Analysis of the WASI™ as a Screening Tool for Brain Lesions

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Providing services to clients who have a cognitive impairment resulting from cerebral dysfunction (CD) that has not been diagnosed can prove difficult in numerous ways. If the CD is undetected, and therefore untreated, psychotherapy and counseling will be complicated and rehabilitation outcomes will likely be impacted negatively. Due to multiple issues, the occurrence of screening for CD has significantly reduced. Counselors at the Master's degree level have a genuine need for a cost-efficient way to detect possible CD to justify neuropsychological evaluations. This study examined the Wechsler Abbreviated Scale of Intelligence™ (WASI™) instrument's ability to screen for possible CD.

Introduction

An often unaddressed need of consumers revolves around, recognizing and addressing, cognitive deficits arising from numerous sources. These sources include strokes, falls, traumatic brain injury, exposure to a variety of chemicals, human immunodeficiency virus (HIV) infection, alcohol or drug abuse, epilepsy, multiple sclerosis, post cardiac episodes, learning disabilities, and attention deficit disorders (Adams, Parson, Culbertson, & Nixon, 1996). Very commonly, vocational rehabilitation counselors, licensed professional counselors, and social workers often work with clients whose presenting problems appear to be cognitive difficulties and/or a coexisting condition associated with psychological disturbance. Survivors of head injury, particularly, have consistently grown in numbers due to advances in emergency medicine and medical management. These clients have tested the treatment community in a variety of ways.

The National Institutes of Health (NIH, 1998), estimates brain injury is fairly prevalent among clients, estimating 1.5 to 2 million people incur some kind of brain injury each year. These injuries typically arise from motor vehicle accidents, falls, acts of violence, and sports injuries. According to the Centers for Disease Control and Prevention (CDC), an estimated 5.3 million Americans live with traumatic brain injury. The CDC indicated residual disabling conditions, caused by brain injury, are experienced by approximately 80,000 individuals (An Overview of Brain Injury, 2003). Approximately 10% of the affected individuals experienced mild to moderate problems, symptomatic of brain injury, which interfered with activities of daily living (NIH, 1998). To put the incidence of TBI in perspective, spinal cord injuries occur at the rate of five per 100,000, while TBI occurs at the rate of 200 per 100,000 per year (Spivack & Balicki, 1990). Studies have found that young men are at greater risk than women with the incidence of TBI ranging from 2.1 to 2.8 men to 1 woman (Spivack & Balicki, 1990; Isom, 1997). About half of all reported cases of TBI are caused by motor vehicle accidents (Spivack & Balicki, 1990; Isom, 1997).

Typically, individuals with head injuries seek services for emotional distress yet often present a wide array of symptoms which include difficulty with concentration, an inability to organize thoughts, poor memory skills, trouble learning and retaining new information, an inability to interpret words and behaviors of others, and relationship difficulties (NIH, 1998). Counselors may notice their clients experiencing a varying amount of difficulty in choosing the right word. Also descriptions are often lengthy or confabulated. Further, an individual with a brain dysfunction may have difficulties related to problem solving, impaired decision-making abilities, and trouble organizing and planning. All of these tasks will very much impact the treatment delivery and outcomes (Ruff & Schraa, 2001).

Review of the Literature

The limitations of managed care have focused on issues such as cost-efficiency and a more narrow and focused approach for interacting with clients. The opportunities for comprehensive intake assessments and testing have been affected by these limitations. Often treatment must focus on immediate short term symptom relief only. Consequently, mild head injuries typically go undetected and untreated. Early intervention is not focused on, and treatment frequently is misdirected or inappropriate. Clients will seek consultation and care from multiple providers seeking relief for unexplained and unresolved conditions.

Counselors and social workers are increasingly working with clientele presenting with more intricate and varied symptoms. Often these clients are not responding to treatments very well. Psychosocial problems of clients may be due to consequences of a latent undiagnosed CD. The consequences include marital problems and divorce, suicidal ideation, family disturbance, chronic unemployment and/or underemployment, economic difficulties, and alcohol or drug abuse (NIH, 1998). Many individuals receive extensive health care targeting mental and physical illnesses, yet often treatment yields poor results with little to no explanation for lack of improvement. Clients see multiple providers for a variety of emotional and physical problems with a paucity of attention paid to potential cognitive sources of impairment. Counselors have become aware of the dire need to gain a better understanding of the client's current state to best match the treatment plan to the individual. Potential cognitive difficulties from a CD may interfere with treatment and possibly prevent therapeutic progress. Many counselors have realized that more needs to be done for the client besides symptomatic relief. By thoroughly investigating the history of the client, potential cerebral dysfunction may be seen as a clinical factor, which obstructs or inhibits progress.

