Detection of noncredible psychological test results is critical:

- The viability of psychological/neuropsychological assessment hinges on ability to verify that scores are true and accurate
- If noncredible performance cannot be detected, then psychological assessments are essentially worthless

Strategies For Detection Of Feigned Cognitive Symptoms

- A. Noncredible pattern on dedicated measures of response bias
- B. Noncredible pattern on standard neurocognitive tests ("embedded")
- C. Elevations on personality test validity scales (e.g., MMPI-2-RF F-r, Fp-r, Fs, FBS-r, RBS scales)
- D. Inconsistency between test scores and ADLs
- E. Inconsistency between injury specifics and test scores (improbable outcome)
- F. Inconsistency in scores within/across evaluations

Neurocognitive Performance Validity Tests (PVTs)

- Rationale (i.e., how/why do they work?)
  - the general public holds faulty information regarding the effects of brain injury, specifically, that the following skills are typically impaired:
    - overlearned information (alphabet, simple calculations, sight reading)
    - recognition memory versus free recall
    - simple motor dexterity and sensory function
    - basic attention
  - Effective PVTs are those that incorporate these skills

Detection of noncredible performance from test data

- Low performance relative to credible patient groups
- Pathognomonic signs (i.e., found only in feigned presentations)

Financial Disclosure

Dr. Boone receives royalties from Western Psychological Services for the b Test and the Dot Counting Test
Neurocognitive domains in which symptoms can be feigned:

- Memory
- Attention
- Mental Speed
- Language (including reading)
- Math

- Visual Perceptual/Spatial
- Intelligence
- Motor dexterity/strength and sensory function
- Any combination of the above

PVTs by Domain

<table>
<thead>
<tr>
<th>Motor/Sensory</th>
<th>Visual-Perceptual/Spatial</th>
<th>Language</th>
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<tbody>
<tr>
<td>Finger Tapping</td>
<td>VIP - Nonverbal</td>
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<tr>
<td>Finger Agnosia</td>
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<td>VIP - Verbal</td>
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<tr>
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<td>Judgment of Line Orientation</td>
<td>Speech Sounds Perception Test</td>
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<td>Grooved Pegboard</td>
<td>Visual Form Discrimination</td>
<td>Stroop Test</td>
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<tr>
<td>RD Effort Equation</td>
<td>Sentence Repetition</td>
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<td>Benton Facial Recognition</td>
<td>Token Test</td>
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<tr>
<td>WAIS-III PIQ/PIQ</td>
<td>WAIS-III VIQ/VCI</td>
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Current Practice Guidelines

- indicate that formal measures of response bias are to be interspersed throughout neuropsychological exams
  - NAN (Bush et al., 2005)
  - Including use of embedded as well as free-standing measures
  - AACN (Heilbroner et al., 2009)

Reliance on a single PVT (incorrectly) assumes that

- Response bias is constant across an exam
- Response bias presents in the same manner in all individuals
  - i.e., that all patients use the same strategies when feigning
Response bias is typically selective:
- Not all individuals feign in the same manner (Boone, 2009)
- Examination of archival data (n = 146) noncredible subjects
  - Compensation-seeking
  - Failure on 2 or more PVTs out of at least 4
- Average percentage of tests failed = 64%
- Only 16.4% of patients failed all PVTs
- 36% of patients failed < half of PVTs
- Shows that response bias is not static across exam

Recent Practice Survey
- Martin, Schroeder, and Odland (2015) surveyed North American neuropsychologists (n = 316) regarding use of PVTs
  - An average of 6 PVTs (embedded and dedicated) were used in forensic exams
  - An average of 5 PVTs (embedded and dedicated) were used in clinical exams

Key Issue:
- Does use of multiple PVTs increase the likelihood of falsely concluding that a patient is non-credible?
  - If the answer is "yes", then the field of neuropsychology must make an abrupt course correction because current practice guidelines recommend use of multiple PVTs
  - Fortunately, available research indicates that the answer is "no"

To summarize:
- Current recommendation and practice in the field of clinical neuropsychology is to:
  - Administer multiple PVTs
  - Interspersed throughout the exam
  - Covering multiple cognitive domains (if not for every task administered)
  - so that performance validity is repeatedly sampled

