

Neuropsychological Testing in Professional Psychology Specialties: Summary Findings of 36 Studies (1990-2016) in Applied Settings

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The extant literature on the status of neuropsychological testing practices largely ignores the myriad of survey-based findings of studies reported in allied professional psychology fields. To date, a systematic analysis of neuropsychological test usage across major mental health professions has not been conducted. To address this lapse in the research literature, the current study presents a summary analysis, based on an extensive literature review of published survey-based findings with regards to neuropsychological testing, that report on assessment and test usage patterns from 1990-2016. The 36 identified survey-based or records-based studies of practice settings served as the data pool in the current review. The analysis revealed that overall, 14 (39%) of the 36 surveys indicated 'high' levels of neuropsychological test usage. The predominant tests were Wechsler Scales, visual-motor tests, Wechsler Memory Scales, Halstead-Reitan Battery, Trail Making Tests, California Verbal Learning Test, and Wisconsin Card Sorting Test. This review supports that neuropsychological tests have been, and continue being emphasized in practice by clinical neuropsychologists, and relied on to a moderate degree by practicing clinical and forensic psychologists, but rather neglected by counseling and school psychologists, and professional counselors. Hence, to some extent, practitioners in allied fields, outside of the specialty of clinical neuropsychology, occasionally engage in neuropsychological assessment. In addition, these findings highlight the apparent dissonance between the practical value of neuropsychological testing evident in practice and the diminutive emphasis toward this assessment area in pre-internship training. Finally, this review revealed three neuropsychological areas of sparse research: a) the lack of cross-disciplinary collaboration in assessment, b) survey-based findings regarding neurological assessment of children, and c) studies on the scope of neuropsychological assessment, particularly in academic training, in countries outside the USA.

Keywords: Neuropsychological assessment, Test usage, Professional specialties, Practice settings

Prior to 1980, examination of survey-based data on test usage patterns of mental health settings attest to the popularity of cognitive, achievement, and visual-motor instruments like the Bender-Gestalt Test (Brown & McGuire, 1976; Lubin et al., 1971; Piotrowski, 1978; Sundberg, 1961). National surveys, during this time frame, found that practicing clinicians suggested required training for clinical students in several neuropsychological tests (e.g., Wade & Baker, 1977). In subsequent years, researchers began reporting survey data specifically on the assessment practices of neuropsychologists, reflecting practice data

of professional neuropsychology groups such as the NAN, INS, and APA Division 40 (e.g., Hartlage & Telzrow, 1980; Putnam & DeLuca, 1990).

Over the last 35 years, survey-based data on neuropsychological test usage, for the most part, reflect the assessment practices of neuropsychologists and the findings largely discussed within the context of neuropsychology proper (Lezak, 1995; Rabin et al., 2005 for a review). However, neuropsychological issues are encountered in practice by clinical and counseling psychologists, professional counselors, and

social workers (Frauenhoffer et al., 1998; Kemp, 1992; Larson, 1992; Vakil, 2012). In fact, there has been extensive discussion on the application of neuropsychological assessment in school psychology over many decades (Hale & Fiorello, 2004; Miller, 2007; Obrzut, 1981; Riccio et al., 2010; Sotelo-Dynega & Dixon, 2014). Moreover, neuropsychological testing is well accepted in health care settings. For example, Parker and Chan (1990) found that rehabilitation psychologists devoted about 25% of service time to neuropsychological assessment.

In support of these trends, a wealth of survey data on assessment practices across specialty-areas in the mental health field has been published. Thus, it would be of interest to examine survey-based data that reflect trends in the professional use and reliance on specific neuropsychological tests across various professional specialties over the last 25 years.

