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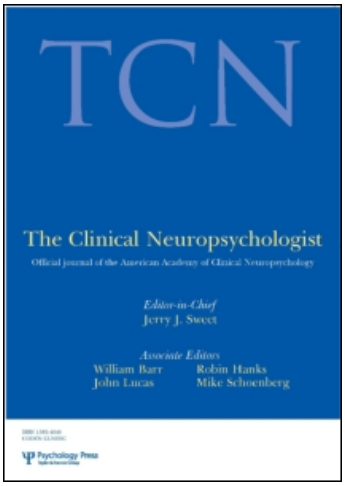

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Independent Validation of the MMPI-2-RF Somatic/Cognitive and Validity Scales in TBI Litigants Tested for Effort

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The MMPI-2 Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008) is replacing the MMPI-2 as the most widely used personality test in neuropsychological assessment, but additional validation studies are needed. Our study examines MMPI-2-RF Validity scales and the newly created Somatic/Cognitive scales in a recently reported sample of 82 traumatic brain injury (TBI) litigants who either passed or failed effort tests (Thomas & Youngjohn, 2009). The restructured Validity scales FBS-r (restructured symptom validity), F-r (restructured infrequent responses), and the newly created Fs (infrequent somatic responses) were not significant predictors of TBI severity. FBS-r was significantly related to passing or failing effort tests, and Fs and F-r showed non-significant trends in the same direction. Elevations on the Somatic/Cognitive scales profile (MLS-malaise, GIC-gastrointestinal complaints, HPC-head pain complaints, NUC-neurological complaints, and COG-cognitive complaints) were significant predictors of effort test failure. Additionally, HPC had the anticipated paradoxical inverse relationship with head injury severity. The Somatic/Cognitive scales as a group were better predictors of effort test failure than the RF Validity scales, which was an unexpected finding. MLS arose as the single best predictor of effort test failure of all RF Validity and Somatic/Cognitive scales. Item overlap analysis revealed that all MLS items are included in the original MMPI-2 Hy scale, making MLS essentially a subscale of Hy. This study validates the MMPI-2-RF as an effective tool for use in neuropsychological assessment of TBI litigants.

Keywords: Minnesota Multiphasic Personality Inventory; MMPI-2-RF somatic/cognitive scales; MMPI-2-RF validity scales; Symptom validity tests; Traumatic brain injury.

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INTRODUCTION

The second edition of the Minnesota Multiphasic Personality Inventory (MMPI-2; Butcher et al., 2001) is among the most widely used personality and psychopathology assessment tools in the field of neuropsychology. The MMPI-2 has recently been revised into a restructured form (MMPI-2-RF; Ben-Porath & Tellegen, 2008; Tellegen & Ben-Porath, 2008), a condensed 338-item version of the test. In the MMPI-2-RF the traditional clinical and content scales have been replaced with the restructured clinical (RC) scales, restructured form (RF) validity scales, and a number of specific problem, interest, and higher order scales. The RC and RF scales were developed to reduce perceived inadequacies of the original scales

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(e.g., high scale intercorrelations and the inclusion of "subtle" items with questionable validity; see Gervais, Ben-Porath, & Wygant, 2009). No new items have been introduced and the test was not restandardized. All of the items were taken from the existing MMPI-2 item pool. Non-gendered T-scores were derived from the MMPI-2 normative group. No new normative data were collected.

Although the MMPI-2 has long demonstrated utility in forensic assessment of psychopathology and in the identification of over-reporting of symptoms, disability, and suboptimal effort, there is still a relative dearth of information about whether the MMPI-2-RF can be used with the same level of effectiveness as its predecessor. The purpose of the current study was to investigate the clinical usefulness of RF Validity and Somatic/Cognitive specific problem scales in the identification of suboptimal effort in a sample of litigating traumatic brain injury (TBI) patients.