Specificity rates with use of multiple PVTs:
Victor et al. (2009)
- Subjects:
  - 32 noncredible
  - 57 credible
- Predictor Variables:
  - Rey 15-item + recognition, Dot Counting Test, Warrington Words, Rey Word Recognition
- Results of backward step-wise logistic regression:
  - Failure on 1 of 4 tests (DCT) = 93% sensitivity, 59.4% specificity, 80.9% overall accuracy
  - Failure on >2 tests (DCT, Warrington) = 68.8% sensitivity, 89.5% specificity, 82.0% overall accuracy
- Failure on two tests - most accurate and efficient for determining group membership; failure on 3/4 or 4/4 did not increase predictive accuracy
- Specificity:
  - 41% of credible subjects failed 1, 5% failed 2, 1.5% failed 3, and 0 failed 4
Specificity rates with use of multiple PVTs:
- Vickery et al. (2004):
  - 3 of 3 indicators failed: 33% sensitivity, 100% specificity
- Sollman, Ranseen, and Berry (2010):
  - 1 of 4 indicators failed: 63% sensitivity, 83% specificity
  - 3 of 4 indicators failed: 47% sensitivity, 100% specificity
- Larrabee (2003):
  - 2 of 5 indicators (88% sensitivity and 94% specificity)
  - 3 of 5 indicators (51% sensitivity and 100% specificity)
- Giger et al. (2010):
  - 1 of 7 indicators failed: 95% specificity
  - 2 of 7 indicators failed: 100% specificity
  - 2 of 9 indicators (83% sensitivity and 100% specificity)
- Chafetz (2011)
  - 3 of 4 indicators (100% specificity)

Specificity rates with use of multiple PVTs:
- Schroeder and Marshall (2011):
  - 2 of 7 indicators (83% to 95% specificity)
  - 3 of 7 indicators (100% specificity)
- Larrabee (2014):
  - 3 of 7 indicators (94% specificity)
  - 4 of 7 indicators (100% specificity)
- Davis and Mills (2014):
  - 2 of 7 indicators (85% specificity)
  - 3 of 7 indicators (97% specificity)
- Dean et al. (2008):
  - With IQ ≥80, failure on >1 PVTs (out of 8) is unusual

How to limit false positive identifications:
- Administer several PVTs
- Failure on increasing number of indicators does not increase sensitivity, but does increase specificity
  - i.e., when tests are very easy, failures are not likely to occur even with increasing numbers of tests administered

Larrabee (2008)
- the likelihood of obtaining a false determination of malingering decreases with each subsequently failed PVT
- Chaining of likelihood ratios showed increase in probability of malingering
  - .713 to .837 for 1 failed PVT
  - .836 to .973 for 2 failed PVTs
  - .989 to .995 for 3 failed PVTs
- Subsequently corroborated by Meyers et al. (2014)

Meyers et al. (2014)
- as the average base rate of invalid performance increases,
  - the number of failed PVTs needed to detect invalid performance decreases:
    - For example, an invalid performance base rate of 0.10 would require three failures for the probability of having invalid data to be over .96, but with an invalid performance base rate of 0.5 or higher, only one PVT failure would be needed for the probability of having invalid data to exceed .90, using a test with a sensitivity of 0.70 and specificity of 0.90.
Is number of PVTs a concern? (i.e., are there ever “too many”?)

- Probably not
  - Davis and Millis (2014)
  - Number of PVTs failed and the number administered showed a small non-significant correlation: rs = .13, p = .10
  - Number of PVTs administered was not a significant predictor of number of PVTs failed

Are some groups at risk for PVT failure despite best effort?

- As discussed above, multiple failures (>3) on PVTs virtually never occur in credible populations, however, there are two noteworthy exceptions:
  - Individuals with dementia and individuals with very low intellectual scores (FSIQ <70)
  - Dean et al. (2009) reported that in individuals with diagnosed dementia
    - 36% of PVTs were failed in those patients with MMSE >20
    - 47% of PVTs were failed when MMSE scores were 15 to 20
    - 83% of PVTs were failed with MMSE <15

Approach for protecting low IQ groups from false identification as noncredible

- Smith et al. (2014)
  - Credible patients with IQ ≤75 (n = 55)
  - Noncredible patients (n = 383) and subset with IQ ≤75 (n = 74)
    - Entire noncredible group > low IQ credible group
      - on verbal crystallized intelligence/semantic memory
      - manipulation of overlearned information
    - Low IQ credible group > entire noncredible group
      - many processing speed and memory tests
    - Low IQ credible group > noncredible group with low IQ scores
      - virtually all domains (attention, visual perceptual/spatial tasks, processing speed, verbal learning/test learning, and visual memory)

