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CE VICTORIA SYMPTOM VALIDITY TEST PERFORMANCE IN A HETEROGENOUS CLINICAL SAMPLE

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We retrospectively reviewed Victoria Symptom Validity Test (VSVT) in 374 patients who underwent neuropsychological assessment in an academic hospital-based practice. Patients were classified as either non-TBI clinically referred (generally patients referred from neurology, neurosurgery, or medicine), clinically referred TBI (no known external financial incentive), and non-clinical referrals (e.g., attorney-referred, Worker's Compensation). Three patients were not classified into any group and considered separately. Intentional response distortion, defined as statistically less than chance performance on hard VST items, was present in only 1/306 (0.3%) clinically referred non-TBI patients, and no clinically referred TBI patient obtained scores significantly less than chance on this measure. One additional clinically referred patient with a non-neurologic diagnosis who was subsequently found to be pursuing a disability claim also performed worse than chance. In contrast, 5/25 patients (20%) referred by attorneys or otherwise deemed a priori to be at-risk for deficit exaggeration performed less than chance. These data suggest that intentional response distortion in patients referred for non-forensic neuropsychological evaluation is rare. Performances by specific diagnosis using different classification criteria are also presented.

Keywords: Malingering; Symptom Validity Testing; Victoria Symptom Validity Test

INTRODUCTION

Neuropsychological testing requires appropriate patient cooperation and effort to insure that results are obtained that accurately characterize a patient's strengths and limitations and which can reasonably be attributed to a change in brain function. Historically, neuropsychological performance patterns were informally evaluated for deviations from known brain–behavior patterns and, much like the neurologic patient who "splits

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the midline" during sensory examination, patients with patterns disparate from established relationships were considered suspect and their validity cast in doubt.

More recent research has focused on two methodologies for detection of suspect performance: (1) detection of neurologically atypical patterns on standard neuropsychological tests (Larrabee, 2003; Meyers & Volbrecht, 2003) and (2) development of specialized procedures for specific evaluation of validity of test performance, referred to as symptom validity tests (SVTs; Larrabee, 2005; Sweet, 1999). SVTs are intended to identify subjects not performing at levels representing a genuine level of effort, and are designed so that patients with independently established neurological/neuropsychological deficits can perform the SVT without difficulty (e.g., Test of Memory Malingering or TOMM; Tombaugh, 1996).

The development of symptom validity testing is largely a byproduct of forensic neuropsychology in which external incentives for suboptimal patient performance are often present. When observed, poor SVT performance raises the possibility that the entire neuropsychological assessment may be invalid. Based on formal SVT measures, the base rate of malingering in forensic neuropsychological evaluation of patients where a clear financial incentive to perform poorly exists has been estimated to be in the range of 30–40% (Larrabee, 2003; Mittenberg, Patton, Canyock, & Condit, 2002).

The routine use of SVT in clinically based referrals—i.e., those from physicians with specific clinically based referral questions rather than referrals from attorneys, Independent Medical Examination (IMEs), or disability evaluations—is not universally endorsed (Lezak, Howieson, & Loring, 2004). Omitting formal SVT testing in general clinical assessments results from several factors. Routine clinical (i.e., non-forensic) evaluations do not involve the same financial incentives associated with specific neuropsychological findings, and patient motivation may higher given their clinical interest in obtaining valid scores for diagnostic and prognostic purposes. Performance by clinically referred patients is less likely to be distorted by outside influences such as coaching, and they are less likely to be given advice about types of questions to expect or how to "best" respond during assessment. Finally, administering SVTs may be an inefficient use of limited patient assessment time. Clinical patients often schedule multiple clinical examinations during the same day (e.g., MRI or EEG in addition to neuropsychological testing), for example, particularly if they live some distance from where their medical care is provided. Unlike attorney referrals, lodging and transportation needs are not provided, and practical considerations often impose limits on the amount of time during which neuropsychological evaluation can be conducted.

This report describes SVT performance using the Victoria Symptom Validity Test (VSVT) in a heterogenous patient sample. The majority of patients were physician referrals, although we also describe performance in a small group of non-clinical referrals. This type of investigation is important to establish that the frequency of invalid performance or false positive rate of tests such as the VSVT is low in non-litigating or non-compensation-seeking clinical populations.

