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Memory for Complex Pictures: Development and Validation of Digit Test of Effort

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MEMORY FOR COMPLEX PICTURES (MCP): DEVELOPMENT AND VALIDATION OF A DIGITAL TEST OF EFFORT

by

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The assessment of client effort during neuropsychological evaluation is of high importance. Two experiments were designed to assess the psychometric properties of a new measure of client effort during neuropsychological assessment (entitled Memory for Complex Pictures (MCP). Participants for Experiment 1 were undergraduates without a history of neurological conditions, mental health concerns, or current problems with alcohol or drug use. Two goals were proposed for Experiment 1: (a) to compare the sensitivity, specificity, and face validity of the MCP with the psychometric characteristics of a frequently-used and well-validated symptom validity test (the Test of Memory Malingering (TOMM) and b) to examine the influence of type of coaching instructions on the performance of simulated malingerers. Participants were randomly assigned to one of three groups: controls, uncoached malingerers (UM), or coached malingerers (CM). All participants were administered one of two symptom validity tests: the MCP or TOMM (order counterbalanced), followed by a brief neuropsychological battery composed of standard cognitive measures. The other symptom validity test followed this battery. Following administration of all tests, participants completed two questionnaires assessing their perception of the purpose of each measure.

Experiment 2 validated the use of the MCP with individuals who had experienced various forms and different severity levels of acquired brain injury. Results from Experiment 1 revealed that controls achieved near-ceiling performance on the MCP, obtaining an average Trial 1 score of 49.15 out of 50 and an average Trial 2 score of 49.67 out of 50. This performance was significantly better than the performance of CM and UM, whose responses differed significantly from each other on Trial 1 but did not differ significantly on Trial 2. Experiment 2 results revealed that mixed-clinical patients not involved in litigation obtained high scores on the MCP, obtaining an average of 44.39 correct responses out of 50 on MCP Trial 1 and an average of 45.78 correct on Trial 2. Results from both experiments lend support for the MCP's potential efficacy as an accurate and brief assessment of client effort during neuropsychological assessment.

Dedication

This work, and the effort and sacrifice that accompanied it, is dedicated to the three most important women in my life: my wife (Krisanne), my mother (Joan), and my Grandma (Jean), with enduring gratitude, love, and admiration. Thank you all.

For Dave, as always. Please come back.

"I love being alive and I will be the best man I possibly can. I will take love wherever I find it and offer it to whoever will take it…seek knowledge from those wiser…and teach those who wish to learn from me.

- DA

"And here are the trees and I know their gnarled surface, water, and I feel its taste. These scents of grass and stars at night, certain evenings when the heart relaxes – and how shall I negate this world whose power and strength I feel? Yet all the knowledge on earth will give me nothing to assure me that this world is mine. You describe it to me and teach me to classify it. You enumerate its laws and in my thirst for knowledge I admit that they are true. You take apart its mechanisms and my hope increases…What need had I of so many efforts? The soft lines of these hills and the hand of the evening on this troubled heart teaches me much more."

- AC

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Introduction

Malingering, defined by the *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition* (*DSM-IV-TR*, APA, 2000), as the "intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives" (V.65.2), is a significant problem for both the neuropsychological community and society at large. Such exaggeration of impairment is often done in circumstances where there is a potential to gain from appearing impaired or injured (e.g., personal litigation, worker's compensation). According to the *DSM-IV*, malingering should be strongly considered if an evaluation is conducted in a medicolegal context and if there is a marked discrepancy between the client's claimed distress or disability and their performance on objective testing measures. Malingerers may receive substantial financial benefits from fraudulent disability or worker's compensation claims, with false claims having a substantial economic impact on the general public (Iverson, 1995).

Although the use of neuroimaging techniques (e.g., magnetic resonance imaging (MRI) may provide clear evidence of brain damage in patients who have sustained a moderate-to-severe brain injury, these techniques often fall short when attempting to locate potential lesions resulting from mild TBI (mTBI; Youngjohn, Burrows, & Erdal, 1995). Thus, researchers such as Lees-Haley, Green, Rohling, Fox, and Allen (2003) argue for the paramount importance of the neuropsychological assessment in detecting functional losses following brain insult. Bigler (2001) agreed: "While neuroimaging information is crucial to the comprehensive evaluation of the neurologic patient, neuroimaging findings alone have only limited predicative ability with regard to neurobehavioral syndromes" (p. 227). Further, many clients with mTBI do not exhibit

cognitive performance decrements more than 1 month beyond their injury (e.g., Lees-Haley, Green, Rohling, Fox, & Allen, 2003; Rohling, Millis, & Meyers, 2000). These findings emphasize the vital nature of valid neuropsychological testing in an assessment context, particularly if an evaluation assesses for the presence of neuropsychological dysfunction secondary to mTBI.

The Importance of Base Rates in Malingering Detection

Base rates are defined as "the current population prevalence of a phenomena of interest" (Gouvier, 1999). Base rate estimates are primarily made based on estimates from high-risk clinical groups (Frazier, Youngstrom, Naugle, Haggerty, & Busch, 2007). Failure to consider the base rates of a given disorder may lead to erroneous diagnostic clinical decision-making. This is particularly true as it relates to the identification of malingering in neuropsychology and the differentiation of suboptimal performance from authentic brain injury. Although sensitivity (i.e., the ability of a malingering detection instrument to detect malingering when it is indeed occurring) is an important psychometric construct, specificity (i.e., the ability to differentiate malingered test performance from authentic brain injury) may be substantially more important if one is concerned about protecting the rights of individuals accused of displaying insufficient effort. In addition to Gouvier's extensive work in this area, Rosenfeld, Sands, and Van Gorp (2000) have highlighted the significance of base rates of malingering on the accuracy of prediction models. The authors also discuss these methodological issues with reference to apparent flaws in several publications dealing with neuropsychological malingering.

Base rates of malingering have been established among criminal forensic defendants referred for neuropsychological assessment, although these estimates vary substantially. Mittenberg, Patton, Canyock, and Condit (2002) estimated the base rate of malingering in a criminal population to be approximately 20%, while Denney (2003), employing the Slick, Sherman, and Iverson (1999) criteria, estimated the base rate to be 50.5%. The disparity in these findings highlights the importance of determining and employing accurate base rates in evaluating the utility of malingering classification systems.

Given the challenge of malingering detection, it should be noted that a true base rate measurement of clinical malingering may never be absolutely determined. In fact, estimation of the true base rate of cognitive dissimulation remains difficult, with research suggesting somewhat high estimates of neuropsychological malingering in standard outpatient settings (15%; Rogers, Harrell, & Liff, 1993; Rogers, Salekin, & Sewell, 1998). Additionally, Mittenberg, Patton, Canyock, and Condit (2002) reported widely varying rates of 8 to 39% depending upon the referral type and whether the patient was currently in litigation. These results underscore the crucial nature of including a symptom validity component in forensic evaluations.

Client Effort During Neuropsychological Assessment: Forensic Implications

Neuropsychologists are increasingly called upon to provide expert testimony in personal injury litigation cases where a plaintiff has sustained a TBI. The role of these professionals in the forensic environment is crucial given that the potential for faking or exaggeration of neuropsychological symptoms is higher in litigation than non-litigation contexts (Auerbach, 1992; Larrabee, 2003; Mittenberg, Patton, Canyock, & Condit,

2002). It has been repeatedly demonstrated that individuals instructed on how to fake non-existing cognitive impairment can intentionally alter their scores on standard neuropsychological measures, appearing similar to brain-injured patients (e.g., Faust & Guilmette, 1990; Faust, Hart, & Guilmette, 1988; Faust, Hart, Guilmette, & Arkes, 1988; Heaton, Smith, Lehman, & Vogt, 1978). At the same time, many factors besides purposeful faking and/or exaggeration may influence the effort of a patient during neuropsychological testing, including (but not limited to) chronic pain, acute anxiety, depression, sleep problems, fatigue, oppositional behavior, confusion, and/or nutritional deficiencies (e.g., Guilmette, Hart, Giuliano, & Leininger, 1994; Ruff, Wylie, & Tennant, 1993).

As forensic referrals have been shown to represent the primary source of income for private practitioners, it is not surprising that an increased recognition of the need for symptom validity assessment has taken place at both a personal and organizational level (Bush et al., 2005; Sweet, Moberg, & Suchy, 2000). This surge in interest in malingering detection may be attributed in part to the rise in forensic cases involving neurological insult (Tombaugh, 1996). In addition, a corresponding increase in the use of evidence resulting from neuropsychological assessment measures to evaluate the authenticity of claims involving neurocognitive deficits may also be a significant factor (Larrabee, 2005; Sweet, 1999; Sweet, Peck, Abramowitz, & Etzweiler, 2003). Regardless of the referral source, including symptom validity measures in neuropsychological assessment is increasingly viewed as a necessary component of the forensic evaluation (Bush et al., 2005). This appears to be reflected in Iverson's (2003) statement, made in the context of forensic practice: "Any neuropsychological evaluation that does not include careful

consideration of the patient's motivation to give their best effort should be considered incomplete" (p. 138).

Given that forensic cases represent the largest financial source of referrals for neuropsychologists, it is notable that clients involved in litigation have been found to have greater neuropsychological complaint rates regardless of head injury history (Green & Iverson, 2001; Green, Iverson, & Allen, 1999). In fact, the tendency to make postconcussive complaints has been found to be a better predictor of neuropsychological test performance than actual history of head injury (Hanna-Pladdy, Gouvier, & Berry, 1997). Additionally, Green, Rohling, Lees-Haley, and Allen (2001) discovered that as much as 50% of the variance in neuropsychological test results in compensation-seeking claimants was explained by poor client effort during testing, whereas an actual assessment of central nervous system dysfunction, the Glascow Coma Scale (GCS) (see Appendix O), explained less than 5% of the variance in the same data. It should be noted, however, that the GCS has been found to have particular flaws, among them restricted sensitivity and limited validity and reliability (Segatore & Way, 1992).

Despite the limitation of the previous study, monetary compensation associated with workers compensation claims has been found to be a major motive for exaggeration and malingering of problems attributed to work-related brain injuries. According to a study conducted by Bianchini, Curtis, and Greve (2006), compensation cases handled under Federal workers compensation guidelines (high financial incentive) showed considerably higher rates of malingering than cases handled under State law (limited financial incentive). These findings show that compensation claims are an influential

motive for exaggeration and malingering of problems attributed to work-related brain injuries.

Client Effort During Neuropsychological Assessment: Clinical Implications

Although there appears to be less incentive to malinger cognitive symptoms in non-forensic settings, the potential for exaggeration or complete fabrication of symptoms continues to be present in standard clinical evaluations. As noted by Bush et al. (2005), even relatively innocuous evaluations that do not appear to have any foreseeable forensic relevance at the time of the evaluation may carry with them a high potential for malingering. Even during assessments that take place in clinical contexts where the use of malingering-detection measures may not be indicated (e.g., inpatient rehabilitative care), neuropsychologists are required to speak to the validity of their testing. As such, symptom validity measures should be considered necessary components of the majority of neuropsychological evaluations.

Although mTBI clients currently involved in litigation demonstrate a particularly high incidence of malingering, malingering has also been shown to occur with moderate-to-severe brain injury patients. Bianchini, Greve, and Love (2003) studied three moderate-severe TBI clients evaluated within a medicolegal context. According to the researchers, all participants met Slick, Sherman, and Iverson's (1999) criteria for "Definite Malingered Neurocognitive Dysfunction" as reflected by the client's scores on the Portland Digit Recognition Test (PDRT) and the Test of Memory Malingering (TOMM). Results showed that each of the three participants performed significantly below-chance on at least one of the symptom validity tests employed. Additionally, Boone and Lu (2003) found noncredible cognitive performance in two litigating patients

with histories of severe brain injuries, as defined by coma ≥ 2 days. The findings above lend support to work done by Nies and Sweet (1994), who found that many neuropsychologists believe that the exaggeration of legitimate cognitive symptoms occurs more frequently than outright faking of non-existing cognitive impairments.

The Continuum of Effort

Along with the increase in clinical attention and research activity devoted to the potential implications of suboptimal client effort during neuropsychological testing, an expanded view and definition of malingering has developed. Many researchers have proposed that the current view of dissimulation is too restrictive and propose that malingering should be viewed as existing on a continuum.

Tombaugh (1996) and other researchers have increasingly recognized that malingering is not an all-or-none phenomenon. These researchers propose that client effort can be found in various degrees during neuropsychological assessment, ranging from minor exaggeration of existing symptoms to more flagrant faking of nonexistent symptoms (Millis, 1992; Travin & Protter, 1984; Zielinski, 1994). Bianchini, Greve, and Love (2003) observed the existence of malingering in patients with moderate-to-severe injury.

Rogers (1997) defined malingering as existing on a range of mild, moderate, and severe. Additionally, Lipman (1962) identified four types of malingering: (1) invention, (2) perseveration, (3) exaggeration, and (4) transference. Whereas Lipman et al. defines invention malingering as cases in which individuals falsely claim the existence of non-existent symptoms, exaggeration malingering occurs when a client reports existing symptoms as worse than they actually are. Transference malingering occurs when

individuals falsely attribute real symptoms to an injury that is extraneous to their neurological condition, whereas perseveration malingering occurs when individuals continue to claim the presence of symptoms that have since abated.

As identified by Travin and Protter (1984), the motivation to fake and/or exaggerate neuropsychological impairment may also be determined by a wide range of unconscious or conscious factors. Among these factors may be the presence of a factitious disorder, client opposition to the evaluation, confusion on the part of the client over the purpose of the evaluation, or the presence of other client factors that could interfere with the optimal effort during neuropsychological evaluation (e.g., poor client sleep, chronic pain) (Bush et al., 2005). The conceptualization of both unconscious and conscious factors being involved in malingering appears to be shared by Slick, Sherman, and Iverson (1999).

In addition to the tendency to exaggerate or fabricate symptoms, there are instances in which examinees may intentionally minimize or deny symptoms (Cima et al., 2003). For example, an evaluation designed to assess a client's decision-making capacity may cause a client to portray an overly-positive view of themselves. As stated by Bush et al. (2005), this inauthentic portrayal is also a form of symptom invalidity. An overly-positive symptom portrayal may also be seen on a client's responding on the Minnesota Multiphasic Personality Inventory – Second edition (MMPI-2), a commonly used measure of psychopathology frequently employed by neuropsychologists.

Although many studies have examined the negative end of the effort continuum (i.e., low client effort), few studies have examined the upper end of this range (i.e., high client effort). Orey, Cragar, and Berry (2000) attempted to study the factors involved in

increased client effort during neuropsychological testing by examining the effect of two motivational manipulations on the test performance of 75 college students with a history of mTBI. In this study head injury was defined as an experience of a blow to the head with (a) a reported loss of consciousness of any duration or (b) the occurrence of any alteration in mental state at the time of the accident.

Participants in this study were randomly assigned to a Motivation to Perform Well Group (MPW), a Motivation to Perform Poorly Group (MPP), or a Standard Control Group (CT). Results of the study showed significant decreases in test performance by participants given $25 to perform poorly, although no reliable differences were found between groups given financial incentives to perform well and a standard instruction group. Although the hypothesized results were not obtained, this study highlights the increasing trend toward a dimensional view of client effort during neuropsychological assessment.