Use of the MMPI-2 in forensic assessment

The MMPI-2 is among the most widely used instruments in the field of forensic neuropsychological assessment. Personal injury litigation or financial compensation claims for traumatic brain injury are associated with increased likelihood of conscious or unconscious exaggeration of symptoms and disability (Binder & Rohling, 1996; Larrabee, 1998; Youngjohn, Burrows, & Erdal, 1995). A relatively high prevalence of suspected malingering occurs with individuals evaluated for mild traumatic brain injury (mTBI) in forensic settings, with estimated base rates as high as 30 to 40% in civil litigation settings (Larrabee, 2005; Mittenberg, Patton, Canyock, & Condit, 2002; Thomas & Youngjohn, 2009; Youngjohn et al., 1995). Malingering base rates may be as high as 50% or more in criminal forensic settings and Social Security Disability settings (Ardolf, Denney, & Houston, 2007; Chafetz, 2008).

The MMPI-2 clinical and validity scales are also commonly used to identify instances of somatization, a phenomenon where unconscious psychological processes are believed to contribute to complaints of physical illness and disability. Elevations on MMPI-2 scales Hs and Hy (the "conversion V"; Gough, 1946) are associated with somatic complaints that cannot be fully explained by physical pathology and frequently are associated with secondary gain. (Graham, 1990; Larrabee, 1998).

There is a well-established line of research demonstrating that individuals with symptomatic mild TBIs show more pronounced elevations on MMPI-2 clinical scales Hs and Hy than individuals with severe TBIs and that this effect is most pronounced when the patient is pursuing litigation regarding their injury (e.g., Miller & Donders, 2001; Thomas & Youngjohn, 2009; Youngjohn et al., 1995; Youngjohn, Davis, & Wolf, 1997). Youngjohn et al. (1997) first described this paradoxical head injury severity effect. They reported that in a sample coded for TBI severity and the presence or absence of litigation, the highest scale elevations on the MMPI-2 occurred for the litigating mild TBI group, followed by the litigating severe TBI group, with the lowest MMPI-2 clinical scale elevations occurring in the most severely injured non-litigating TBI group. Thomas and Youngjohn (2009) found that elevations on MMPI-2 validity (including FBS), clinical, and the restructured clinical (RC) scales were all associated with suboptimal effort and that

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elevations on the validity scales were paradoxically inversely related to the severity of traumatic brain injury.

The MMPI-2 has been demonstrated to be an effective tool in identifying symptom over-reporting. The F family validity scales can be used to differentiate between healthy, illness-feigning control participants and individuals with genuine psychiatric illnesses (Rogers, Sewell, Martin, & Vitacco, 2003). The F family scales also have a demonstrated association with effort test failure, though these associations appear to be less robust than FBS (Geiffenstein, Gola, & Baker, 1995; Larrabee, 1998).

The Symptom Validity scale (FBS)—a scale designed specifically to identify feigned symptom complaints in civil litigation settings (Lees-Haley, English, & Glenn, 1991)—effectively identifies over-reporting of psychopathology, physical symptoms, disability, and failure on effort tests in TBI populations (Larrabee, 1998; Nelson, Hoelzle, Sweet, Arbisi, & Demakis, 2010; Nelson, Sweet, & Demakis, 2006). Wygant et al. (2007) found that FBS scale elevations significantly predicted effort test failure in both civil and criminal litigation cases. For litigating evaluees, FBS now appears to be among the most effective validity scales from the MMPI-2.

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MMPI-2-RF Somatic/Cognitive and Validity scales

The MMPI-2-RF includes 9 restructured clinical scales, 8 new or revised validity scales, and 28 specific problem and higher-order scales. In addition to the seven revised validity scales, the MMPI-2-RF includes Fs, The Fs was designed to detect non-credible reporting of physical complaints by identifying a rare symptom strategy adopted by individuals who attempt to feign illness. The Fs is comprised of MMPI-2 items with somatic content that were endorsed by fewer than 25% of a large group of medical patients as well as the normative group. F-r includes quite a few items not scored on the original F scale. F-r items were derived by identifying items endorsed by fewer than 10% of the men and women that were not contained on other RF validity scales.

The 23 specific problem scales are intended to represent the clinically significant substance of the MMPI-2 item pool with a comprehensive set of psychometrically adequate measures (Tellegen & Ben-Porath, 2008). These scales were included to measure significant attributes not or not directly assessed by the RC scales. The methods used for specific problem scale derivation were not described in the MMPI-2-RF technical manual.