Historical Context

Mental Health Practice Settings

In the first national survey, on test usage in psychological clinics in the USA, Louttit and Browne (1947) found that the Bender-Gestalt Test (BGT) was rarely used. However, just over a decade later, Sundberg (1961) reported that the BGT was one of the most popular tests (ranking 3rd) across clinical service settings; the Porteus Maze Test and Perdue Pegboard were used moderately. The data obtained from a national sample of clinical agencies in 1969, Lubin et al. (1971) found several neuropsychological measures amongst the top ranked tests viz. BGT (#3), Memory-for-Designs (#13), WMS (#19), and the Benton VRT (#21). In a 1974 survey of community mental health agencies and hospitals, Brown and McGuire (1976) identified several popular neuropsychological tests, i.e., BGT (#2), Memory-for-Designs Test (#16), and the WMS (#17). Interestingly, Piotrowski and Keller (1978) found that the BGT was the top ranked test overall in terms of usage in outpatient mental health facilities. In a national sample of public and VA psychiatric hospitals, Craig (1979) reported that the BGT, HRNB, Memory-for-Designs, WMS, and Benton VRT were frequently used to address diagnostic issues.

Emphasis in practice with neuropsychological testing continued into the 1980s. Tuma and Pratt (1982) reported that 52% of clinical-child practitioners relied on the BGT for assessment. Surveys of practicing school psychologists reported that perceptual-motor evaluation was a major assessment area (by 22%; Goh et al., 1981). Lubin et al. (1984), in a national sample from mental health facilities, psychiatric and VA hospitals, found neuropsychological testing quite popular (BGT #3, WMS #12, Memory-for-Designs #13, Benton VRT #18). Moreover, Rosenberg and Beck (1986) found that, overall, one-third (33.7%) of clinical child psychologists endorsed neuropsychological testing in assessing ADHD (BGT 64%; HRNB 19%; LNNB 12%; Porteus Maze 10%). In a comprehensive survey across several specialties (clinical, counseling, and school psychology), Harrison et al. (1988) reported moderate use of the BGT. Supporting these findings, Watkins et al. (1988) found that mental health practitioners in hospital settings conducted neuropsychological testing, mostly with the BGT and WMS. In a national survey on the overall psychological test usage across various mental health facilities, the BGT, WMS, Benton VRT, HRNB, Memory-for-Designs, and the LNNB all ranked amongst the 'Top 25' tests (Piotrowski & Keller, 1989).

Several surveys specifically on neuropsychological assessment practices appeared in the 1980s. Based on a NAN sample, Hartlage and Telzrow (1980) reported that the most popular neuropsychological tests were the BGT, HRNB, Benton VRT, LNNB, and WMS. Seretny (1986) found that the HRNB, LNNB, Benton VRT, WMS, and the WCST amongst the most frequently used neuropsychological instruments. Surprisingly, there is limited published data regarding the usage of neuropsychological tests overseas. In a sample of hospital psychologists in New Zealand, Knight and Godfrey (1984) found that the Benton VRT, WMS, LNNB, and Memory-for-Designs tests were highly touted. Based on test usage data from 383 Australian psychologists, Sharpley and Pain (1988) found that the WMS was amongst the top 'most valued' tests and was highly recommended for inclusion in graduate-level training.

Investigatory Design

In order to appreciate historical trends on the scope of emphasis and usage of neuropsychological tests in practice/professional settings, the author utilized bibliometric analyses of the extant literature to identify survey-based studies. To that end, a systematic search of the database PsycINFO (published by the American Psychological Association) was conducted, as this research repository is considered as the leading scholarly file of research in the social and behavioral sciences worldwide. Table 1 summarizes survey findings of 36 published studies on applied settings on usage of neuropsychological tests since 1990, mostly from the USA.

Findings

Two caveats are in order: First, due to the extensive popularity of the Wechsler Scales, achievement tests, and the Bender-Gestalt Test across most survey-based 'Test use' studies, these instruments are not a major focus of the current analysis. Second, response-rates of the reviewed survey studies varied widely; thus, the conclusions of the current analysis must be tempered by the unknown views of a sizeable percentage of non-responders from the samples under study.