Cut-offs for the most sensitive tests

- b test # of omissions ≥ 46
- Digit Span four-digit time ≥ 4"
- Digit Symbol Recognition score ≤ 4
- RAVLT trial 5 ≤ 6
- RAVLT Effort Equation ≤ 7
- Rey Word total correct ≤ 7
- Warrington total score ≤ 38
When failure rates were tabulated across seven most sensitive scores (≥40%),
≥ 2 failures was associated with 85.4% specificity and 85.7% sensitivity
≥ 3 failures resulted in 95.1% specificity and 66.0% sensitivity

**Approach to protecting groups at risk for PVT failure**

1) Adjust individual cut-offs to achieve approximately 90% specificity in the target group
2) Tabulate number of failures
   * Increasing numbers of failures most likely due to feigning

**Case: Actual versus Feigned Low IQ**

- 24-year-old patient sustained massive injuries 3 ½ years prior to exam when he ran in front of a car in an apparent suicide attempt during an acute psychotic episode
- In the hospital ED the patient was noted to be awake and moaning with eyes open, and trying to sit up; Glasgow Coma Scale was rated at 10 (+4+2). Neurologic exam was grossly non-focal with movement in all extremities. The patient was intubated and sedated with GCS of 3.
- He was found to have sustained multiple fractures, including multiple facial fractures and a fracture at the base of the skull, as well as fractures of his pelvis, left hip, left leg, left arm, and lower spine and rib.
- Brain CT did not show intracranial lesions but did reveal a small amount of blood in the posterior horns of the lateral ventricles.
- During his hospitalization the patient was described as making “steady improvement” and that he had “recovered his mental status.” He indicated that he did not recall running in front of the car, and his first recollection following the injury was of awakening in the hospital and thinking he was “dreaming.”
- Six weeks after injury he was transferred to a subacute facility for ongoing physical therapy and occupational therapy; discharge diagnoses included paranoid schizophrenia and cerebral concussion.

**Case: Actual versus Feigned Low IQ**

- The family filed a lawsuit alleging that the patient exhibited reduced cognitive function secondary to a significant brain injury incurred at the time of injury.
- When asked whether he was experiencing problems in thinking skills related to the accident, the patient responded that he did not know.
- When asked as to psychiatric symptoms stemming from the accident, the patient indicated that he was “more cautious,” he denied depression or anxiety, and stated that he did not know if he was experiencing changes in sleep or appetite.
- When asked as to current physical problems he related to the accident, he initially only reported left leg pain/discomfort and missing teeth, but when specifically queried, he admitted that he could not extend the fingers of his left hand, and that he had “a little bit of pain” in his back.

**Educational, Linguistic, and Psychosocial Background:**

- The patient spoke English as a second language; he learned English when he entered school at age 5. He spoke Spanish to his parents, and was spoke Spanish and English to his siblings.
- He performed very poorly in school, began receiving special education services in the 4th grade, and did not begin reading until 5th or 6th grade. He reportedly had difficulty playing sports because “he didn’t understand the rules.”
- He had never lived independently from his family, and had never held employment, never obtained a drivers license, had never had a romantic relationship, and was described as socially isolated throughout his schooling.
Case: Actual versus Feigned Low IQ

Psychiatric History:
- His first psychotic episode began approximately four months prior to the injury, and was characterized by isolating himself and locking himself in his room, not communicating with family members, and attempting to run away.
- He was psychiatrically hospitalized, during which time he was described as confused and disoriented, responding to internal stimuli, selectively mute, and aggressive toward staff and patients, with numerous bizarre behaviors (folding his ears while screaming, taking off his clothes, banging his head and punching himself, displaying waxy flexibility and posturing, and urinating and defecating on himself).
- With treatment his acute symptoms resolved, and he was released to home, during which time the suicide attempt occurred.

Medical History:
- Records indicated some substance use, including marijuana.
- He had been born prematurely (36 weeks) and had suffered from jaundice.
- At the age of 14 months he was observed to have episodes of brief “passing out,” and the differential diagnosis included absence seizures.
- He had sustained a previous concussion at the age of 17/18.
- Family medical history was noteworthy for seizures in two siblings, and possible psychosis in a brother.

