

25 HIGHLIGHTS ON THE USE OF THE MMPI/MMPI-2 IN A NEUROPSYCHOLOGICAL TEST BATTERY ¹

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The MMPI scales have been shown to make a valid and effective contribution to assessment of patients in neuropsychological evaluations. The extensive research detailing the instruments' validity and effectiveness is highlighted to illustrate the empirical research in a wide range of neuropsychological problems. Many studies on neuropsychological problems have been published over the past 75 years. The following highlights describe some special contributions using the MMPI/MMPI-2 for decision making in these settings:

- 1955 Reitan contributed substantially to the use of the MMPI in neuropsychological assessment. His early research on brain-damaged versus non-brain-damaged patients indicated the brain damaged tends to experience neurotic-like symptoms ('neurotic triad'). Significant differences between the 2 groups were found on several scales, with the brain-damaged having the higher scores. Results discussed in relation to problems in experimental design and to treatment of the brain damaged established the value of the MMPI in the neurological test battery.
- 1960 Doehring conducted an evaluation of 51 neuropsychological patients: 17 brain-damaged with aphasic symptoms, 17 brain-damaged with nonaphasic symptoms, and 17 nonbrain damaged with neurotic symptoms. Patients were administered the individual form of the MMPI. The 3 groups were carefully matched with respect to age and number of years of education. Both brain-damaged groups were also carefully matched in terms of type of brain lesion. It was found that the brain damaged patients with aphasic symptoms did not differ

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appreciably from the brain damaged patients with no aphasic symptoms on the clinical scales of the MMPI and the Taylor Anxiety scale. A comparison of these 2 groups with the nonbrain-damaged group with neurotic symptoms did not show significant differences. The relatively large number of L responses produced by the brain damaged groups is interpreted as an indication that the clinical scale scores by these 2 groups might be affected by attempts to choose socially acceptable responses.

- 1974 Boll, Heaton and Reitan investigated intellectual, perceptual, psychomotor, and motor impairment in patients with Huntington's chorea (mean age = 46.9 yrs). Comparisons of these patients were also made with a control group of patients matched for age and education and 9 brain-damaged patients equated for the amount of neuropsychological impairment (Halstead Impairment Index). All patients completed a battery of psychological tests including the Wechsler-Bellevue Intelligence Scale, the MMPI, and the Trail Making Test. Huntington's chorea patients showed serious impairment in both motor and psychomotor abilities and in a broad range of higher mental functions which are not dependent on motor skills. These patients also obtained MMPI profiles (elevations on Hs, D, Sc scales) similar to those seen in the brain-damaged group.
- 1978 Heaton, Smith, Lehman, and Vogt compared the results of 16 volunteer malingers with those of 16 cooperative, nonlitigating head-trauma patients on the WAIS, the Halstead-Reitan Test Battery, and the MMPI. The overall level of ability impairment shown by the malingers equaled that of the head-injury group, but different patterns of strengths and deficits were produced by the 2 groups on testing. The malingers also showed more severe personality disturbance on the MMPI. The test protocols were sent to 10 neuropsychologists, who made "blind" judgments as to whether each was probably produced by a malingerer or by a real head-injury patient. Neuropsychologists' diagnostic accuracies ranged from chance-level prediction to about 20% better than chance. Discriminant functions based on the neuropsychological test results and the MMPI, respectively, correctly classified 100 and 94% of Ss in both groups. In another sample of 84 head-injury patients, those who were involved in court actions and/or gave clinical evidence of faking were more likely to be classified as malingers by the discriminant functions.
- 1978 Heaton, Chelune and Lehman assessed the ability deficits and personality disturbances associated with 3 levels of employment in 381 patients (mean age 37.7 yrs) referred for neuropsychological testing. They administered: the WAIS, the Halstead-Reitan Neuropsychological Test Battery, the Peabody Individual Achievement Test (Reading Recognition, Reading Comprehension, and Spelling subtests), the Figure Memory subtest of the Wechsler Memory Scale, Reitan's Story Memory Test, and the MMPI. The unemployed group consistently showed the greatest pathology on the tests, the full-time-employed group performed

relatively normally, and the part-time-employed group earned intermediate scores. A discriminant function analysis which used both neuropsychological and personality measures satisfactorily discriminated unemployed from full-time-employed patients. Classification rates support its clinical utility in identifying new patients who are at high risk for unemployment. It appears that psychological tests commonly used in neurological and psychiatric diagnosis can also help predict some aspects of patients' abilities to function in everyday life.