METHOD

Subjects

Subjects were retrospectively identified from the Medical College of Georgia (MCG) neuropsychology database, which contains neuropsychological data for

patients evaluated by an academic hospital-based neuropsychology practice. Clinical referrals were from both MCG and community physicians in neurology, medicine, and neurosurgery specialties, and were classified as either non-TBI clinically referred ($n = 297$) or clinically referred TBI with no known external financial incentive ($n = 49$), resulting in 374 clinical referrals. The non-clinically referred group included 25 patients with an increased likelihood of deficit exaggeration because of their referral from attorneys, Worker's Compensation, or disability insurance carriers, and were broken down as follows: 20 of the non-clinical referrals were to evaluate possible TBI from either motor vehicle accidents or work-related injuries, 3 patients suffered electrical injuries, and 2 patients suffered a cerebral vascular event. Three additional patients were not classified into any group and are considered separately (two with mental retardation and FSIQs in the 50s, one with Sjorgren's syndrome).

Clinically referred non-TBI patients were further subdivided into five diagnostic categories based on a combination of their initial referral diagnoses and neuropsychological test results. The diagnoses included dementia ($n = 50$), cerebrovascular disease ($n = 38$), multiple sclerosis ($n = 19$), mixed neurologic ($n = 27$), and patients referred because of memory complaints and in whom no neurologic etiology was suggested either from neurologic evaluation or based on neuropsychological test findings ($n = 163$).

Specific dementia subtyping was not attempted, although dementia cases with clear evidence of a vascular etiology were included in the cerebrovascular disease category. The dementia group included patients with Huntington's disease, HIV dementia, probable Alzheimer's disease, and probable frontotemporal dementia. The cerebrovascular group included patients with stroke, transient ischemic attacks, arteriovenous malformations (AVMs), lupus, as well as vascular dementia. The mixed neurologic group included neurocysticercosis, hypothalamic tumor, B-12 deficiency, coronary artery bypass graft, astrocytoma, meningioma, meningitis, oligodendroglioma, colloid cyst, normal pressure hydrocephalus, Parkinson's disease, and Korsakoff syndrome.

All patients were administered the Victoria Symptom Validity Test (VSVT) (Slick, Hopp, & Strauss, 1997). The VSVT is a forced-choice SVT consisting of 48 five-digit stimuli presented in series of 16 stimuli with recognition delays of 5, 10, or 15 seconds. Each stimulus is presented for 5 seconds on a computer screen. After the brief delay, the target stimulus is presented with a foil and the subject indicates which of the two stimuli is the target. Half of the stimuli are easy targets in which foils sharing no common digits with the target are used; hard targets are contrasted with foils in which two of the digits have been transposed.

Neuropsychological testing began in the morning and, with the exception of personality or depression assessment, was generally completed prior to lunch. The VSVT was the final test in the cognitive assessment protocol and was administered prior to personality or depression testing.

RESULTS

Demographic characteristics of each group, as well as WRAT-3 Reading, WAIS-III FSIQ, VIQ, and PIQ Index are presented in Table 1. The majority of cases ($n = 347$) were also administered the WMS-III, and General Memory Index scores

Table 1 Demographic information and basic neuropsychological test performances for all patient groups