Neuropsychological Exam

Behavioral Observations:
- He presented as “young” and immature, and he was friendly but socially awkward and shy, and he laughed nervously at times.
- He did not appear to be acutely psychotic, however, on one task he stopped responding and appeared possibly to either have had an absence seizure or to be reacting to internal stimuli.
- Responses were slowed.
- Speech was noteworthy for soft spokenness, mumbling, and articulation errors (“sloppy” “s”), the latter appeared related to missing teeth rather than to dysarthria.
- Thought processes were grossly within normal limits, but the patient displayed a knowledge deficit (e.g., for aspects of his medical history, symptoms, and treatment) which appeared to be related primarily to low intelligence. He counted on his fingers when solving math problems.

Neuropsychological Exam

Information, Processing Speed

<table>
<thead>
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<td>Trails A</td>
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<tr>
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<td>Trails B</td>
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Verbal Comprehension

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Fluid Reasoning

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Performance

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Memory

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</tbody>
</table>
Neuropsychological Exam

PVT Scores:
- The patient failed PVTs from 9 of 14 separate tests using published cut-offs, which in most cases would suggest that he was not performing to true ability.
- However, overall IQ score was low (FSIQ = 75), and judged accurate (rather than as reflecting negative response bias) because it was consistent with very poor premorbid academic and social function.

Personality Testing:
- MMPI-2-RF was invalid due to a true response bias (TRIN-r = 80T) and failure to consistently comprehend the meaning of test items (VRIN-r = 82T) (despite administration through an audio version).

Case Conceptualization
1) The patient was judged to have most likely performed to his true ability level, and scores on standard neurocognitive scores were considered to reflect true skill level.
2) Neurocognitive scores were interpreted as showing substantial impairments in processing speed and visual memory, impaired to average skills in visual perceptual/spatial skills, verbal memory, and executive functions, borderline to low average academic skills (word reading, spelling math), and low average vocabulary range and basic attention.
Case Conceptualization

The patient was considered not likely to have any current cognitive sequelae related to the injury 3½ years earlier.

The available data suggested that the patient most likely met criteria for a mild traumatic brain injury

Records from his hospitalization referred only to a "cerebral concussion," and brain imaging was normal.

It is unclear whether the patient was rendered unconscious; in the emergency department he was described as awake and moaning with eyes open, and was trying to sit up.

He initially had Glasgow Coma Scale of 10, which normally would fall within the moderate traumatic brain injury category, although it is unclear whether the patient's extensive orthopedic injuries contaminated the ratings.

Further, he was described as "confused/disoriented" (score of 4 on verbal response section of the Glasgow Coma Scale), but this was also likely true prior to the suicide attempt due to his severe psychosis.

Anterograde amnesia could not be reliably assessed due to sedation after the injury.

Reviews of the literature on neuropsychological function in mild traumatic brain injury (see Carroll et al., 2004, 120 studies; Dikmen et al., 2009, 33 studies), including 6 meta-analyses involving dozens of studies and thousands of patients in the aggregate (Liu et al., 2016, 463, Belanger et al., 2005, 23 studies, n = 790, Belanger & van der Loop, 2003; 8 studies, Bruder et al., 1997; 17 studies, n = 639, Frencher, Fox, & Maybery, 2005; 23 studies, n = 2828, Roth et al., 2014, 39 studies, n = 1716, Schretlen & Shapiro, 2003)

show that patients who experience mild brain trauma have returned to baseline by weeks to months post-injury.

At the time of testing the patient was more functional than prior to the suicide attempt; for example, the patient's sister reported that he was now responding verbally to the family member's questions, whereas prior to the injury he did not.

Concluded that the patient had a longstanding, developmental intellectual disability as well as a chronic psychotic disorder that were unchanged by the suicide attempt and related injuries 3½ years prior to exam, and that the patient had no current cognitive or psychiatric conditions stemming from that event.

Future Directions

A critical goal within clinical neuropsychology is to quickly develop methods that adequately protect credible patient subgroups who are at risk for being inaccurately determined to be malingering or otherwise not performing to true ability.