Within the 23 new RF specific problem scales, 5 scales are devoted to complaints of somatic and cognitive problems: Malaise (MLS), Gastrointestinal Complaints (GIC), Head Pain Complaints (HPC), Neurological Complaints (NUC), and Cognitive Complaints (COG). The manual for administration, scoring, and interpretation (Ben-Porath & Tellegen, 2008) suggests that when interpreted in conjunction with Fs and FBS-r, Somatic/Cognitive scale elevations can indicate over-reporting of somatic and cognitive symptoms. It specifies, however, that attribution to volitional over-reporting requires extra-test data indicative of intentionality, and in the case of malingering, an external incentive. The MMPI-2-RF technical manual (Tellegen & Ben-Porath, 2008) presents validation data in samples of community mental health center outpatients, psychiatric inpatients, VA

hospital inpatients and outpatients, disability claimants, criminal defendants, and college students. However, few independent validation studies of the Somatic/Cognitive scales have yet been made available.

Gervais et al. (2009) examined the scores on the COG scale with non-brain-injured disability claimants and concluded that it was a predictor of subjective affective and cognitive complaints. COG correlated with self-reported Mental Health Inventory (MHI) anxiety, depression, and memory clusters, but not with the migraine, pain, or neurological complaint scales. A recent study from Locke et al. (2010) indicated that four somatic scales (MLS, GIC, HPC, and NUC) successfully discriminated between individuals diagnosed with epilepsy and those with psychogenic non-epileptic seizures (PNES). Individuals with PNES consistently reported higher and more varied somatic symptoms than those with epilepsy. Thomas and Locke (2010) further evaluated the four somatic scales using taxometric confirmatory factor analysis and item response theory procedures in their epilepsy/PNES sample, and found that each is comprised of domain specific as well as general somatic-related variance. Beyond the aforementioned studies, however, research on the clinical usefulness of these RF somatic/cognitive scales has been sparse.

Similarly, there is a growing body of research examining the RF validity scales. Sellbom and Bagby (2008) reported that the revised L (Uncommon Virtues; L-r) and K (Adjustment Validity; K-r) scales added validity in differentiation between individuals instructed to under-report symptoms and naturally responding individuals. This was replicated with college students, inpatient individuals with schizophrenia, and child custody litigants. Most recently, Sellbom, Toomey, Wygant, and Kucharski (2010) found that MMPI-2-RF validity scales F-r and Fp-r were associated with malingering of psychiatric symptoms in a criminal forensic setting.

There have been relatively few studies investigating the MMPI-2-RF validity scales in neuropsychological populations. Gervais, Ben-Porath, Wygant, and Sellbom (2010) reported that the RF validity scales (F-r, FBS-r, Fp-r, and Fs) demonstrated incremental validity above their MMPI-2 counterparts (F, Fp, and FBS) in the prediction of over-reporting of subjective memory complaints in a predominantly non-head injury population.

Several studies have looked at the associations between MMPI-2-RF validity scales and performances on tests of effort during neuropsychological evaluation. Gervais, Lees-Haley, and Ben-Porath (2007) found that the revised FBS-r and Fs scales were negatively correlated with performance on effort tests such as the Word Memory Test (WMT), Medical Symptom Validity Test (MSVT), Computerized Assessment of Response Bias (CARB), and the Test of Memory Malingering (TOMM). A study by Wygant et al. (2009) predicted rates of effort test failure using the F-r, Fp-r, Fs, and FBS-r validity scales in a known-groups sample of personal injury litigants and found that Fs, F-r, and Fp-r scores were significantly higher in a dissimulating head-injury group than in a non-dissimulating head-injury group. Furthermore, the researchers found that there were significant elevations in all four validity scales in a litigating personal injury group when patients from that group had also failed two or more effort tests.

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Goals of the present study

There is promising evidence that the MMPI-2-RF retains the ability to identify somatization, over-reporting of symptoms, and suboptimal effort in the assessment of individuals with traumatic brain injury, but further research remains necessary to illuminate the utility of the restructured validity and specific problem scales with this population. This study will assess the ability of the MMPI-2-RF validity and somatic/cognitive scales to correctly distinguish between cumulative "pass or fail" status on formal cognitive effort tests in a group of litigating TBI patients.

METHOD

Participants

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Our sample has been previously reported by Thomas and Youngjohn (2009). It included 82 consecutively evaluated litigating patients with claimed TBI. Participants averaged 12 years of education, 45 years of age, and 66% were male. All participants were involved in some form of litigation. The various forms of litigation included personal injury lawsuits, workers' compensation claims, and private insurance disability claims. One participant was excluded from Thomas and Youngjohn's (2009) original sample, due to missing data.