Diagnosis	Sex	Age	Education	WRAT-3 Reading	FSIQ	VIQ	PIQ	WMS-III General
Dementia	22 M, 28 F	59.9	12.9	95.2	82.2	87.9	77.8	72.4
		(11.8)	(3.2)	(14.6)	(11.3)	(11.8)	(11.4)	(10.6)
Cerebro vascular	21 M, 17 F	51.6	13.3	90.7	87.9	91.2	85.8	88.7
		(11.4)	(2.7)	(17.4)	(15.0)	(14.0)	(15.8)	(18.9)
Multiple sclerosis	2 M, 17 F	39.7	13.7	90.5	86.7	89.5	85.2	88.5
		(10.0)	(2.3)	(13.7)	(7.5)	(15.1)	(19.0)	(22.7)
Mixed neurologic	14 M, 13 F	47.4	13.9	98.8	90.8	95.7	86.3	86.6
		(13.2)	(2.4)	(10.9)	(16.8)	(16.6)	(16.7)	(17.6)
Memory complaints	56 M, 107 F	51.8	13.8	97.8	97.1	98.8	95.4	100.4
		(13.0)	(2.6)	(13.7)	(15.7)	(14.3)	(14.6)	(17.1)
Clinically referred TBI	28 M, 21 F	36.7	12.7	89.4	87.6	88.7	88.2	82.5
		(10.8)	(1.9)	(16.8)	(14.7)	(14.2)	(14.6)	(24.3)
Attorney, IME, WC	19 M, 6 F	41.3	12.4	84.6	81.8	84.3	81.9	70.4
		(13.3)	(3.6)	(22.1)	(20.5)	(19.6)	(18.7)	(38.4)

The three atypical clinical referrals are not included. Note that the sample sizes for WMS-III are smaller than other cells (see text for details). TBI = Traumatic Brain Injury; IME = Independent Medical Examination; WC = Worker's Compensation.

for these patients are also presented. The lowest average FSIQ for clinical referrals was seen in the dementia group (FSIQ = 82.2) and the highest mean FSIQ for this group was present in the memory complaints group (FSIQ = 97.1). The lowest FSIQ was present in the non-clinically referred patients (FSIQ = 81.8).

Across all clinically referred subjects, patients averaged 23.4 ($SD = 1.6$) on the easy VSVT items. Mean easy VSVT performance for clinically referred TBI patients was 23.5 ($SD = 1.0$) and for non-clinical referrals was 22.1 ($SD = 4.9$)

VSVT results for the hard stimuli are displayed in Table 2. Mean performance for the clinically referred patients ranged from 20.3 in dementia patients to 21.4 in the memory complaints group. Average performance for the non-clinically referred group was the lowest group performance observed (16.5). Cumulative percentile distributions for both clinically referred patient groups and the non-clinically referred patients are presented in Table 3.

Table 2 Hard Victoria Symptom Validity Test performance and classification rates

Dx	Mean (*SD*)	≤ 7/24	8/24–15/24	16/24–24/24	≤ 17	≤ 20
Dementia ($N = 50$)	20.3 (4.0)	0 (0%)	6 (12%)	44 (88%)	11 (22%)	19 (38%)
Cerebrovascular ($N = 38$)	20.7 (3.9)	0 (0%)	5 (13%)	33 (87%)	6 (16%)	11 (29%)
MS ($N = 19$)	21.2 (3.7)	0 (0%)	2 (11%)	17 (89%)	2 (11%)	5 (26%)
Mixed ($N = 27$)	21.2 (3.9)	0 (0%)	2 (7%)	25 (93%)	3 (11%)	7 (26%)
Memory complaints ($N = 163$)	21.4 (3.8)	1 (1%)	16 (10%)	146 (90%)	24 (15%)	36 (22%)
Clinical TBI ($N = 49$)	20.7 (4.1)	0 (0%)	6 (12%)	43 (88%)	9 (18%)	14 (29%)
Attorney, IME, WC ($N = 25$)	16.5 (7.1)	5 (20%)	5 (20%)	15 (60%)	11 (44%)	15 (60%)

MS = Multiple Sclerosis; TBI = Traumatic Brain Injury; IME = Independent Medical Examination; WC = Worker's Compensation.

Table 3 Cumulative percentiles for all referral groups

VSVT Hard	Dementia (N = 50)	Cerebrovascular (N = 38)	MS (N = 19)	Mixed (N = 27)	Memory complaints (N = 163)	Clinical TBI (N = 49)	Non-clinically referred
4	0	0	0	0	0	0	8
5	0	0	0	0	0	0	16
6	0	0	0	0	0	0	16
7	0	0	0	0	1	0	20
8	0	0	0	4	1	2	20
9	2	3	0	4	2	4	20
10	4	3	5	4	4	4	20
11	8	5	5	4	4	4	20
12	8	5	5	4	6	6	32
13	10	5	5	4	7	10	36
14	10	13	5	7	9	10	40
15	12	13	11	7	10	12	40
16	20	16	11	11	11	14	44
17	22	16	11	11	15	18	44
18	24	21	21	15	17	22	44
19	30	24	21	22	18	24	52
20	38	29	26	26	22	29	60
21	44	42	37	37	29	43	68
22	58	58	53	41	39	57	72
23	74	71	68	67	67	73	80
24	100	100	100	100	100	100	100

The three atypical clinical referrals are not included. VSVT = Victoria Symptom Validity Test; MS = Multiple Sclerosis; TBI = Traumatic Brain Injury.