A logical foundation for the missed diagnoses of head injury is, to a large degree, attributed to managed care. Griffith (1997) reported that managed care companies often required preauthorization for testing. The findings were based upon data obtained through a survey of nine managed care companies. The companies provided broad reasons why preauthorization was required for testing. These included, avoiding overutilization of services/testing, the importance of having a purpose for the testing (avoiding the 'shotgun approach'), a desire to counteract the myth that "more is better", and reducing generalized assessments in favor of truly individualized ones. Eisman, Dies, Finn, Eyde, Kay, Kubiszyn, Meyer, and Moreland (1998) outlined the development of negative associations and attributions connected to testing and assessment by managed care. The broad areas of criticism included: poor psychometric properties of tests, such as reliability and validity; the evaluator's focus on patients' pathology, negative behaviors and resistance to treatment; the often unclear benefits of treatment, and overutilization of testing methods.

To assess the potential for cognitive deficits and disability in mental health and vocational rehabilitation settings, an expeditious method of screening for cognitive deficits is needed. Furthermore this need is underscored by the importance of its utility by master's level counselors. Screening allows for proper treatment planning. This includes the ability to meet the demands of both managed health care cost containment and limited agency funding. Counselors must validate and justify the need for an additional referral and subsequent evaluation. If the condition is not identified, clients with a possible CD that may interfere with their recovery are not being served appropriately or fitting the limited financial expenditure modality.

The most well-known area that counselors primarily test to evaluate cognitive functioning is intelligence. Standard IQ tests, such as the Wechsler Adult Intelligence Scale – Revised® IQ test (WAIS-R®, Psychological Corporation, San Antonio, Texas) (Wechsler, 1981) and the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1986), typically take between 1 and 2 hours to give. These tests must be administered by a licensed psychologist or, in the least, administered by a technician under supervised of a licensed psychologist. A brief version of the intelligence test would not require administration by a licensed psychologist. This would save time and money. Furthermore the test would be administered by a master's level counselor—expediting the evaluation and planning process in a more cost efficient manner.

A brief measure of IQ is needed for research and clinical practice, especially in today's economy in which time and funding for quantitative studies are limited. Furthermore costly services and evaluations must be justified. An efficacious screening tool, which is useable by Master's level counselors, would fill this need. Of particular interest are Groth-Marnat's (1999) parameters of financial efficacy in clinical assessment. The author logically asked the following question: "Would clients receiving a full neuropsychological evaluation as part of their rehabilitation planning benefit more quickly and have higher success rates than those who do not have such an evaluation?" (p.818). An added advantage of such an instrument would be that, clients who would not benefit from a psychologically-oriented treatment program, could be screened out, thus saving dollars spent on unproductive therapies. One major issue in a counseling practice is the counselor's ability to initially screen for cognitive difficulties among diverse populations, thereby justifying the expense of comprehensive testing such as a neuropsychological evaluation.

This study evaluated a screening instrument for counselors that may be useful in the justification of a need for further assessment and treatment planning. Additionally another aim was to determine if the instrument may be appropriate for researchers who need an abbreviated IQ screening instrument in the interest of cost-effective studies. Only a few measures of detection currently exist with the capabilities of the Wechsler Abbreviated Scale of Intelligence™ IQ test (WASI™, Psychological Corporation, San Antonio, Texas) that may be administered by a master's level mental health clinician. The purpose of this study was to determine if the WASI, a cost-effective and clinically appropriate screening tool for intellectual capacity, constitutes a reliable and valid means to detect possible CD.

A NIMH committee found a wide array of neuropsychological tests with consistent validity that were sensitive to diffuse brain damage. The committee further surmised that brief test batteries meet the objectives of a broad functional assessment. The Halstead-Reitan Neuropsychological Test Battery and the Luria-Nebraska Neuropsychological Test Battery were considered to be the major standardized tests, but the committee also considered a number of select tests to be potentially useful for those clinicians who preferred them. Among the tests they included in the NIMH battery were subtests of the Halstead-Reitan Neuropsychological Test Battery, specifically the Trail Making Test, Category Test, Tactual Performance Test, and Finger Tapping Test. The committee also identified the Wechsler Memory Scale® test (Psychological Corporation, San Antonio, Texas) and a symbol digit test similar to the Digit Symbol Modalities Test as valid neuropsychological tests. The Wechsler Abbreviated Scale of Intelligence was not included, because it had not gone to publication until 1999.