Participants were coded on two overlapping categorical subject variables. The first participant variable was severity of TBI. The sample was divided into participants with mild TBIs ($n = 55$), participants with complicated mild TBIs ($n = 13$), and participants with moderate/severe TBIs ($n = 14$). The sample was also divided into participants who failed at least one effort test ($n = 34$) and participants who passed all effort tests ($n = 48$). Results from t-tests did not reveal significant differences between the effort test pass and fail groups on either age or gender. Participants did differ on education levels, with the effort test pass group having slightly more education ($t = 1.99$, $p < .05$).

Mild traumatic brain injury. Mild TBI was defined by a field and/or emergency room Glasgow Coma Scale (GCS) score of 13 to 15, an estimated loss of consciousness (LOC) of less than 30 minutes, negative computerized tomography (CT), and negative magnetic resonance brain images (MRI).

Complicated mild traumatic brain injury. Complicated mild TBIs were defined as those injuries where only one of the following criteria were met: (1) a recorded or estimated GCS of less than 13; (2) an estimated loss of consciousness of greater than 30 minutes; or (3) a CT and/or MRI positive for skull fracture or extraparenchymal bleeding within the cranium (e.g., subarachnoid hemorrhage or subdural hemorrhage).

Moderate/severe traumatic brain injury. Moderate/severe TBIs were defined as those injuries where at least two of the following three criteria were met: (1) a recorded or estimated GCS of less than 13; (2) an estimated loss of consciousness of greater than 30 minutes; or (3) a positive CT and/or MRI. Individuals with imaging studies positive for intraparenchymal bleeding

(i.e., intracerebral hemorrhage or contusion) were always classified as moderate/severe regardless of a second criterion being met.

Effort test status. All participants were administered formal effort tests as part of a standard neuropsychological test battery. Our sample was divided into participants who either passed all cognitive effort tests or failed at least one effort test. A total of 48 participants passed all effort tests (Effort Pass $n = 48$) and 34 participants failed at least one effort test (Effort Fail $n = 34$).

Measures

MMPI-2RF. MMPI-2-RF Validity and Somatic/Cognitive scale T-scores were obtained from MMPI-2s that were administered to all participants in our sample. The MMPI-2 Validity, Clinical, and Restructured Clinical (RC) scale profiles in this sample were described previously (Thomas & Youngjohn, 2009). The MMPI-2-RF Validity scales examined in our current investigation include F-r (Infrequent Responses), Fp-r (Infrequent Psychopathology Responses), Fs (Infrequent Somatic Responses), FBS-r (Symptom Validity), L-r (Uncommon Virtues), and K-r (Adjustment Validity). The MMPI-2-RF Somatic/Cognitive scales examined in this study include MLS (Malaise), GIC (Gastrointestinal Complaints), HPC (Head Pain Complaints), NUC (Neurological Complaints), and COG (Cognitive Complaints).

Effort tests. The Portland Digit Recognition Test (PDRT; Binder, 1993) is a forced-choice measure designed to identify poor effort on cognitive tests. Examinees are asked to perform a digit recognition task following distraction. The PDRT has been found to have good sensitivity and excellent specificity to malingered cognitive disorders (Greve, Bianchini, Love, Brennan, & Heinly, 2006). Examinees who passed 23 of 36 easy items and 20 of 36 hard items—that is, who fall in the top 98% of the distribution for number of items passed in a large sample of non-litigating patients with documented TBIs—were considered to have passed the PDRT.

The Word Memory Test (WMT; Green & Astner, 1995) is another forced-choice effort test. Examinees perform an immediate and a delayed recognition of word pairs task. In the present study examinees were considered to have passed the WMT if they met two out of the following three criteria: passed 32 of 40 immediate recall items, passed 31 of 40 delayed recall items, and/or passed 33 of 40 consistency items.