Diagnostic Terminology of Malingering

Rogers (1990a; 1990b) was among the first to propose detailed diagnostic criteria for malingering of psychiatric disturbance that incorporated data from self-report, test scores, behavioral observations, and collateral information. More recently researchers have supplemented the term malingering by offering specific definitions of burgeoning concepts such as symptom validity, response bias, and dissimulation (Bush et al., 2005).

Building off of the criteria of malingering put forth by Greiffenstein, Baker, and Gola (1994), Slick, Sherman, and Iverson (1999) define malingering as the "volitional exaggeration or fabrication of cognitive dysfunction for the purpose of obtaining material gain, or avoiding or escaping formal duty or responsibility" (p. 552). According to the

authors, four criteria should be used to determine the presence of MND: (a) presence of substantial external incentive, (b) evidence from neuropsychological testing, (c) evidence from self-report, and (d) behaviors meeting the necessary B and C criteria are not fully accounted for by psychiatric, neurological, or developmental factors. The criteria devised by the researchers allows for a diagnostic rating of definite, probable, or possible MND.

The Effect of Coaching on Malingering

In addition to motivational issues, it has been consistently shown that coaching (i.e., providing patients with information about specific tests or the effects of brain injury) can influence the performance of participants simulating the effects of an acquired brain injury (e.g., Hanlon-Inman & Berry, 2002; Heaton, Smith, Lehman, & Vogt, 1978; Lees-Haley & Dunn, 1994; Martin, Gouvier, Todd, Bolter, & Niccolls, 1992; Rose, Hall, & Szalda-Petree, 1995). Coaching in neuropsychological assessment involves providing information about brain injury to clients or research participants. Utilizing information concerning common brain injury symptoms, individuals appear to be able to simulate the performance of patients with authentic neurological impairment (e.g., Rogers, Gillis, Bagby, & Monterio, 1991).

Relatively minimal coaching has been found to be effective in producing sophisticated malingering. For example, Kerr et al. (1990) provided simulators with a magazine article regarding the effects of head injury, finding that the performance of participants in this study closely resembled the performance of participants with an authentic brain injury. Similarly, Martin, Gouvier, Todd, Bolter, and Niccolls (1992) found that a group of simulated malingerers who received rather brief coaching instructions performed worse than brain injury patients. This finding was replicated by

Hiscock, Branham, and Hiscock (1994), who found that additional information regarding the effects of brain injury allowed coached malingerers to alter their testing presentations to resemble patients with authentic neurological impairment. Additionally, Martin, Bolter, Todd, Gouvier, and Niccolls (1993) found that uncoached malingerers performed well below chance on a forced-choice symptom validity test while a coached group performed significantly better, although not so well as a group who had experienced authentic TBI insult.

In research similar to that presented above, Rose, Hall, Szalda-Petree, and Bach (1998) compared the performance of authentic TBI patients to coached and uncoached student simulators, finding that coached participants (while still performing worse than controls) performed significantly better than uncoached malingerers. Additionally, Rose, Hall, and Szalda-Petree (1995) administered a computerized version of the PDRT (PDRT-C) to controls as well as coached and uncoached simulated malingerers, finding that student simulators who have been provided with information about common symptoms associated with head injury demonstrated improved ability to escape detection by the PDRT-C. Although the simulators provided with brain injury information demonstrated more successful malingering, it should be noted that not all of these participants were able to escape detection in this study.

Dunn, Shear, Howe, and Ris (2003) tested the vulnerability of two popular malingering-detection instruments (the Computerized Assessment of Response Bias (CARB) and the Word Memory Test (WMT) to explicit coaching or brain injury information, finding that the tests showed little difference in differentiating normal from malingered performance in either naïve or coached malingering groups. Wolfe (2004)

examined the effects of coaching on simulated malingering performance using three symptom validity measures: the Victoria Symptom Validity Test (VSVT), the WMT, and the Letter Memory Test (LMT). Participants were randomly assigned to either naïve or sophisticated instructional sets. The author found that the performance of the two groups differed significantly on the symptom validity assessments employed.

In addition to findings from specialized malingering-detection instruments, many published studies exist on the effects of coaching on standard neuropsychological measures. Rapport, Farchione, Coleman, and Axelrod (1998), utilizing a dissimulation paradigm, used motor function tests (Grooved Pegboard Test, Grip Strength, and Finger Tapping Test) to compare naïve, coached malingerers, and control participants. Findings from this study revealed that the two malingering groups performed more poorly than the control group, although the malingering groups did not differ significantly from one another in terms of test performance. Coleman, Rapport, Millis, Ricker, and Franchione (1998) found that the California Verbal Learning Test – Second edition (CVLT-II) was less sensitive to malingering when simulated malingerers were given coaching instructions. Similarly, DiCarlo, Gfeller, and Oliveri (2000), after instructing participants to fake impairment on the Category Test, found that providing participants with specific instructions to avoid detection resulted in significantly more participants being misclassified as controls (i.e., more successful malingering).

Cato, Brewster, Ryan, and Giuliano (2002) assessed the ability of normal controls to simulate mTBI with or without the aid of general simulation strategies. In this study student simulated malingerers were given instructions to fake non-existing cognitive impairment with no guidance, a minimal level of guidance, or a moderate level of

guidance. The authors found that students provided with relatively brief simulation strategies were able to match the performance of a TBI group in only those instances when TBI performance was similar to the normal comparison group, although when TBI performance fell considerably below the normal comparison group, the performance of naïve simulators most closely mirrored the performance of patients with authentic TBI.

Despite the prevalence of research support emphasizing the significant effects of coaching on simulated malingering performance, several research studies have yielded results inconsistent with these findings. For example, Borckardt et al. (2003) found that coached and uncoached student simulated malingerers did not differ significantly in their performance on a driving inventory. Additionally, Martin, Hayes, and Gouvier (1996) found that, at times, coaching was ineffective and led to a lower performance in the coached group when this group was compared to an uncoached malingering group. Dunn, Shear, Howe, and Ris (2003) also found that the Computerized Assessment of Response Bias (CARB) and the Word Memory Test (WMT) could not accurately differentiate between naïve and coached malingering efforts. Similarly, Huskey and Hall (2002) found that three malingering groups composed of student simulators receiving different levels of instruction did not differ significantly in terms of test scores.

The Effect of Warning on Malingered Neuropsychological Performance

Additional research has found that warning participants prior to testing about the presence of measures that can detect insufficient effort can alter the test performance of simulated malingerers. In a survey of 188 professional members and fellows, 52% of respondents indicated rarely if ever providing a warning that measures of effort will be administered, while 27% of respondents indicated that they often or always provide such

a warning (Sharland & Gfeller, 2007). Johnson and Lesniak-Karpiak (1997) found that those analog malingerers who were cautioned about the presence of specialized malingering-detection techniques produced more sophisticated performances on assessment measures. Specifically, warning malingerers led these participants to improve their performance on select assessment instruments over those who were not warned, ultimately leading to 45% of the warned malingerers being misclassified as controls. Youngjohn, Lees-Haley, and Binder (1999) have also found that warning malingerers produces more sophisticated malingering on neuropsychological tests.

Suhr and Gunstad (2000) tested analog participants on a variety of neuropsychological measures, including the Warrington Memory Test, the PDRT, and the expanded Auditory Verbal Learning Test (AVLT). Although the researchers did describe using a coached condition in this study, this group did not receive explicit coaching-to-test instructions. Instead, this group was given a general warning that their efforts to fake impairment may be susceptible to detection. The researchers found that the warning instructions increased the ability of those participants to go undetected by specialized malingering-detection instruments.

The Role of Feedback in Symptom Validity Testing

Few researchers have examined the role of feedback in symptom validity testing. Bolan, Foster, Schmand, and Bolan (2002) conducted three experiments to validate the use of the English language version of the Amsterdam Short Term Memory Test (ASTM test), a malingering-detection measure. The researchers found that immediate feedback on the accuracy of test responses had no significant effect on performance, although trends in the direction of statistical significance were noted, with the presence of

immediate feedback influencing patients to perform worse on both the ASTM test and the TOMM). Bosh (2002) also examined the relationship between negative feedback regarding participant's responses during neuropsychological testing on their personality types and possible ways of maladaptive responding.

Malingering-detection techniques

Due to the difficulty inherent in the detection of malingering, researchers and clinicians have explored various statistical and clinical methods of ascertaining the presence of malingering. Select researchers and clinicians have employed multivariate statistical techniques, with some multivariate procedures being shown to be superior to clinical judgment in identifying malingering (Heaton, Smith, Lehman, and Vogt, 1978). At the same time, researchers have found that interviews with significant others enhanced the detection of malingering in a neuropsychological context (Sbordone, Seyranian, & Ruff, 2000).

Test Performance on Standard Neuropsychological Measures

Researchers have examined the test performance of suspected or known malingerers in detailed fashion in an attempt to identify markers of insufficient effort. Many researchers have focused on the serial position effect, a common phenomenon among normal as well as neurological patients. For example, Suhr (2002) examined the serial position effect (i.e., the tendency to remember more information from the beginning and end of word lists) using the AVLT in 34 individuals performing with relatively normal effort, 38 naïve malingerers, 33 warned malingerers, and 29 head-injured patients. In this study, the authors focused on the hypothesized tendency of malingerers to recall fewer words from the beginning of word lists, essentially leading to

a suppressed primacy effect. The results of this study suggest that a neuropsychologist conducting forensic work may interpret a suppressed primacy effect during learning trails as suspicious of insufficient effort. It should be noted that other researchers have failed to replicate this finding, finding that control and simulated malingerers do not demonstrate significantly different learning curves (Bernard, Houston, & Natoli, 1993).

Bush et al. (2005) identified six possible inconsistencies that can be observed when examining the performance of clients on standard neurocognitive tests: (a) inconsistent performance on empirically-derived indices obtained from scores on ability measures, (b) performance patterns on ability measures indicative of invalid responding, (c) inconsistencies between test results and known patterns of brain functioning, (d) inconsistencies between test results and observed behavior, (e) inconsistencies between test results and reliable collateral reports, and (f) inconsistencies between test results and documented background information (p. 422).

As stated by Tombaugh (1996), inconsistent performance often occurs when a person incorrectly guesses what cognitive construct a test may be measuring. This is exemplified in the finding that patients faking amnesia, when tested for memory, may provide incorrect information when asked their name, age, or date of birth (Wiggins & Brandt, 1988). This result is remarkable given the fact that amnesic brain-damaged patients seldom forget autobiographical information. Tombaugh (1996) hypothesized that it may be possible that individuals who fake amnesia may confuse amnesia secondary to brain damage with psychogenic amnesia, the latter referring to the loss of personal information from memory due to psychological causes.

Tombaugh (1996) points out that patients often incorrectly guess that measures of digit span assess memory, whereas these tests actually measure attention and concentration. The failure of clients to realize this discrepancy may provide useful information for examiners attempting to assess malingering. This is exemplified in work by Andrikopoulos (1994) and Mittenberg, Azrin, Millsaps, and Heilbronner (1993), who reported that patients faking cognitive impairment due to head injury frequently scored in the impaired range on digit span tests. This is in apparent contrast to findings that immediate attention remains relatively intact in TBI and global amnesia (Butters et al., 1988; Levin, Benton, & Grossman, 1982; Schacter & Crovitz, 1977; Squire, 1987; Strub & Black, 1985). Tombaugh (1996) points out that unusually low scores on measures of attention (e.g., Wechsler Adult Intelligence Scale – third edition (WAIS-III) Digit Span and the Wechsler Memory Scale – third edition (WMS-III)) may point to poor client effort.

Research has found that malingerers may fail to obtain correct responses on "easy" items on the Weschler Memory Scale – Revised (WMS-R), while at the same time mastering many of the more difficult items (Gronwall, 1991). There is also evidence to suggest that malingerers provide near misses to questions on intelligence tests. This is reflected in Bash and Alpert's (1980) finding that dissimulators provided approximate answers that were close to the correct responses (while still remaining inaccurate) on the Wechsler Adult Intelligence Scale – Revised (WAIS-R). Additionally, research has consistently demonstrated that malingerers perform worse on recognition tasks than on recall tasks (Beetar & Williams, 1995; Bernard, 1990; Wiggins & Brandt, 1988), a finding that is quite uncharacteristic of both control and neurological patients. Even with

the advent of these specialized procedures, malingering detection remains difficult, as exemplified by Lezak's (1995) indication that malingering is a "special problem" in clinical neuropsychology.

Other Factors

In addition to the use of specialized symptom validity measures, other methods have been developed to ascertain the validity of neuropsychological assessment findings. Although these techniques vary depending on the context of the evaluation, there are some relatively common methods for assessing symptom validity (Slick, Sherman, & Iverson, 1999). One such method is consistency of information obtained from interviews, observations, and test findings. As stated by Bush et al. (2005), the following inconsistencies may be indicative of the exaggeration or fabrication of symptoms: (a) self-reported history that is inconsistent with known patterns of brain functioning, (b) self-reported history that is inconsistent with documented history, (c) self-reported symptoms that are contradictory to the individual's documented history, (d) self-reported symptoms that are inconsistent with information obtained from reliable collateral informants, and (e) self-reported presence of absence of symptoms that are inconsistent with performance levels on psychometric tests.

Tombaugh (1996) outlined qualitative signs and symptoms of malingering on tests of cognitive abilities. These qualitative markers include neuropsychological disability that is disproportionate to the severity of injury, memory performance in which recognition scores are lower than recall scores, disproportionately impaired attention relative to learning and memory scores, and pronounced decrements in delayed recall. In general, a central hallmark of poor client effort during neuropsychological assessment is

a pattern of scores on neuropsychological tests that is inconsistent from those expected from neurological illness or injury (p. 20). See Appendix P for a complete list of common signs and symptoms of neuropsychological malingering.

Bush et al. (2005) consider data from subjective factors to hold considerably less weight in the identification of malingering than data from symptom validity assessments. Although subjective data may be less accurate than data obtained from symptom validity tests (Cragun, DenBoer, & Hall, 2004), it appears that information concerning psychological and behavioral variables may be valuable as a supplement to data from both standard neuropsychological measures and specialized symptom validity tests. In particular, the use of subjective data may have high utility when the use of malingering-detection instruments is not indicated (Meyers & Volbrecht, 2003). The use of subjective data to supplement finding from symptom validity measure is also supported by the following empirical work: Brandt (1988), Franzen, Iverson, and McCracken (1990), Nies and Sweet (1994), Pankratz (1988), Rogers (1988), Ruff, Wylie, and Tennant (1993), Trueblood (1994), Trueblood and Schmidt (1993), Wasyliw and Cavanaugh (1989), and Zielinski (1994).

It is also important to note that even if an individual is found to be malingering, this does not exclude the possibility that they may be experiencing authentic cognitive deficits. Bianchini, Greve, and Love (2003) found that even patients with moderate-to-severe brain injury are capable of exaggerating their symptoms. As stated by Tombaugh (1996), it is often impossible to pinpoints the effects of valid cognitive compromise when an individual fails to provide an appropriate level of effort on cognitive measures.