A final reason for selecting the WASI is its accessibility to and appropriateness for use by master's level clinicians. Only doctoral level psychologists are qualified to administer full IQ test batteries such as the WAIS-III. Additionally, many states regulate who is qualified to administer IQ tests, usually only by licensed psychologists or individuals who are closely supervised by a psychologist. Master's clinicians may administer and score both the K-BIT and the WASI. The WASI is accessible to a range of mental health professionals, including Master's level counselors whom can administer and score the WASI. Administration qualifications listed in the WASI manual state individuals with a baccalaureate degree in related fields such as counseling, psychology, education, speech and occupational therapy are permitted to use the instrument. The qualifications also require that the administrators have received proper training for standardized test administrations. The manual does caution that interpretations of WASI scores should be conducted by professionals with psychological training.

Purpose of the Study

Clients of counseling and vocational rehabilitation services presenting with cognitive deficits often require unique interventions. Appropriate and individualized treatment can only be provided when deficits are detected. Counselors need reliable, valid, cost-effective, time-efficient, and clinically appropriate screening instruments to detect possible cognitive deficits. Several reasons exist for why the WASI appears to potentially be an appropriate tool to meet this need. These reasons include the short duration of the test, the independent norms available, the established psychometric properties, the sharing of characteristics with other Wechsler IQ instruments, and its capability to be used by clinicians with less than a doctorate degree. Only a few studies, using the WASI, with participants known to have cognitive impairment, have been conducted. In these studies the WASI was able to detect impairment to a particular degree. Additionally, WASI scores have not been correlated with scores on other standardized neuropsychological test instruments to date.

The purpose of this study was to investigate the relationship, if any, among these tests. Additionally the VIQ-PIQ discrepancy generally associated with cognitive impairments was examined to predict severity of disability. Lastly, investigation of the sensitivity of the individual WASI subtests was conducted to determine if a shorter version of the WASI using two subtests is sufficient in screening for CD, and of the four subtests, which two of the subtests were most sensitive.

A finding of significant correlations holds potential for widespread impact in the rehabilitation counseling. Similarly the mental health professions may be able to benefit from such findings as well. Clinically significant data on the WASI could be used as economic justification for referrals for comprehensive neuropsychological evaluations. The resulting information and diagnoses from those evaluations could be used by mental health professionals to identify and provide appropriate interventions to clients with cognitive deficits. This might increase the probability of helpful treatment outcomes, while reducing the costs of inappropriate and unwarranted evaluations.

Methodology

Operational Definition

For the purposes of this research, the term cerebral dysfunction was defined as an impairment of cognitive

function caused by an organic (structural, chemical, or metabolic) or nonorganic (unknown) cause. Additionally dysfunction can be either global (e.g., diffuse inflammation, vasculopathy, disseminated malignancy) or focal (e.g., space-occupying lesions, stroke, trauma, maldevelopment, scars) (Beers & Berkow, 1999).

Participants

The participants in this research were comprised of a sample of 73 adults (60 = males, 13 = females). The participants were referred for a neuropsychological assessment to a Commission on Accreditation of Rehabilitation Facilities (CARF) accredited, comprehensive rehabilitation center. These individuals were clients of either the vocational technical training unit or patients in the medical rehabilitation unit. All participants in this study had a known history of traumatic brain injury (TBI), cerebral vascular accident (CVA), mental retardation (MR), attention deficit hyperactivity disorder (ADHD), learning disabilities (LD), or other neurological conditions (ONC) such as cerebral palsy or epilepsy.

Instruments

The instruments used for this research were derived from tests and measurements utilized in the Hot Springs Rehabilitation Center Neuropsychological Evaluation System (HSRCNES). The instruments involved with the HSRCNES are a combination of known, standardized psychological and neuropsychological tests. Furthermore, each test is documented in one or more editions of the Mental Measurements Yearbook (Brown, 1992; D'Amato, 2001; Dean & Kaufman, 1985; Garbin, 1992; Keith, Powell, & Powell, 2001). More specifically, the HSRCNES is comprised of selected subtests from well known neuropsychological test batteries. These batteries included: the McCarron-Dial System, the Halstead-Reitan Neuropsychological Test Battery, the Wechsler Memory Scale-III, and the Symbol Digit Modalities Test. All of the aforementioned tests were chosen due to high intercorrelations with more comprehensive versions of these tests.