Keeping this in mind, based on the review of the 36 practice-based studies in the current analysis, 39% (n=14) reported high levels of neuropsychological testing; 22% (n=8) moderate levels; 30% (n=11) low usage; and three studies found negligible use of these types of tests. Thus, the level of usage of neuropsychological test, overall, in applied settings appears to be quite moderate, although the emphasis of neuropsychological assessment varies as a function of practice settings. This latter point has been corroborated by prior research (see Piotrowski, 2007; Rabin et al., 2016). Not surprisingly, neuropsychological tests tend to be frequently used by clinical neuropsychologists; however, based on data across surveys of these specialists, personality tests and behavior rating scales are also relied upon frequently. While clinical psychologists engage in

neuropsychological assessment to a moderate degree, neuropsychological tests are not emphasized in professional counseling or school psychology, but with the exception of moderate levels of evaluation regarding perceptual-motor ability. However, based on several surveys done by forensic psychologists, there has been an increasing level of usage of neuropsychological testing by these practitioners in legal-related consultation in recent years. Perhaps, this trend reflects emerging interest, by expert witnesses and researchers, in the evaluation of 'Validity' testing within the context of the critical issue of malingering (Groth-Marnat, 1999).

In terms of specific test usage rankings: The IQ (i.e., Wechsler scales) and perceptual-motor evaluation (i.e., BGT, Beery VMI, & Benton VRT) have been perennial assessment areas across all surveys. The top used tests were the WMS, HRNB, Trail Making Test, CVLT, and the WCST. The evidence suggests that over time all these instruments have continued to be held in high regard by mental health practitioners. In addition, testing in educational achievement levels and learning disabilities appear to be major areas of assessment practice. However, it appears that the interest in the LNNB has (historically) diminished over the last decade. Interestingly, the current review revealed few investigations (e.g., Cashel, 2002) on the extent of neuropsychological testing practices in clinical child psychology and child neuropsychology specialties. This seems a fertile area for further survey-based research.

Recently, Rabin et al. (2016) advised that a revision in academic graduate-level training in neuropsychological assessment seems warranted, based on burgeoning demands for neuropsychological findings requested by medical, educational, and legal referrals. Recent research on PsyD/PhD professional psychology coursework and training opportunities indicates that neuropsychological assessment does not receive an adequate coverage (see Kohns, 2016). Moreover, recent studies suggest that supervision in neuropsychological assessment at clinical training sites is lacking in expert supervision and training models (see Schwent-

Shultz et al., 2014). Over the years, the importance of pre-internship clinical experience with neuropsychological testing has been stressed by directors of internship programs (Mittenberg et al., 2000; Ritchie et al., 2012; Stedman et al., 2001), and it remains as a perennial, thorny issue to date (Lan & Chang, 2016). Competency in training is crucial for gaining competency in select tests and instilling a professional interest in assessment as research has shown that graduate-level academic coursework tends to provide a seminal foundation in testing practices (e.g., Anderson et al., 1984; McCaffrey et al., 1985; Piotrowski, 1999). These concerns have also been observed in sub-doctoral level specialty programs (e.g., Lambert, 1991).

Finally, there is limited research on the status of neuropsychological assessment in professional practice in countries outside the USA (see Bartram & Coyne, 1998; Piotrowski, 2015b). Moreover, survey data on the training with neuropsychological tests in university programs worldwide would be a welcome addition.

Conclusion

There has been a consistency in test selection regarding neuropsychological assessment, by clinical neuropsychologists, over the last 25 years. The Wechsler IQ tests, Wechsler Memory Scales, HRNB, the CVLT, WCST, and achievement tests have been the top used tests, although neuropsychologists rely on

a myriad of tests across a host of assessment purposes. In fact, an increase in use of child neuropsychological instruments has been recently noted (Rabin, 2016).

