a family member's attention. Thus, family members may be more attentive to other more dramatic and salient deficits in functioning than to any specific cognitive impairment. Second, unless the patient is overtly

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confused, cognitive changes may be relatively subtle and undetectable except under more demanding conditions and circumstances. Consequently, family members may not have had the opportunity to observe the patient under conditions that necessitated that the patient exhibit adequate memory, judgment, or problem-solving skills. Third, and last, following an acute neurologic event in which the patient's survival may have been uncertain, family members are likely relieved to have the patient in rehabilitation with some expectation of improvement and recovery. This relief and optimism about their loved one's deficits may interfere with an accurate appraisal of the patient's cognitive status by minimizing any perceived mental status changes. Consistent with this perspective, some research has revealed that proxy assessments of the functioning of persons who have had strokes are more reliable at 6 months poststroke than in the 2 to 3 weeks following the onset of the infarct (Pickard et al., 2004).

Occupational therapists' (OTs'), physical therapists' (PTs'), and nurses' (RNs') determinations of a patient's cognitive functioning may be based on formal evaluation and/or observations of the patient during therapy, which may affect, in part, treatment decisions, length of stay, and recommendations for supervision at home. However, observational data may be biased by the types of demands placed on the patient during treatment and by the training, understanding, and observational skills of the rehabilitation staff member regarding cognitive function/dysfunction and their behavioral manifestations.

Despite the potentially important role that staff members' qualitative descriptions may have in the understanding of the patient's cognitive status, there is little evidence in the scientific literature of their reliability or validity. Guilmette, Snow, Grace, and Giuliano (1992) examined the relationship between rehabilitation staff members' (OTs', PTs', and RNs') observations of "how frequently the patient's emotional functioning interfered with participation in rehabilitation activities" (p. 589) and the patient's acknowledgment of depression and anxiety on formal psychological measures. Guilmette et al. found a number of significant but variable correlations among staff members in determining how frequently participants' emotional distress interfered with rehabilitation participation. Thus, differences among staff members' observations of emotional distress were evident. In the only investigation that examined the observations of cognitive functioning made by OTs and PTs (Ruchinskas, 2002), low rates of accurate detection of cognitive abnormalities by therapists were reported, particularly for patients with known or suspected cognitive dysfunction as measured by the Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975).

The primary purpose of this study was to examine the relationships among staff members' observations of cognitive functioning interfering with rehabilitation participation. In addition, the relationship between therapists' observations and patients' performance on standardized screening measures of neuropsychological functioning was examined.

Method

Participants

Participants were 39 persons admitted to a Commission on Accreditation of Rehabilitation Facilities-accredited inpatient acute physical medicine rehabilitation unit who were referred for a neuropsychological evaluation due to known or suspected cognitive dysfunction. To be included in the study, patients had to be English speaking, nonaphasic (e.g., able to follow a three-step command), nonhemiplegic of their dominant hand, and able to participate in the evaluation with regard to effort and attention. Patients also had to have intact vision and hearing and be able to give informed consent.

During the 18-month study period, 178 patients were referred for neuropsychological assessment. Of those patients, 54 (30%) met eligibility criteria, although 15 declined to participate. The reasons for ineligibility for the 124 patients included the following: 40 had significant confusion, 25 were not English speaking, 23 had aphasia, 10 had poor endurance, 10 had visual disturbance, and 16 were ineligible for miscellaneous reasons (e.g., because of scheduling conflicts; a history of severe traumatic brain injury, learning disability, or mental retardation; motor problems such as ataxia or hemiplegia; poor hearing acuity; the presence of VRE or tracheotomy; or because they were younger than 18).

The sample consisted of 20 men and 19 women. The mean age of the sample was 65.5 years ($SD = 15.9$), and the mean educational attainment was 12.4 years ($SD = 2.3$). The racial breakdown of the sample was 36 Caucasian participants, 2 African American participants, and 1 participant classified as "other." Participants were admitted to the rehabilitation hospital a mean of 9.7 days ($SD = 6.1$) following their acute hospitalization admission. The average length of stay in the rehabilitation hospital was 18.4 days ($SD = 7.8$). Presenting problems were cerebrovascular accident ($n = 22$), orthopedic injury ($n = 5$), brain tumor ($n = 2$), subdural hemorrhage ($n = 2$), congestive heart failure or myocardial infarction ($n = 2$), ventriculo-peritoneal shunt placement ($n = 2$), and "other" ($n = 4$).