One such method for protecting patients with low IQ was described (i.e., adjusting cut-scores to maintain >90% specificity in low IQ populations, then tabulate the number of failures)

Memory (especially recognition) and attentional measures appear to be most robust to low intelligence (Smith et al., 2014), and these are likely to show the most promise in differentiating actual versus feigned low IQ.

Qualitative aspects of some memory recognition tasks may reveal error types not found in individuals with low IQ (thereby specific to noncredible performances).

E.g., Marshall and Happe (2007) indicated that it was rare for subjects with low IQ to produce "dyslexic" false positive errors on the Rey 15-item recognition trial

Significantly below chance performance on forced choice measures would not be explainable on the basis of lw IQ

Novel techniques may be worth pursuing

E.g., developing measures that assess for a "yes" response bias (exhibited by individuals with IQ, but not necessarily adopted by noncredible individuals attempting to feign low IQ, such as on the Logical Memory recognition trial (Marshall & Happe, 2007).
Case: Actual versus Feigned Dementia

- The patient filed a lawsuit alleging reduced cognitive function secondary to:
  - direct effects of traumatic brain injury
  - effect of stroke which was claimed as caused by the traumatic brain injury and which precluded him from returning to work as a taxi driver
- Claimed symptoms reported at the time of evaluation included:
  - decline in memory
  - reduced balance
  - back and right leg pain and pain at hand fracture site
  - insomnia
  - depression and anxiety
- He resided with his wife and adult daughter, and no concerns were expressed regarding his ability to function within the community; he had an active driver’s license.

Previous Relevant History

- Medical history was rather extensive, including:
  - chronic hypertension (with associated borderline hypertrophy on echocardiogram and calcification of the aorta)
  - high cholesterol
  - elevated blood sugar levels
  - low testosterone
  - possible sleep apnea
  - lengthy smoking history
  - treatment for GI cancer in the year prior to the accident including six months of chemotherapy
  - chronic depression
  - thyroid and parathyroid dysfunction
  - possible excessive alcohol use (current use of 2 glasses of wine 3 to 4 nights per week)
  - had performed poorly in school due to difficulty “concentrating” but he stated that he did not know whether he had an actual learning disability or attention deficit disorder.

Neuropsychological Exam

- Behavioral Observations:
  - Speech characteristics were unremarkable
  - No cognitive abnormalities were noted in spontaneous interactions; the patient was able to provide a full history and thought processes were organized and relevant.
  - He worked on tasks in a focused manner and efficient manner (he completed the MMPI-2-RF quickly), and he displayed no confusion regarding test instructions.
  - He initially presented as irritable. Mood appeared to be depressed.
  - He used his fingers in a dexterous manner.
  - No signs of fatigue or physical discomfort were observed during the several hour exam.

Neuropsychological Exam
Neuropsychological Exam

The patient failed 100% of PVTs administered (15 of 15 separate tests)
- the graphs below contrast the patient's PVT scores against mean scores for credible and noncredible groups:

Neuropsychological Exam

Figure 1: Scores on Free-Standing PVTs

- Figure 2: Scores on Embedded PVTs involving Attention, Visual Perception/Spatial Skills, Motor Dexterity, and Verbal and Visual Memory

Neuropsychological Exam

Figure 3: Scores on Embedded PVTs involving Processing Speed

Neuropsychological Exam

Personality Testing
- Validity Scales:
  - No significant under- or over-report
- Substantive Scales:
  - Elevated on Somatic Complaints (RC1, Somatic/Cognitive), Depression-related (EID, RC2, Helplessness/Hopelessness, Social Avoidance, Interpersonal Passivity, PSY-5 Intrinsic/Low Positive Emotionality – revised), and worry-related (Stress/worry, multiple specific fears) scales.

Neuropsychological Exam

Results of neurocognitive testing revealed
- impaired scores in finger dexterity, visual perceptual/spatial skills, visual memory, and word retrieval
- impaired to borderline scores in processing speed
- impaired to low average scores in verbal memory
- low average performance in basic attention

In a test taker in the patient's age range who has documented evidence of small strokes and multiple medical illnesses, the question arises as to whether he has developed cognitive deterioration to the level of a dementia and if this accounts for the widespread PVT failures.
Differential Diagnosis of Actual versus Feigned Dementia

The determination as to whether a patient’s performance validity failures reflect noncredible performance versus the effects of an actual dementia is made by examining:

1. The patient’s functionality in activities of daily living (ADLs) to see if it is consistent with dementia.
2. The patient’s test scores versus spontaneously displayed skills for evidence of consistency of impairment.
3. Whether performance on PVTs matches that expected for dementia.
4. Whether the patient still fails PVTs when cutoffs are selected that adequately protect against false positive identifications of malingering in credible dementia patients.