The combination of these tests provided a method for a three-part decision process needed by the rehabilitation facility and referral sources. These decisions included 1) determining the appropriate educational or vocational competency level for training, 2) identifying available services within the community to facilitate job success, and 3) establishing support and structure for the individual with a brain injury to function in society independently (Isom, 1997). The WASI was substituted for the WAIS®-III IQ test (Psychological Corporation, San Antonio, Texas) due to its shorter administration time and fit with the HSRCNES. This battery evaluates concentration, attention, perceptual organization, verbal and visual learning, motor function, memory, concept formation, and reasoning (Isom, 1997). The evaluation system has been used at the center to determine functional abilities of individuals with CD, typically TBI, CVA, MR, ADHD/LD, and ONC.

For the purposes of data analysis, the following tests were used: the WASI Verbal IQ (VIQ), Wechsler Memory Test®-III (WMS®-III, Psychological Corporation, San Antonio, Texas) Logical Memory I and II, and WMS-III Mental Control. These tests were grouped in the verbal trait category. The verbal trait category reflects language development, verbal fluency, verbal memory abilities, word knowledge, comprehension, abstract reasoning, and extent of educational learning (Broshek & Barth, 2000; Psychological Corporation, 1999, 2002). The performance trait category included the WASI Performance IQ (PIQ), the Haptic Visual Discrimination Test (HVDT) from the McCarron-Dial System and the and WMS-III Visual Reproduction I and II tests. Also the Trail Making Test-Parts A and B (TMT-A, TMT-B), the Finger Oscillation Test (FOT), the Tactual Performance Test (TPT) and the Short Category Test Booklet (SCT) from the Halstead-Reitan Neuropsychological Test Battery were components of the battery. Finally, the Symbol Digit Modalities Test (SDMT) was used as well. These tests assess motor, sensory, tactile, and visuospatial functions (Broshek & Barth, 2000; McCarron & Dial, 1986; Psychological Corporation, 1999, 2002; Smith, 2002).

Analysis

Demographic data and test scores were analyzed using Microsoft SPSS Base 11.01 (2001). By examining the relationship of scores on one instrument to scores on other instruments, the statistical analysis assessed the convergent and discriminant validity of the WASI's ability to measure similar constructs as the neuropsychological test scores. A multitrait-multimethod matrix (MTMM) was constructed following Campbell and Fiske's (1959) model for determining convergent and discriminant validity. The matrix had two traits: verbal and performance. The matrix compared two methods: the WASI and the HSRCNES. The MTMM presented the resulting intercorrelations when each of the two traits were measured by several test methods. The MTMM evaluated which neuropsychological tests were specifically in common with the WASI VIQ and PIQ.

Based upon the matrix, the WASI VIQ was expected to correlate significantly higher with the verbal subtests of the HSRCNES. The WASI VIQ was also expected to correlate significantly lower with the WASI PIQ, the motoric and nonverbal subtests of the HSRCNES. Likewise, the PIQ was expected to correlate significantly higher with the motoric and nonverbal subtests of the HSRCNES and significantly lower with the VIQ and the verbal

subtests of the HSRCNES. The verbal measure was comprised of the WASI VIQ, the WMS-III Logical Memory I and II, and WMS-III Mental Control. The performance measure was comprised of the WASI PIQ, HVDT, TPT, TMT-A, TMT-B, FOT, SCT, SDMT, and WMS-III Visual Reproduction I and II. Intercorrelations were examined among the tests and traits.

Next, a one way Analysis of Variance (ANOVA) was conducted to determine if the WASI VIQ-PIQ absolute difference scores discriminated in predicting severity of disability ratings. The mild disability group was expected to significantly differ from the severe disability group. Based on the results of the ANOVA, a significant difference was detected between severity groups, leading to a further analysis (MANOVA) to determine which subtests of the WASI seemed to discriminate between severity groups as hypothesized.

Additionally, the four WASI subtests were compared among the severity groups to determine if Vocabulary and Matrix Reasoning were able to equally detect CD as a shortened version of the WASI. A post hoc regression analysis was conducted using Pearson correlations. This analysis was intended to determine which of the HSRCNES tests could account for the PIQ and VIQ variance.