The Difficulty of Malingering Detection

Given the need for neuropsychologists to incorporate principles that have a sound scientific basis, (as delineated in *Daubert v. Merrell Dow* (1993)) clinicians have increasingly made decisions on the basis of results from standardized testing instruments. Although there has been an increase in the use of specialized symptom validity assessment measures to detect suboptimal effort, there has also been an increase in accessibility of information concerning the effects of brain injury to the general public. It is presently acknowledged that clients undergoing neuropsychological assessment can easily obtain information about head injury from a variety of sources, including (but not limited to) university and public libraries, television, friends and family, physicians, lawyers, and the Internet (Essig, Mittenberg, Peterson, Strauman, & Cooper, 2001).

Research studies have highlighted the difficulty in differentiating authentic brain injury from insufficient effort simply on the basis of low test scores (e.g., Heaton, Smith, Lehman, & Vogt, 1978). Faust, Hart, and Guilmette (1988) found that 87% of practicing neuropsychologists erroneously attributed test results to "cortical dysfunction" where 0 identified the patient's results as indicative of poor effort. Although Bigler (1990) has countered this finding with his assertion that "blind interpretation" is not a valid assessment of clinical accuracy, it should be noted that Heilburn, Bennett, White, and Kelly (1990) have estimated that 70% or more of patients assessed by a clinical neuropsychologist in a forensic context are thought to alter their presentations. Similarly troublesome is Youngjohn, Burrows, and Erdal's (1995) speculation that almost half of all workers' compensation claims may involve faked cognitive deficits. With such

potentially high base rates of malingering, clinicians must seriously consider that clients may not be putting forth a completely authentic presentation.

This appears especially true if the neuropsychological evaluation occurs in a medicolegal context. Lees-Haley (1997) and other researchers have raised concerns that litigating clients may be going to significant lengths to defeat malingering detection instruments on the advice of unethical attorneys. Youngjohn (1995) has confirmed the occurrence of an attorney coaching a client prior to neuropsychological testing. In this case, the lawyer provided the client with literature regarding malingering-detection measures as well as methods of simulating brain injury. Additionally, Loring (1995) found that neuropsychologists performed at chance level to about 20% above chance level in their ability to detect simulated malingerers.

Past research employing an analog paradigm has found that malingerers are capable of faking neurological deficits on standard neuropsychological tests, thus appearing similar to patients who have sustained a TBI (e.g., Hanlon-Inman & Berry, 2002; Heaton, Smith, Lehman, & Vogt, 1978). In the past researchers have relied upon malingerers over-exaggerating their deficits and producing an inconsistent pattern of test scores (Benton & Spreen, 1961; Goebel, 1983; Greve, Bianchini, Mathias, Houston, & Crouch, 2002; Heaton, Smith, Lehman, & Vogt, 1978; Suhr & Gunstad, 2000). As stated by Tombaugh (1996), if malingerers score patterns were thought to not make "neurological sense" then poor client effort was suspected. It has been asserted that the odd pattern of test scores displayed by malingerers reflects the erroneous belief that many laypersons have about neurological conditions and their associated sequelae (Aubrey,

Dobbs, & Rule, 1989; Hayward, Hall, Hunt, & Zubrick, 1987; Mittenberg, Azrin, Millsaps, & Heilbronner, 1993).

Although the notion that there is a typical "malingering profile" has received a great deal of theoretical support, empirical work has failed to support this concept. In fact, various research findings have led many researchers to question the idea of using results from standard neuropsychological tests to detect malingering (e.g., Guilmette, Hart, Giuliano, & Leininger, 1994). In contrast to Tombaugh's (1996) concept of an "odd" malingering profile, the results of recent research suggests that simulated malingerers may actually produce testing performances quite similar to brain-injured patients while, at the same time, escaping detection on well-validated symptom validity tests (DenBoer & Hall, in press; DenBoer, Cragun, & Hall, 2004; DenBoer et al., 2005).

The literature reviewed above makes it clear that it is possible to exaggerate or fake neuropsychological deficits in such a way as to closely approximate the performance of individuals with actual neurological deficits. This close approximation of performance results in malingerers escaping detection by well-validated symptom validity tests. This fact underscores the need for more information about various techniques of malingering and better methods of detecting malingerers. Despite recent efforts to develop more sophisticated methods of malingering detection, the identification of inadequate patient effort during the neuropsychological exam remains, as observed by Slick, Sherman, and Iverson (1999), "difficult and largely idiosyncratic."

The difficulty of malingering detection is exemplified by the finding that among expert neuropsychologists the majority of respondents indicated that only 10% of the litigants they assessed in the past year were "definitely malingering" (Slick, Tan, Strauss,

& Hultsch, 2005). In this study, approximately 79% of the respondents reported using at least one specialized technique for detecting sub-optimal client performance in every litigation assessment and 50% stated that they always give malingering tests at the beginning of the assessment. Highlighting the challenging nature of malingering-detection, additional findings revealed that almost half of the neuropsychologists sampled rarely used the term "malingering." In fact, more than 80% surveyed indicated that they report that tests results are invalid, inconsistent with the injury, or indicative of exaggeration.

Clinical Judgment and Malingering

Clinical judgment among psychologists, in the absence of psychometric data, has been shown by many researchers to have serious disadvantages and to be inaccurate when compared to more objective, empirical methods (Heaton, Smith, Lehman, & Vogt, 1978; Meehl, 1954). At the same time, research has shown that clinicians can in fact make highly reliable and valid judgments when these judgments are supported by psychometric testing (e.g., Westen & Weinberger, 2004). In an effort to detect poor client effort better, researchers and clinicians have proposed that neuropsychologists transcend basic clinical judgments by looking at specific test factors associated with neuropsychological performance. These specific factors are reviewed below.

Standard Neuropsychological Measures: Validity indicators

Psychometrically-based response validity markers are often found in standard neuropsychological measures, including the Halstead-Reitan battery (Goebel, 1983; Mittenberg, Rotholc, Russell, & Heilbronner, 1996), the Wechsler Memory Scale (Mittenberg, Azrin, Millsaps, & Heilbronner, 1993), the Category Test (DiCarlo, Gfeller,

& Oliveri, 2000), and the WAIS III – Digit Span (Wechsler, 1997a; Heinly, Greve, Love, Brennan, & Bianchini, 2004). These markers may serve to provide direct evidence of invalid performance on select cognitive measures (Greve, Bianchini, Mathias, Houston, & Crouch, 2002). While often promising, validity indicators derived from traditional neuropsychological instruments often suffer from inadequate sensitivity or specificity (Bernard, McGrath, & Houston, 1996; DenBoer & Hall, 2004; Greve & Bianchini, 2002; Hiscock, Branham, & Hiscock, 1994; Suhr & Boyer, 1999). Due to the limited psychometric characteristics for traditional neuropsychological instruments, specialized malingering-detection techniques have been developed.

Specialized Malingering-detection Instruments

In contrast to the relatively poor sensitivity and specificity of standard instruments, an array of specialized malingering-detection instruments have been designed. The majority of tests designed specifically to detect malingering employ symptom validity testing, which is based on a forced choice paradigm (Binder & Pankratz, 1987; Guilmette, Hart, & Giuliano. 1993; Hiscock & Hiscock, 1989; Pankratz and Binder, 1997; Slick, Hopp, Strauss, Hunter, & Pinch, 1994; Slick, Hopp, Strauss, & Spellacy, 1996). This paradigm involves the presentation of an initial stimulus (the target item) to an individual, after which that person is asked to select the target item when this item is paired with a foil.

In this testing paradigm, patients have a minimum 50% chance of guessing the correct answer. As such, symptom validity tests detect malingerers, in part, due to the propensity of these individuals to consciously answer below 50% accuracy (Loring, 1995). Due to the fact that more sophisticated malingerers do not typically perform

below chance-level, empirically-derived cutoff scores for each test are commonly used. As delineated by researchers such as Tombaugh (1997), Binder (1993a), and Binder and Willis (1991), these cutoff scores are both above chance level of responding and lower than scores obtained from neurological patients. When the patient's scores on a symptom validity test are lower than the scores of patients with authentic brain injury, malingering is strongly suspected (Tombaugh, 1997).

As neuropsychologists have recognized the challenge of malingering detection there has been a corresponding push for the use of multiple symptom validity measures during one assessment session. Given that the majority of malingering-detection instruments have imperfect sensitivity and specificity, the use of multiple symptom validity tests is thought to provide a more comprehensive detection method. This approach requires a criterion of multiple test failures as a minimum standard upon which to make a diagnosis of malingering (Slick, Sherman, & Iverson, 1999). As stated by Gouvier, Uddo-Crane, & Brown (1988), a disadvantage of employing the strict cutoff approach is that it may let more malingerers escape undetected (i.e., less sensitivity), although the conservativeness of this approach provides a greater degree of confidence in a diagnosis of malingering (i.e., greater specificity).

Portland Digit Recognition Test (PDRT)

One symptom validity test that uses a forced choice paradigm is the Portland Digit Recognition Test (PDRT; Binder & Willis, 1991). In an effort to improve on the sensitivity of this instrument, the researchers employed a series of distraction procedures. Although the PDRT was found to demonstrate respectable sensitivity and specificity, the fact that it is a relatively long test (i.e., approximately 45 minutes) ultimately has limited

its utility in clinical practice. Lezak (1995) states that patients who are performing with an optimal level of effort may become annoyed by the PDRT and start to give answers without attending to the test stimuli. A computerized version of this test has been developed (PDRT-C; Rose, Hall, & Szalda-Petree, 1995). Additionally, an abbreviated form of this test is also in use (Binder, 1993b).

Test of Memory Malingering (TOMM)

Given the challenges associated with the PDRT, the TOMM (Tombaugh, 1996; 1997) was developed as an alternative. The TOMM presents 50 line-drawings of common objects to the client or participant at a rate of 3 sec each with a 1 sec inter-stimulus interval. Research has shown that investigators using the TOMM are capable of identifying malingerers who have been coached on how to fake non-existing brain damage. The TOMM has been validated in a diverse sample of neurological populations, including litigating and non-litigating patients with TBI and patients with dementia, aphasia, and individuals experiencing acute pain (Ashendorf, Costantinou, & McCaffrey, 2004; Etherton, Bianchini, Greve, & Ciota, 2005; Gansler, Tombaugh, Moczynski, & Rees, 1995; Rees, Tombaugh, Gansler, & Moczynski, 1998). Additionally, mTBI patients currently involved in litigation perform worse on the TOMM than nonlitigating patients, showing the test's ability to detect suboptimal performance due to external motivation (i.e., financial gain; Tombaugh, 1996). The TOMM is the most frequently-used symptom validity measure both among neuropsychologists with special expertise in malingering research and those in private practice (Slick, Tan, Strauss, & Hultsch, 2004; Shandera, Hall, DenBoer, & Crouse, 2005).

The TOMM has been found to effective with various populations, including patients with right hemisphere lesions and patients with dementia (Gavett, Fisher, & McCaffrey, 2005). The TOMM has also been shown to be valid for use with a psychiatric population. Specifically, Ruocco et al. (2005), using factor analytic methods, delineated two distinct components for neuropsychological and psychiatric forms of malingering. Additionally, researchers have approved the use of the TOMM with individuals diagnosed with moderate to severe depression and anxiety (Ashendorf, Costantinou, & McCaffrey, 2004).

Despite the extensive validation of the TOMM, this measure has been found to be inappropriate when used with select populations. While Kennedy et al. (2005) found that the TOMM was appropriate for use in individuals with intellectual functioning in the mildly deficient range, the researchers concluded that the test may be inappropriate for individuals functioning within the low range of intellectual functioning (i.e., individuals with FSIQ < 70). Similarly, Trial 1 of the TOMM (although not Trial 2 or the Retention Trial) has been shown to be sensitive to the effects of acute anxiety and depression (Finlay, O'Bryant, & O'Jile, 2005). Recent research has emphasized the importance of administering the Retention Trial when the TOMM is the only malingering-detection used in a battery (Greve & Bianchini, 2007).

Test of Memory Malingering – Second Edition (TOMM-2)

In an effort to improve upon the TOMM, the TOMM-2 was developed as a supplement (Tombaugh, 2002). The TOMM-2 was designed to appear to be a more difficult test than the TOMM (i.e., increased face validity) by employing 24 abstract

geometric figures rather than pictures of common objects. Similar to the original version, the TOMM-2 also utilizes a forced-choice recognition paradigm.

Tombaugh (2002) presented the normative results of a study with 83 healthy adults and two studies involving malingering groups. The first malingering study used students who were either asked to simulate a head injury in order to achieve monetary compensation (*n*=31) or to try their best (*n*=31), whereas the second study tested 112 TBI patients using both the TOMM and the TOMM-2. In this second study, malingerers (*n*=16) were empirically-chosen as those who did not meet the cutoff score of 45 on TOMM Trial 2 or on the TOMM retention trial. The experimenters found that the TOMM-2 did not discriminate between malingering and non-malingering subjects as well as did the original TOMM. The authors stated that further modifications on the TOMM-2 are needed before it can be considered as a "stand-alone" effort measure.

Multidimensional Inventory of Neuropsychological Dysfunction (MIND)

Since the advent of the TOMM, other symptom validity tests have been developed. For example, Holmquist and Wanlass (2002) developed the MIND, a measure that utilizes eight multiple, empirically-based strategies to detect poor effort. This measure was designed as an attempt to fuse several existing malingering detection strategies into one symptom validity test; the eight scoring indices on the measure reflect the diversity of malingering-detection methods that currently exist in the effort literature (Forced-Choice, Split, Similarity, Grouped vs. Ungrouped, Sequence, Consistency, Recall, and Learning). Using six of the eight predictor variables (Forced-Choice, Grouped vs. Ungrouped, Learn, Recall, Sequence, and Split indices), the MIND yielded an overall classification rate of 68%, reflecting only a 10% false negative rate in the

malingering group. The particular advantage of the MIND appears to be its sensitivity to a variety of malingering strategies, although cross-validation of the instrument in a larger sample is needed.

Victoria Symptom Validity Test (VSVT)

The VSVT, developed by Slick, Hopp, Strauss, and Spellacy (1996), is a well-validated forced-choice malingering-detection instrument. The researchers have studied the performance of various patient groups on the VSVT and, on the basis of these research findings, developed a three-level classification system for identifying malingering participants. Although invalid scores are defined by the test authors as definitive signs of malingering or insufficient effort, performance in questionable or invalid ranges emphasizes the need to look at other data to determine if the patient is putting forth sufficient effort (Slick, Hopp, Strauss, & Spellacy, 1996; Slick, Hopp, Struass, & Thompson, 1997). Recent research has elucidated the latent structure of cognitive symptom exaggeration on the VSVT (Frazier, Youngstrom, Naugle, Haggerty, & Busch, 2007). The need for cross-validation of insufficient effort appears consistent with the criteria for MND put forth by the authors.

