Validity Assessment in Traumatic Brain Injury Impairment and Disability Evaluations

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KEYWORDS

• Traumatic brain injury • Validity • Response bias • Malingering
• Physical examination • Cognition • Behavior • Forensic

KEY POINTS

- Differential diagnosis in cases of claimed post-traumatic brain injury (TBI) impairment requires an understanding of the principles of validity assessment and their application in the context of physical and cognitive-behavioral assessment.
- Clinicians must appreciate the nuances between effort and response bias assessment, and performance and symptom validity testing in the context of assessing anyone with a reported history of TBI, particularly when there are potential secondary gain incentives present that may impact examination validity.
- Practitioners must be aware that there are many reasons for symptom magnification and that the driving factors may not necessarily be consciously mediated or discoverable by the clinician/examiner.

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INTRODUCTION

In the context of impairment and disability evaluations following claimed or documented traumatic brain injury (TBI), it is crucial to understand the importance of validity assessment methodologies, and their impact on impairment assessment accuracy

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- Physiatrists must also appreciate the potential role of patient/examinee and personal biases in the context of forensic assessment.
- Any physiatrist providing expert testimony should be aware of their own potential liability in such cases and judicial trends as to what might be considered unacceptable areas of testing or testimony from the courts' perspective in brain injury cases; arguments contrary to these attempts at exclusion of scientifically formulated opinions must also be explored.

and differential diagnosis. Unfortunately, aside from neuropsychologists and psychologists, most health care professionals have not been trained adequately, if at all, in validity assessment and, consequently, are unfamiliar with methodologies to evaluate such issues as effort, response biases, symptom and/or sign validity, or performance validity. These issues are of paramount importance not just in forensic or medicolegal applications but also in the day-to-day clinical assessment of patients who present after purported or well-documented TBI. In that context, understanding the nuances of impairment assessment and the ramifications of said findings on function are critical for any clinician to understand. More specifically, clinicians need to be able to differentiate TBI-related impairments from impairments that may either be minimized or exaggerated and from alternative conditions including trauma and stress-related disorders, somatic symptom disorders including functional neurologic symptoms disorder (the Diagnostic and Statistical Manual of Mental Disorders [DSM]–5th Edition term for conversion disorder),[1] factitious disorder, and malingering, among other conditions.[2–5] It should also be noted that multiple conditions may coexist. It is therefore critical to consider the context of the evaluation and presentation, the preinjury history, the injury history, and the postinjury course and evolution of signs and symptoms over time, as reported by the person with the TBI and by others.

Opinions with an acceptable degree of medical probability must include consideration of all factors that may influence the clinical presentation. All relevant postinjury diagnostic testing should be reviewed and, as feasible, corroboratory sources sought out and interviewed. Increased awareness of specific testing methodologies to assess validity is crucial for all clinicians evaluating such patients for a multitude of reasons but at the same time the limitations of said testing also need to be appreciated.[6] Lastly, it is of paramount importance to understand that assessment of issues, such as effort, symptom and performance validity, and response biases does not exist in a vacuum. In and of themselves, the results of such testing are not clinical states or categorical values but rather a complex and potentially multifaceted spectrum of performance unique to that individual. Such variables, when properly assessed, are shown to be influenced by multiple factors including genetic loading variables, the injury itself, other medical factors, sociocultural influences, and litigation/secondary gain incentives. This article provides readers with increased insight into the assessment of persons with TBI, into caveats on differential diagnosis of claimed impairment and disability post-TBI, and into methodologies to establish same.

THE CONCEPT OF VALIDITY ASSESSMENT

Valid diagnostic conclusions require that the examinee's symptoms, signs, and test performances are themselves valid.[7] Valid examination findings that lead to appropriate differential diagnosis are best produced by

- Optimal patient effort and cooperation on testing
- Relative lack of response bias as related to inquiries regarding their condition whether verbally or on examination (no response is totally bias free)
- Physical examination findings that make sense relative to the injury history, imaging, time postinjury, and expected neuromusculoskeletal findings and correlations
- Acceptable/above cutoff performance on symptom validity testing (SVT) and performance validity testing (PVT)

The neurologic assessment of a person with TBI-related impairment is complex and fraught with diagnostic challenges regarding form and interpretation.[8,9] In clinical and forensic contexts, validity assessment can have many facets and clinicians must be aware of these when drawing conclusions about symptoms in a given individual following TBI or claimed TBI. Proper assessment, regardless of evaluation context, takes time and attention to detail, not just with regard to the physical examination but also as it pertains to eliciting an adequate history. Putting in the time to take a detailed history not only allows the clinician or examiner to garner details about the injury and its consequences but to also understand what issues that particular patient brings to their TBI relative to preexisting medical problems, prior injuries, genetic loading risk variables, learning disabilities, personality traits, and affective disorders, to name a few. It is also important to analyze patient/examinee reporting across time to see if problems get worse or the history deviates from the expected course given the nature of the injury and/or early patient/examinee reporting. Only with this information is the clinician adequately armed to analyze their findings and draw medically probable conclusions about sign and symptom validity relative to any claimed post-TBI impairments.[10] Clinicians must keep in mind that dualism as a conceptual framework for approaching impairment evaluation in this patient population does not work and that examination findings and performance on validity-related measures occur across a spectrum.

THE CONCEPT OF EFFORT ASSESSMENT IN FORENSIC EVALUATIONS

For many years, response distortion and invalidity were thought to be determinable by experienced practitioners with no need for objective data but it is now known that without objective data clinicians are notoriously bad at making such determinations. Now, in contrast, objective methods to assess effort are thought to be central to the assessment of validity. The move from subjective judgment to actuarial decision-making represents an important improvement.