Results

Convergent and discriminant validity among the WASI PIQ and VIQ and the HSRCNES verbal and performance test methods were examined using the Multitrait Multimethod Matrix (MTMM) (Campbell and Fiske, 1959). The matrix presents all of the intercorrelations resulting when each of the 2 traits were measured by each of the several methods. Each test applied in the study for measurement purposes was a trait-method unit, specifically a union of a particular trait content with measurement procedures. The MTMM is presented in Table 1. The four criteria of Campbell and Fiske's MTMM, did not meet the validity diagonal of the matrix. This can be found imprinted in the bold and italicized text in the table. Moderate convergent validity with verbal measures using the overall average correlations among the Verbal trait was indicated. Additionally low average correlations among the performance measures indicated discriminant validity (Betz & Weiss, 2001). Average correlations among motoric and nonverbal measures indicated both low convergent and discriminant validity of the Performance trait. Convergent validity among all verbal measures of the Verbal trait is moderately supported, while convergence among some of the motoric and nonverbal measures of the Performance trait is only partially supported.

Based upon the ANOVA, the comparison of the three severity of disability groups to the absolute difference between VIQ and PIQ scale scores did not yield statistically significant differences ($df = 2$, $MS = 14.631$, $F = .200$, $p < .05$, significance = .819). The VIQ-PIQ difference was not able to predict the severity of the participants' cerebral dysfunctions. A statistical difference was observed among the means of the VIQ and PIQ scales. Specifically the difference was observed between the mild and severe groups. Levene's Test indicated equality of variance at .64 and .73, demonstrating a significant two-tailed t-test for VIQ and PIQ respectively. The WASI subtests' potential to predict the severity of disability was investigated using MANOVA. The individual subtest scores yielded a statistically significant difference as noted by Wilks' Lambda = .435 ($df = 2$, $F = 8.632$, $p < .05$, significance = .000). The subtests did discriminate among severity groups based upon between-subject effects in the expected direction. The results of the MANOVA are presented in Table 2.

Post hoc analyses were conducted, using separate multiple regressions to determine if subtests of the HSRCNES were able to predict PIQ and VIQ scores as dependent variables. The first analysis found that the prediction of motoric and nonverbal tests could account for 63% of the PIQ variance ($r^2 = .632$, $df = 13$, $MS = 848.641$, $F = 7.791$, significance = .000). Structure coefficients were calculated next, from the Beta weights, to determine the contribution of each of the subtests independent of one another. The SCT coefficient accounted for 68% of the variance accounted for in PIQ. Next the second multiple regression was conducted, to determine if the verbal neuropsychological tests of the HSRCNES predicted VIQ. A significant equation was found. Results indicated that verbal neuropsychological tests accounted for 40% ($r^2 = .402$, $df = 3$, $MS = 1523.75$, $F = 15.491$, significance = .000) of the variance in VIQ, with structure coefficients revealing that the WMS-III LM1 and MC accounted for 81% and 78% of the variance in VIQ respectively. These results also appear in Table 3.

Discussion

Both convergent and discriminant validity were moderately supported in the examination of the neuropsychological tests of the HSRCNES battery in relation to the WASI. Post hoc analyses revealed the SCT, TMT-A, and HVDT right shape explained a major portion of the performance IQ. The major Halstead-Reitan neuropsychological tests such as the FOT, TPT, TMT-B, and SDMT were not found to be significant predictors for PIQ, casting doubt on the current widespread practice to place emphasis on these tests for diagnosis of impairment in performance skills associated with CD. "However, the WMS-III LM1, LM2, and MC explained major portions of VIQ, a finding that was expected" (Snowden,

Table 1
Multitrait-Multimethod Matrix of Correlations Among Measures of Performance & Verbal Traits