We first examined hard VSVT performance using classification criteria recommended by the test authors. In this approach, scores that are statistically poorer than chance are considered invalid, and valid performance is inferred for scores that are significantly above chance. Chance responding is classified as questionable.

Only a single patient obtained less than chance performance on the easy VSVT series, and this was a non-clinical referral. Of the patients summarized in Table 2, there were six patients with less than chance performance on the hard VSVT items, and five of these were in the non-clinically referred group. One patient with memory complaints had less than chance performance on the hard VSVT items, and this patient had a life-long diagnosis of major depression. None of the clinically referred TBI patients had less than chance hard VSVT performances. There were significantly more invalid test performances ($\leq 7/24$) in the non-clinically referred group ($p < .0001$, Fisher's Exact Test) compared to clinical referrals.

One of the three non-classified patients also had significantly less than chance performance on the hard VSVT items (2/24). This patient was not included in the overall group classification because, although he was clinically referred, he did not have a neurological diagnosis and, after his assessment, it was established that he was seeking disability insurance. The other two patients not included in the overall group classification had referral diagnoses that included mental retardation and FSIQs in the 50s. These patients obtained scores of 9/24 and 13/24 on the hard VSVT stimuli.

Chance hard VSVT responding ranged from a low of 7% in patients with mixed neurologic etiologies to a high of 13% in patients with cerebrovascular disease. Chance responding in the non-clinical group was 20%, but was not significantly more frequent than that of clinically referred patients.

Hard VSVT scores that were significantly better than chance varied from a low of 87% (cerebrovascular disease) to a high of 93% (mixed neurologic patients) in clinical referral, although non-clinically referred patients performed in this range less frequently (60%) ($p < .0004$, Fisher's Exact Test).

We also used classification approaches based on empirically derived cutpoints (Grote, Kooker, Garron, Nyenhuis, Smith, & Mattingly, 2000; Loring, Lee, & Meador, 2005). In a sample of 30 epilepsy surgery candidates who were screened to exclude subjects with potential compensation issues, no patients scored outside the valid range on the hard VSVT stimuli (i.e., less than 16/24), and all patients scored at least 18/24 correct (Grote et al., 2000). In addition, 28/30 epilepsy surgery candidates obtained hard VSVT scores of at least 21/24, leading Grote et al. (2000) to suggest that these two additional cutpoints (i.e., 18/24, 21/24) should be considered when evaluating neuropsychological performance validity.

Using the $\leq$17/24 criterion, the rate of failures in the clinical groups ranged from 11% (MS and mixed neurologic groups) to 22% (dementia). Although the failure rate for non-clinical referrals was double that of the highest clinical group (i.e., 44%), this difference was not statistically significant owing to the small sample size of the non-clinical referral group. The percentage of patients failing to exceed the $\leq$20/24 criterion varied from a low of 22% in the memory complaints group to 38% in the dementia group. Comparing dementia patients to other clinical referrals revealed a trend toward statistical significance ($p = .06$, Fisher's Exact Test), indicating that dementia patients were less likely to achieve scores of at least 21/24 correct on the hard VSVT than other clinical groups. Comparing non-clinical referrals to the entire clinical group, including dementia patients, yielded a statistically significant difference in classification rate ($p < .05$, Fisher's Exact). This indicates that non-clinical referrals obtained invalid VSVT scores ($<$21) on hard stimuli more frequently than the clinically referred sample.