As outlined below, the evidence in the current case indicated that:

- The patient did not in fact have a dementia.
- His neuropsychological test performance was noncredible.

A. Evidence from PVT performance:

1. Patient obtained a MMSE score of 19 (out of 29 possible points), which would suggest a mild/moderate dementia. Yet, he failed 100% of PVTs administered, which is markedly higher than that expected for this MMSE score.

   - Dean et al. (2009) found that with a MMSE score of 15 to 20, an average of 47% of PVTs are failed (in contrast to 36% with MMSE scores >20, and 83% with MMSE scores <15).

2. The only PVT employed in the Dean et al. (2009) study that maintained 90% specificity in dementia at published cut-offs was:
   - Mean time to recite 4 digits on forward Digit Span (cut-off \( \geq 4' \))
   - The patient’s score markedly exceeds this cut-off (16.5’).

3. When cut-offs were adjusted per the Dean et al. (2009) study to maintain a <10% false positive rate in dementia patients,
   - The patient still failed the Warrington Words (cut-off <26), finger tapping dominant hand (cut-off <21), and Rey Word Recognition (cut-off <5).

4. On a forced choice measure (Warrington – Words), the patient obtained a score significantly below chance (19/50).

   - This performance would suggest that the patient knew correct answers that he did not provide.
   - In contrast to patients with significant dementia (i.e., who have little to no ability to learn new information), and who would be expected to perform at worst at chance levels on the test.

5. As shown below:

   - Scores on the Dot Counting Test, Rey 15-item total recall, and TOMM Trial 1 were worse than mean scores obtained by patients with mild dementia.
   - Mean scores (with the exception of Rey 15-item recall and mean ungrouped dot counting time) were worse than mean scores obtained by patients with moderate to severe dementia who were residing in a locked residential facility.

B. Mismatch between Test Scores and Demonstrated Functionality:

6. He was able to provide detailed information regarding the accident and his symptoms/treatment in his deposition and on interview, and showed no memory lapses in his interactions with the examiner (e.g., did not re-ask questions already asked, did not require test instructions be repeated, etc.), behaviors which would be inconsistent with his dementia-level word recall scores on the RAVLT.

7. He scored below chance levels on one forced choice recognition memory test, arguably performing worse than a blind person (who would be predicted to perform at chance levels).
Differential Diagnosis of Actual versus Feigned Dementia

B. Mismatch between Test Scores and Demonstrated Functionality:
- 8) His very low scores on measures of visual perceptual/constructional skills, visual memory, and processing speed would likely preclude ability to drive, yet he was driving at the time of the exam.
- 9) His low confrontation naming score (Boston Naming = 32/60) would be indicative of a significant word-retrieval difficulty, yet no such expressive language difficulties were observed in spontaneous speech.
- 10) He obtained very low finger tapping scores yet used his fingers normally during the exam (to turn book pages, hold and use a pen, etc.), and did not report dysfunction of his fingers when asked regarding physical symptoms.

Differential Diagnosis of Actual versus Feigned Dementia

C. Marked Inconsistency in Test Scores Across Cognitive Exams
- 14) Three years prior to current testing the patient scored in the high average range on a visual spatial reasoning task, in contrast to the impaired scores obtained on current testing.
- 15) Two years prior to current exam the patient scored in the average range in processing speed, in contrast to the borderline to impaired scores obtained on current exam.