Computerized Assessment of Response Bias (CARB) and Word Memory Test (WMT)

Although other specialized malingering detection measures have been developed, most prominent among the newer symptom validity tests are the Computerized Assessment of Response Bias (CARB) and the Word Memory Test (WMT; Green, 2005). Both tests are extensively researched and well-validated. For example, Dunn, Shear, Howe, and Ris (2003) found that both tests differentiated “normal” from “malingered” instructional sets and showed little difference in specificity and sensitivity between naïve

and coached malingering efforts. Although the researchers found little difference between a brain injury information and no-information condition, it was found that response times (when added to total items correct) were effective in detecting those who were not giving optimal effort from malingerers. The WMT has undergone extensive validation, including validation with dementia patients and patients with psychiatric disorders (Patton, Mittenberg, Lowenstein, & Roberts, 2004).

Comparison Studies of Symptom Validity Tests

As new specialized malingering-detection instruments have been developed researchers have tested the psychometric characteristics of these measures versus one another in head-to-head comparison studies. Vickery, Berry, Hanlon-Inman, Harris, and Orey (2001) used a meta-analysis to summarize 32 studies of commonly researched neuropsychological malingering tests in an effort to evaluate their effectiveness in differentiating individuals giving good effort from those giving suboptimal performance. The researchers found that studies using the PDRT, Digit Memory Test (DMT) (Prigatano & Amin, 1993), 15-Item Test (Rey, 1941, 1964), and the Dot Counting Test (Binks, Gouvier, & Waters, 1997) yielded moderate effect sizes, indicating that malingerers obtained scores that were approximately 1.1 standard deviations below those of honest responders. Additionally, although the DMT, PDRT, 21- and 15-Item tests all demonstrated high specificity, the DMT displayed the highest sensitivity of all the tests. The authors noted that the relatively modest sensitivity of all the measures included in their review lend support for the notion that effort tests should not be used in isolation. Indeed, they argue, multiple effort tests should be employed to accurately gauge client motivation throughout a single assessment.

Additionally, these findings were also cross-validated with behavioral observations taken from the assessments conducted. The authors incorporated the methodological recommendations employed by Rogers (1990a; 1990b), resulting in a design in which they utilized college students with a history of mild head injury as simulated malingerers. A total of 108 participants were initially recruited for the study. Fifty-five participants were selected from a pool of individuals enrolled in Introduction to Psychology due to their history of head injury of at least mild severity (determined by self-reported loss of consciousness following head injury and self-reported post-traumatic amnesia). In this study, the authors also aimed to increase generalizability by using a relatively standard battery of tests. The LMT and the DMT attained the highest hit rates for the detection of malingering, while the sensitivity of the other measures used in the study declined upon cross-validation. Despite the development of new measures of malingering detection, in addition to the aforementioned revisions in clinical guidelines in malingering detection, significant disagreement still exists amongst clinicians about the validity of neuropsychological test results (Green, 2001).

DenBoer and Hall (2004) compared the psychometric properties of the TOMM with those of a standard neuropsychological measure, the Wisconsin Card Sorting Test (WCST). In this study validity indicators proposed by Bernard, McGrath, and Houston (1996) were used for the WCST. Analysis revealed that the TOMM accurately identified significantly more coached malingerers than the WCST (66% vs. 22%, respectively). The WCST also demonstrated a high false positive error rate (i.e., identifying actual controls as suspected malingerers) significantly more than the TOMM (12% vs. 0%). The results of this study suggest that well-validated tests designed to detect malingering

may be superior in identifying malingerers when compared with traditional instruments measuring brain functioning. This finding corroborates results from Greve and Bianchini (2002), who found that the WCST "malingering equations" developed by Bernard, McGrath, & Houston (1996) and Suhr and Boyer (1999) produced high false positive error rates in most samples.

Malingering Detection: The Future?

In an effort to better detect malingerers, investigators are supplementing traditional forced-choice procedures with relatively sophisticated techniques. Rosenfeld, Sweet, Ellwanger, and Song (1996) developed a procedure for using event related potential (ERP) recording instruments in addition to traditional malingering-detection instruments. Additionally, litigation cases involving brain injury are increasingly utilizing video surveillance tapes from private investigators (Woltersdorf, 2005). Client presentations on such tapes are then coupled with responses to both standard and effort measures.

As the state of the art of malingering detection progresses, many computerized versions of paper-and-pencil measurements are being constructed. It is thought that computerized versions of these tests may appear more like standard tests to patients (i.e., have higher face validity as standard neuropsychological measures), thus increasing the ability of the test to detect insufficient client effort. Research concerning the importance of face validity is emphasized below.

Face Validity

Described by Anastasi (1988) as what a test appears to measure, face validity is an important component in the development of malingering-detection instruments.

Although few researchers have explicitly examined this construct, it appears to be an essential component in the development of symptom validity measures (Bornstein, Rossner, Hill, & Stepanian, 1994). Mosier (1947) indicated that a measure "should not only be valid but it should also appear valid" in terms of being "practical, pertinent, and related to the purpose of the test" (p. 192). Additionally, Nevo (1985) noted that the attitudes of participants regarding a test may be impacted by a multitude of factors, including when they are asked to rate their beliefs regarding the purpose of the test.

Bornstein (1996) found that face validity can have both a positive and negative impact on test performance. As cited by the author, an intelligence test with high face validity (i.e., the test appears to measure intelligence) has the potential of increasing the motivation and effort of participants to perform well, particularly if individuals perceive this test as an intellectual challenge. In contrast, if a test has low face validity, this may lead to a decrease in the participant's motivation and effort to perform well, particularly if a participant perceives a test as assessing suboptimal effort rather than actual cognitive aptitude.

Bornstein (1992; 1996) examined the result that women are typically more willing than men to report dependency traits, finding that score on dependency tests that have high face validity for assessing these traits are consistently lower among male than female responders. At the same time, on dependency tests with low face validity the women and men in the study scored in a similar fashion. Additionally, Bornstein, Rossner, Hill, and Stepanian (1994) have shown that when an individual realizes the purpose of a test they may consciously decide to answer questions dishonestly. It is clear from these results that a malingering-detection instrument must have high face validity as

a test of neuropsychological aptitude (e.g., memory), rather than appear like a measure designed to assess client effort.

In studying the face validity of personality measures, Rees and Metcalfe (2003) found that only 36% of mental health professionals believed that personality questionnaires were effective. A high number of clinicians endorsed their belief that it is easy for clients to provide favorable impressions of themselves on personality measures (i.e., fake good). Many of the same professionals also indicated that it was difficult for qualified professionals to identify fake-good responses. According to the researchers, 17% of the respondents indicated that they would either "probably" or "definitely" provide unrealistically favorable impressions of themselves if they were given a personality questionnaire during an interview for a highly desirable job (p. 158).

Face validity reactions were examined in Caucasian and African-American college students (Chan & Schmitt, 1997). After giving the students information about the desired qualities of a production worker, the researchers asked them about their beliefs regarding the relationship between the tests they were administered (paper and pencil tests vs. video-based) and the occupational aptitude of a production worker. The researchers confirmed their hypotheses that face validity perceptions were higher for the video-based test than for the paper-and-pencil test (i.e., participants viewed the video test as more favorable and representative of the job). Interestingly, Caucasian students reported higher face validity ratings for the paper-and-pencil test compared to African-Americans students. It is probable that the differences in the face validity rating of the tests negatively impacted the Black student's motivation and, as a result, suppressed their overall test performance.

Chan, Schmitt, DeShon, Clause, and Delbridge (1997) demonstrated that the test performance of participants, motivation, and perceptions regarding the face validity of measures are all factors that interact during testing procedures. In studying these factors in college students, the researchers found that face validity perceptions of the first administered measure affected the performance of participants on a similar test that was subsequently administered. According to these researchers, this effect was mediated by the participant's test motivation. The results highlighted the substantial impact that an individual's view of selected tests may have upon other measures within the evaluation.

As shown above, face validity is an important area of concern in the development of valid and reliable psychological measures. Similarly, face validity has taken on an increased importance in the detection of malingering. It has been shown by researchers that malingerers who detect the purpose of malingering-detection tests perform in a more sophisticated fashion, producing scores that are in the non-impaired range (Cercy, Schretlen, & Brandt, 1997). In light of this finding, it is critical for any malingering-detection instrument to possess high face validity.

Tombaugh (1997) examined the face validity for the TOMM, finding that participants viewed the TOMM as an actual test of memory when it was administered along with other neuropsychological measures. Additionally, Rees, Tombaugh, Gansler, and Moczynski (1998) found that the TOMM was viewed as a memory test when it was administered in a battery of other standard neuropsychological measures. Similarly, Simonds, DenBoer, and Hall (2004) found that the TOMM had relatively equal face validity as a standard neuropsychological measure when used in the context of an abbreviated cognitive battery.

Tan, Slick, Strauss, and Hultsch (2002) examined the face validity of the TOMM, WMT, and VSVT. The researchers found that the WMT displayed the best face validity, with approximately 31% of respondents viewing it as a cognitive measure. This was followed by the VSVT, with 23% of respondents viewing this as a cognitive test. In this study, the TOMM displayed the worst face validity, with only 10% of respondents indicating that the TOMM was a true measure of cognitive ability. On the other hand, it should be noted that the TOMM was noted as being both a malingering-detection instrument and a neuropsychological tests by more than half of the participants.

Examining the face validity of malingering and standard neuropsychological tests via questionnaires, Huskey and Hall (2003) found that student participants viewed the TOMM and PDRT as similar to standard cognitive measures. These results show that participants, when provided with a brief warning about the presence of malingering-detection instruments, may be able to discriminate between symptom validity tests and standard assessments. These findings have important implications for the development of improved malingering-detection measures.

Response Latency in the Assessment of Client Effort

Response latency has been shown to be an effective variable in detecting brain injury simulators on a variety of neuropsychological measures. Specifically, when used in conjunction with other indicators of dissimulation, response latency has been shown to be an effective indicator of poor client effort on computerized versions of the Wisconsin Card Sorting Test and the Category Test (Hall & Croyle, 1997) as well as the Portland Digit Recognition Test (Rose, Hall, & Szalda-Petree, 1995). Huskey (2005) found that response latency was effective in differentiating control participants from simulated

malingerers. Specifically, when compared to malingerers control participants were found to respond significantly faster to both easy and difficult items on the Victoria Symptom Validity Test (VSVT). Empirical support has been shown for the efficacy of measuring a patient's average response time to both correct and incorrect items on computerized neuropsychological tests (Haines & Norris, 1995).

The Role of Visual Memory in the Assessment of Client Effort

Given that memory problems are the most common patient complaints and frequently represent the initial symptoms of acquired brain injury, neuropsychologists must be able to detect malingering on tests that measure an individual's ability to learn and retain information that has been recently encoded into memory (Brandt, 1988). Additionally, untrained individuals typically think of memory as a cognitive area that will receive significant decrements as the result of head injury (Huskey, 2005).

When devising a malingering-detection measure the stimulus materials used are of paramount importance. The criteria for good malingering-detection stimuli are that they perpetuate the high face validity of the measure (i.e., foster the impression that the test is a relatively difficult measure of cognitive impairment), resulting in the perceived difficulty of the test being significantly higher than its actual difficulty (Tombaugh, 1996). Additionally, the stimuli employed by a symptom validity test should be sensitive to malingering while being insensitive to the effects of authentic brain injury.

A multitude of studies have shown that pictures presented visually work well in accomplishing these goals, as they appear difficult to participants while, at the same time, are quite easy. In fact, several studies have shown that individuals have a high capacity for storing and retrieving visual information (Nickerson, 1965, 1968; Shepard, 1967).

Tombaugh (1996) found that the majority of patients with significant cognitive impairment (corroborated by radiological findings that were positive for a variety of serious concerns) displayed passing performance on the TOMM, a test that employs line-drawings of common objects. Additionally, aphasic, TBI, and dementia patients (many with significant radiological findings) also scored, on average, in the range of 90 to 95% correct on all TOMM trials. It should be noted that the majority of participants in Tombaugh's sample displayed significant verbal and visual memory deficits, as reflected by their scores on a measure of learning and memory for verbal information, the California Verbal Learning Test (CVLT), and a measure of visual memory, the Visual Reproduction subtest of the Wechsler Memory Scale – Revised (WMS-R).

Human Visual Memory for Pictures

Human visual memory for pictures has been shown to be a relatively robust phenomenon. Throughout many studies, individuals have demonstrated an impressive ability to remember pictures they have seen before. This finding has been demonstrated in both recognition (Nickerson, 1965) and recall paradigms (Bousfield, Esterson, &Whitmarsh, 1957). For example, Standing, Conezio, and Haber (1970) exposed 1,100 pictures to 2 participants for 5 seconds each, finding that both subjects correctly identified 95% and 99% of the pictures (respectively) on a recognition trial after a 30-minute delay. The researchers replicated this level of retention using 120 pictures that were presented for 1 second each. In addition to the work of Tombaugh (1996), the robustness of recognition memory has been demonstrated by other researchers in older adults and in other populations with acquired brain injury (Freed, Corkin, Growdon, &

Nissen, 1989; Hart & O'Shanick, 1993; Huppert & Piercy, 1976; 1978; 1979; Kopelman, 1985; Park, Puglisi, & Smith, 1986; Winograd, Smith, & Simon, 1982).

Shepard (1967) found that when participants were exposed to a series of approximately 600 stimuli selected at random they were able to correctly recognize information presented in visual format (i.e., pictures) approximately 98% of the time. Vision for pictures appears to be the most accurate modality for recognition memory, as depicted by the author's finding that participants only recognized approximately 90% of the words shown to them, whereas visual recognition for sentences appeared to be only 88%. Martone, Butters, and Trauner (1986) found that, with prolonged exposure times, patients with Korsakoff's syndrome and patients with Huntington's Disease did not differ from a normal control group in terms of the features of the stimuli that they analyzed and remembered.

It appears that human visual memory is best for relatively complex pictures. Park, Puglisi, and Smith (1986) found that participants remembered normal photographs significantly better than they remembered high-contrast photographs or line drawings. The researchers found that participants remembered the most elaborate pictures best upon both immediate and delayed (i.e., 4 weeks later) recall. In this study the researchers also concluded that old (i.e., 60 years old or older) and young (i.e., college students aged 18 to 36) adults profited equally from visual embellishment and that memory for meaningful pictures remained relatively intact with age. Additionally, Park, Puglisi, and Sovacool (1984) found an effect for embellishment of pictures with older adults.

Certain qualities of complex pictures appear to account for client's increased ability to remember them. Pezdek (1987) compared the effect of the amount of physical detail

in pictures on picture recognition memory for 7-year-olds, 9-year-olds, young adults, and older adults over 68. Results revealed that all subjects were less accurate in detecting deletions from changed complex pictures than additions to changed simple pictures. Based on these findings, the author concluded that visual information that communicates the central schema of each picture is more likely to be encoded and retained in memory than information that does not communicate this schema.

Nelson, Metzler, and Reed (1974) presented college students with three different types of visual pictures that varied along a continuum of embellishment or detail. In this study the high embellishment pictures consisted of black-and-white photographs with a great deal of background detail. The moderate level pictures were line drawings of the photos with a great deal of background detail present, whereas the low embellishment pictures consisted of line drawings with no background detail. In this study the authors varied the pictures along two dimensions: detail within objects (photograph (which contains more detail) vs. a line drawing), and background detail. The authors reported no effect of detail, as all their participants were at ceiling on visual immediate recognition for stimuli.