- 1984 Novack, Daniel and Long Administered the Halstead-Reitan Neuropsychological Test Battery, Thurstone Word Fluency Test, Trails Test, WAIS, Wechsler Memory Scale, and MMPI to 119 16–60 yr old closed head injury patients. 69 Ss were considered mildly injured because posttraumatic amnesia was less than 24 hrs in duration; 50 Ss were considered severely injured on the basis of posttraumatic amnesia of more than 24-hrs duration. They reported that the MMPI scales *Hs*, *Hy*, and *Pd* (Hypochondriasis, Hysteria, and Psychopathic Deviate) significantly discriminated between mildly and severely head injured patients; more mildly injured patients scored above 70T on both *Hs* and *Hy*. However, elevations on MMPI scales were more strongly correlated with patient age, time since injury, and number of post-concussion symptoms than with neuropsychological functioning. It is suggested that the number of post-concussion symptoms may be a rough index of emotional adjustment.
- 1988 Bigler evaluated adults with frontal lobe damage using neuropsychological tests, including the Halstead-Reitan Neuropsychological Test Battery, Wechsler Memory Scale, Wechsler Adult Intelligence Scale—Revised (WAIS—R), Raven Coloured Progressive Matrices, Rey-Osterrieth Complex Figure Design (D. A. Osterrieth, 1944) and the Minnesota Multiphasic Personality Inventory (MMPI). Data indicate that frontal lobe damage may result in a wide-spectrum of behavioral and cognitive changes that do not conform to a specific syndrome entity.
- 1988 Cripe and Dodrill assessed adults with chronic low-level formaldehyde exposure in domestic environments were administered a comprehensive battery of neuropsychological tests after removal from the environments for several months. The formaldehyde exposure group was group-matched by sex, age, and education with 13 control and 13 mild head-injury patients, and test results were compared using 1-way analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA). Results indicate that the formaldehyde-exposed group was significantly different from the mild head-injury group and similar to the control group on the neuropsychological measures. Comparisons between the groups on the Minnesota Multiphasic Personality Inventory (MMPI) indicate emotional reactions and somatic concerns for both the formaldehyde and the head-injured groups. Findings suggest that once

individuals were removed from a chronic formaldehyde exposure, their neuropsychological performances were within the normal range.

- 1988 Diamond, Barth and Zillmer studied adult mild head trauma patients at 3 mo postinjury compared with patients who were referred for neuropsychological evaluation, using the Minnesota Multiphasic Personality Inventory (MMPI), the Wechsler Adult Intelligence Scale (WAIS), and the Halstead-Reitan Neuropsychological Test Battery. The MMPI findings for the mild head trauma group showed scale elevations that were distinct from normative scores for the general population but markedly similar to findings for the comparison group. They concluded that ratings of neuropsychological impairment combined with the MMPI as an objective measure of emotional distress may be more predictive of difficulties in returning to preinjury activities than either individual measure.
- 1994 Binder, Salinsky and Smith conducted a study of the psychological correlates of psychogenic seizures (PSs), 53 patients with medically intractable seizure disorders underwent intensive EEG monitoring. 64% had diagnoses of epileptic seizures (ESs) and 36% had diagnoses of psychogenic seizures (PSs). Ss were compared on the MMPI, Portland Digit Recognition Test (PDRT; a forced choice measure of motivation), disability status, Face Hand Test, and Finger Agnosia. Patients with PSs were significantly higher in number of somatoform MMPI profiles and likelihood of applying for financial benefits, and significantly lower on the PDRT. Patients with PSs made more Finger Agnosia errors. Differences on the Face Hand Test were of borderline significance. Results support the existence of multiple psychometric correlates of PSs.
- 1994 Lamb, Berry, Wetter and Baer provide a cautionary perspective to test use in assessing brain injury. They evaluated the impact of detailed information on closed-head injury (CHI) and/or the MMPI-2 validity scales on malingering of psychological symptoms of CHI on the MMPI-2 was investigated. In an analog investigation using college students, experimental malingerers produced reliably different MMPI-2 protocols relative to controls answering honestly. Experimental malingerers were divided into 4 groups on the basis of the complete crossing of 2 factors: CHI information (present/absent) and MMPI-2 validity scale information (present/absent). No 2-way interactions were noted, but main effects for both factors were found on several MMPI-2 clinical and validity scales. In general, CHI information raised both clinical- and validity-scale scores, whereas information on MMPI-2 validity scales lowered both clinical- and validity-scale scores. These results suggest that coaching may have an impact on simulation of CHI on the MMPI-2.
- 1996 Gass conducted a study of Attention span (Digit Span), verbal list learning, and memory test performance (Wechsler Memory Scale—Revised; WMS-R) in