Over time and despite cautions against drawing equivalences, effort tests have become more and more synonymous with malingering detection. As a cautionary note, tests of effort identify poor effort only, are unable to gauge degrees of good effort, and cannot identify the causes of poor effort. A “normal” score on an effort test does not necessarily indicate optimal effort and a low score does not imply a particular cause, such as feigning. Lastly, individual patients can perform well on some tests of effort and not others making it critical to administer several different types of measures to assess validity.

Performance Validity

Larrabee[11] is credited with suggesting that there is a difference between tests and methods that identify feigned cognitive deficits and those that detect feigned psychopathology, hence the term “performance validity testing” to denote tests of cognitive effort. Although stand-alone PVTs tend to be longer and more specific to poor effort,

and in the extremes (malingering), embedded PVTs tend to be less specific but more time-effective.

Research suggests that aggregating PVTs may improve classificatory accuracy. For example, Larrabee[12] found that posttest probabilities of malingering increased markedly when three PVTs were failed as compared with one PVT failure. More recently, Whiteside and colleagues[13] used a similar aggregation strategy and again found that greater than two effort tests failed is a reasonable cutoff for malingering. However, the precise number of PVTs that should be used (the denominator) and how many of those that should be failed (the numerator) to signal poor effort are still subject to debate.

Symptom Validity

SVT refers to the detection of feigned physical, cognitive, or behavioral symptoms with only indirect implications of performance on psychological tests. Noncognitive symptom exaggeration and poor cognitive effort do not always coexist.[14] Exaggeration of symptoms can occur for several reasons and should not be equated with malingering (a point made several times throughout this article). For example, patients may exaggerate their symptoms as part of a tendency to somaticize or because of feelings that their symptoms have not been taken seriously as a so-called "plea for help." In order for symptom exaggeration to be categorized as malingering, it must be motivated by external incentives or gain. **Table 1** provides a list of commonly administered PVTs and SVTs.

THE CONCEPT OF RESPONSE BIAS ASSESSMENT IN IMPAIRMENT EVALUATIONS

Examinee response bias occurs along a spectrum and can take several forms, ranging from symptoms that are denied or minimized to those that are exaggerated. The ideal patient or examinee is one who is neither stoic and prone to minimization nor one that exaggerates their symptoms, but rather one who reports their symptoms as they are with a balanced view of the positives and negatives of the situation. Response bias tendencies, when present, is either in the negative or positive direction. Although a positive response bias may be healthy in some ways and indicate adaptation and resilience, it can also indicate that a patient is repressing negative thoughts, preferring to ignore or minimize what might be perceived as impairments or other problems, whether or not injury related. Also, an overly positive response bias suggests poor psychological insight, which in turn is associated with a tendency to interpret stress symptoms as signs of a physical disease, complicating diagnosis and recovery. When secondary gain incentives are present (eg, in personal injury cases), the risk of response bias has been shown to be increased.[15] The authors believe it is important to "prime" the individual with TBI, as it is with any other patient, about the need to provide "down the middle" reporting regarding their problems since injury. In that context,

Table 1
Commonly administered PVTs and SVTs

Examples of Freestanding PVTs	Examples of Embedded PVTs	Examples of SVTs
TOMM	Reliable Digit Span	MMPI-2-RF SVT/FBS
Word Choice Test	CVLT-3 FCT	SIRS-2
Validity Indicator Profile	RBANS Effort Index	PAI NIM

it is also important to know the literature on the relative inaccuracy of patient reports after TBI, which may be colored by neurologic lack of awareness, denial, secondary gain, or other factors. Clinicians should request opportunities to interview corroboratory sources (the more independent said sources are, the better)[16]

Symptom exaggeration is often associated with psychological factors, such as catastrophizing, but probably not as often with malingering, and rarely in factitious disorder. Symptoms may be accurately or inaccurately attributed to different events. For instance, preexisting symptoms may be suddenly misattributed to an accident because of a heightened perception of symptoms, which itself can cause anxiety and attention deficits. Increased awareness of these symptoms or difficulties, which may be normal or common (eg, cognitive problems associated with stress and/or age), can be temporally related to an accident or injury and misattributed, typically unconsciously, to such an event. Social and external reinforcement, such as advocogenic attorneys who represent clients and the litigation process itself, clearly influence the patient's response to symptoms. Several injury context variables have been associated with poorer postinjury adaptation and recovery and increased likelihood of response bias that should be considered in the context of thorough case analysis (**Table 2**).

These variables represent vulnerability factors, which can reduce effective coping with postinjury impairments and increase the likelihood of maladaptive coping and response biases. They are not mutually exclusive and more than one can contribute to symptom report and presentation. A frequently overlooked form of bias is that created by worker's compensation physicians who are not necessarily qualified to assess and treat such patients, the frustrations regarding the restrictions of worker's compensation and commercial insurance coverage or delays in service provision and/or service approval, and the often adversarial worker's compensation and medicolegal systems. Clinicians, and in particular those serving in an expert witness role, need to understand that patients and examinees may amplify symptoms to ensure they are being "heard" and frequently present for initial contact with the clinician/

Table 2
Variables associated with poor postinjury adaptation and response bias

Delayed correct diagnosis or treatment	Fear of failure or rejection
Paranoid or overly guarded behavior caused by concerns of being watched	Greater reinforcement for illness behavior than wellness behavior
Anger, resentment, or perceived mistreatment	Discrepancies between personality/resilience/coping style and injury consequences
Loss of self-confidence and self-efficacy	Insufficient residual coping resources/skills
Loss of nidus of control	Prolonged inactivity (mental and/or physical) resulting in "disuse atrophy"
Irrational fears of injury extension, reinjury, or pain	Fear of losing benefits and associated safety net of same
Preinjury job dissatisfaction	Perceptions of high compensable ability for injuries incurred
Inadequate and inaccurate medical information	Payor delays in appropriate referrals and/or treatment