Procedure

Potential participants were identified from referrals for neuropsychological evaluations who met the criteria described above. In the initial neuropsychological exam, a flexible battery approach was used that was composed of measures that the clinician believed were most relevant to the patient's condition, capabilities, and referral question. Following the neuropsychological assessment, patients were asked whether they were willing to participate in the study by being administered a brief neuropsychological screening battery within the next 7 days and by having their therapists asked a few questions about their functioning. The informed consent document and procedures, which were approved by the hospital's Institutional Review Board, were reviewed with the patient. Patients were paid $20 for their participation. All participants were seen for the study protocol within 1 to 7 days of the initial neuropsychological assessment and never on the same day as the first exam.

Following the patient's agreement to participate in the study, the patient's OT, PT, and RN were asked to respond to two Likert-type items about the participant's progress in rehabilitation based on the staff member's experience with the patient. Specifically, each staff member was asked, "How frequently does the patient's attention/concentration interfere with his/her progress in rehabilitation?" The staff member was also asked the same question about the participant's memory. The therapist or nurse checked one of five

options: 1 = *never or almost never* (0%–10%), 2 = *occasionally* (11%–25%), 3 = *frequently* (26%–50%), 4 = *often* (51%–75%), and 5 = *always or almost always* (>75%). This is a methodology that is similar to that used by Guilmette et al. (1992), in which therapists and nurses were asked to rate how frequently the participant's emotional functioning interfered with his/her progress with rehabilitation. We chose to ask staff members to use progress in rehabilitation as ratings rather than other types of qualitative descriptions, such as whether cognitive impairments were evident at all or an estimate of the degree of cognitive dysfunction (e.g., mild, moderate, severe), for several reasons. First, we believed that progress in rehabilitation was a more concrete behavioral anchor than qualitative descriptors for which there are essentially no psychometric markers and variable agreement even among very experienced neuropsychologists (Guilmette, Hagan, & Giuliano, 2008). Second, clinical decisions about whether cognitive impairment exists or whether current cognitive functions deviate from premorbid levels are very difficult assessments to make, as they require that therapists can differentiate between normal and abnormal aging as well as make an estimate about premorbid abilities. Third, rehabilitation staff members are frequently asked to give their opinions about rehabilitation progress given its potential effect on length of hospital stay, prognosis, and discharge plans. Fourth, and last, how reliably rehabilitation staff members can gauge rehabilitation progress due to cognitive factors is more functionally relevant than is simply questioning whether impairment exists, as this gauging may necessitate specific cognitive rehabilitation strategies or interventions to facilitate general rehabilitation improvement.

For this study, the Screening Module of the Neuropsychological Assessment Battery (NAB; Stern & White, 2003) and the Mental Control (MC) subtest of the Wechsler Memory Scale—Third Edition (WMS–III; Wechsler, 1997) were administered to participants as objective measures of cognitive functioning. The NAB is "a comprehensive modular battery of neuropsychological tests developed for the assessment of a wide variety of cognitive skills and functions in adults aged 18–97, with known or suspected disorders of the central nervous system" (Stern & White, 2003, p. 5). The NAB consists of six modules, five main modules (Attention, Language, Memory, Spatial, and Executive) and a Screening Module. The Screening Module contains items identical or similar to each of the five main modules, referred to as "screening domains." Demographically corrected (i.e., by age, sex, and education) index scores ($M = 100$, $SD = 15$) from the attention and memory portions of the Screening Module were used in this study. A Screening Index score can also be calculated, which represents a summary score of a participant's performance across the entire Screening Module.

The MC subtest of the WMS–III is composed of eight timed mental control tasks, such as reciting the months of the year and the days of the week in forward and backward order. The MC subtest was chosen to supplement the NAB because it has no motor or visual demands, as do half of the NAB Attention subtests. Also, the MC subtest is very quick to administer and was developed as part of a nationally standardized memory battery resulting in normative data up to age 89. Raw scores for the MC subtest were converted to age-corrected standard scores ($M = 10$, $SD = 3$) based on the age of the participant.