relation to MMPI-2 measures of depression, anxiety, and psychotic thinking in male patients with closed-head injury and with psychiatric disorder. He found, in both samples, MMPI-2 scores were significantly related to Attention Span but independent of List Learning performance. MMPI-2 scores correlated with factor scores derived from the Logical Memory and Visual Reproduction subtests of the WMS-R. Further analysis using a hierarchical regression analysis supported the view that MMPI-2 scores are relevant to the interpretation of performance on neuropsychological tests of attention and memory.

- 1996 Zwart, Ellertsen and Bovim examined the relationship between MMPI-2 scales, pain characteristics, sick-leave, and psychosocial factors in a sample of 17 patients with migraine, 18 patients with tension headache, 14 patients with cluster headache, and 18 patients with cervicogenic headache. Migraine and cluster headache Ss showed group profiles within the normal range. Both Ss with cervicogenic and Ss with tension-type headache showed an elevation of the first 3 clinical scales ("neurotic scales") on the MMPI-2. The pattern was different in the 2 groups. Anxiety seemed to be more pronounced in tension-type headache Ss, while somatization seemed to be the most characteristic feature in cervicogenic headache Ss. There was a strong relationship between elevation of the neurotic scales of the MMPI-2 and number of days with headache per month. Furthermore, patients on sick leave showed an elevation of the neurotic scales compared to patients at work, regardless of the diagnosis. The authors discussed whether there was an interrelationship between sick leave and psychological factors is discussed.
- 1997 Reitan and Wolfson reviewed the literature on emotional disturbances and their interaction with neuropsychological deficits in brain-damaged individuals addressing questions such as (1) whether indications of emotional disturbance are to be expected as a direct consequence of brain damage, (2) if indications of emotional disturbance can be differentiated from results obtained with psychiatrically disturbed (nonbrain-damaged) Ss, and (3) why so many emotionally disturbed persons without brain damage tend to perform normally on neuropsychological tests. They provided comprehensive views on (1) different general approaches to these questions and their implications for neuropsychology, (2) evidence of differential sensitivity to brain damage of neuropsychological and emotional instruments, (3) the sensitivity and specificity of self-assessments and complaints of head-injured Ss, (4) MMPI findings among head-injured Ss and in interaction with neuropsychological measurements detailed, and (5) principles and guidelines that may be of value in clinical application of findings were noted.
- 1997 Youngjohn, Davis and Wolf conducted a study concerning MMPI-2 profiles of consecutive patients with moderate/severe head injury were compared with those of consecutive symptomatic minor/mild head injury patients. The severe litigating group had significant elevations on Hypochondriasis (*Hs*), Hysteria (*Hy*), Schizophrenia (*Sc*), and Health Concerns relative to the severe

nonlitigating group. The minor/mild group had significant elevations on *Hs*, Depression (*D*), *Hy*, and Psychasthenia (*Pt*) over both the litigating and nonlitigating severe groups and additional elevations on *Sc* and Health Concerns over the severe nonlitigating group. The significant differences found indicated that patients in litigation tend to respond in more pathological directions than those not in litigation.