Modified from Martelli MF, Nicholson K, Zasler ND. Assessing and addressing response bias. In: Zasler N, Katz D, Zafonte R, eds. Brain Injury Medicine: Principles and Practice. 2nd ed. New York, NY: Demos Publishers; 2013:pg. 1416.

examiner anxious about the process and what they are going to be told or not told. These findings emphasize the importance of considering the motivational factors for negative response bias that operate on patients and examinees that present for impairment and disability evaluations. Martelli and coworkers[17] provide a comprehensive review on the topic of response bias assessment in persons with TBI that serves as a good resource to practitioners engaged in evaluating this group of patients.

Forensic Implications of Response Bias in the Examiner

Several biases that impact the validity of the examinee's responses must be considered in forensic examinations. But biases involving the examiner also exist and are equally detrimental to validity determinations. There is a broad and longstanding literature regarding these biases.[18,19] **Table 3** provides brief summaries of some common examiner biases.

Fink[19] recommends that examiners systematically use self-examination techniques in efforts to debias decision-making. For example, the examiner should reflect on the following introspective questions: "Do I receive referrals from [defense or plaintiff] attorneys only? Do I almost always reach conclusions that are favorable to the side that retained me? Do I routinely apply the same decision rules no matter which side retained me? Although debiasing via self-examination is beneficial, it is recommended that examiners also seek feedback from professional peers.

POSTCONCUSSIVE DISORDERS (SYNDROME) AND CONTROVERSY

Postconcussive syndrome (PCS) refers to the neurogenic cognitive, somatic, and emotional problems that some patients report following mild TBI (mTBI). However, it has since come to refer to the constellation of symptoms that persists beyond the expected time frame for recovery from concussion (ie, 1–3 months).[20] PCS is a controversial construct[20] and for many years, critics have underscored its conceptual limitations including that the disorder does not meet definitional criteria for a syndrome. Zakzanis and Yeung[21] replicated long-standing findings that symptoms of PCS are common in healthy people and additionally noted that certain symptoms were more prevalent than others, depending on culture. They cautioned that common symptoms unrelated to concussion may be misattributed to PCS. Similarly, months after the injury, PCS symptoms are reported about as often among individuals with

Table 3
Examiner biases

Confirmation bias	The tendency to search for or interpret information in a way that confirms a preconception or belief while also avoiding information that counters the belief. Many other biases stem from this fundamental bias.
Illusory correlation	The inaccurate belief that 2 co-occurring things are causally or conceptually related. Things that co-occur or occur in temporal sequence are not necessarily conceptually or causally related. For example, the fact that X predates Y does not mean X caused (or is otherwise associated with) Y.
Anchoring bias	The tendency to rely too heavily on a past reference or on one piece of information. For example, when informed by an attorney that the client is highly conscientious, the examiner may then ignore or explain away implausible symptoms.
Neglect of base rates	The tendency to fail to consider known probabilities of various test findings. For example, the examiner should know the probability of low test scores occurring by chance alone when considered within a large test battery.

orthopedic injuries (but no brain trauma) as they are among patients with mTBI (eg, 46.8% in mTBI vs 48.3% in trauma control subjects; Meares and colleagues).[22]

Moreover, Ponsford and colleagues[23] found that anxiety predicted persistence of PCS symptoms at 3 months postinjury, but presence of mTBI did not. Donnell and coworkers[24] found that just 32% of patients with mTBI met DSM-IV-TR criteria for PCS, whereas 91% of patients with somatization disorder met these same criteria. In fact, several disorders were more diagnostically similar to PCS than was mTBI. A rapidly growing body of research indicates that mTBI is not a particularly useful predictor of PCS.

Various forms of the previously mentioned cognitive biases can occur after mTBI and complicate the diagnosis of PCS. For example, some individuals systematically report few preinjury problems relative to postinjury problems. This tendency has been called the "good-old-days" bias.[25] Silverberg and colleagues[26] found that the good-old-days bias was more pronounced in patients with mTBI than in orthopedic trauma control subjects. It seems that patients with mTBI histories are prone to believing that all of their symptoms are caused by the mTBI, and as a result, do not often recall preinjury PCS-like symptoms.[27]

Another bias relevant to PCS occurs because of distorted perceptions of illness and anxiety sensitivity. Whittaker and coworkers[28] discovered that patients with mTBI who believed that their symptoms were serious and long-lasting tended to report more symptoms 3 months later than those who anticipated a less negative outcome. Importantly, injury severity, anxiety, depression, and post-traumatic stress disorder (PTSD) symptoms did not add to the predictive model. Hou and colleagues[29] found similar results; negative perceptions about mTBI, all-or-nothing appraisals, depression, and anxiety all predicted PCS 6 months postinjury.