Survey findings affirm that allied professionals and specialists in the mental health field, such as clinical psychologists and forensic psychologists also rely on these same testing instruments for neuropsychological assessment purposes.

While it may not necessarily be used for neuropsychological diagnostics, the Bender-Gestalt Test has ranked as a 'top 10' instrument, across mental health settings and practice specialties over the last 60 years (Archer et al., 1991; Bubenzer et al., 1990; Piotrowski, 1995, 2016).

Counseling and school psychologists do not overly focus on neuropsychological assessment (e.g., Kennedy et al., 1994), but some interest is observed within these professions (see D'Amato et al., 2005).

In health care settings, use of neuropsychological testing may be somewhat de-emphasized reflecting high costs and reimbursement constraints due to managed care/insurance limitations (see Kubiszyn et al., 2000; Piotrowski, 1999).

Surprisingly, the area of pain assessment has not garnered much attention in neuropsychological practice (see Rabin et al., 2016), despite the use of pain 'tests' in forensic and health care settings (Piotrowski, 1998).

Table 1. Emphasis or Use of Neuropsychological Tests in Practice Settings across 36 Studies (1990-2016)

| Study | Sample | Findings |
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| Guilmette et al. (1990) | Psychologists' practice patterns regarding neuropsychological assessment, from varied training models | The major 'neuropsychological' issues addressed were academic attainment, work ability, and organic etiology; Top tests for assessment: WMS, Trailing Making Test, Benton VRT, HRNB, WCST, and LNNB. |
| Piotrowski & Lubin (1990) | Assessment practices of 270 members of APA Division 38 (health psychologists) who also belonged to Division 12 (clinical psychology) | In the area of 'Neuropsychological' test usage, the top tests in rank order: WMS (68% of sample), HRNB (48%), Benton Visual Retention Test (42%), Memory-for-Designs (36%), and LNNB (24%). |

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| Slick & Craig (1991) | Neuropsychological test usage by staff psychologists at 114 public and VA psychiatric hospitals | Top tests in rank order: HRNB (46%); WMS (47%); BGT (43%); Trail Making Test (33%); LNNB (31%); Halstead-Wepman Aphasia Screening (18%); WCST (13%); Category Test (12%). |
| Butler et al. (1991) | 280 members of the International Neuropsychological Society on neuropsychological test usage | Most highly ranked: WCST (73%), Boston Naming Test (63%), Rey-Osterrieth Complex Figure (60%), Trails A & B (59%), Grooved Pegboard (52%), WMS (49%), Rey AVLT (46%), Stroop Color-Word Test (45%), Benton VRT (42%), HRNB (29%), & LNNB (8%). |
| Hutton et al. (1992) | 389 school psychologists (members of NASP); update on the Goh et al. (1981) study | Neuropsychological instruments were rarely noted, other than 'perceptual-motor' tests, Wepman Auditory Discrimination Test (50%); Beery VMI(20%). |
| Retzlaff et al. (1992) | Test selection for neuropsychological test batteries by 250 members of the INS | 34% described their theoretical orientation as Eclectic, 31% as 'Hypothesis-Testing', Process approach (25%), Halstead-Reitan approach (20%); Benton and Luria orientations were negligible. |
| Stinnett et al. (1994) | Data analysis based on 123 members of the National Association of School Psychologists (NASP) in 1993 | Other than the Wechsler scales and Bender-Gestalt, only Beery Test of VMI was frequently used (50% of sample). |
| Watkins et al. (1995) | 412 APA members who were clinical psychologists | Amongst a myriad of tests, the WMS ranked 12th (used by 65% of respondents); the Benton VRT and HRNB were ranked as 22nd and 23rd, respectively(used by about one-third of sample); the Memory-for Designs Test and the LNNB were used by less than 25% of respondents. |
| Mardell-Czudnowski (1996) | National test use survey, based on 1059 assessment personnel from the Council for Exceptional Children-Division for Special Education in the USA | Only the Beery VMI (ranked #9), BGT (10th), and Wepman Auditory Discrimination Test were amongst the 'Top 20' in terms of usage. |
| Lees-Haley et al. (1996) | Forensic evaluation reports by 100 forensic neuropsychology experts | WMS/WMS-R ranked 3rd; Trails A & B as 4th; Finger Oscillation Test as 6th; Category Test was at 8th; WCST at 9th; Tactual Performance Test at 11th; Grooved Pegboard at 15th; Seashore Rhythm at 16th; Boston Naming Test at 18th; Grip strength at 20th; Stroop Test at 22nd; CVLT at 29th; RAVLT at 22nd; &LNNB at 33rd. |
| Sullivan & Bowden (1997) | 102 clinical neuropsychologists in Australia | Top tests used: Rey Complex Figure Test (88%), WMS (83%), Multilingual Aphasia Exam (81%), Trail Making Test (81%), Rey AVLT (77%), Austin Maze (77%), WCST (49%), and Benton VRT (32%). |