- 1997 Axelrod and Milner conducted a study to examine complaints of memory, attention, and problem-solving difficulties among veterans of Operation Desert Storm and Shield (ODSS). They evaluated a sample of male veterans (mean age 33.3 yrs) of ODSS using a comprehensive neuropsychological evaluation. Deficits relative to normative data were observed only on finger dexterity (Grooved Pegboard, bilaterally) and the Stroop Color and Word Test. Those with impaired Pegboard performance had lower performance on other tasks requiring psychomotor speed. Those with impaired Stroop had significantly lower motor and set-shifting performance. Scores of both impaired groups were higher on many clinical and supplemental scales of the MMPI. Despite subjective cognitive complaints reported in 39% of the overall sample, veterans with cognitive complaints differed from their peers primarily in greater psychological distress as depicted on the MMPI.
- 1998 Bachna, Sieggreen, Cermak, Penk and O'Connor examined the reliability between the MMPI and MMPI-2 in a group of 10 amnesic patients (aged 32–78 yrs). The study also examined the content of Ss' responses to the tests to determine whether the MMPI/MMPI-2 captures fundamental personality characteristics of amnesic patients with regard to profile configuration as well as consistency of clinical/psychological presentation over time. Findings indicate that there were no statistical differences between versions of the MMPI and further revealed that many of the scales were significantly correlated. Ss produced elevated scores on subscales 2 (depression) and 8 (schizophrenia). This indicates that MMPI and MMPI-2 scores in this patient population may reflect the medical and psychosocial effects of brain damage rather than premorbid personality dysfunction. A close evaluation of Ss' performance, in conjunction with the critical items they endorsed, offers insight into the personality traits of the amnesic patient population. The relative stability of performance across personality tests administered over several weeks is relevant to the formation and stability of the amnesic's concept of self.
- 2000 Gasquoine evaluated measures of persisting postconcussional and control symptom change (postinjury–preinjury self-ratings on 5-point scales) for selected groups of consecutive referrals with traumatic back pain and concussion. 18 patients (mean age 39.1 yrs) were in the traumatic back pain group and 10 Ss (mean age 32.5 yrs) were included in the concussion group. Mean symptom change was not significantly different between the 2 groups. Positive correlations were found between post-concussional symptom change and psychometric measures of emotional distress for participants with valid

Minnesota Multiphasic Personality Inventory profiles in the 2 groups combined. Results suggested that persisting post-concussional symptoms were not specific to concussion but were associated with increased emotional distress. The authors suggest that the concussion and traumatic back pain groups were similar in having undergone sudden trauma with resultant functional impairment, and it is likely that some combination of these factors influenced both the persisting self-reported symptom change and the emotional distress.

- 2003 Ross, Putnam, Gass, Bailey and Adams, provided further evidence that MMPI-2 indices of psychological disturbance are related to performance on NP tests of attention and memory in psychiatric and head-injured patients. In a large sample (N = 381) referred for evaluation after sustaining presumed head injury, we examined the relationship between MMPI-2 indices of psychological disturbance and measures of attention and memory from the Wechsler Memory Scale-Revised, Wechsler Adult Intelligence Scale-Revised, California Verbal Learning Test, and the Memory Assessment Scales. Although related to other domains, MMPI-2 variables were most consistently related to measures of attention and List Learning. Even when demographic variables, injury severity, and litigation status were controlled, MMPI-2 indices significantly predicted performance on six out of eight tests.
- 2003 Patch and Hartlage examined the neuropsychological effects of exposure to the neurotoxic industrial sterilizing agent ethylene oxide (ETO). Ss were 66 patients (mean age 37 yrs) with traumatic brain injury (TBI) and 22 patients (mean age 43.2 yrs) with ETO exposure from working in a medical setting. Results of neurocognitive examination show higher IQ scores for the TBI group, and elevated MMPI scores for both groups, indicating preoccupation with bodily concerns, anxiety, depression, alienation, isolation, social disconnectedness, and a tendency to channel stress into physical symptoms. These results indicate a more significant effect of ETO exposure compared to TBI on intellectual functioning and anxiety.
- 2003 Crews, Jefferson, Broshek, Rhodes, et al. examined the neuropsychological profiles of potential lung transplant candidates. Neuropsychological data are presented for patients with end-stage pulmonary disease who were being evaluated as potential candidates for lung transplantation. Neuropsychological test results indicated that a significantly greater proportion of the patients exhibited impaired performances on a number of Selective Reminding Test (SRT) tasks as compared to the expected population frequency distributions for these measures. The highest frequencies of impairment were observed on the SRT's Immediate Free Recall (46.43%), Long-term Retrieval (41.67%), and Consistent Long-term Retrieval (51.19%) variables. On the Minnesota Multiphasic Personality Inventory-2 (MMPI-2)/Minnesota Multiphasic Personality Inventory-Adolescent (MMPI-A), patients' mean clinical profile revealed elevations on Scales 1 (Hypochondriasis) and 3 (Conversion Hysteria). This profile indicated that they were experiencing an array of symptomatology