The Dot Counting Test (DCT; Rey, 1941) is a non-forced-choice test meant to identify poor effort on cognitive tests. Examinees are asked to quickly count patterns of black dots on a card. The DCT is generally considered to have moderate sensitivity and high specificity (Nitch & Glassmire, 2007). Boone, Lu, & Herzberg (2002) developed a scoring method for the DCT called the "E-score" (mean ungrouped dot counting time + mean grouped dot counting time + number of errors) that demonstrated reasonable sensitivity and good specificity. In the present study examinees with E-scores of 18 or less were considered to have passed the DCT.

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Procedure

The 567-item MMPI-2 was administered to all participants according the standard instructions as part of a neuropsychological evaluation. Answer sheets were scored by software provided by the test's publisher. MMPI-2-RF scorings used in our present study were calculated from the original MMPI-2 responses.

Effort tests were also administered to participants according to the standard instructions. Although participants did not uniformly receive all effort tests, all received at least two effort tests.

RESULTS

We used the same statistical methods to analyze the MMPI-2-RF Validity and Somatic/Cognitive scales that Thomas and Youngjohn (2009) used to analyze the MMPI-2 Validity, Clinical, and Restructured Clinical scales profiles from the same participants. Two-way multivariate analysis of variance (MANOVA) tests were used to compare T-scores from each of the two profile sets (Validity and Somatic/Cognitive scales) for participants classified into the two participant variables: TBI severity (mild, complicated mild, or moderate/severe) and effort test status (pass or fail). Discriminant analyses were used to determine the classification accuracy of each profile using discrimination weights that best differentiated between the groups.

Table 1 presents the MMPI-2-RF validity scales' mean T-scores and variance accounted for by TBI severity and effort test status. A two-way MANOVA comparing the validity scales profiles of the TBI severity groups indicated non-significant group differences; $F(12, 142) = 1.72$, $p = .07$, $\eta_p^2 = .13$. The validity scales profiles for the effort test status groups also did not differ significantly; $F(6, 71) = 1.63$, $p = .15$, $\eta_p^2 = .12$. The interaction of the TBI severity and effort test status was non-significant; $F(12, 142) = 0.80$, $p = .65$, $\eta_p^2 = .06$.

Figure 1 presents the validity scales profiles for the TBI severity groups and the two effort test status groups. The validity scales were entered into a discriminant function analysis to determine the accuracy of the validity scales profile in classifying TBI severity. The resulting function ($\Lambda = .68$), $\chi^2(12) = 29.30$, $p = .004$, accurately classified 72% of participants. The validity scales were also entered into a discriminant function analysis to determine the accuracy of the validity scales profile in classifying effort test status. The resulting function ($\Lambda = .80$), $\chi^2(6) = 16.78$, $p = .01$, accurately classified 64.6% of participants.

Table 2 presents the MMPI-2-RF somatic/cognitive scales mean T-scores and variance accounted for by TBI severity and effort test status. A two-way MANOVA comparing the somatic/cognitive scales profiles of the TBI severity groups indicated non-significant group differences; $F(10, 144) = 1.17$, $p = .32$, $\eta_p^2 = .08$. The somatic/cognitive scales profiles for the effort test status groups were significantly different; $F(5, 72) = 3.66$, $p = .005$, $\eta_p^2 = .20$. The interaction of the TBI severity and effort test status was non-significant; $F(10, 144) = 0.89$, $p = .55$, $\eta_p^2 = .06$.

Figure 2 presents the somatic/cognitive scales profiles for the TBI severity groups and the two effort test status groups. The somatic/cognitive scales were entered into a discriminant function analysis to determine the accuracy of the

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Table 1. MMPI-2RF validity scales' mean T scores and variance accounted for by traumatic injury severity and symptom validity test status

	Traumatic brain injury severity				Symptom validity test status		
MMPI-2 Scale	Mild ($n=55$)	Comp ($n=13$)	Mod/Sev ($n=14$)	η_p^2	Fail ($n=34$)	Pass ($n=48$)	η_p^2
F-r							
M	76.58	74.62	71.00	.01	84.09	69.10	.03
SD	23.67	20.48	23.63		23.68	20.59	
Fp-r							
M	55.42	54.00	63.64	.04	60.59	53.77	.02
SD	15.02	10.27	20.59		16.71	14.35	
Fs							
M	69.31	66.15	75.00	.02	78.71	63.46	.04
SD	24.36	16.25	21.56		24.49	19.25	
FBS-r							
M	72.95	69.38	63.21	.02	77.88	65.65	.10*
SD	15.40	9.46	17.63		14.33	14.03	
L-r							
M	62.33	66.08	66.36	.02	65.15	62.52	0
SD	13.09	12.98	12.16		13.69	12.34	
K-r							
M	49.20	47.08	51.64	.01	48.09	50.13	0
SD	10.31	11.45	8.45		9.93	10.35	