PVT cut-scores that do not require adjustment for dementia:
- In the Dean et al. (2009) study,
  - mean time to recite 4 digits in forward order on Digit Span maintained 90% specificity at established cut-offs in 48 dementia patients,
  - although sensitivity has been reported as low (38% to 37%; Babbkian et al., 2006)
  - specificity for finger tapping cut-offs was low in the overall sample of 55 dementia patients, but was 100% in subgroups of patients with Alzheimer's disease and frontotemporal dementia (but only 43% in vascular dementia), although subgroup n's were small.
  - Sensitivity levels for dominant finger tapping cut-offs are at least moderate (50% to 61%; Arnold et al., 2005)

In the Rudman et al. (2011) study,
- 100% specificity in 42 patients with “working age” dementia (diagnosed prior to age 65) was observed for the discrepancy between grouped and ungrouped dot counting times on the Dot Counting Test
  - failure was defined as total ungrouped dot counting time < total grouped dot counting time
  - Although sensitivity rate is unknown (in current patient, mean grouped time was 12.5” and mean ungrouped time was 13.0”)
Additional Techniques

- In addition to the performance validity scores employed in the above case (e.g., 4-digit forward span time, TOMM Trial 1, Dot Counting Test, Rey Word Recognition, Warrington Recognition Test - Words), other techniques have been investigated and/or appear to have promise in discriminating actual versus feigned dementia.

1) A “severe impairment profile” on the Medical Symptom Validity Test (Green, 2004) can be used to flag patients with actual severe cognitive dysfunction and thereby reduce the test false positive rate in these patients.

- E.g., Howe and Loring (2009) reported a 94% specificity rate in 52 dementia patients using this algorithm.

- However, Chafetz and Biondolillo (2013) showed that noncredible patients can easily produce the severe impairment profile, and others have argued that the requirement that the severe impairment profile only be considered if there is a probability that the patient has true impairment is circular (Axelrod & Schutte, 2010).

2) Likewise, a “genuine memory impairment profile” (GMIP) has been developed to reduce false positive rates on the Word Memory Test (WMT) in patients with significant memory deficits.

- Martins and Martins (2010) showed a high false positive rate on the WMT in 21 patients diagnosed with MCI. Cognitive Impairment (67%).

- Which was reduced to 5% using the GMIP, while still maintaining 85% sensitivity in identifying simulators.

- However, little data are available regarding sensitivity rates in “real world” noncredible subjects when the GMIP is used.

3) Forced choice “Coin-in-the-Hand” Test (the examiner holds a coin in 1 hand. After showing the coin to patients for approximately 2 seconds, the examiner closes both hands and asks the patients to close their eyes. With eyes closed, the patients are asked to count backward from 10 to 1 out loud and then to open their eyes and point to the hand that holds the coin. Ten trials are given, with the examiner alternating the coin from hand to hand according to standardized instructions).

- Schroeder et al. (2012) tested 45 hospitalized patients with moderate to severe cognitive deficits (mean RBANS Global score = 1st percentile; mean MMSE score = 20.47).

- > 1 error = 89% specificity

- > 2 errors = 96% specificity

- > 4 errors = 100% specificity (Dementia subtype was not related to test performance).

- Rudman et al. (2011) observed lower specificity for this measure in 42 patients of varying types of dementia:

- > 2 errors = 88.1% specificity

- In contrast, in simulators of memory impairment:

- > 2 errors = 90% sensitivity (Cochrane et al., 1998)

- Mean error rate = 5.6/10 and only 1 scored above chance (Rudman et al., 1999)

- Mean error rate = 1.9 (Kelly et al., 2005)

4) Yes/no recognition task (presentation of 20 unfamiliar faces, followed by a recognition trial in which the 20 faces are interspersed with 20 new faces, with the test taker instructed to report whether each face was previously seen).

- In a small sample of dementia patients (n = 47) and suspected malingerers (n = 41), the dementia patients exhibited an inflated “yes” response bias, while the suspected malingerers displayed an increased “no” response bias (Schindler et al., 2013).

- At a cut-off of 9 false negative responses, sensitivity was 54% and specificity was 100%.

5) Word Completion Test

- Hilsabeck and colleagues (2001) reported data for a PVT involving priming that requires test takers to complete word stems with previously studied words (Inclusion subtest), and then after exposure to a new list of words, test takers are asked to complete word stems without using these latter words (Exclusion subtest).

- Normal controls and a small group of memory disordered patients (n = 14), including two patients with dementia, used more list words on the first task than on the second.

- While simulators showed the opposite pattern, obtaining a mean difference score that was negative.
6) Tasks that rely on old, overlearned information and implicit memory (which are relatively intact in patients with dementia):
- For example, Cuddy and Duffin (2005) reported spared recognition for music in a woman with advanced dementia (MMSE = 8) as measured by recognition of familiar versus unfamiliar melodies, and detection of “wrong” notes in known melodies as well as distinguishing distorted versus correctly played melodies.
- Horton and colleagues (1992) observed that normal individuals and amnestic patients both showed typical priming effects on word or fragment completion tasks, in contrast to an amnesia simulation condition in which word completion rates were substantially below baseline performances.