ranging from somatic complaints to lethargy and fatigue, and that they may have been functioning at a reduced level of efficiency.

- 2005 Guez, Brannstrom, Nyberg, Toolanen and Hildingsson assessed neuropsychological functioning in patients with chronic neck pain, with a whiplash trauma and without previous trauma. They reported that the whiplash group was more forgetful and had more concentration difficulties compared with the non-traumatic group. The neuropsychological tests did not reveal any differences between the two groups and a reference group of healthy individuals. Thus, chronic neck pain did not seem to interfere with neuropsychological functioning. The personality traits assessed with MMPI-2 in the group of patients with chronic neck pain differed significantly from the normals on several scales. They also reported that the whiplash group had more divergent test results than the non-traumatic group on the MMPI-2 test. They concluded that the health status in those with chronic neck pain is closely linked to separate personality traits. Thus, subjective complaints and poor performance in patients with chronic neck pain may be associated to somatization and inadequate coping, especially in chronic whiplash patients.
- 2005 Dearth, Berry, Vickery, Vagnini et al. MMPI-2 results from 39 moderately to severely head injured (HI) and 44 community volunteer (CV) participants given instructions to feign symptoms or answer honestly during an analog forensic neuropsychological examination were compared. No significant effects for HI or the interaction between the HI and instruction set (IS) factors were noted on either clinical or selected validity scales (*F*, *Fb*, *F(p)*, *Ds2*, *FBS*). However, the main effect of IS was significant for both clinical and validity scales (median Cohen's *d* = 1.34 and 1.39, respectively). Most validity scales were characterized by perfect specificity rates but low to modest sensitivity, whereas *FBS* had both moderate sensitivity and specificity. Logistic regressions showed that the *F* and *Ds2* scales made a significant contribution independent of motivational tests to the identification of feigning during neuropsychological examination.
- 2008 Hessen, Anderson and Nestvold evaluated the utility of using the MMPI-2 in follow-up of neurological treatment of head injury. Their study investigated very long-term outcome of subjective complaints after pediatric mTBI. They followed-up 23 years after a prospective head injury study at a general hospital in Norway. Forty-one patients were assessed with the MMPI-2 23 years after sustaining mTBI as children. They found good overall outcome with scores close to the normative mean, average length of education and normal employment rate. However, the children that sustained complicated mTBI showed slightly more pathological scores, typical for mild post-concussive syndrome. The best predictors of poor outcome were skull fracture and a combination of post-traumatic amnesia > 30 minutes and EEG pathology within 24 hours after TBI. No influence of pre- and post-injury risk factors on current

MMPI-2 profiles was evident. The results supported the view of potentially differential impact of uncomplicated vs complicated mTBI. The findings suggest that children and adolescents sustaining complicated mTBI may be at risk of developing subtle chronic symptoms typical of post-concussive syndrome.

- 2009 Gass conducted a comprehensive review and integration of research on the MMPI-2/MMPI within the field of neuropsychology. He pointed out that the MMPI was incorporated into a standardized and subsequently validated neuropsychological test battery by Ralph Reitan over 50 years ago and that the amount of past and present research efforts involving the MMPI-2 in the neuropsychological context is substantial and far exceeds that involving any other multidimensional measure of personality or psychopathology. Gass concluded that extensive research base is one of the reasons for widespread use of the MMPI-2 by neuropsychologists. He reviews the important aspects of using the MMPI-2 specifically in clinical neuropsychological practice though some of this material lends itself to a broader application.

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