Comp = complicated mild; Mod/Sev = moderate/severe; η_p^2 = partial eta squared; F-r = Infrequent Scale; Fp-r = Infrequent–Psychopathology Scale; Fs = Infrequent Somatic Scale FBS-r = Fake Bad Scale; L-r = Lie Scale; K-r = Correction Scale.

*$p < .05$.

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validity scales profile in classifying TBI severity. The resulting function ($\Lambda = .78$), $\chi^2(10) = 20.07$, $p = .03$, accurately classified 70.7% of participants. The somatic/cognitive scales were also entered into a discriminant function analysis to determine the accuracy of the somatic/cognitive scales profile in classifying effort test status. The resulting function ($\Lambda = .73$), $\chi^2(5) = 24.80$, $p < .001$, accurately classified 73.2% of participants.

Unexpectedly, MLS had the largest effect size of any Validity or Somatic/Cognitive scale in predicting pass/fail status on effort tests (see Table 2). MLS elevations appear to be more closely associated with failure on effort tests than the MMPI-2-RF Validity scales, which were anticipated to be the most effective predictors of effort test failure, i.e., FBS-r and Fs.

Given these unanticipated results, we conducted a post hoc item overlap analysis of the Somatic/Cognitive scales (see Table 3). Interestingly, none of the eight MLS items is included on either FBS-r or Fs. Only one MLS item is present on RC1. No MLS items are present on RC3. However, all eight MLS items are included on the original MMPI-2 Hy scale. This makes MLS, in effect, a virtual subscale of Hy.

With the exception of the Cog scale, which has only 1 of 10 items on FBS-r and Fs respectively, and no item overlap with RC1 or Hy, the rest of the Somatic/

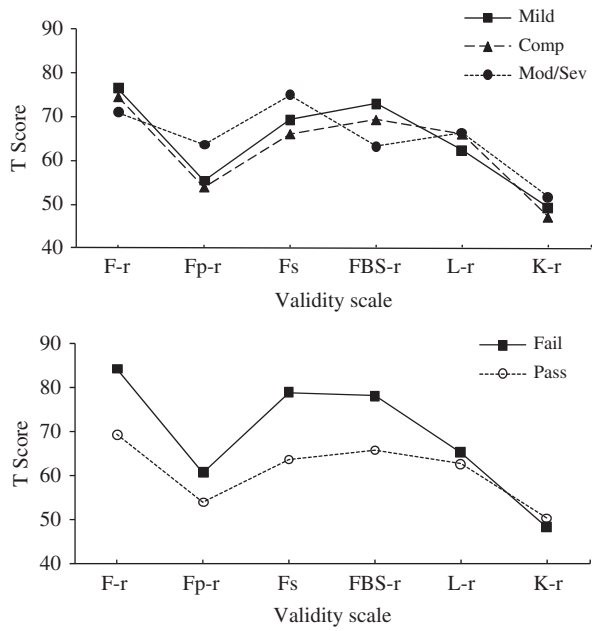

Figure 1 Graphs of MMPI2-RF Validity T-scores by TBI severity and by effort test pass/fail status.

Table 2. MMPI-2RF somatic/cognitive scales' mean T scores and variance accounted for by traumatic injury severity and symptom validity test status

	Traumatic brain injury severity				Symptom validity test status		
MMPI-2 Scale	Mild ($n = 55$)	Comp ($n = 13$)	Mod/Sev ($n = 14$)	η_p^2	Fail ($n = 34$)	Pass ($n = 48$)	η_p^2
MLS							
M	71.87	73.62	63.36	.02	77.12	66.15	.18***
SD	10.04	10.15	14.98		7.80	11.42	
GIC							
M	60.44	57.23	53.86	.01	66.41	53.42	.10**
SD	15.65	15.70	16.92		17.15	12.52	
HPC							
M	70.35	72.31	57.29	.09*	74.91	63.83	.07*
SD	11.95	9.30	17.18		9.31	14.15	
NUC							
M	73.65	76.46	72.07	0	79.97	69.48	.05*
SD	15.29	10.25	10.94		11.09	14.09	
COG							
M	72.75	72.46	69.29	.01	76.97	68.67	.02
SD	13.76	13.80	15.61		11.92	14.40	

Comp = complicated mild; Mod/Sev = moderate/severe; η_p^2 = partial eta squared; MLS = Malaise; GIC = Gastrointestinal Complaints; HPC = Head Pain Complaints; NUC = Neurological Complaints; COG = Cognitive Complaints.