Memory for Complex Pictures

Given the relatively high visual memory capacity of human beings as well as the need for improved face validity among malingering-detection instruments, the current dissertation project aims to develop a test of memory malingering by employing a recognition procedure using digital photographs of complex visual scenes. This computerized measure (described in greater detail below) is named Memory for Complex Pictures (MCP). In an effort to improve on many existing symptom validity measures,

the current dissertation project proposes to construct a malingering measure with improved face validity, specificity, and sensitivity. It is anticipated that a computerized measure of malingering will have high face validity as an actual measure of memory.

The research questions in the dissertation are explored using experimental methodology. The general aim of these experiments was to develop and validate the MCP as a malingering-detection instrument. In order to accomplish this goal, the MCP was validated among neurological patients, controls, and simulated malingerers. This validation process took the form of the following two experiments.

Purpose of Experiment 1

Experiment 1 had two goals: 1) to compare the sensitivity, specificity, and face validity of the MCP with the psychometric characteristics of a frequently-used and well-validated symptom validity measure, the TOMM and 2) to examine the effect of coaching on the test performance of controls, coached malingerers (CM) and uncoached malingerers (UM).

The first goal was designed to compare the ability of the MCP and the TOMM to detect students who are simulating a brain injury during neuropsychological testing (i.e., sensitivity). Additionally, these two measures were compared in their ability to differentiate the performance of malingerers from individuals performing to the best of their ability during testing (i.e., specificity).

The second goal was designed to delineate what type of information regarding head injury is needed for relatively naïve college students to realistically recreate the neuropsychological performance of an individual with a mild TBI. To this end, the type of coaching instructions given to simulated malingerers was manipulated. Specifically,

the instructions of CM contained a paragraph about the common symptoms of head injury along with a warning not to overexaggerate deficits, while the instructions of UM did not contain this additional paragraph. As previously noted, the majority of research has supported the effect of coaching instructions on aiding simulated malingerers in producing more realistic performances during neuropsychological testing.

Hypotheses for Experiment 1

1) It was hypothesized that all control participants would obtain significantly higher scores on the MCP than CM and UM. Additionally, CM were hypothesized to obtain significantly higher scores on the MCP than UM.
2) It was hypothesized that all control participants would obtain significantly higher scores on the TOMM than CM and UM. Additionally, CM were hypothesized to obtain significantly higher scores on the TOMM than UM.
3) It was hypothesized that control participants would have significantly quicker response latencies (both correct and incorrect choices) on the MCP compared to both UM and CM.
4) UM and CM were hypothesized to have slower response latencies on items in which they responded incorrectly. CM were hypothesized to have faster response times on both correct and incorrect items than UM. The response latencies of CM were hypothesized to be slower than those of controls on items in which they give incorrect responses.
5) It was hypothesized that controls would provide more consistent responding on the MCP and the TOMM. Specifically, participant's responses to each item on Trial 1 and Trial 2 on both tests were compared to determine if participants

missed an item on Trial 2 that they answered correctly on Trial 1. UM were hypothesized to provide the most inconsistent responding on both the MCP and TOMM. CM were hypothesized to provide significantly more consistent responding than UM on both measures, although the consistency of responding of this group was predicted to be below that of controls.

6) It was hypothesized that the MCP would demonstrate higher overall face validity as an actual measure of visual memory than the TOMM. Specifically, on Post-experimental Questionnaire 1 (PEQ1) it was anticipated that the MCP would be endorsed by more participants as an actual measure of neuropsychological functioning (e.g., a memory test) than the TOMM. On PEQ2, it was anticipated that the MCP, when compared to the TOMM, will receive less endorsements as a malingering-detection measure and that the MCP would receive a lower numerical rating of how confident participants are that the measure was a symptom validity test than the TOMM.
7) It was hypothesized that the MCP would demonstrate improved sensitivity and specificity when compared to the TOMM. Additionally, it was predicted that both the MCP and TOMM would correctly detect significantly more UM as compared to CM participants.
8) It was hypothesized that all control participants would obtain significantly higher scores on all standard neuropsychological measures than CM and UM. CM were hypothesized to obtain significantly higher scores on standard measures than UM.
9) Compared to controls, UM and CM were predicted to demonstrate greater time discrepancy between Trail Making Test – Part A and Trail Making Test – Part B.

Specifically, UM were hypothesized to show the greatest time discrepancy between the two measures, followed by the performance of CM and then by the performance of controls, who were hypothesized to have the lowest time discrepancy.

10) It is hypothesized that participants, regardless of group designation, would endorse the following symptoms as most strongly associated with head injury (i.e., endorsement of 4 or 5): "memory problems" and "attention problems, difficulty concentrating, slowed-thinking, *and/or* decrease in problem-solving abilities. It was further hypothesized that participants, regardless of group designation, would endorse symptoms as least strongly associated with head injury (i.e., endorsement of 1 or 2): "language problems, speech problems, *and/or* trouble finding the correct word" and "anxiety, depression, temper is lost easily, *and/or* irritability."

Experiment 1

Method

Participants and Procedure

Participants were students enrolled in an Introduction to Psychology course at The University of Montana. Participants received partial course fulfillment of the course experimental credit requirement as compensation for their participation. All participants were at least 18 years of age and were treated in accordance with the American Psychological Association's (2002) "Ethical Principles of Psychologists and Code of Conduct."

During a designated screening day all potential participants were screened for psychological symptoms and current mental health treatment, neurological conditions, and substance abuse problems as assessed by the medical and health history questionnaire (see Appendix A). Students who indicated experiencing current psychological or neurological symptoms or stated that they were currently receiving treatment for mental health problems were not invited to participate in the experiment. Students who answered yes to three or more of the five items on the substance abuse portion of the screening measure were also not asked to participate.

Participants received one of three types of instructions. The order of these instructions was randomized (without replacement). Control participants were asked to perform to the best of their ability, while uncoached simulated malingerers (UM) received the following instructions:

> You are about to take some cognitive tests that examine mental abilities such as attention, memory, thinking and reasoning skills, and your ability to think quickly. While responding to the tests, please pretend that you have experienced brain damage from a car accident involving a head-on collision. You hit your head against the windshield and were knocked out for 15 minutes. Afterwards, you felt "dazed" so you were hospitalized overnight for observation. Because the driver of the other car is at fault, you have decided to go to court to get money from the person responsible. During the next few months following the accident, the negative effects from your head injury disappear. Your lawsuit has not been settled yet, and your lawyer has told you that you may get more money if you look like you are still suffering from brain damage.
>
> As you pretend to be this car accident victim, try to respond to each test as a patient who is trying to appear brain damaged in order to get money from the lawsuit. Thus, your performance on the tests should convince the examiner as well as the people involved in deciding the outcome of your lawsuit that you are still suffering from brain damage. *If you succeed in convincing the examiner that you have suffered a brain injury, you will receive two additional experimental credits, for a total of 6 credits.*

Coached simulated malingerers received the same instructions as above, but with the following additional paragraph:

> Try to produce the most severe problems that you can *without* making it too obvious to the examiner. Major exaggerations, such as remembering absolutely nothing, are easy to detect. If the examiner does not believe that you have any problems you will not get any money for your head injury. People who have a head injury often have problems paying attention, cannot remember things as well, and do not learn things as easily as they did before their injury. They also think a little slower than they used to. Keep this in mind when taking the tests. Remember you are to try to mimic the performance of persons who are truly brain damaged.

All participants were administered the medical and health history questionnaire, followed by the MCP. These measures were followed by an abbreviated version of Post-Experimental Questionnaire 1.

Materials

Medical and Health History Questionnaire. A medical and health history questionnaire was used to assess participants' history of psychological, neurological, and substance abuse conditions (see Appendix A). This questionnaire has been used in previous studies within The University of Montana Neuropsychology Laboratory (e.g., DenBoer & Hall, 2004; DenBoer et al., 2005; Simonds, DenBoer, & Hall, 2004; Hoffman, DenBoer, & Hall, 2005; Huskey, 2005). This measure is designed to serve as a post-experiment screening measure. Specifically, the data from participants who passed all the screening measure criteria and who participated in the study was excluded from analysis if participants endorsed current psychological symptoms and/or mental health treatment, neurological conditions, or substance abuse problems.

MCP. The MCP is a forced-choice, two-alternative measure consisting of digital photographs of complex visual scenes. It is designed to assess level of client effort during neuropsychological assessment. The test begins with a sample trial using 3 digital photographs immediately followed by a recognition trial that pairs the target stimulus pictures with comparable foils. Participants are required to recognize all three sample items correctly before proceeding to Trial 1. Participants have three opportunities to correctly complete the sample trial. If they fail all three trials the test is cancelled.

Fifty photographs are presented in a fixed order over the course of two learning trials, although the order of stimulus presentation is not the same for each trial. During both learning trials the individual is exposed to all 50 photographs presented for 3 sec each with a 1 sec inter-stimulus interval. Immediately following each learning trial is a recognition trial. All pairs are the same in Trails 1 and 2 but are presented in a different order over the course of the two learning trials. Given that a total of 50 correct responses per trial can be obtained, a total score of 25 or below on Trial 2 represents chance level of performance. A cutoff score on MCP Trial 2 was empirically-derived at the conclusion of this study via the results of Experiments 1 and 2.

After completing the stimulus presentation trials, participants view a brief screen that provides them with instructions for the recognition trial. The recognition trial immediately follows each presentation trial. In the recognition trial the target stimulus is paired, following Tombaugh's (1996) procedure, in vertical fashion with a foil and the individual is asked to choose the image that they remember seeing previously. The examinee chooses an image by pressing the "2" key for the top picture of the pair or the "8" key for the bottom picture. As an alternative, the examinee is also allowed to use the

keyboard arrows, with ↑ denoting the top picture and ↓ denoting the bottom picture. The foil is another complex visual scene that closely resembles the target scene. The same procedure is followed for the second presentation and recognition trial.

The MCP contains a feedback mechanism that allows the individual to receive immediate input if their responses are correct or incorrect. Specifically, during the recognition trial if the examinee chooses the target stimulus the word "RIGHT" appear in all caps, 18-point, bold font, approximately two inches to the right of the target stimulus. Both the target stimulus and the foil are present for .75 sec. If the examinee selects the foil instead of the target, then the word "WRONG" appears to the right of the foil and both pictures remain on screen for .75 sec. In addition to visual feedback, verbal feedback can also provided in the form of a recorded human female voice that stated the words "WRONG" and "RIGHT" to the examinee. This auditory feedback mechanism can be turned on and off by the examiner.

Based in part on the work of Reitan and Wolfson (1997), Rose, Hall, Szalda-Petree (1995) and others, the MCP measures the following response latency variables: average response latency for correct and incorrect responses for both Trial 1 and Trial 2, average response latency for correct and incorrect responses for the MCP as a whole, and average response latency for top and bottom responses. All response latency values are measured by computer and are recorded in milliseconds (ms).

In addition to response latency, the MCP also measures response consistency. Specifically, a Consistency Index, a numerical rating of the consistency of examinee responses from MCP Trial 1 to 2, was computed. The Consistency Index is a numerical rating (in the form of a percentage) of the number of objects that the individual answers

the same to from the first to the second recognition trial. Specifically, if an individual gets an item correct on Trial 1 but gets this item incorrect on Trial 2, then this response will be coded as "inconsistent." The number of consistent items are totaled, divided by the total possible responses, and converted into a percentage to form an overall Consistency Index.

In addition to measuring total correct responses, average response latency, and response consistency, the MCP employs an "Average Run Index" for both correct and incorrect responses. The Run Index is a numerical rating of the average number of correct and incorrect responses the examinee obtains in a row per trial. An Average Run Index was calculated for both trials and these results were collapsed for the test as a whole.

The MCP employs both visual and auditory feedback components. The visual feedback components include the word "RIGHT" and "WRONG" being displayed after each trial. This is accompanied by a recorded human female voice stating these words. The MCP also contains two forms of non-verbal auditory feedback (i.e., a beep) that can be used to designate whether the words are correct or incorrect. These options can be turned on an off by the examiner prior to test administration. All participant data derived from the MCP is automatically saved and written to a test database, in addition to being converted directly into a Microsoft Excel file.

When participants arrived for testing, they were asked if they required corrective visual aids (e.g., glasses, contacts; see Appendix A). Data from participants who were not wearing their prescribed corrective aids was not analyzed. For clients or participants with potential visual acuity problems, the sample trial served as a check to see if the

individual was experiencing problems seeing. Specifically, if the examinee was not able to obtain three correct responses on the sample trial they were given another chance to complete it correctly. If they are not able to complete all sample items accurately in three tries, they were not allowed to take the test.

Test of Memory Malingering (TOMM). The TOMM is a 50-item, two-alternative, forced-choice measure of client effort used during neuropsychological evaluation. This measure consists of two learning trials and a delayed retention trial. Both learning trials contain the same 50 line drawings of common objects, although they are presented in a different order between trials. The examiner administers these trials using three separate paper booklets, (Trial 1, Trial 2, and the Retention Trial). During administration of the learning trials the examiner exposes each line drawing for 3 sec each followed by a 1 sec inter-stimulus interval. Each learning trial is followed immediately by a recognition trial. During the recognition phase the target stimulus and another line drawing (the foil) are presented in vertical fashion on a small page and the examinee is asked to point to which picture they were shown before. The vertical presentation of test stimuli was a conscious attempt by Tombaugh (1996) to reduce left-right visual differences as a possible test confound. In the TOMM the foil is unrelated in context and is noticeably dissimilar in shape to the target stimulus. The examinee is instructed to point to (i.e., not identify verbally) the correct response. The examiner informs the examinee verbally after every recognition response if their answer was “correct” or “incorrect.” For the TOMM, a score of 25 on Trial 2 represents a chance level of performance and a score of 45 on Trial 2 or the Retention Trial represented cutoff score performance. This Trial 2 cutoff score was derived through empirical validation of the TOMM using data obtained from 138

consecutive neuropsychological assessments of inpatients and outpatients at the Boston Veterans Administration Hospital (Tombaugh, 1996) and a sample of 23 head-injured participants obtained as part of a doctoral dissertation (Rees, 1996). This mixed-clinical group was composed of 13 patients with no documented cognitive impairment (8%), 42 patients with cognitive impairment (22%), 21 patients with aphasia (11%), 45 patients with traumatic brain injury (TBI) (24%), and 40 patients with dementia (21%).

For the purposes of Experiment 1 a Consistency Index was also developed for the TOMM. As previously mentioned, the same pictures were presented for both TOMM trials, although the order of presentation of the pictures differed between trials. A consistency score was recorded each time a participant answered an item wrong on Trial 2 that they answered correctly on Trial 1. The number of inconsistent items was then subtracted from the total amount of items (50) and the number of consistent responses was formed into a percentage. The development of the TOMM Consistency Index was based on the rationale that if a person is capable of getting the correct answer on Trial 1 then it is reasonable to assume that they would also answer correctly on the same Trial 2 item, even after experiencing another exposure to the same item. As stated by Huskey (2005), the TOMM Consistency Index (and the MCP Consistency Index as well) is similar to using the Variable Response Inconsistency (VRIN) index on the Minnesota Multiphasic Personality Inventory-2 (MMPI-2).