Impact of Non-English language status on PVT performance
- Despite the fact that 13% of the US population speaks Spanish in the home (38 million; Ryan, 2013), relatively few studies have validated PVTs in participants tested in Spanish.
- ≤46 credible mild traumatic brain injury patients of lower educational level tested in Spain administered the Dot Counting Test, b Test, Rey-15 item, TOMM, and Victoria Symptom Validity Test (Vilar-Lopez et al., 2008a,b).
- 29 Spanish-speaking medical clinic patients of lower educational level in North Carolina administered the Dot Counting Test and Rey 15-item (Burton et al., 2012).
- 130 Spanish-speaking normal controls in Texas administered the Rey 15-item (Strutt et al., 2011).

Impact of Non-English language status on PVT performance
- Robles et al. (2015) obtained PVT data on 65 male, young to middle-aged (range of 18-49), monolingual Spanish-speaking, day laborers recruited in Los Angeles (n = 65) and Guadalajara, Mexico (n = 50).
- Exclusionary criteria included history of head trauma, neurological disorders, significant psychiatric history, learning disorder, and alcohol or drug abuse/dependence per participant report. Participants were provided $10 per hour for their participation.
- Data were collected on 4 PVTs:
  - Dot Counting Test
  - b Test
  - Rey 15-item plus recognition
  - Rey Word Recognition Test (translated).

Impact of Non-English language status on PVT performance
- The sample was divided into those with 0–6 years of education (n = 56) versus those with 7 to 10 years of education (n = 59) to allow development of cutoffs specific to educational level.
- Groups did not differ on Dot Counting Test scores, but those with lower education performed more poorly on:
  - b Test E-score
  - Rey Word total correct
  - 3 Rey 15-item scores (combination score, recall intrusion errors, and recognition false positives).
Impact of Non-English language status on PVT performance

- As can be seen from the table, a majority of cutoffs had to be made less stringent to limit false-positive identifications to ≤10% with the exception
  - Rey Word Recognition false positives
  - Dot Counting E-score and grouped dot counting time
  - b Test total time
- In the more educated subgroup, no changes to cutoffs were needed for
  - Rey 15-Item recall intrusions and recognition false-positive errors
  - Rey Word Recognition total correct

Conclusions/Recommendations:

- Some PVT cutoffs that maintained approximately 90% or higher specificity in the current sample match, or are even more stringent than, those recommended for use in US test takers who are primarily Caucasian, are tested in English, and have higher educational levels, i.e.,
  - Rey Word Recognition correct false-positive errors
  - Rey 15-Item recall intrusions and recognition false-positive errors
  - b Test total time
  - Dot Counting E-score and grouped dot counting time
- Thus, performance on these PVT variables appears relatively robust to cultural/language/educational factors, and these measures are particularly recommended for use when evaluating primarily Spanish-speaking individuals of lower educational level in the US and Mexico.

Conclusions/Recommendations:

- In contrast, most previously published cutoffs for the Rey 15-Item (with the exception of false-positive errors on recognition) and b Test (excluding time scores) were associated with inadequate specificity rates in the current sample and require adjustment before they can be used in patients matching the demographics of the current sample.

Conclusions/Recommendations:

- Moderating effect of education:
  - Participants with 0 to 6 years of education scored worse than participants with 7 to 10 years of education on some verbal/visual memory and letter identification PVT scores.
  - In contrast, the two groups generally scored comparably on processing speed and simple calculation PVT scores, but all PVT cutoffs required some adjustment in the lowest education group with the exception of
    - Dot Counting Test errors and grouped dot counting time
    - b Test “d” commission errors
    - Rey Word Recognition false-positive errors

Conclusions/Recommendations:

- In conclusion
  - The field of neuropsychology has made considerable strides in developing methods to accurately identify noncredible neurocognitive test performance.
  - However, an important research focus is on perfecting techniques to protect groups at risk for false positive identification as noncredible.
  - Available data on individuals with low IQ or dementia, and who speak Spanish and are of lowered educational level suggest that use of PVT subcomponents may be of more use than overall equation scores.
Questions?
Comments?