Bias and misattribution of PCS symptoms to mTBI are not unique to patients only and are also found in health care professionals. When PCS symptoms are endorsed as permanent brain damage by a physician, for example, patients may then feel more despairing and helpless (the so-called nocebo effect), which can perpetuate or cause new symptoms. There often is no easy way for providers or patients to discern that these symptoms are not attributable to the mTBI, which opens the door for misattribution. Well-meaning health care providers may inadvertently perpetuate iatrogenic symptoms simply by making the PCS diagnosis. The use of PCS checklists and questionnaires exacerbates this problem by increasing number of symptoms reported without improving specificity.[30]

Another source of response bias arises from litigation and other adversarial situations. So-called "jurisogenic" (or "lexigenic") symptoms arise when the patient's symptoms are challenged or contested. For example, persistent questioning of the veracity of the injury and symptoms often occurs in litigated mTBI cases (in contrast to cases of stroke, for example), and may contribute to the jurisogenic process.[31,32]

In summary, the constellation of symptoms known as PCS still lacks clear diagnostic boundaries and PCS may become a pejorative. It contributes to the mislabeling of symptoms and may cause iatrogenic problems.[20,33] Nonetheless, it is important not to rule out the possibility of genuine suffering in PCS, whether or not it was caused by the mTBI itself.

MALINGERING: CAVEATS AND CONTROVERSIES

The DSM-5[1] defines malingering as the intentional fabrication or gross exaggeration of symptoms. The definition also states that the exaggeration or fabrication must be motivated by external incentives. Although the terms "intentional" and "external" are

important in differentiating malingering from other conditions, motivation is at the heart of the definition. Unfortunately, another person's motivations cannot be directly assessed. Although the existence of such unknowns is not unique to malingering detection, the consequence of being wrong with regard to the label of malingering may be uniquely harmful.[34,35] Clinicians should be aware, additionally, that expert witnesses have been sued for slander or libel for opining that the examinee was/is malingering.[36]

Avoiding work or military duty, obtaining financial compensation, evading criminal prosecution, or obtaining drugs are all examples of external incentives that may lead to malingering.[1] Malingering can also be adaptive in some situations (eg, feigning illness while held captive in a time of war). The DSM-5 cautions practitioners to suspect malingering if any combination of the following is present:

- Medicolegal context
- Marked discrepancy between the stress level being claimed and objective findings
- Lack of cooperation during the evaluation and/or treatment
- Antisocial personality disorder

At least some of these criteria from the DSM-5 "Index of Suspicion," whereas certainly present in some cases, do not actually seem to be closely associated with malingering. Antisocial personality disorder, for example, is not necessarily associated with an increased incidence of malingering.[37] This serves as a reminder that a potentially common characteristic is not necessarily a distinguishing characteristic. In the clinical context of TBI impairment assessment the actual incidence of malingering is likely low; although, in select scenarios the incidence of findings of exaggeration, suboptimal effort, and/or negative response biases are not that uncommon.[38] Nonetheless, it is important for practitioners to feel totally comfortable with the terminology they use when opining in these matters and understand the potential ramifications of same.[39] There are certainly numerous other options to the term malingering including but not limited to:

- The pattern of performance reflects a substantive mismatch with the injury as documented in the medical records that cannot be explained by organic factors.
- The pattern of the examinee's performance was not consistent with an underlying organic impairment consequential to their history of TBI.
- The pattern of performance raised substantive concerns regarding the ability of this or any other examiner to establish a probable causal link between their current complaints and/or examination findings and their history of purported TBI.
- Results from SVT raised significant concerns about the degree of symptoms exaggeration present in this case.

Finally, it is worth noting that malingering is not a diagnosis. Rather, it is a classification of behavior, and as such it is included in the DSM-5 as a V-code. Because malingering is not a disorder, it is not always subject to the same assumptions of neuropsychiatric assessment that most actual disorders are, and as a result, are challenging to detect reliably.

LEGAL TRENDS IN LIMITING VALIDITY TESTIMONY IN CASES INVOLVING TRAUMATIC BRAIN INJURY: OBSTRUCTIONISM DRIVEN BY IGNORANCE OR GREED?

Although trends are highly variable across jurisdictions, there has been an increased propensity by attorneys representing persons with TBI over the last two decades to

exclude testimony that deals with validity-related issues, such as symptom and performance validity, response bias, and effort testing. Although most of these efforts have been directed at defense-retained neuropsychologists,[40] it also has affected expert opinions provided by other health care practitioners including physicians. Prior rulings in the Commonwealth of Virginia have noted that experts "will not, in direct testimony, opine that the plaintiff is lying, faking, malingering or not credible."[41] Additionally, statements regarding or referencing secondary gain have been considered an invasion of the province of the jury. In another recent Virginia case, a neuropsychologist expert witness called by the defense was not permitted to testify regarding his opinion about SVT that was administered to the examinee or opine that the examinee was overreporting, amplifying or exaggerating symptoms, or for that matter that she suffered from a somatic symptom disorder; although, the court did allow him to testify to "other tests he administered to evaluate whether the patient suffered any cognitive deficits or impairment." Physicians are also not immune from these restrictions. Physician testimony has been limited by the court regarding the use of cognitive SVT, effort testing, and response bias testing. Even examinee complaints of high levels of job dissatisfaction have been disallowed in prior cases. Numerous cases have been reported where the court took the position that an expert may not testify as to a claimant's veracity because such testimony "improperly invades the purview of the jury to determine the credibility of the witness."

As recently reported to one of the authors (N.D.Z.) by a Richmond, Virginia based defense attorney: "Courts are excluding testimony about validity testing routinely in brain injury cases. I just tried one a couple of weeks ago and the Court excluded any reference from the defense experts about either symptom or performance validity. We were not even allowed to say the word 'validity.' We couldn't use the usual words like 'malingering,' 'exaggerating,' or even 'overreporting.' The only thing our expert was allowed to say is that the symptoms were 'not consistent' with traumatic brain injury."