We also classified clinically referred patients according to their scores on the WMS-III General Memory Index, and these data are presented in Table 4. The ANOVA examining hard VSVT across memory performance was statistically significant, $F(3, 316) = 8.3$, $p < .0001$. However, this group difference was associated with an extremely modest effect size ($\eta^2 = .073$). No difference was observed across the three groups with General Memory Indices that were less than 90.

Table 4 Hard VSVT classification rates by WMS-III General Memory Performance in clinically referred patients

WMS-III	Mean (*SD*)	$\leq$7/24	8/24–15/24	16/24–24/24	$\leq$17	$\leq$20
$<$70 ($N = 44$)	19.9 (4.6)	0 (0%)	7 (16%)	37 (84%)	9 (20%)	15 (34%)
70–79 ($N = 52$)	20.0 (4.3)	0 (0%)	10 (19%)	42 (81%)	12 (23%)	16 (31%)
80–89 ($N = 48$)	19.9 (4.8)	1 (2%)	7 (15%)	40 (83%)	14 (29%)	18 (38%)
90+ ($N = 176$)	22.1 (3.0)	0 (0%)	10 (6%)	166 (94%)	14 (18%)	27 (21%)

Because of the relationship between age and VSVT performance in a previous report (Loring et al., 2005), we analyzed whether subjects aged 40 and older had non-valid performances (i.e., $< 21/24$) at a higher frequency than younger subjects, and no significant difference was observed. We then formed three age groups (< 40 years, 41–60 years, $60+$ years), and again found no significant relationship between grouping and frequency of hard VSVT failure.

DISCUSSION

These data suggest that clinically referred patients with no known external incentive to perform poorly have extremely low rates of intentional response distortion as reflected by significantly less than chance performance on the hard items from the VSVT. Of the 346 clinical referrals, including 49 patients with TBI, only a single patient performed significantly less than chance on the hard VSVT items. This patient was referred for evaluation of memory complaints, and had a longstanding history of depression, with normal neurological and laboratory findings. One additional clinically referred patient had less than chance performance, although this patient was not included the group classification because of unique referral circumstances. Of 25 patients, 5 (20%) with non-clinical referrals, and considered a priori to have increased incentive to obtain poor neuropsychological results, obtained hard VSVT scores that were below chance; this failure rate is significantly higher than clinically referred patients. This discrepancy between clinically referred and non-clinically referred patients is consistent with expectations, and supports the utility of the VSVT for the detection of intentional response distortion in patients with an a priori increased risk of deficit exaggeration. Neither of the two patients referred with mental retardation and with FSIQs in the 50s performed at less than chance levels.

Chance responding on the hard VSVT items (8/24–15/24) was slightly greater than 10% (37/346) in the clinically referred group and did appear to differ as a function of diagnosis. As with less than chance performance, chance responding was more frequent in non-clinical referrals (20%), although this difference was not statistically significant. Both patients diagnosed with mental retardation scored in the chance range.

We examined hard VSVT performances as a function of WMS-III General Memory scores to explore the relationship between memory and VSVT, and found a significant group effect. Although statistically significant due to our relatively large sample size, the effect size was extremely modest ($\eta^2 = .07$). Further, there was no significant group effect across the three patient groups with General Memory Indices equal to 90 or below. These both suggest that memory functioning is only minimally contributing to hard VSVT scores, and that the overall statistically significant effect is derived for individuals with average or better memory rather than being related to degrees of less than average memory function.

The results of the present study using classification criteria suggested by the test authors is generally consistent with our previous VSVT report with epilepsy surgery candidates (Loring et al., 2005). In that study of 120 patients, no patient scored below chance on hard VSVT stimuli and 10 patients (8.3%) had chance responding levels (8/24–15/24). Although not statistically different, a higher percentage of the present group of clinically referred patients failed to obtain performance levels at the two empirically derived criteria from Grote et al. (2000). Approximately 16% of the

present sample of clinical referrals failed to achieve a score of at least 18/24 compared to 12% in our epilepsy surgery sample. A greater disparity between samples was seen with the higher criterion of 21/24, with 27% of the present clinical sample failing to score at this level compared with 20% of the epilepsy surgery patients.