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| Smith-Seemiller et al. (1997) | Practices of 50 NAN members on assessing premorbid IQ | Interview, school records, and vocational history were noted by over 90% of respondents; neuropsychological tests were not mentioned. |
| Frauenhoffer et al. (1998) | Obtained 'test usage' data from 171 practicing psychologists | Amongst a myriad of psychological tests, 32% of respondents (n=54) used the WMS (ranked 16th); 23% used the HRNB (ranked 23rd). |
| Piotrowski et al. (1998) | 137 practitioners in National Register of Health Service providers in Psychology | Tests considered most important for practice: WMS-R, HRNB & LNNB amongst top 10 psychological tests mentioned. |
| Boccaccini & Brodsky (1999) | Diagnostic test usage in personal injury cases by 80 practicing forensic psychologists | The SIRS was used by 26% of respondents; the HRNB by 11%. |
| Camara et al. (2000) | Test usage practices of neuropsychologists | Most used neuropsychological tests (in descending rank order): WMS, Trail Making Test, FAS Word Fluency Test, Finger Tapping Test, HRNB, Boston Naming Test, Halstead Category Test, Rey Complex Figure Test, &WCST. |
| Archer & Newsom (2000) | Test usage data on 346 psychologists, whose primary clinical practice is with adolescents | The only neuropsychological test in the 'top 30' was the Bender-Gestalt. |
| Martin et al. (2001) | Use of tests in forensic assessment by 79 Australian psychologists | The Rey Complex Figure Test ranked amongst the 'top 5' tests; noteworthy, 7 of the top 10 instruments were neuropsychological tests. |
| Van Wijck et al. (2001) | Surveyed members of World Forum for Neurological Rehabilitation, in 75 countries, on assessment of motor deficits | Based on limited respondents (n=68), only the modified Ashworth Scale, Fugl-Meyer, Action Research Arm Test, and Functional Independence (FIM) were noted frequently in rehabilitation. |
| Muniz et al. (2001) | European professional psychologists from six countries on use of psychological tests | Three countries indicated moderate use of BGT; no neuropsychological tests ranked in 'top 10', other than the Rey Complex Figure Test (only 5%) in Belgium. |
| Cashel (2002) | 162 child & adolescent practitioners in outpatient, hospital and school settings | The Beery Test of VMI ranked in the top 10 tests; the Continuous Performance Test was used by 39% of respondents. |
| Dugdale & Dunn (2002) | Testing professionals in New Zealand | Competency in specific neuro-psychological tests was not emphasized. |
| Lally (2003) | 64 diplomates of the American Board of Forensic Psychology opinions on professional 'acceptability' of various tests in forensic cases | Neuropsychological tests found 'acceptable' in the area of Malingering: TOMM, Rey, HRNB. Both the HRNB and LNNB were found acceptable in the assessment of competency and mental state evaluations. |
| Shapiro & Heick (2004) | Determined assessment practices of 648 school psychologists (NASP members) | Intellectual assessment was a prominent area (84%); but perceptual-motor functioning was also popular (60%). |