As of the time this article is going to print there has of yet been no Virginia Supreme Court case on this issue. It will have to be seen where this goes but physicians should be aware of case law in their state/jurisdiction and any state Supreme Court opinions on these types of issues. Such rulings are based on unscientific principles and create a judicial bias by excluding relevant foundational data for expert opinions. Clinicians use validity checks in multiple ways in all aspects of clinical assessment and care, such as differentiating between pronator and nonpronator drift in claims of assessment of upper extremity weakness or when assessing specific gravity and temperature in urine toxicology screens to ensure that the specimen is valid and was not tampered with. A responsible clinician or expert witness in a TBI case is not attacking a patient's or claimant's credibility when reporting examination evidence of invalid performance or symptom reporting. Rather, they are letting the patient's or examinee's own performance serve as a basis for formulating a set of diagnostic formulations that thereby contribute to opinions made with a degree of medical probability. This is no different than reporting any other type of examination finding.

Validity assessment is an evaluative judgment of the degree to which empirical evidence and theoretic rationales support adequacy and appropriateness of interpretations and actions based on test scores or other modes of assessment.[42] How can expert witnesses be expected to testify with a degree of medical probability if they do not know that the data, whether based on physical, cognitive, or behavioral assessment, are valid? Would it make clinical or scientific sense to exclude certain findings because a court directed one to do so? No, of course not. Should standards for establishing diagnostic formulations be less scientific and evidence-based when providing

medicolegal testimony than those used in standard day-to-day clinical evaluations? We doubt that is the intent of these actions but it is certainly the product.

The importance of validity assessment is even more critical in contexts where there is potential for secondary gain behavior, such as worker's compensation, Social Security disability, and personal injury cases where the rate of symptom exaggeration is approximated to be about 30% and compensation has been shown to affect performance substantively.[3,43] We are obliged to address the validity of the data generated by the person being examined, otherwise it is the old "garbage in, garbage out." If we do not assess for the multiple faces of validity, we would be rightfully accused of being lackadaisical and unscientific by our peers, and would be practicing below the current standards of care as related to differential diagnosis in this patient population. A better answer is clearly needed to this problem.

WHAT PHYSIATRISTS SHOULD KNOW ABOUT FORENSIC NEUROPSYCHOLOGICAL ASSESSMENT AND TRAUMATIC BRAIN INJURY

It is of paramount importance for physiatrists to understand how to correctly interpret diagnostic tests that may be used to confirm the presence of brain injury and/or quantify the degree of specific impairment following brain injury (whether physical, sensory, neurocognitive, neuropsychiatric, linguistic, or psychological). In a parallel fashion, Physiatrists should be keenly aware of general issues as they relate to assessing the quality of neuropsychological tests and ultimately the validity of the opinions generated given the potential importance of such test findings on clinical decision making. When reviewing neuropsychological evaluations and assessing the overall quality of the work product relative to the ultimate diagnostic formulations and their robustness and validity, physiatrists should have a keen eye to the following issues:

- Is the source of the referral clearly stated?
- Are the sources of information that serve as the foundation for the report clearly stipulated relative to records reviewed, people spoken with, tests reviewed, surveillance videos watched, and so forth?
- Are all tests that were administered listed including effort, response bias, and symptom and performance validity assessments?
- Were the tests used validated, standardized, and normed?
- Was adequate effort, response bias testing, and SVT and PVT done as part and parcel of the comprehensive evaluation as recommended by the American Academy of Clinical Neuropsychology?[44]
- Were appropriate measures of psychoemotional status used, such as the Minnesota Multiphasic Personality Inventory-2 Restructured Form or Personality Assessment Inventory, as opposed to screens for anxiety or depression that do not assess validity, such as the Zung or Beck?
- Were all test results recorded in the report including those for effort and response bias testing with feedback regarding specific levels of impairment?
- Was the report written in a fair-handed, unbiased manner pointing out strengths and weaknesses of the individual's performance and fairly critiquing any areas of performance concern?
- Were appropriate comments made to address potential contributors to observed performance deficits including issues of post-traumatic neuromedical conditions, such as communicating hydrocephalus, epilepsy, or neuroendocrine deficiencies; pain disorders; dyssomnias; fatigue; poor concentration; learning disability; anxiety disorders including PTSD; depression and/or adverse effects caused by prescribed medications or illicit substance use/abuse?

- Was an adequate effort made to define the patient's or examinee's preinjury level of intellectual function including solicitation of standardized academic testing records from elementary and high school versus simply basing an opinion on patient and/or family report or alternatively on calculations that estimated preinjury intellectual capabilities (eg, Barona equation)?
- Was a set of diagnostic formulations provided toward the end of the report delineating all opinions/diagnoses?
- Were appropriate neuropsychological rehabilitation interventions including need for particular types of counseling, cognitive retraining programs, use of specific cognitive compensatory strategies, and/or need for further testing, among other possible recommendations, clearly delineated at the end of the report?
- Were all opinions provided with a degree of neuropsychological probability?