CNS involvement secondary to Sjorgren's is exceedingly rare. This patient, however, obtained the lowest scores on the hard VSVT items for all patients in this series (2/24). During further background confirmation about this patient's history, we found an ongoing investigation by a state regulatory board, and this person was in danger of losing a professional practice license. Although not part of the formal neuropsychological consultation question, this patient should be considered to be at increased risk for deficit exaggeration by traditional classification standards.

This report only indirectly addresses whether patients with no a priori concern for neuropsychological deficit exaggeration should be routinely administered formal SVT measures. Our data suggest an increased likelihood of poor SVT performance in dementia patients compared to other clinical diagnoses ($p = .06$) using either chance responding or empirically derived cut-offs for classification. We believe that this reflects disease characteristics, and consequently should be considered false positive errors. Patients with severe dementia requiring constant supervision have previously been reported to have an increased incidence of false positive SVT (Meyers & Volbrecht, 2003). As we have shown, even patients with cerebrovascular disease or dementia do not obtain scores that are significantly worse than chance. Therefore, if used, SVT approaches in these populations should always be interpreted with great caution.

From a strictly clinical perspective, elderly patients with probable dementia are much more fragile than other categories of patient referral, and given the present evidence that dementia itself may affect VSVT performance we think that it is unnecessary to include SVTs as part of their routine clinical assessment. Although exceptions exist to all rules of thumb, many elderly patients are reluctant to undergo detailed neurocognitive evaluation, and we consider it largely unnecessary to perform testing that may take up to 30 additional minutes without providing specific additional clinical information. We believe that in most cases, embedded performance measures derived from neuropsychological measures comprising the assessment protocol (e.g., Reliable Digit Span; Greiffenstein, Baker, & Gola, 1994) or specified test relationship patterns (Meyers & Volbrecht, 2003) will provide sufficient sensitivity for determining performance validity for routine clinical referrals. In situations in which performance validity remains unclear, the assessment may then be supplemented with formal SVT assessment.

We recognize that there are those who will differ from our recommendations. However, the choice of SVT use ultimately reflects a cost/benefit comparison in order to balance Type I vs Type II errors. The rate of poor VSVT performance by any of the criteria examined is lower in each clinical group compared to non-clinical referrals from attorneys or Workman's Compensation boards. In medicine, tests are generally not ordered unless they have the potential to alter treatment strategies. Thus, the utility of SVT testing in general clinical practice given the extremely low rate of intentional response distortion will depend on how a neuropsychologist alters his or her interpretation of neuropsychological findings when chance SVT responding is seen.

A limitation of this report is its retrospective design. However, we believe that the sample size is sufficiently large such to demonstrate convincingly that overt distortion of neuropsychological test results in a strictly clinical context is rare (Mittenberg et al., 2002). The study's retrospective nature and its reliance on a general-purpose database preclude us from characterizing specific clinical characteristics with greater precision. For example, length of coma and loss of consciousness were not data fields, since TBI referrals were a very small percentage of this neuropsychology practice. Nevertheless, because less than chance responding was not present in any of the clinical TBI referrals, as well as comparable chance responding rates in these patients compared to other clinical referrals, the incentives associated with litigation or disability determination negatively contribute to poor neuropsychological test performance in some non-clinically referred patients. Of course, there are also non-economic incentives to reward poor performances in certain family, work, or other social contexts.

We also employed a post-hoc classification of clinical diagnoses that included information based on neuropsychological test results. In addition, the decision to categorize vascular dementia into the cerebrovascular disease category rather than a subtype of the dementia category can be debated, with similar arguments advanced for Parkinson's disease, TIA with no residual deficits, etc. However, the main group comparison was across all clinical referrals as distinct from non-clinical referrals, and consequently specific group assignment will not affect these main findings. A final limitation of the present study is the placement of VSVT as the final test in the assessment protocol. At this time, it is possible that many patients simply want to finish the assessment and, if tired from hours of assessment, may be more inclined to have their attention wander during computerized SVT.

In conclusion, these data indicate a very low rate of intentional response distortion in clinically referred patients undergoing neuropsychological evaluation. Future prospective studies will be valuable to determine the relative contribution of different SVT to general clinical assessment, as well as possible position effects of SVT within the context of an entire neuropsychological assessment protocol.

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