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| Echemendia & Harris (2004) | Test use practices of 911 neuropsychologists with Latino populations in the USA | Top tests in rank order: Trails, WMS, WCST, Rey Complex Figure Test, CVLT, Reitan-Klove Sensory Perceptual Exam, Boston Naming Test, Ravens Progressive Matrices, and Symbol Digit Modalities Test. |
| Rabin et al. (2005) | Assessment practices of 747 clinical neuropsychologists | Top tests endorsed by more than 10% of respondents: WMS, Trail Making Test, CVLT, HRNB, WCST, and ROCFT. |
| Archer et al. (2006) | 152 forensic psychologists' use of neuropsychological tests in court-related assessments | Trail Making Tests ranked highest; WCST and Category Test had 'moderate' usage; both the LNNB and HRNB were not used frequently. In the evaluation of malingering, the SIRS, Test of Memory Malingering, the Validity Indicator Profile, and the Rey-15 were highly ranked. |
| Sharland & Gfeller (2007) | 188 NAN members' testing practices in assessment of effort and malingering | Top used tests: Test of Memory Malingering, MMPI-2 F-K ratio, MMPI-2 FBS, Rey 15-item Test, CVLT, Rey Complex Figure Test, WCST, and Trail Making Test. |
| Smith et al. (2010) | 404 members of the International Neuropsychological Society or National Academy of Neuropsychology were surveyed on assessment practices | Over 80% of respondents use verbal memory tests and executive function tests 'almost always'. |
| Donoso et al. (2010) | 150 professionals who conduct vocational rehabilitation evaluations | WMS ranked 5th; Trail Making Tests 7th; & WCST was at 19th. |
| Evers et al. (2012) | 17 European countries; 400 professional psychologists' use regarding testing practices | The only neuropsychological test that ranked highly was the WMS: in UK (12%), Czech Republic (7%), Austria (6%); cited 2008 Finnish study (37% use WMS). |
| Peterson et al. (2014) | 926 counselors (clinical mental health, school, occupational) rated tests of all types regarding their usage | Top 100 list: the highest ranked neuro psychological test was the WMS(60th); further down, Trail Making Test (84th), HRNB (85th), LNNB (93rd), Boston Process Approach (97th). |
| Neal & Grisso (2014) | 434 forensic examiners of professional organizations | Overall, across a variety of forensic/legal domains, a few neuropsychological tests were used. In civil tort litigation, the Trail Making Test was used(by 8.3%); for civil commitment, the WCST (8.1%); and in disability determination, pain scales were used (10.3%). |
| Rabin et al. (2014) | Use of computerized neuropsychological test batteries by 512 neuropsychologists from USA and Canada, affiliated with NAN or INS | Only 21% use CNTBs 'often' or 'always'. Top CNTBs: Conner's CPT, WCST, Word Memory Test, Test of Variables of Attention, ImpACT. |

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| Martin et al. (2015) | Investigated 'Validity testing' practices of 316 neuropsychologists with adult clients | Most used tests: TOMM, CVLT, Word Memory Test, Finger tapping, Medical Symptom Validity Test, WCST, Dot Counting Test, Rey 15-item Test, WMS, Victoria Symptom Validity Test. Findings confirm that 'Validity testing' has increased in recent years. |
| Rabin et al. (2016) | Testing practices of 512 doctoral-level members of the NAN and INS (10 yr. update of 2005 survey) | Top tests used: Wechsler Memory Scales, Trail Making Test, CVLT, Delis-Kaplan Executive Function System; HRNB used by 5%, and WCST by 5% as well. Noted an increase in reliance on the Neuropsychological Assessment Battery over the last decade; Computerized systems rarely used; major concern in the field is the lack of ecological/predictive validity of neuropsychological tests. |

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