WHAT PHYSIATRISTS SHOULD KNOW ABOUT THE FORENSIC NEUROLOGIC EXAMINATION OF PERSONS WITH ACQUIRED BRAIN INJURY

Physicians who specialize in brain injury medicine should be familiar with musculoskeletal and neurologic disorders associated with TBI and polytrauma including the use of specialized bedside examination techniques for physical, behavioral, and cognitive assessments that are used to assess for functional or feigned impairment.[8,45,46] Examples include such strategies as Hoover test for evaluation of malingered lower extremity weakness, collapsing weakness suggesting a functional origin, sideways/backward walking for assessment of feigned gait disturbance, nonpronator drift in claimed TBI-related hemiparesis, and a positive Stenger test on audiologic assessment for nonorganic hearing loss.[8] Other tests that might be of value in the context of the physical examination of the person with TBI include Mankopf maneuver, strength reflex test, arm and/or wrist drop test, hip adductor test, axial loading test, Gordon-Welberry toe test, Bowlus and Currier test, Burns bench test, and Magnuson test.[5,9] Common hallmarks of functional gait disorders that tend to be "uneconomical" include walking on ice type of gait (small slow steps), swaying gait, dragging gait of functional leg weakness, hyperkinetic gait, sudden knee buckling, and crouching gait. Tremor is seen post-TBI but is also a common presentation for a functional neurologic problem and is differentiated from neurogenic tremor in several ways:

- If tremor disappears transiently or changes in rhythm when copying movements with the good arm or leg
- If the patient/examinee has difficulty making rhythmic movements with their good hand or leg
- If the tremor is a lot worse when someone attempts to stabilize the limb in question
- If the frequency is variable

Sensory examination findings that suggest a possible nonneurologic basis for the observed impairments include patchy sensory loss, pain in an improbable and nondermatomal distribution (eg, midline sensory demarcation, although thalamic lesions can result in same), and/or astasia-abasia.[8,47,48] Motor and other impairment inconsistencies that fluctuate or disappear under hypnosis, drug-assisted interviews, or "presumed" nonobservation may also suggest some psychophysiologic or functional substrate and cast doubt on an underlying TBI-related organic deficit.[47,49] Certainly, motor weakness in the absence of other upper motor neuron findings brings into question a claim that the weakness was related to a brain injury.[8] Importantly, recent literature indicates that functional neurologic presentations may

correlate with central psychophysiologic factors associated with actual changes in brain activity as measured by a variety of functional brain injury imaging techniques, which have revealed a fairly consistent pattern of hypoactivation in brain regions linked to the specific conversional symptom or sign in conjunction with ancillary activations in limbic, paralimbic, and basal ganglia structures.[50] Both feigned and conversional hemiparesis are typically more common on the left side, perhaps because most persons are right-hand dominant. Consistency regarding laterality of symptoms, particularly with neurologic impairment and/or referred pain, should also be evaluated. Readers are referred to other sources for more detailed information on neurologic physical examination caveats in general and specific to TBI assessment.[8,9]

When of central (vs peripheral) origin, pain complaints should be assessed, in part, by concurrently assessing temperature perception, given that the same neural pathways mediate these sensations. When temperature sensation is preserved in the presence of a loss of pain sensation after central nervous system injury, the deficit is not likely to reflect direct central nervous system impairment (the loss should occur contralateral to and below the level of the lesion).[8] This point also reinforces the need to understand the neuropathology of the lesion based on imaging or other neurodiagnostic studies and to appreciate the implications that these results have on the anticipated clinical examination findings. Alleged pain imperception can be evaluated, as can nearly any reported neurologic impairment, with appropriately designed forced choice testing. Additionally, examiners should realize that alleged pain imperception or loss of sensation is difficult to fake on repeated bilateral stimulation. This is because examinees who exaggerate rely on subjective strategies rather than truly responding to the strength of the stimuli. Therefore, assessments with such techniques as Von Frey hairs could be used to provide further objective evidence of the validity of reported symptoms.[8,47]

Diagnosing post-traumatic pain and disability and its possible deception is extremely challenging in general and probably even more so after TBI. Again, a primary reliance on a thorough history and physical is paramount to assessing post-traumatic pain generators.[51] Pain is usually described as an unpleasant sensory and emotional experience and associated with or described in terms of actual or potential tissue damage. When acute, there is identifiable tissue damage or noxious event and clearly defined assessment and treatment targets. When chronic, associated tissue damage or pathology is often obscure or absent versus increased expression of anxiety, maladaptive protective responses or pain behaviors, protracted medication use, minimally effective medical services, marked behavioral or emotional changes, and restrictions in daily activities. Hence, necessary differentiation between pain and suffering versus exaggeration in the context of impairment evaluation is complicated because these are inextricably intertwined with each other and with affective conditions, such as depression and anxiety and even perpetuation of PTSD. Several methodologies have been used to assess for pain amplification and pain malingering that are useful as adjutants to the aforementioned pointers.[52]

Clinical presentations typically are not “pure” and people with genuine neurologic problems associated with TBI can still have elements of functional overlay to their presentation, response biases (either negative or positive), symptom minimization or magnification, and other findings. One should not approach these patients and their evaluation with blinders on[5] or without a full understanding of the nuances of differential diagnosis and the influence of multiple variables on sign in symptom presentation.

CLINICAL CAVEATS

Clinical and forensic experience and the associated literature dictate that assessing validity in the context of impairment evaluation in cases involving claimed (or proven) TBI is a challenging task that requires time, an eye to detail, a depth of knowledge regarding the condition being evaluated, and specialized knowledge regarding validity assessment techniques as described previously. Primary clinical caveats in the aforementioned context are as follows:

- Review pertinent preinjury, peri-injury, and postinjury records with attention to symptom presence and evolution.
- Ensure review of pertinent neurodiagnostic testing to enable correlation with clinical examination findings.
- Always seek out corroboration, the more objective the better.
- Elicit as detailed a history from the person with TBI as possible, and compare and contrast with historical records and corroboratory reports.
- Understand the nature of the TBI incurred as far as severity, neuropathology, neuromedical complications, expected natural history, and the likely impairments to be found on assessment.
- Request and review comprehensive neuropsychological testing as available; if believed to be necessary to better understand the presentation, ensure referral to a neuropsychologist with good differential diagnostic skills who includes various measures of validity, embedded and stand alone.
- Learn specific examination techniques to assess for effort, response bias, and symptom and performance validity in the context of doing impairment evaluations of persons after TBI.
- Develop a sophisticated understanding of how to perform a neurologic examination (including neurophysical, cognitive, behavioral, and language functions), what techniques can be used in the context of validity assessment regarding same, and nuances of what types of impairments go hand in hand versus not.
- Be cognizant of your own cognitive biases, such as confirmation bias and anchoring.
- Provide clinical and medicolegal opinions with a degree of medical probability based at least in part on understanding the implications of the findings noted on validity testing with the patient/examinee in question.