Standard Neuropsychological Measures. Following the first symptom validity measure administered, the following standard neuropsychological assessment measures were administered in a uniform order: the Digit Symbol-Coding and Digit Span subtests from the Weschler Adult Intelligence Scale – third edition (WAIS-III; Weschler, 1997a),

the Trail Making Test – Parts A and B (Reitan & Wolfson, 1985), the California Verbal Learning Test – second edition (CVLT-II) (Delis, Kramer, Kaplan, & Ober, 2000), and Family Pictures I and II from the Weschler Memory Scale – third edition (WMS-III; Weschler, 1997b). With the exception of the MCP, paper-and-pencil versions of all instruments were administered according to standardized procedures by trained examiners. Raw and standardized measures were obtained for all measures.

Role-Play Termination Instructions (RPTI). After completing all standard neuropsychological measures and symptom validity tests, simulated malingerers received brief written instructions asking them to terminate their role play for the remainder of the study. See Appendix N for the RPTI.

Post-Experimental Questionnaire 1 (PEQ1). After taking both symptom validity tests, all the standard neuropsychological measures, and receiving the RPTI, participants completed PEQ1 (see Appendix G). Two experimenters checked the answers to this measure to determine whether participants' written responses accurately reflected an understanding of their task. For each packet, one of the experimenters was the principal investigator. In order to establish the participants' effort at and success in following their instructions, a Likert-type item ranging from 1 (*didn't try at all*) to 10 (*tried very hard*) was also included. Data collected from participants indicating they correctly understood their instructions and tried at least moderately hard (i.e., a score of "5" on a 10-point Likert-type item) to follow the instructions were included in the analyses. Another Likert-type item, ranging from 1 (*not at all successful*) to 10 (*very successful*), was included to determine how successful the participants felt they were in accomplishing their task. See Table 4 for complete results.

Participants were asked to guess what cognitive function each test measured. Participants' responses to these questions were grouped into cognitive domains (e.g., memory, attention) by two independent raters (one being the present author) and were quantified for the purposes of analysis. PEQ1 was designed to ensure that participants followed their test instructions accurately, although this measure also provided an initial face validity assessment of both the symptom validity measures and standard measures used in Experiment 2.

Post-Experimental Questionnaire 2 (PEQ2). After participants completed PEQ1 they completed PEQ2 (see Appendix H). This measure first informs participants that some of the measures that they completed were designed to detect if they were faking a neuropsychological deficit or not. After this information was provided, participants were then asked to rate their confidence that each test was a malingering-detection measure using a scale of 0 (not a malingering-detection measure) to 10 (definitely a malingering-detection measure). PEQ2 was designed to provide a more in-depth face validity assessment of the malingering-detection measures and standard measures used in Experiment 1. This measure was also used to examine participant's face validity ratings following a warning that some of the tests they completed were symptom validity measures.

Head Injury Sequelae Questionnaire (HISQ). After completing PEQ2, participants completed the HISQ. The HISQ was included in order to assess participants' beliefs regarding head injury sequelae (see Appendix F). Each item on this measure contained symptoms that were grouped together based on their similarity (e.g., one item included all of the following symptoms: language problems, speech problems, and/or

trouble finding the correct word). Participants were instructed to indicate how common they believed certain symptoms were following a head injury using a Likert-type scale ranging from 1 (*not at all associated with head injury*) to 5 (*strongly associated with head injury*). Information concerning the percentage of participants who endorsed each symptom as being strongly associated with a head injury was gathered (i.e., 4 or 5 on the scale) and analyzed.

In an effort to eliminate any possible confounds due to order effects of test administration, the two symptom validity measures were counterbalanced within the test battery. That is, half of all participants received the TOMM first in the battery of tests, while the other half of participants received the MCP. Both SVT's were followed by the battery of standard neuropsychological measures.

Power for Experiment 1

For the purposes of this analysis power was set at .80 with a significance level of $\alpha = .05$ (Cohen, 1992). Large effect sizes were assumed based on the work of Huskey (2005), whose results with similar measures yielded effect size estimates for type of instructions (i.e., group) exceeding .40 and power ranging from .92 to 1.0 (p. 71). Given that mean differences were collected, 26 participants per group were required for the analyses. Provided that a 2 x 3 ANOVA was required to be conducted for two analyses, a minimum of 156 total participants were needed in Experiment 1.

Results for Experiment 1

Demographic Information

A sample of 188 participants was obtained. Demographic characteristics are shown in Table 1. No significant gender differences were found between the three

groups, χ^2 (2, N = 188) = 0.266, p>.05. Group differences for Age and Education were analyzed using two separate one-way ANOVAs. There were no significant differences found for Age, F(2, 185) = 0.572, p>.05 (*effect size=.01*; small effect) or Education, F(2, 185) = 0.257, p>.05 (*effect size=.00*; small effect).

Table 1

Demographic Information for Participants in Experiment 1

	Group			
	Controls *(n=61)*	CM *(n=66)*	UM *(n=61)*	χ^2 *or F*
Gender				
Males (n)	25	24	23	.266
Females (n)	36	42	38	
Age				
M (SD)	20.85 *(5.03)*	20.15 *(2.88)*	20.87 *(4.88)*	.572
Education				
M (SD)	12.54 *(1.23)*	12.42 *(1.15)*	12.34 *(2.05)*	.257

Performance on Symptom Validity Tests

Memory for Complex Pictures (MCP). The means and standard deviations for the number of correctly answered items on the MCP for Trials 1 and 2 are presented in Table 2. Significant group differences were observed on MCP Trial 1, F(2, 185) = 84.29, p<.05, with controls obtaining significantly higher scores on Trial 1 compared to both CM and UM, whose scores did not differ significantly from each other (*partial eta squared* = .55; large effect).

Significant group differences were found on MCP Trial 2, F(2, 185) = 67.42, p<.05, with controls obtaining significantly higher scores on Trial 2 compared to both

CM and UM; CM obtained significantly more correct responses than UM (*partial eta squared* = .50; eta squared).

Table 2

Mean Correct Responses on the MCP and TOMM

	Group			
	Controls *(n=61)*	CM *(n=66)*	UM *(n=61)*	*F* (2, 185)
MCP - T1				
M (SD)	49.15_{a} *(1.09)*	32.60_{b} *(8.56)*	30.63_{b} *(11.13)*	84.29*
MCP -T2				
M (SD)	49.67_{a} *(0.63)*	35.52_{b} *(7.88)*	31.52_{c} *(11.56)*	67.42*
TOMM - T1				
M (SD)	48.83_{a} *(1.67)*	33.84_{b} *(7.93)*	31.23_{b} *(10.97)*	57.51*
TOMM - T2				
M (SD)	50.00_{a} *(0.00)*	36.57_{b} *(10.14)*	32.95_{b} *(12.31)*	37.06*
TOMM - Ret.				
M (SD)	49.91_{a} *(0.35)*	35.75_{b} *(9.36)*	32.74_{b} *(13.12)*	35.93*

Note. Means in the same row having the same subscript are not significantly different at $p < .05$ in the Tukey HSD comparison. T1 = Trial 1, T2 = Trial 2, Ret. = Retention Trial
*$p < .05$.

Test of Memory Malingering (TOMM). Significant group differences were observed on TOMM Trial 1, $F(2, 185) = 57.71$, $p<.05$, with controls obtaining significantly higher scores on Trial 1 compared to both CM and UM, whose scores did not differ significantly from each other (*eta squared* = .49; large effect).

Significant group differences were found on TOMM Trial 2, $F(2, 185) = 37.06$,

$p<.05$, with controls obtaining significantly higher scores on Trial 2 compared to both CM and UM, whose scores did not differ significantly from each other (*eta squared* = .39; large effect).

Significant group differences were found on the TOMM Retention Trial, $F(2, 185) = 35.93$, $p<.05$, with controls obtaining significantly higher scores on the Retention Trial compared to both CM and UM, whose scores did not differ significantly from each other (*eta squared* = .68; large effect).

MCP Response Latency for Correct and Incorrect Responses

No significant group differences were observed on Average Response Latency for total correct responses, $F(2, 185) = .439$, $p>.05$; see Table 3. No significant group differences were observed on Average Response Latency for total incorrect responses, $F(2, 185) = .215$, $p>.05$.

Table 3

Average Response Latency for Correct and Incorrect Responses on the MCP

	Group			
	Controls	CM	UM	*F*(2, 185)
RL – C				
M	377.60 ms	473.39 ms	702.77 ms	.439
(SD)	*(837.63 ms)*	*(1058.66)*	*(2093.21 ms)*	
RL – IN				
M	512.75 ms	575.17 ms	794.38 ms	.215
(SD)	*(784.19 ms)*	*(1340.97 ms)*	*(2351.16 ms)*	

Note. No significant differences noted in the Tukey HSD comparison. RL = Response Latency; C = Correct; IN = Incorrect. ms = milliseconds.

A 2 (correct or incorrect MCP response) x 3 (group) mixed ANOVA was used to compare the response latencies of all three groups on items in which they responded correctly *and* items in which they responded incorrectly. Data from participants from any group whose response times on either correct or incorrect items exceeded three standard deviations (faster or slower) was removed from the analysis. A significant main effect was not observed for MCP responses that were either correct or incorrect, $F(1, 185) = .330$, $p>.05$. There was no significant main effect observed for group, $F(1, 185) = .303$, $p>.05$. Additionally, the analysis did not yield a significant interaction effect, $F(1, 185) = .460$, $p>.05$.

MCP and TOMM Response Consistency

Significant group differences were observed on the MCP Consistency Index, $F(2, 185) = 87.45$, $p<.05$; with controls obtaining higher consistency ratings than UM and CM, whose consistency scores did not differ from each other (*eta squared* = .54; large effect). See Table 4.

Significant group differences were observed on the TOMM Consistency Index, $F(2, 185) = 46.65$, $p<.05$, with controls performing more consistently than UM or CM, whose performance consistency did not differ significantly from each other (*eta squared* = .53; large effect).

Table 4

Percent Consistent Responding on the MCP and TOMM

	Group				
	Controls	CM	UM	$F(2, 185)$	effect size
MCP - RC					
M (SD)	96_a *(7.89)*	62_b *(15.30)*	63_b *(18.00)*	87.45*	.54
TOMM – RC					
M (SD)	97_a *(4.36)*	75_b *(8.62)*	72_b *(10.92)*	46.65*	.53

Note. Means in the same row having the same subscript are not significantly different at $p < .05$ in the Tukey HSD comparison. RC = Response Consistency. *$p < .05$.

Questionnaire Responses

Post-experimental Questionnaire 1 (PEQ1). The means and standard deviations for effort and success ratings are presented in Table 5. All participants whose data was included in the study endorsed adequate adherence to their participant instructions. A post-experimental questionnaire was administered to all participants after they had been exposed to the experimental manipulation (i.e., read their assigned instructions) and subsequently completed all neuropsychological tests. Designed as a "manipulation check," PEQ1 contained three questions designed to make certain that participants followed their instructions accurately. All participants included in this study's analysis were able to recall their instructions accurately and indicated that they had, at the very least, put forth a moderate effort at following their experimental instructions during the study. All participants included in the analysis also indicated they were at least moderately successfully in carrying out their designated instructions.

PEQ1 ratings were analyzed by two separate one-way ANOVAs. Significant group differences were found for effort, $F(2, 185) = 18.12$, $p<.05$; with control participants rating their effort as significantly greater than UM and CM; CM rated their effort as significantly greater than UM (*eta squared* = .17; large effect). See Table 5.

Significant group differences were found for how well participants followed their instructions, $F(2, 185) = 49.81$, $p<.05$, with controls rating their success at following their instructions as significantly greater than UM and CM, whose ratings did not differ significantly from each other (*eta squared* = .36; large effect).

Table 5

Mean Effort and Success Ratings in Following Instructions

	Ratings			
	Effort		Success	
Group	*M*	*SD*	*M*	*SD*
Controls	9.34_{a}	.80	8.80_{a}	1.28
CM	7.97_{b}	1.72	6.27_{b}	1.87
UM	7.74_{b}	2.00	5.89_{b}	2.00

Note. Means in the same column having the same subscript are not significantly different at $p < .05$ in the Tukey HSD comparison. 1 = low effort/success in following instructions, 10 = high effort/success in following instructions.

Results from the PEQ1 were examined to determine the face validity of the measures. All three groups of participants were combined for the analyses on this portion of the PEQ1, due to the fact that the primary goal of this analysis was to determine participant's beliefs regarding the purpose of each test, regardless of what instructions

they received. That is, the primary question was whether the measures had good face validity as authentic measures of neuropsychological functioning as viewed by all participants. Before taking PEQ1, participants were administered a document instructing them to stop following their role-play instructions (see Appendix N). It is also important to note that, at this point, the results below represent participants' beliefs regarding the nature of the tests employed in the current study prior to receiving PEQ2, which informs them that some of the tests they completed may have been malingering measures.

Participants' responses were categorized for each test and agreed upon by two independent raters. The following categories were created: (a) Memory, (b) Attention/Concentration, (c) Mental Speed, (d) Psychomotor Coordination, (e) Learning, (f) Other, and (g) Don't Know. Percentages are shown in Table 6 for the various categories endorsed for each test. The majority of participants viewed the TOMM (87%) and MCP (85%) as genuine tests of memory. Additionally, the CVLT (89%), Family Pictures (82%), and Digit Span (78%) were also viewed as measures of memory. Many participants viewed the COWA (39%) as a measure of memory, although a considerable percentage (24%) of these participants viewed this test as a measure of mental speed (24%). Many participants classified the SSPT as "Other," with a small number of participants viewing this measure as testing attention and concentration (9%), memory (4%), or learning (4%). Additionally, the TMT Part A (28%) and Part B (20%) were most commonly viewed as tests used to measure mental speed. Interestingly, 38% of the participants believed the Digit Symbol – Coding subtest was measuring some aspect of memory, while 13% accurately surmised the test was measuring mental speed.

These percentages represent participant's beliefs regarding the nature of the tests prior to receiving information that some of the tests may be malingering measures. The responses show that participants were generally accurate in identifying the nature of the standardized neuropsychological tests. Additionally, according to PEQ1, the MCP and the TOMM were shown to have good face validity as memory measures.

Table 6

Percentage of Participants Endorsing Cognitive Domains on the PEQ1

	Test									
Category	TOMM	MCP	CVLT	FP	COWA	SSPT	T – A	T – B	DS – C	DS
Memory	87	85	89	82	39	4	14	13	38	78
Attent./ Conc.	5	5	1	8	5	9	5	13	7	6
Mental Speed	2	0	0	1	24	0	28	20	13	1
Coordin.	2	0	0	1	1	0	16	10	3	1
Learning	1	1	4	1	1	4	1	3	7	0
Other	2	6	8	6	7	46	39	15	16	9
Don't Know	1	2	1	2	3	1	3	2	4	3

Note. T – A = Trails A; T – B = Trails B; DS – C = Digit Symbol – Coding; DS = Digit Span; FP = Family Pictures

Post-experimental Questionnaire 2 (PEQ2). All three groups of participants were combined for the analyses on this portion of the PEQ2, due to the fact that the primary goal of this analysis was to determine which tests were viewed as malingering measures, regardless of participants' instructions.