		Performance														Verbal			
	Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Performance																		
1	WASI PIQ	1																	
2	HVDT R SP	.487	1																
3	HVDT R SZ	.309	.385	1															
4	HVDT L SP	.242	.335	.066	1														
5	HVDT L SZ	.308	.229	.388	.410	1													
6	TMT-A	.502	.491	.313	.362	.275	1												
7	TMT-B	.481	.512	.246	.351	.283	.739	1											
8	FOT-R	.367	.436	.247	.307	.073	.537	.422	1										
9	FOT-L	.342	.249	.047	.459	.170	.423	.276	.617	1									
10	TPT	.401	.585	.191	.457	.231	.633	.565	.406	.294	1								
11	SDMT	.466	.436	.050	.262	.115	.387	.514	.391	.214	.379	1							
12	SCT	.656	.259	.166	.216	.114	.303	.362	.201	.258	.329	.409	1						
13	WMSIII-VR1	.498	.329	.171	.229	.174	.450	.478	.291	.242	.354	.390	.408	1					
14	VMSIII-VR2	.302	.337	.081	.183	-.088	.275	.317	.306	.249	.254	.350	.235	.600	1				
	Verbal																		
15	WASIVIQ	.492	.253	.104	.105	.234	.432	.413	.373	.189	.355	.488	.385	.496	.301	1			
16	WMSIII-LM1	.334	.180	-.037	.045	-.043	.384	.423	.233	.169	.234	.377	.267	.447	.387	.572	1		
17	WMSIII-LM2	.255	.256	.117	.055	-.034	.365	.409	.249	.157	.200	.408	.173	.505	.527	.513	.870	1	
18	WMSIII-MC	.501	.360	.125	.288	.074	.482	.554	.517	.388	.451	.592	.302	.356	.327	.560	.593	.579	1

N=73 Note. Italicized numbers represent the validity diagonalp<.01

Table 2
Univariate ANOVA for WASI Subtests as Predictors of Severity of Disability

Measure	df	MS	F
WASI Subtests			
Vocabulary	2	1190.184	20.423
Block Design	2	1360.279	19.245
Similarities	2	881.980	13.399
Matrix Reasoning	2	2097.369	21.480

Note. N=73, Wilks' Lambda = .435, Significance = .000

Table 3
Beta Weights and Squared Structure Coefficients of Selected HSRCNES Tests

Predictor	Beta	r	Squared Structure Coefficients	
Performance				
HVDTRP	.227	.61	.372	(37%)
HVDTLZ	.180	.30	.09	(09%)
TMT-A	.179	.63	.396	(40%)
SCT	.472	.825	.680	(68%)
Verbal				
WMSIII-LMI	.391	.902	.813	(81%)
WMSIII-MC	.343	.883	.779	(78%)

Note. r = structure coefficient

2004, p. 71). Also of note is that thought these findings were statistically significant, with regards to the subtests, clinical or practical significance was not assessed. Numerous reports exist in the literature citing the clinical utility of the FOT and TMT parts A and B.

Additionally, the WASI was not able to distinguish between levels of CD impairment based upon the VIQ-PIQ differences in a statistically significant manner. This study is not consistent with prior research in this manner. The VIQ-PIQ differences have historically been linked to detection of cognitive impairments (Bornstein, 1983; Groth-Marnat et al., 2000; Wechsler, 1958; Zubicaray, Smith, & Anderson, 1996). Bornstein cautions though, that the discrepancy should only be viewed as an indicator, and not a statistical or clinical index. Caution must be exercised when using the differences between VIQ and PIQ, as it was not supported in this study to be an indicator of CD either. When accompanied by a diagnosis of TBI, it may be more appropriate to use the discrepancy between scores.

In summary, this study contributes further to the inconsistencies present in the professional literature regarding the significance of VIQ-PIQ difference in relationship to CD. In considering the lack of sensitivity of the WASI to detect CD based upon the VIQ-PIQ difference, a limitation of the instrument and study must be noted. Specifically the differing results from other research may be an effect of the reduced number of subtests present in the abbreviated IQ test. Other instruments such as the WAIS-R and WAIS®-III are comprised of 11 and 7 subtests respectively. More information can be gathered regarding the client's capabilities. Fewer tests mean less data. The possibility exists that having less sampling of the individual's cognitive abilities as a result of fewer subtests may skew the data. Potential phenomena may include an overgeneralization or lack of specificity in detecting the presence of CD. The VIQ-PIQ discrepancy obtained from a full WAIS test battery may, in fact, be more representative of a cognitive impairment. Also the full WAIS may be better prepared to assess a CD than using the VIQ-PIQ discrepancy obtained from the WASI.

The results of this study did not support the use of VIQ-PIQ discrepancy to differentiate between the levels of severity of CD; however the findings did support the use of the WASI actual scores to discriminate be-

tween the absence of a clinically significant CD and the existence of a possible CD. The WASI still offers clinical value though, by efficiently predicting cognitive deficits. These cognitive deficits may interfere with work capacity and therapeutic interventions. Based upon this study and previous research findings, a combination of the Similarities and Block Design may offer the best opportunity for screening for CD when using a shortened version of the WASI (Crisp, 2002; Donders et al., 2001; Groth-Marnat et al., 2000; Reitan & Wolfson, 1993; Warrington et al., 1986).