Results

Means and standard deviations for the relevant study variables are presented in Table 1, and correlations among therapists' ratings and objective measures of attention and memory are presented in Table 2. As can be seen in Table 1, rehabilitation staff members on average reported that cognition interfered with rehabilitation progress "occasionally," and that performance on neuropsychological measures fell from the 25th percentile (NAB Memory Index) to the 2nd percentile (NAB Attention Index). The Mean NAB Screening Index score, which provides an overall summary of the cognitive functioning of our sample, was 74.7 ($SD = 14.1$), or at the 5th percentile. Visual inspection of the distribution of these scores revealed two outliers (standard scores = 111, 121), both high scores relative to the rest of the sample.

Associations involving therapist ratings were analyzed via Spearman rank order correlations, and associations among cognitive measures were analyzed with Pearson coefficients. As can be seen from Table 2, the strongest relationships among ratings were observed between therapists' own ratings of attention and memory (rs = .52–.73). PT and OT attention ratings were also strongly correlated ($r = .63$, $p < .0001$). With regard to cognitive measures, a strong positive correlation was observed between the NAB Attention Index and the WMS–III Mental Control subtest ($r = .65$, $p < .0001$). There were no other significant associations among the cognitive measures.

Examination of the relationships between therapist ratings and objective cognitive measures revealed that performance on the NAB Memory Index was negatively related to OTs' ratings of both memory ($r = -.53$, $p < .01$) and attention ($r = -.4$, $p < .05$), which reflects that higher NAB Memory scores were associated with therapist ratings of less frequent interference of rehabilitation progress due to attention and memory. WMS–III Mental Control performance was significantly associated with PTs' memory ratings ($r = -.34$, $p < .05$). No significant relationships were observed between therapist ratings and the NAB Attention Index.

Kruskal-Wallis tests (i.e., the nonparametric equivalent of an

Table 1
Descriptive Data for Therapists' Ratings and Cognitive Test Measures

Rating or measure	*M*	*SD*
OT attention rating	2.3	1.5
OT memory rating	2.1	1.1
PT attention rating	2.2	1.4
PT memory rating	2.2	1.2
RN attention rating	2.0	1.2
RN memory rating	1.9	1.1
NAB Attention Index	69.4	11.2
NAB Memory Index	89.5	15.2
WMS–III Mental Control	6.6	2.5

Note. Therapist ratings range from 1 to 5, with 1 = *never or almost never* (0%–10%), 2 = *occasionally* (11%–25%), 3 = *frequently* (26%–50%), 4 = *often* (51%–75%), and 5 = *always or almost always* (>75%). For the NAB Indices, $M = 100$, $SD = 15$; for the WMS–III Mental Control subtest, $M = 10$, $SD = 3$. OT = occupational therapist; PT = physical therapist; RN = registered nurse; NAB = Neuropsychological Assessment Battery (Stern & White, 2003); WMS–III = Wechsler Memory Scale—Third Edition (Wechsler, 1997).

Table 2
Correlations (With n Values in Parentheses) Among Therapist Ratings of Attention, Memory, and Cognitive Test Variables

Rating or measure	1	2	3	4	5	6	7	8	9
1. OT memory rating	—								
2. PT memory rating	.168 (35)	—							
3. RN memory rating	.448** (34)	.349* (34)	—						
4. OT attention rating	.522** (37)	.548** (35)	.397* (34)	—					
5. PT attention rating	.179 (35)	.679*** (37)	.318 (34)	.624*** (35)	—				
6. RN attention rating	.354* (34)	.337 (34)	.728*** (34)	.161 (34)	.377* (34)	—			
7. NAB Memory Index	−.53** (34)	−.16 (37)	−.25 (36)	−.40* (37)	−.02 (37)	−.12 (36)	—		
8. NAB Attention Index	−.07 (34)	−.21 (35)	−.26 (33)	−.25 (34)	−.19 (35)	−.20 (33)	.08 (36)	—	
9. WMS–III Mental Control	−.14 (35)	−.34* (36)	−.28 (34)	−.14 (35)	−.19 (36)	−.32 (34)	.28 (37)	.65*** (36)	—

Note. Correlations among therapist ratings and between therapist ratings and cognitive measures are Spearman rank order correlations, and associations among cognitive measures are Pearson correlations. OT = occupational therapist; PT = physical therapist; RN = registered nurse; NAB = Neuropsychological Assessment Battery (Stern & White, 2003); WMS–III Mental Control = Wechsler Memory Scale—Third Edition (Wechsler, 1997) Mental Control subtest.
* $p < .05$. ** $p < .01$. *** $p < .0001$.

analysis of variance) were conducted to test for differences among the three types of therapists on ratings of attention/concentration and memory. The three therapists did not differ significantly on their ratings of attention/concentration, $F(2, 107) = 0.73$, $p = .48$, or memory, $F(2, 107) = 0.87$, $p = .42$.