SUMMARY

In the context of evaluating impairment following claimed or documented TBI, physiatrists must develop an appreciation and understanding of the various techniques used in validity assessment. These techniques, although commonly espoused in the neuropsychological and psychological literature, have not received adequate attention in the TBI rehabilitation or neurorehabilitation literature. Physiatrists, given their broad training background, are in a unique position to evaluate impairment after TBI. To ascertain whether the data that are being used to develop clinical and/or medicolegal opinions with a degree of medical probability are in fact reliable and representative of neurogenic impairment, it is paramount to include validity assessments as part of the global physiatric evaluation, whether in the context of history or physical examination. Additionally, it is particularly important for physiatrists to be able to differentiate neurogenic impairment secondary to TBI from consciously mediated efforts at exaggeration/fabrication of impairment and from functional disorders. Given the multidimensionality of TBI, practitioners need to be aware of

methodologies germane to validity assessment that span physical, cognitive, behavioral, and language functions where differential diagnosis is critical, whether in the clinical or medicolegal context.

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REFERENCES

1. American Psychiatric Association (APA). Diagnostic and statistical manual of mental disorders. 5th edition. Arlington (VA): American Psychiatric Publishing; 2013.
2. Aronoff GM, Mandel S, Genovese E, et al. Evaluating malingering in contested injury or illness. Pain Pract 2007;7(2):178–204.
3. Bass C, Halligan P. Factitious disorder and malingering: challenges for clinical assessment and management. Lancet 2014;383(9926):1422–32.
4. Lockhart J, Satya-Murti S. Symptom exaggeration and symptom validity testing in persons with medically unexplained neurologic presentations. Neurol Clin Pract 2015;5(1):17–24.
5. Zasler ND, Martelli MF. Appendix. Functional disorders. State of the art reviews physical medicine and rehabilitation. In: Zasler ND, Martelli MF, editors vol. 16. Philadelphia: Hanley & Belfus, Inc.; 2002. p. 167–74.
6. Bigler E. Effort, symptom validity testing, performance validity testing and traumatic brain injury. Brain Inj 2014;28(13–14):1623–38.
7. Zasler ND, Bigler E. Medicolegal issues in traumatic brain injury. Phys Med Rehabil Clin N Am 2017;28:379–91.
8. Zasler ND. Validity assessment and the neurological physical examination. NeuroRehabilitation 2015;36:401–13.
9. Hirsch AR, editor. Neurological malingering. Boca Raton (FL): CRC Press/Taylor & Francis Group; 2018.
10. Carone DA, Bush SS, editors. Mild traumatic brain injury: symptom validity assessment and malingering. New York: Springer Publishing Company; 2013.
11. Larrabee GJ. Forensic Neuropsychology: a scientific approach. 2nd edition. New York: Oxford University Press; 2012.
12. Larrabee GJ. Aggregation across multiple indicators improves the detection of malingering: relationship to likelihood ratios. Clin Neuropsychol 2008;22(4):666–79.
13. Whiteside DM, Gaasedelen OJ, Hahn-Ketter AE, et al. Derivation of a cross-domain embedded performance validity measure in traumatic brain injury. Clin Neuropsychol 2015;29(6):788–803.
14. Rogers R, Gillard ND, Berry DTR, et al. Effectiveness of the MMPI-2-RF validity scales for feigned mental disorders and cognitive impairment: a known-groups study. J Psychopathol Behav Assess 2011;33(3):355–67.
15. Lees-Haley PR, Williams CW, Zasler ND, et al. Response bias in plaintiff's histories. Brain Inj 1997;11:791–9.
16. Sbordone RJ, Seyranian GD, Ruff RM. The use of significant others to enhance the detection of malingering is from traumatically brain injured patients. Arch Clin Neuropsychol 2000;15(6):465–77.