Additional research is needed to generalize the results further. This study needs to be replicated in different clinical and rehabilitation settings as well as in differing geographic locations. By expanding the research, the association among the types and location of brain injury in relationship to test performance could be further delineated. Future research should also further explore the impact of verbal and performance variance.

Conclusion

In conclusion, the results of the study hold several implications for counselors, especially in the early stages of the rehabilitation planning process, with regards to conducting initial screenings for possible CD. The importance of determining whether a legitimate need exists for referral for a more comprehensive neuropsychological assessment to evaluate the nature and severity of the disability cannot be understated. Pending further investigation of WASI applications, it is suggested that, counselors should initially administer both the Similarities and Block Design subtests of the WASI. If low scores result, it is recommended to administer the remaining two WASI subtests. Also the brief neuropsychological tests SCT and TMT-A will prove useful. Verbal and/or Performance subtest scores below 40, on the WASI, may be considered indicators of a possible CD. Also, the larger the SCT score gets over 60 (M = 50, SD = 10) and the poorer the TMT-A score below 7 (M= 10, SD = 3), the likelihood of a more severe CD exists. When such scores are obtained in conjunction with the low WASI scores, the possibility of a diagnosis of CD is strengthened, and the counselor's referral of the client for a comprehensive neurological assessment appears more judicious. Finding effective, parsimonious and quick screening tools for counselors to predict success and determine appropriate use of services is essential in clinical practice. Counselors can benefit from administering the WASI in a traditional sense to estimate IQ. However, the WASI also offers the potential to detect CD that will allow the counselor to identify the need for further evaluation. This will significantly increase the likelihood of obtaining a feasible outcome in rehabilitation and psychotherapy for the maximum value.

References

Adams, R. L., Parson, O. A., Culbertson, J. L., & Nixon, S. J. (Eds.). (1996). *Neuropsychology for clinical practice: Etiology, assessment, and treatment of common neurological disorders.* Washington, DC: American Psychological Association.

Beers, M. H., & Berkow, R. (Eds.). (1999). Function and dysfunction of the cerebral lobes. In The *Merck Manual of Diagnosis and Therapy* (17th ed.) (chap. 169). Retrieved September 23, 2003, from http://www.merck.com/mrkshared/mmanual/home.jsp

Betz, N. E., & Weiss, D. J. (2001). Validity. In B.F. Bolton (Ed.). *Handbook of measurement and evaluation in rehabilitation* (3rd ed.). Gaithersburg, MD: Aspen Publishers, Inc.

Bornstein, R. A., (1983). Verbal IQ-performance IQ discrepancies on the Wechsler Adult Intelligence Scale-Revised in patients with unilateral or bilateral cerebral dysfunction. *Journal of Consulting and Clinical Psychology, 51*(5), 779-780.

Broshek, D. K., & Barth, J. T. (2000). The Halstead-Reitan neuropsychological test battery. In G. Groth-Marnat (Ed.). *Neuro-psychological assessment in clinical practice.* New York: John Wiley & Sons, Inc.

Brown, S. (1992). [Review of the Short Category Test Booklet Format]. In J. J. Kramer & J. C. Conoley (Eds.), *The eleventh mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin, 56,* 81-105.

Crisp, R. (2002). Short forms of the Wechsler Adult Intelligence Scale-III: How useful in a rehabilitation setting? *Journal of Cognitive Rehabilitation, 20*(4), 20-24.

D'Amato, R. C. (2001). [Review of the Wechsler Memory Scale III]. In J. C. Impara & B. S. Plake (Eds.), The fourteenth mental measurements yearbook. Lincoln, NE: Buros Institute of Mental Measurements.

Dean, R. S., & Kaufman, A. S. (1985). [Review of the Halstead-Reitan Neuropsychological Test Battery]. In J. V. Mitchell (Ed.), *The ninth mental measurements yearbook* (pp. 644-646). Lincoln, NE: The Buros Institute of Mental Measurements.

Donders, J., Tulsky, D. S., & Zhu, J. (2001). Criterion validity of new WAIS-III subtest scores after traumatic brain injury. *Journal of International Neuropsychological Society, 7,* 892-898.