*$p < .05$. **$p < .01$. ***$p < .001$.

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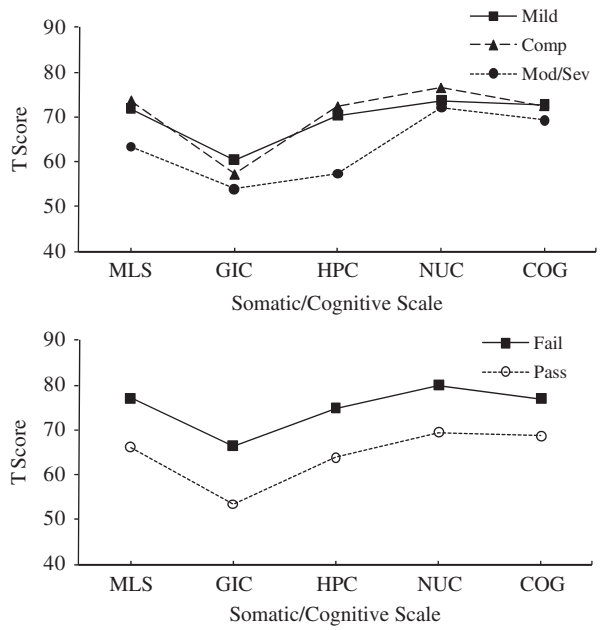

Figure 2 Graphs of MMPI2-RF Somatic/Cognitive T-scores by TBI severity and by effort test pass/fail status.

Table 3. Somatic/Cognitive scale item overlap with selected MMPI-2 and MMPI-2-RF scales

Item Overlap	MLS 8 Items	GIC 5 Items	HPC 6 Items	NUC 10 Items	COG 10 Items
Hy	8	2	4	4	0
RC1	1	4	6	8	0
FBS-r	0	4	4	1	1
Fs	0	2	0	2	1

Cognitive scale items are fairly heavily represented on FBS-r, RC1, and Hy, but not Fs. Four of five GIC items are on FBS-r and RC1 respectively, and two of five GIC items are on Hy and Fs. Four of six HPC items are on FBS-r and Hy respectively, with all six HPC items being present on RC1. No HPC items overlap with FS. Only 1 of 10 NUC items is present on FBS-r and 2 of 10 are on Fs, but 8 of 10 NUC items are on RC1 and 4 of 10 NUC items are on Hy. None of the Somatic/Cognitive scales had any item overlap with RC3.

DISCUSSION

This study examined MMPI-2-RF Validity and Somatic/Cognitive scales in a sample of litigants with claimed traumatic brain injury who were tested for effort. It follows up Thomas and Youngjohn's (2009) investigation of the original MMPI-2

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validity, clinical, and the newly restructured clinical (RC) scales in the same sample. Although the original MMPI-2 validity scales, particularly FBS, have been extensively evaluated in this population, including our current sample (see meta-analysis by Nelson et al., 2010), there are relatively few studies examining the effectiveness of the MMPI-2-RF validity scales, including the newly created Fs and the extensively revised F-r. There are even fewer investigations of the newly created MMPI-2-RF Somatic/Cognitive scales.

Our results suggested non-significant trends for Fs, and F-r in discriminating between TBI litigants who pass and fail formal effort tests. Only FBS-r accounted for a significant portion of the variance. FBS-r, a truncated version of the highly validated original FBS, appears to have retained a substantial portion of FBS's proven effectiveness at discriminating persons with poor effort during cognitive testing. However, unlike the original FBS in this sample (see Thomas & Youngjohn, 2009), FBS-r was not significantly paradoxically inversely related to severity of TBI. Our study revealed modest, non-significant association with poor effort for the new Fs scale, which was specifically designed to detect over-reporting of somatic complaints.