17. Martelli MF, Nicholson K, Zasler ND. Assessing and addressing response bias. In: Zasler N, Katz D, Zafonte R, editors. Brain injury medicine: principles and practice. 10th edition. New York: Demos Publishers; 2013. p. 1415–36.
18. Iverson GL, Brooks BL, Holdnack JA. Misdiagnosis of cognitive impairment in forensic neuropsychology. In: Heilbronner RL, editor. Neuropsychology in the courtroom: expert analysis of reports and testimony. New York: Guilford Publishing; 2008. p. 243–66.
19. Fink JW. Beyond the tests: record review, interview, and observations in forensic neuropsychology. In: Bush SS, editor. APA handbook of forensic Neuropsychology. Washington, DC: APA; 2017. p. 41–55.
20. Bender SD, Matusewicz M. PCS, iatrogenic symptoms, and malingering following concussion. Psychol Inj Law 2013;6(2):113–21.
21. Zakzanis KK, Yeung E. Base rates of post-concussive symptoms in a non-concussed multicultural sample. Arch Clin Neuropsychol 2011;26(5):461–5.
22. Meares S, Shores EA, Taylor AJ, et al. The prospective course of post-concussion syndrome: the role of mild traumatic brain injury. Neuropsychology 2011;25(4): 454–65.
23. Ponsford J, Cameron P, Fitzgerald M, et al. Predictors of postconcussive symptoms 3 months after mild traumatic brain injury. Neuropsychology 2012;26(3):304.
24. Donnell AJ, Kim MS, Silva MA, et al. Incidence of postconcussion symptoms in psychiatric diagnostic groups, mild traumatic brain injury, and comorbid conditions. Clin Neuropsychol 2012;26(7):1092–101.
25. Gunstad J, Suhr JA. Expectation as etiology" versus "the good old days": postconcussion syndrome symptom reporting in athletes, headache sufferers, and depressed individuals. J Int Neuropsychol Soc 2011;7(3):323–33.
26. Silverberg ND, Iverson GL, Brubacher JR, et al. The nature and clinical significance of preinjury recall bias following mild traumatic brain injury. J Head Trauma Rehabil 2016;31(6):388–96.
27. Vanderploeg RD, Belanger HG, Kaufmann PM. Nocebo effects and mild traumatic brain injury: legal implications. Psychol Inj Law 2014;7(3):245–54.
28. Whittaker R, Kemp S, House A. Illness perceptions and outcome in mild head injury: a longitudinal study. J Neurol Neurosurg Psychiatry 2007;78(6):644–6.
29. Hou R, Moss-Morris R, Peveler R, et al. When a minor head injury results in enduring symptoms: a prospective investigation of risk factors for postconcussional syndrome after mild traumatic brain injury. J Neurol Neurosurg Psychiatry 2012;83(2):217–23.
30. Iverson GL, Brooks BL, Ashton VL, et al. Interview versus questionnaire symptom reporting in people with the postconcussion syndrome. J Head Trauma Rehabil 2010;25(1):23–30.
31. Hall RCW, Hall RCW. Compensation neurosis: a too quickly forgotten concept? J Am Acad Psychiatry Law 2012;40(3):390–8.
32. Silver JM. Effort, exaggeration, and malingering after concussion. J Neurol Neurosurg Psychiatry 2012;83(8):836–41.
33. Larrabee GJ, Rohling ML. Neuropsychological differential diagnosis of mild traumatic brain injury. Behav Sci Law 2013;31(6):686–701.
34. Drob SL, Meehan KB, Waxman SE. Clinical and conceptual problems in the attribution of malingering in forensic evaluations. J Am Acad Psychiatry Law 2009; 37(1):98–106.
35. Rogers R, Bender SD. Evaluation of malingering and related response styles. In: Otto Rk, Weiner IB, editors. Handbook of psychology: forensic psychology. Hoboken (NJ): John Wiley & Sons Inc; 2013. p. 517–40.

36. Weiss KJ, Van Dell L. Liability for diagnosing malingering. J Am Acad Psychiatry Law 2017;45:339–47.
37. Niesten IJM, Nentjes L, Merckelbach H, et al. Antisocial features and "faking bad": a critical note. Int J Law Psychiatry 2015;41:34–42.
38. McDermott BE, Feldman MD. Malingering in the medical setting. Psychiatr Clin North Am 2007;30:645–62.
39. Lockhart J. How should validity testing impact expert's opinion? Arch Foren Psych 2015;1(2):78–96.
40. Kaufmann PM. *Neuropsych*ologist experts and neurolaw: cases, controversies and admissibility challenges. Behav Sci Law 2013;31:739–55.
41. Creager RT, Shea JC, Larner GP. Role of defense neuropsychologists should be limited under Virginia evidence law. Journal of the Virginia Trial Lawyers Association 2002;(Fall Issue):24–32.
42. Pierchowski LD. Identifying the examiner related threats to validity in the forensic assessment of disability. Int J Law Psychiatry 2015;42-43:75–80.
43. Bianchini KJ, Curtis KL, Greve KW. Compensation and malingering in traumatic brain injury: a dose-dependent response relationship? Clin Neuropsychol 2006; 20:831–47.
44. Heilbronner RL, Sweet JJ, Morgan JE, et al. American Academy of Clinical Neuropsychology consensus conference statement on the neuropsychological assessment of effort, response bias and malingering. Clin Neuropsychol 2009;23: 1093–129.
45. Granacher RP. Traumatic brain injury: methods for clinical and forensic neuropsychiatric assessment. 3rd edition. Boca Raton (FL): CRC Press/Taylor & Francis Group; 2015.
46. Merten T, Merckelbach H. Symptom validity testing in somatoform and dissociative disorders: a critical review. Psychol Inj Law 2013;6:122–37.
47. Daum C, Hubschmid M, Aybek S. The value of positive clinical signs for weakness, sensory and gait disorders in conversion disorder: a systematic and narrative review. J Neurol Neurosurg Psychiatry 2014;85(2):180–90.
48. Ruchinskas R, Maitin I. The detection of exaggerated sensory symptoms. In: Zasler ND, Martelli MF, editors. Physical medicine and rehabilitation: state of the art reviews functional disorders. Philadelphia: Hanley and Belfus; 2002. p. 113–8.
49. Greer S, Chambliss L. What physical exam techniques are useful to detect malingering. J Fam Pract 2005;54(8):719–22.
50. Feinstein A. Conversion disorder. Continuum (Minneap Minn) 2018;24(3):861–72.
51. Greve KW, Bianchini KJ, Brewer ST. The assessment of performance and self-report validity in persons claiming pain related disability. Clin Neuropsychol 2013;27(1):108–37.
52. Aronoff GM, Livengood JM. Pain: Psychiatric aspects of impairment and disability. Curr Pain Headache Rep 2002;7:105–15.