Visual inspections showed that all tests were endorsed as malingering-detection measures at significantly higher rates than would have been expected by chance (i.e., 50%). See Figure 1.

Figure 1

Percentage of Participants Identifying a Test as a Malingering Test

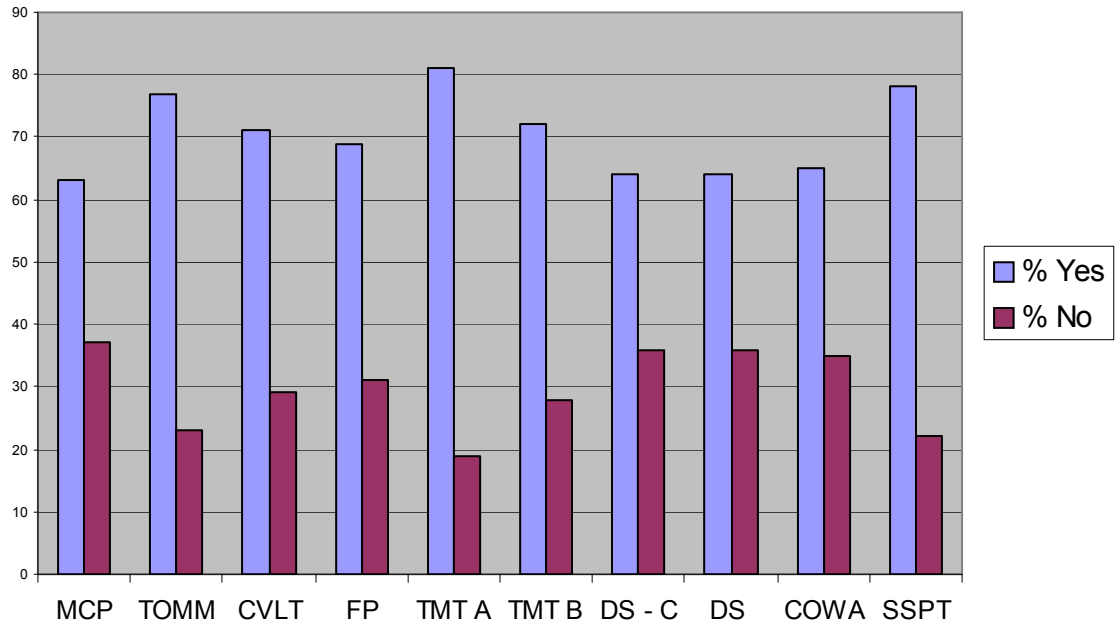

Table 7 displays the mean certainty ratings and standard deviations for each test participants identified as a malingering measure. For the following analyses, the three groups were not collapsed. Each group was examined separately in order to determine if the additional information provided to CM made them feel more certain about their beliefs regarding the purpose of each test. Recall that PEQ2 results were obtained after the participants were informed about the presence of malingering measures. Participants reported an average MCP face validity rating of 3.75 and an average TOMM face validity rating of 3.92 (1=not at all certain test is a malingering measure and 10=very certain the test is a malingering test).

Significant differences in group PEQ2 ratings were observed for the MCP, $F(2, 185) = 3.17$, $p<.05$, with controls providing a significantly lower rating than CM and UM, whose ratings did not differ significantly from one another. Calculation of effect size revealed a large effect (*eta squared* = .22).

Significant group differences were not obtained for PEQ2 ratings for the TOMM, $F(2, 185) = .57$, $p>.05$; see Table 7. Significant group differences were also not obtained for PEQ2 ratings for the SSPT, $F(2, 185) = .62$, $p>.05$. No significant PEQ2 group differences were obtained for the COWA, $F(2, 185) = .90$, $p>.05$. Similarly, significant group differences were not obtained for Trail Making Test for either Part A, $F(2, 185) = .35$, $p>.05$, or Part B, $F(2, 185) = .11$, $p>.05$. Significant group differences were not obtained for PEQ2 ratings for the CVLT-II, $F(2, 185) = .00$, $p>.05$; see Table 7. Significant group differences were not observed for PEQ2 ratings for Digit Symbol – Coding, $F(2, 185) = .53$, $p>.05$.

Significant differences in group PEQ2 ratings were observed for Digit Span, $F(2, 185) = 2.93$, $p<.05$; with CM providing a significantly lower rating than controls and UM and UM providing significantly lower ratings than controls (*eta squared* = .17; large effect). Significant group differences were not obtained for PEQ2 ratings for WMS-III Family Pictures, $F(2, 185) = .40$, $p>.05$.

Table 7

Certainty Ratings for Each Test Identified as a Malingering Measure

	Group			
	Controls	CM	UM	
Test	*M (SD)*	*M (SD)*	*M (SD)*	*F*(2, 185)
MCP				
M (SD)	2.71_{a} *(3.42)*	4.31_{b} *(3.43)*	4.14_{b} *(3.63)*	3.17*
TOMM				
M (SD)	3.57 *(3.53)*	3.89 *(3.18)*	4.28 *(3.46)*	.57
SSPT				
M (SD)	3.65 *(3.78)*	3.92 *(3.39)*	5.04 *(3.76)*	.62
COWA				
M (SD)	3.70 *(3.29)*	2.54 *(3.19)*	3.16 *(2.63)*	.90
TMT A				
M (SD)	4.10 *(3.35)*	4.62 *(3.21)*	4.27 *(3.39)*	.35
TMT B				
M (SD)	4.39 *(3.30)*	4.30 *(3.46)*	4.08 *(3.55)*	.11
CVLT-II				
M (SD)	4.36 *(3.78)*	4.30 *(3.10)*	4.35 *(3.73)*	.00
DSy-C				
M (SD)	3.33 *(3.32)*	3.70 *(3.23)*	4.02 *(3.41)*	.53
DS				
M (SD)	4.31_{a} *(3.56)*	2.71_{b} *(2.98)*	3.74_{c} *(3.51)*	2.93*
Fam Pics				
M (SD)	3.63 *(3.56)*	4.30 *(3.43)*	4.58 *(3.67)*	.40

Note. 0 = not malingering measure, 10 = very certain a malingering measure. Means in the same row having the same subscript are not significantly different at $p < .05$ in the comparison., *$p<.05$.

MCP vs. TOMM: Sensitivity and Specificity

In order to empirically determine a cutoff score for suboptimal effort for the MCP, it was necessary to examine the performance of clinical participants in Experiment 2 (see Appendix Q). Following guidelines outlined by Tombaugh (1996), a cutoff score of 44 on MCP Trial 2 optimally classified clinical patients, correctly classifying 93% of

this sample; see Table 8. Therefore, a cutoff score of MCP Trial 2 < 44 was used in Experiment 1. This cutoff score should be taken to mean that scores of 43 or below on Trial 2 were interpreted as suboptimal effort.

Using MCP Trial 2 < 44 as the cutoff score, the MCP, when used alone, correctly identified 100 out of 127 malingerers as giving suboptimal effort (79%) with no false positive errors; see Table 8. Given that the goal was to determine the ability of the MCP and TOMM to accurately classify any participant giving suboptimal effort, CM and UM were combined for this analysis.

Using the standard TOMM cutoff score of Trial 2 or Retention Trial < 45, the TOMM, when used alone, correctly identified 85 out of 127 malingerers as giving suboptimal effort (67%). When using cut-off score classification, the sensitivity of the MCP was significantly better than that of the TOMM (z = 2.84, p<.05). Neither the MCP nor the TOMM demonstrated any false positive errors when using the empirically-derived cutoff score.

Table 8

Sensitivity and Specificity of the MCP and TOMM

	MCP	TOMM	MCP vs. TOMM
Sensitivity	79%	67%	z = 2.84*
Specificity	0	0	

Note. Sensitivity = percentage of malingerers classified correctly by the MCP or TOMM; Specificity = percentage of malingerers classified incorrectly by the MCP or TOMM.
*p < .05.

Standard Neuropsychological Tests

WAIS-III Digit Symbol – Coding. For Digit Symbol – Coding, significant group differences were obtained, F(2, 165) = 15.68, p<.05, with controls obtaining significantly

higher scores than those of UM and CM, whose scores were not significantly different from one another. Calculation of effect size revealed a large effect (*eta squared* = .21).

WAIS-III Digit Span. Significant group differences were observed on Digit Span – Total, $F(2, 162) = 12.80$, $p<.05$, with controls obtaining significantly higher scores than those of UM and CM, whose scores were not significantly different from one another (*eta squared* = .19; large effect). See Table 9.

Trail Making Test – Part A (TMT A). Three separate one-way ANOVAs were used to analyze the TMT findings. Significant differences were found between the three groups for TMT A, $F(2, 180) = 8.12$, $p<.05$, with controls performing significantly faster than UM or CM, whose scores did not differ significantly from each other (*eta squared* = .11; moderate effect).

Trail Making Test – Part B (TMT B). Significant group differences were found for TMT B, $F(2, 180) = 9.12$, $p<.05$, with controls performing significantly faster than UM and CM, whose scores did not differ significantly from each other (*eta squared* = .12; moderate effect). See Table 9.

Trail Making Test – Discrepancy (TMT D). Significant group differences were found between the three groups for TMT discrepancy score, $F(2, 185) = 3.45$, $p<.05$, with the discrepancy scores of controls being significantly lower than those of CM and UM and CM exhibiting significantly greater discrepancy scores than UM (*eta squared* = .05; small effect).

WMS-III Family Pictures. Significant group differences were obtained on Family Pictures I, $F(2, 185) = 50.26$, $p<.05$, with controls obtaining significantly higher scores

than both UM and CM, whose scores were not significantly different from one another (*eta squared* = .37; large effect).

Significant group differences were obtained on Family Pictures II, $F(2, 185) = 47.72$, $p<.05$, with controls obtaining significantly higher than those of UM and CM, whose scores were not significantly different from one another (*eta squared* = .39; large effect).

California Verbal Learning Test – Second Edition (CVLT-II). Significant group differences were obtained on CVLT-II Trials 1-5 Free Recall Total Correct scores, $F(2, 185) = 18.50$, $p<.05$; with controls obtaining significantly higher scores than UM or CM, whose scores were not significantly different from each other (*eta squared* = .23; large effect).

Significant group differences were found on CVLT-II Long Delay Free Recall Total Correct, $F(2, 185) = 26.06$, $p<.05$, with controls obtaining significantly higher scores than CM or UM, whose scores did not differ significantly from each other (*eta squared* = .30; large effect). See Table 9.

Speech Sounds Perception Test (SSPT). The average number of errors per group on the SSPT is displayed in Table 9. A one-way ANOVA showed significant group differences in total errors for the SSPT, $F(2, 185) = 15.29$, $p<.05$, with controls obtaining significantly less errors on this measure than CM or UM, whose scores did not differ significantly from each other (*eta squared* = .31; large effect).

Controlled Oral Word Association (COWA). The means and standard deviations for the total amount of correct words generated by participants on the COWA are shown in Table 9. A one-way ANOVA showed significant group differences in total words

generated, $F(2, 185) = 9.54$, $p<.05$, with controls obtaining higher scores on the COWA than CM and UM, whose scores did not differ significantly from one another (*eta squared* = .24; large effect).

Table 9

Mean Performance on Standard Neuropsychological Measures

	Group			
	Controls	CM	UM	*F*
DS – C				
M (SD)	77.39 $_{a}$ *(16.86)*	58.04 $_{b}$ *(23.97)*	56.73 $_{b}$ *(22.92)*	15.68*
DS – Total				
M (SD)	18.40 $_{a}$ *(.48)*	14.38 $_{b}$ *(.70)*	13.17 $_{b}$ *(.70)*	12.80*
T – A				
M (SD)	22.11 $_{a}$ *(6.06)*	49.00 $_{b}$ *(46.81)*	48.55 $_{b}$ *(40.37)*	8.12*
T – B				
M (SD)	50.08 $_{a}$ *(13.34)*	105.36 $_{b}$ *(111.83)*	95.63 $_{b}$ *(68.18)*	9.12*
T – D				
M (SD)	27.97 $_{a}$ *(13.08)*	56.36 $_{b}$ *(71.12)*	47.08 $_{c}$ *(46.09)*	3.45*
FP I				
M (SD)	49.52 $_{a}$ *(9.02)*	32.53 $_{b}$ *(9.72)*	31.30 $_{b}$ *(14.26)*	50.26*
FP II				
M (SD)	49.50 $_{a}$ *(7.86)*	30.45 $_{b}$ *(11.84)*	31.81 $_{b}$ *(14.10)*	47.72*
CVLT 1-5				
M (SD)	54.93 $_{a}$ *(7.61)*	45.28 $_{b}$ *(10.33)*	41.45 $_{b}$ *(13.35)*	18.50*
CVLT- LD				
M (SD)	12.23 $_{a}$ *(3.10)*	6.68 $_{b}$ *(4.23)*	7.07 $_{b}$ *(4.30)*	26.06*
SSPT				
M (SD)	6.03 $_{a}$ *(2.21)*	21.16 $_{b}$ *(14.15)*	17.03 $_{b}$ *(8.88)*	15.29*
COWA				
M (SD)	37.48 $_{a}$ *(9.41)*	25.90 $_{b}$ *(1.41)*	29.48 $_{b}$ *(9.03)*	9.54*

Note. Means in the same row having the same subscript are not significantly different at $p < .05$ in the Tukey HSD comparison. T – A = Trails A; T – B = Trails B; DS – C = Digit Symbol – Coding; DS = Digit Span; FP = Family Pictures.
*$p < .05$.

Head Injury Sequelae Questionnaire (HISQ)

All three groups of participants were combined for the analyses on the HISQ, due to the fact that the primary goal of this analysis was to ascertain participants' knowledge and beliefs regarding symptoms of head injury, regardless of what instructions they received. The HISQ was administered after PEQ1 and PEQ2, after participants were informed about the presence of malingering measures. Recall that participants received instructions to stop following their role-play directions prior to completing the HISQ.

Visual inspection of Table 10 revealed that participants endorsed a variety of problems on the HISQ, including "memory problems," "attention problems," "dizziness, blurred vision, or headaches," and "language problems."

Table 10

Mean Endorsement Rates of Head Injury Sequelae

	Physical 2	Memory	Attention/ Problem Solving	Language	Physical 1	Anxiety/ Depression
M	3.83	3.79	3.72	3.47	2.95	2.18
(SD)	*(1.19)*	*(1.14)*	*(1.29)*	*(1.14)*	*(1.18)*	*(1.21)*

Note. Physical 1 = Fatigue, Insomnia, Bothered by Noise and/or Bothered by Light; Physical 2 = Dizziness, Blurred Vision, and/or Headaches.

Purpose of Experiment 2

The main purpose of this experiment was to validate the use of the MCP with individuals who have an acquired brain injury. Data was obtained from two primary patient groups: 1) patients at an outpatient brain injury rehabilitation center and 2) patients presenting to a private practice specializing in neuropsychological assessment. Data from litigating and non-litigating patients was included, although statistical comparisons were not performed due to the low number of participants in these sub-

samples. At both sites test data was supplemented with information gained from medical records regarding the location and severity of the participant's injury, including neuroradiological findings (e.g., CT, MRI) and medical and health history.