Discussion

The purpose of the present investigation was to examine the relationships among rehabilitation staff members' (RNs', OTs', and PTs') observations of cognitive deficits interfering with rehabilitation progress as well as the relationship of these observations to objective neuropsychological testing. Results indicated that therapists' ratings of a particular cognitive domain (attention or memory) were most highly correlated with their own ratings of the other cognitive domain—more so than with other therapists' ratings of the same domain. This finding suggests that therapists may not be discriminating between attention and memory functioning as independent contributors to rehabilitation performance.

This finding would be expected if objective cognitive performance in these domains was also highly correlated. Analysis of correlations between objective memory and attention measures, however, revealed that this was not the case, as none of the correlations between measures of attention and memory reached statistical significance (e.g., the correlation between NAB Memory and Attention = .08, and the correlation between NAB Memory and the MC subtest = .28). Taken together, these results suggest that, when determining the effects of cognition on rehabilitation performance, therapists may be viewing or interpreting cognition as a unitary construct rather than identifying the independent contributions of different cognitive domains.

The lack of strong, consistent correlations between therapists' ratings of a given cognitive domain suggests that OTs, PTs, and RNs may conceptualize these constructs somewhat differently, at least as they apply to how deficits in attention and memory may impede rehabilitation progress. Also, the heterogeneity of ratings within each cognitive domain may reflect differences in the demands placed on patients by different rehabilitation professionals.

The results of this study also revealed the lack of consistent relationships between therapist ratings of a given cognitive domain and objective test performance in that domain. There are several possible reasons for this finding. First, therapists were asked to rate the extent to which performance in a given domain interfered with rehabilitation progress and not to give their assessment of the presence or absence of deficits in that domain per se. Neuropsychological constructs such as attention and memory were measured relatively independently of one another, whereas an individual brings all cognitive strengths and weaknesses to bear in a functional activity. Thus, compensation may occur, allowing an individual to adequately perform a functional task within the rehabilitation setting despite the presence of an objective deficit. Arguably, the cognitive demands during acute rehabilitation would be less than during the postacute or community re-entry phase. Another possibility involves the relatively brief nature of the NAB Screening Module and the WMS–III Mental Control subtest, with both providing only a sampling of performance in each cognitive domain. Perhaps these measures lacked sufficient scope to predict functioning in a rehabilitation setting. Thus, it may also be that the types of functional tasks required of persons in rehabilitation are different from the types of cognitive activities assessed by formal neuropsychological measures. Finally, it is possible that, similar to the findings of Ruchinskas (2002), the weak relationships reflect poor detection by rehabilitation staff members of impairment in specific cognitive domains. Future research is needed to investigate these variables more carefully. However, it appears that formal cognitive testing may provide information about a rehabilitation patient's cognitive status that is not gleaned from therapists' observations alone.

There are several limitations to this study. First, the small sample size warrants caution about the conclusions drawn from it. Second, the participants were rated and tested relatively early in their recovery process, at a time in which their cognitive status may have been dynamic or inconsistent. Third, the participant sample was relatively heterogeneous with regard to age and diagnosis. It may be that therapists' ratings of cognitive dysfunction interfering with rehabilitation might be different in a larger sample of participants in the same age range or with the same diagnoses. Fourth and last, the participants in our sample had to meet relatively strict criteria in order to participate (e.g., they had to be able to follow a three-step command, be able to attend and cooperate

with testing, be nonhemiplegic of their dominant hand), which precluded over 100 potential research participants from being included in the study. Inclusion of these more impaired individuals may have altered the results by increasing the severity and range of the therapists' ratings of poor progress in rehabilitation, although the participants as a group exhibited cognitive functioning that fell as low as the 2nd and 5th percentiles (NAB Attention and Screening Index scores, respectively).

Replication of this study with persons in the acute and postacute phases of recovery and with similar ages and diagnoses might allow for greater generalization and confidence in the reliability of the results. Despite these limitations, the current study adds to the rehabilitation literature by providing data on the relationships among staff observations of cognitive difficulties interfering with progress, as well as the relationship between these observations and objective neuropsychological data.

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