Eisman, E. J., Dies, R. R., Finn, S. E., Eyde, L. D., Kay, G. G., Kubiszyn, T. W., Meyer, G. J., & Moreland, K. L. (1998). *Problems and limitations in the use of psychological assessment in contemporary healthcare delivery: Report of the Board of*

Professional Affairs Psychological Assessment Work Group, Part II. Washington, DC: American Psychological Association.

Garbin, C. P. (1992). [Review of the McCarron-Dial System]. The McCarron-Dial Systems. In J.J. Kramer & J.C. Conoley (Eds.), *The eleventh mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

Griffith, L. F. (1997). Surviving no-frills mental health care: The future of psychological assessment. *Journal of Practical Psychiatry and Behavioral Health, 3*, 255-258.

Groth-Marnat, G. (1999). Financial efficacy of clinical assessment: Rational guidelines and issues for future research. *Journal of Clinical Psychology, 55*(7), 813-824.

Groth-Marnat, G., Gallagher, R. E., Hale, J.B., & Kaplan, E. (2000). The Wechsler intelligence scales. In G. Groth-Marnat (Ed.). *Neuropsychological assessment in clinical practice.* New York: John Wiley & Sons, Inc.

Isom, R. N. (1997). *Gender and vocational assessment of people with traumatic brain injury: Estimating the androcentricity of neuropsych- ological / vocational tests.* Unpublished doctoral dissertation, University of Northern Colorado, Greeley.

Keith, T. Z., Powell, A. L., & Powell L. R. (2001). [Review of the Wechsler Abbreviated Scale of Intelligence]. In J.C. Impara & B. S. Plake (Eds.), *The fourteenth mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

McCarron, L., & Dial, J. (1986). *McCarron-Dial Evaluation System manual.* Dallas, TX: McCarron-Dial Systems.

National Institutes of Health consensus statement online. (1998, October 26-28). *Rehabilitation of persons with traumatic brain injury.* Retrieved September 23, 2003, from http//:consensus. nih. gov/ news/releases/109_release.htm

Reitan, R. M., & Wolfson, D. (1993). *Halstead-Reitan Neuropsychological Test Battery: Theory and clinical interpretation.* Tucson, AZ: Neuro-psychology Press.

Ruff, R. M., & Schraa, J. C. (2001). Neuropsychological assessment. In B. Bolton (Ed.), *Handbook of measurement and evaluation in rehabilitation* (pp.233-254). Gaithersburg, MD: Aspen Publishers, Inc.

Smith, A. (2002). *Symbol Digit Modalities Test manual.* Los Angeles, CA: Western Psychological Services.

Snowden, M. D. (2004). *The WASI(TM) as a screening tool for counselors in the referral decision for a neuropsychological evaluation.* Ph.D. dissertation, University of North Texas, United States — Texas. Retrieved February 7, 2008, from ProQuest Digital Dissertations database. (Publication No. AAT 3145010).

Spivack, M., & Balicki, M. (1990). Scope of the problem. In D. Corthell (Ed.), *Traumatic brain injury and vocational rehabilitation* (pp. 3-20). Menomonie, Wisconsin: Research and Training Center, Stout Vocational Rehabilitation Institute, University of Wisconsin-Stout.

The Psychological Corporation. (1999). Wechsler Abbreviated Scale of Intelligence™ manual. San Antonio, TX: Author.

The Psychological Corporation. (2002). *WAIS®-III / WMS®-III technical manual.* San Antonio, TX: Author.

Thorndike, R., Hagen, E. P., & Sattler, J. M. (1986). *Stanford-Binet Intelligence Scale* (4th ed). Chicago, IL: Riverside Publishing Co.

Warrington, E. K., James, M., & Maciejewski, C. (1986). The WAIS as a lateralizing and localizing diagnostic instrument: A study of 656 patients with unilateral cerebral lesions. *Neuropsychologia, 24*(2), 223-239.

Wechsler, D. (1958). *The measurement and appraisal of adult intelligence* (4th ed). New York: The Psychological Corporation.

Wechsler, D. (1981). *Wechsler Adult Intelligence Scale®-Revised.* San Antonio, TX: The Psychological Corporation.

Zubicaray, G., Smith, G., & Anderson, D. (1996). Comparisons of IQs and verbal performance IQ discrepancies estimated from two seven-subtest short forms of the WAIS-R. *Journal of Psychoeducational Assessment, 14*, 121-130.

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