This study provides one of the first independent validations of the newly created Somatic/Cognitive scales. Surprisingly, the Somatic/Cognitive scales as a group are better predictors of effort test failure in our head-injured litigators than the MMPI-2-RF validity scales. Although among the MMI-2 RF validity scales only FBS-r accounted for a significant portion of the variance in effort, four of five Somatic/Cognitive scales accounted for significant portions of the variance of effort test performance, and one of the Somatic/Cognitive scales, Head Pain Complaints (HPC), revealed a paradoxical inverse relationship with head injury severity, i.e., less-severely head-injured participants had greater head pain complaints (HPC). These results suggest that the MMPI-2-RF's Somatic/Cognitive scales, rather than an exclusive focus on the Validity scales, may be useful in determining the likelihood of symptom over-reporting in litigating patients.

The classical "conversion V" profile of elevated Hs and Hy on the original MMPI and MMPI-2 has long been known to be closely associated with over-reporting and exaggeration of somatic complaints. Indeed, McKinley and Hathaway (1944) first created Hs and Hy to assist in the identification of hypochondriacal and hysterical disorders, now called somatoform disorders. The conversion V is one of the most extensively validated clinical scale profile configurations. It has also been shown to be closely associated with effort test failure (Boone & Lu, 1999; Larrabee, 1998; Smart et al., 2008; Thomas & Youngjohn, 2009; Youngjohn et al., 1995).

The RC scales of the MMPI-2-RF were created to provide more homogeneous, discrete measures of psychopathology, and to maximize internal consistency. All Hy items associated with somatic complaints were removed when RC3 was restructured. Twenty of these items were included on RC1. Consequently, RC3 has been altered to the extent that it no longer measures a predisposition for somatization, but rather the construct of "cynicism." Thomas and Youngjohn (2009) showed that while Hs, Hy, and RC1 elevations were closely associated with effort test failure in this sample, RC3 had no such relationship. Furthermore, there was no suggestion of the paradoxical inverse relationship between Hs and Hy

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elevations with TBI severity described by prior investigators (Miller & Donders, 2001; Youngjohn et al., 1997).

It is interesting to note that in the present study the MLS scale arose as accounting for the most variance in effort test performance among all of the restructured Validity and Somatic/Cognitive scales. MLS had no item overlap with FBS-r, Fs, RC3, and minimal overlap (one item) with RC1. By contrast, all eight items on the MLS scale overlap with Hy from the MMPI-2, making MLS a virtual subscale of Hy. MLS shows particular promise as an indicator of over-reported symptoms and disability in TBI litigants. To a lesser degree, the other somatic (but not cognitive) specific problem scales also overlap with Hy; GIC has two out of five items, HPC has four of six, and NUC has four of ten. GIC, HPC, and NUC are heavily represented on RC1, which is also predictive of symptom validity test failure in our sample (Thomas & Youngjohn, 2009).

Our experience suggests that the loss of Hy's sensitivity to somatization and symptom over-reporting might cause reluctance on the part of some clinicians to switch from the MMPI-2 to the RF. These results and those of Thomas and Youngjohn (2009) provide reassurance that the MMPI-2-RF scales FBS-r, RC1, and the newly created Somatic/Cognitive scales retain much of the sensitivity to somatization and over-reporting that might have been lost when the MMPI-2 was restructured.

Our sample was relatively small, and lack of power may explain the non-significant trends for Fs and F-r in predicting effort test failure. The large variances on Fs and F-r may have washed out the effects, even though Fs and F-r had large mean differences in the expected direction. The superiority at predicting effort test failure of the Somatic/Cognitive scales in general and MLS in particular, despite smaller mean differences than the validity scales, reflects smaller variance in the effort test fail group due to ceiling effects. Our results warrant cross-validation with a larger, more powerful sample.

CONCLUSIONS

Archival data presented in this and an earlier study from a forensic neuropsychology practice suggest that MMPI-2-RF scales FBS-r, RC1, and the Somatic/Cognitive scales (MLS, GIC, HPC, and NUC) can be useful tools in assessing symptoms, disability, and over-reporting in TBI litigants. Further investigations are encouraged as the MMPI-2-RF replaces the MMPI-2 as the preferred personality profile for practicing neuropsychologists.

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