Hypotheses for Experiment 2

1) Mixed-clinical patients not currently involved in litigation were hypothesized to achieve high scores on the MCP. Specifically, non-litigating patients were anticipated to demonstrate near-ceiling performance on this measure.
2) Control participants were hypothesized to obtain significantly quicker response latencies on the MCP for both correct and incorrect responses when compared to non-litigating patients with any severity level of acquired brain injury.
3) Litigating patients were hypothesized to display significantly longer response latencies on MCP items in which they provided incorrect answers than items in which they provided correct responses. When matching for head injury severity, litigating patients were hypothesized to display longer response latencies on both correct and incorrect items than non-litigating patients.
4) It is hypothesized that non-litigating patients with any form of head injury would display consistent responding on the MCP and TOMM.
5) It was hypothesized that control participants and patients with mild head injury would obtain significantly higher scores on the MCP and TOMM than patients with moderate-to-severe brain injury, although the scores of these two groups were hypothesized not to differ significantly from each other on either measure.
6) Litigating patients were hypothesized to display significantly less consistent responding than non-litigating mixed-clinical patients on the MCP and TOMM.

Experiment 2

Method

Participants

In Experiment 2, participants were either patients at an outpatient brain injury rehabilitation program or clients referred to the private practice of a local clinical neuropsychologist. Data from participants under the age of 18 were not included. Local, state, or national medical providers refer patients to the outpatient brain injury rehabilitation program for physical and cognitive rehabilitation, while local medical providers primarily refer patients to the private neuropsychology practice for neuropsychological assessment. All participants were adults over the age of 18. Litigation cases were defined as patients at either location who were participating in neuropsychological assessment and who were seeking compensation for a potential head injury through legal means. Disability evaluations were considered litigation cases. All participants were treated in accordance with the American Psychological Association's (2002) "Ethical Principles of Psychologists and Code of Conduct."

Procedure and Measures

In Experiment 2, patients at both locations were administered the MCP as part of a larger neuropsychological battery chosen by the supervising clinical neuropsychologist. In addition to the MCP, performance on the following standard neuropsychological measures were examined: the WAIS-III Digit Symbol – Coding and WAIS-III Digit Span, Trail Making Test – Parts A and B, the CVLT-II, the WMS-III Family Pictures I and II, the SSPT, and the COWA – FAS. The CVLT-II was chosen as an assessment of memory in Experiment 2 due, in part, to its extensive application in the assessment of traumatic brain injury (TBI) sequelae (Crosson, Novack, Trenerry, & Craig, 1988;

Curtiss, Vanderploeg, Spencer, & Salazar, 2001; Weigner & Donders, 1999). The results from standardized measures were also combined with the TOMM when this measure was administered. Raw and standardized scores were obtained for all measures. The administration of these measures was conducted in standardized fashion by a trained psychometrist; the results were used as part of a comprehensive neuropsychological evaluation.

The CVLT-II and Family Pictures I and II were used as the criterion measures for memory ability in Experiment 2. The Wide Range Assessment of Memory and Learning – Second edition (WRAML-2) (Sheslow & Adams, 2003) was used when either the CVLT-II or Family Pictures was not administered. Following methodology employed by Tombaugh (1996), data from participants who scored 1 standard deviation (SD) or below the mean on the CVLT-II indices of Trial 1-5 Total Correct or Long Delay Free Recall Total were considered to have an authentic deficit in the area of verbal memory (or, if the CVLT-II was not administered, obtained a WRAML-2 Verbal Memory composite score of 1 SD or below). Additionally, data from participants who scored 1 SD or below the mean on either Family Pictures I or II (or, if Family Pictures was not administered, obtained a WRAML-2 Visual Memory composite score of 1 SD or below) were considered to have an authentic visual memory deficit. If a participant met the above cutoff criteria from either test then their data were used in the current study; all other participants' data were excluded from analysis.

All participants in the clinical sample underwent a clinical interview and review of medical records, both conducted by the supervising neuropsychologist prior to testing. The supervising neuropsychologist wrote a report of this interview. Information

extracted from this report included type and duration of brain injury or neurological disorder. If the patient was diagnosed with a neurological condition, the following information was obtained: the date that the patient was diagnosed with the neurological disorder, current symptoms experienced as a result of this condition, how long the patient had been experiencing these symptoms, and the overall severity rating of the condition. If the patient had sustained a traumatic brain injury (TBI), the following information was obtained: the nature, neuroanatomical location (if available) of the injury, and date of the injury, current symptoms experienced as the result of the injury, the duration of these symptoms, GCS score (if available), estimated loss of consciousness (if any and if available), and the estimated post-traumatic amnesia (PTA) (if any and if available). These factors were used to determine an overall severity rating of the patient's TBI (see below). Additional information was also obtained concerning the patient's head injury history, including all past TBI's experienced. Findings from neuroradiological scans (CT, MRI), as well as EEG, were also obtained from all patients when such information was available. This information was recorded on a summary sheet (see Appendix E).

The following criteria (taken from Adams, Parsons, Culberton, & Nixon (1996)) was used to classify the nature of the patient's acquired brain injury: mild = Glasgow Coma Scale (GCS) total score 13-15, loss of consciousness (LOC) less than 20 minutes, and posttraumatic amnesia (PTA) less than 24 hrs; moderate = GCS total score 9-12, LOC 20 minutes to 36 hours, and PTA for 1-7 days; severe = GCS total score 3-8, LOC greater than 36 hours, and PTA greater than 7 days. The GCS provides a score in the range of 3-15; a copy of this measure is provided in Appendix O.

Power for Experiment 2

For the purposes of this analysis power was set at .80 with a significance level of $\alpha = .05$ (Cohen, 1991). Given that large effect sizes were assumed and that mean differences were collected, 26 participants per group (mild head injury and moderate-severe head injury) were required (resulting in a total N of 52 participants for this experiment). Due to difficulty in participant recruitment for this phase of the study, complete data from only 28 adult patients was collected. Of these 28 participants, 18 (64%) met the aforementioned criteria for memory impairment.

Results for Experiment 2

Demographic Information

A total sample size of 18 adult patients with memory impairments completed the MCP (12 males, 6 females). Participants ranged in age from 18 to 82 years, with a mean age of 37.78; see Table 11. Participants' highest level of education ranged from 7 to 22 years, with a mean education level of 12.33 years (SD = 3.94).

Table 11

Demographic Information for Participants in Experiment 2

	n	Gender	age (mean)	education (mean)
Mixed-Clinical Group w/ Memory Impairments	18	12 males / 6 females	37.78 *(17.57)*	12.33 *(3.94)*

Note. Age and Education data expressed in means and standard deviations

All participants were adults who agreed to take the MCP as a part of a larger neuropsychological evaluation. A total of 12 patients (66%) had sustained a traumatic brain injury (TBI) (5 met the aforementioned criteria for mild TBI, 4 met criteria for moderate TBI, and 3 met criteria for severe TBI); 4 patients (22%) were being evaluated

for possible TBI; 1 patient (6%) had been diagnosed prior to neuropsychological evaluation with a degenerative neurological condition (i.e., HIV dementia). The diagnosis of 1 remaining patient (6%) had not been determined at the time of evaluation. No participants were diagnosed with both a brain injury and a current neurological condition.

Glasgow Coma Scale (GCS) ratings were only obtained for two patients, who received scores of 11 and 14. Estimated loss of consciousness (LOC) data was obtained for 13 participants (72%). Two patients reported no LOC secondary to their injuries. For the 11 participants whose medical records did indicate a LOC, estimates of LOC varied greatly, ranging from 1 min for 2 participants to a participant who was in a coma for 75 days. Eleven participants (61%) had a LOC of 30 minutes or less. Of these 11 patients, the mean estimated LOC was 11.2 minutes. The other two participants who had a LOC rating revealed estimates of 14 days and (as mentioned previously) 75 days. The median LOC for the 13 participants from which this information was obtained was 15 minutes.

Estimated post-traumatic amnesia (PTA) ratings were obtained for 11 participants (42%). Two participants reported experiencing no PTA. For the 9 participants (50%) that did report experiencing PTA, estimates ranged from 7.5 minutes to 2 days. The median PTA for the 11 participants from which this information was obtained was 45 minutes. Two patients (11%) were currently pursuing litigation related to their brain injury. As previously mentioned, all patients displayed at least mild deficits (i.e., -1 SD) on at least one standard test of memory (e.g., the CVLT-II).

Symptom Validity Tests

Memory for Complex Pictures (MCP). The mixed-clinical group (n = 18) obtained an average of 44.39 correct responses out of 50 on MCP Trial 1 and an average of 45.78 out of 50 correct on Trial 2. Of these 18 patients, the 16 patients that were not currently involved in litigation achieved an average score of 45.56 out of 50 correct on Trial 1 and an average of 47.00 out of 50 correct on Trial 2. The results of this subgroup are reviewed in Table 12. On average, patients completed the MCP in approximately 12 minutes.

Table 12

MCP Performance for Adult Non-litigating Patients with Cognitive Impairment

	n	Trial 1	Trial 2
Non-litigating Patients w/ Memory Impairment	16	45.56 *(6.11)*	47.00 *(4.10)*
TBI	11	46.33 *(3.75)*	47.50 *(2.39)*
Possible TBI	3	38.00 *(13.29)*	39.50 *(12.12)*
Dementia – HIV	1	42	47
Diagnosis Undetermined	1	49	49

Statistical comparisons were not conducted between litigating and non-litigating patients due to the low sample size of litigating patients, although visual inspection of Table 13 reveals that the scores of non-litigating patients on the MCP were higher than those of litigating patients on both Trial 1 and Trial 2.

Table 13

Number of Correct Responses on the MCP for Litigating and Non-litigating Patients

	n	Trial 1	Trial 2
Litigating patients	2	41.67 *(9.67)*	43.00 *(9.21)*
Non-litigating patients	16	45.56 *(6.11)*	47.00 *(4.10)*

Visual inspection of Table 14 reveals that the response latencies of litigating and non-litigating patients on the MCP were relatively equivalent across both MCP trials, with no systematic differences noted between groups. Visual inspection of this table revealed no major differences on average response latency for either correct or incorrect responses.

Table 14

MCP Average Response Latency for Litigating and Non-litigating Patients

	n	Trial 1 (correct)	Trial 1 (incorrect)	Trial 2 (correct)	Trial 2 (incorrect)
Litigating patients	2	199.13 ms *(115.73 ms)*	219.64 ms *(84.24 ms)*	168.57 ms *(88.27 ms)*	201.79 ms *(75.44 ms)*
Non-litigating patients	16	192.23 ms *(101.00 ms)*	371.68 ms *(287.44 ms)*	161.34 ms *(64.91 ms)*	322.38 ms *(269.49 ms)*

Note. ms = milliseconds

Test of Memory Malingering (TOMM). Although the entire sample took the MCP as part of a larger neuropsychological battery, 6 patients (33%) were also administered the TOMM. The following results will focus on the performance of these 6 patients. Due to the small sample of both litigating and non-litigating patients who completed the

TOMM, visual inspection of Table 15 was used to compare litigating versus non-litigating patients. Litigating patients were found to have slightly lower TOMM Trial 1 scores than non-litigating patients, although litigating patients were found to have relatively equivalent Trial 2 scores compared to non-litigating patients.

Table 15

Total Correct on TOMM Trial 1 and 2 for Litigating and Non-litigating Patients

	n	Trial 1	Trial 2	Retention
Non-litigating patients	4	37.25 *(11.18)*	42.50 *(11.90)*	40.00 (*14.14)*
Litigating patients	2	28.00 *(5.66)*	39.50 *(14.85)*	26.00[a]

[a]n = 1

Response Consistency for the MCP and TOMM. Visual inspection of Table 16 reveals that non-litigating patients displayed more consistent responding on the MCP and TOMM when compared to patients currently involved in litigation. As a reminder, response consistency was measured using a numerical rating of the number of objects that an individual answered the same to from the first to the second recognition trial (expressed in the form of a percentage).

Table 16

Consistency Ratings for the TOMM and MCP for Litigating and Non-litigating Patients

	MCP Consistency	TOMM Consistency
Litigating patients (*n=2*)	69.32% *(24.04)*	70.54% *(21.02)*
Non-litigating Patients (*n=16*)	89.41% *(10.48)*	81.00% *(18.92)*

Severity of TBI and MCP Performance. In order to test the hypothesis that control participants and patients with mild head injury would obtain significantly higher scores on the MCP than non-litigating patients with moderate-to-severe brain injury, MCP performance data from controls in Experiment 1 were compared with MCP data from the mixed-clinical group in Experiment 2. A one-way ANOVA found significant between-group differences on MCP Trial 1 Total Correct, $F(2, 70) = 11.99$, $p<.05$, with controls obtaining significantly more correct responses on MCP Trial 1 than patients with mild and moderate-severe brain injury, although the scores for patients in the mild and moderate-severe brain injury groups were not significantly different from each other (*eta squared* = .30; large effect).

Significant between-group differences were also observed on MCP Trial 2 Total Correct, $F(2, 70) = 23.99$, $p<.05$, with controls obtaining significantly more correct responses on MCP Trial 2 than patients with mild and moderate-severe brain injury, although the scores for patients with mild and moderate-severe brain injury were not significantly different from each other (*eta squared* = .46; large effect). Although controls did obtain significantly higher scores on the MCP than patients with any level of

severe brain injury, it should be noted that patients with varying levels of brain injury also performed very well on this test.

Table 17

MCP Performance of Controls and Mixed-Clinical Patients

	TBI Severity				
	Controls (n = 61)	Mild (n = 5)	Moderate-Severe (n = 6)	$F(2, 70)$	effect size
MCP – T1 *M (SD)*	49.15_a *(1.09)*	45.60_b *(3.78)*	47.33_b *(2.22)*	11.99*	.30
MCP – T2 *M (SD)*	49.67_a *(.63)*	46.60_b *(2.07)*	47.83_b *(2.40)*	23.99*	.46

Note. Means in the same row having the same subscript are not significantly different at $p < .05$ in the Tukey HSD comparison.
*$p < .05$.

Discussion

Two experiments were designed to assess the psychometric properties of the MCP, a new measure of client effort during neuropsychological assessment. These investigations proposed to measure the psychometric characteristics of this instrument and compare them to those of the TOMM, and to validate the use of the MCP in a population with cognitive deficits due to acquired brain injury. Experiments 1 and 2 were run concurrently and used patients from two different samples: 1) undergraduate psychology students (who served as controls, UM, or CM) and 2) patients presenting for neuropsychological assessment to either an outpatient brain-injury rehabilitation center or the private practice of a local clinical neuropsychologist. Only data from mixed-clinical

patients with demonstrable memory deficits on standardized measures of memory (e.g., the CVLT-II) was included in the analysis.

As hypothesized, controls participants demonstrated near-ceiling performance on the MCP (Trial 1 mean = 49.15, Trial 2 mean = 49.67). These scores were significantly higher than those of CM and UM. Contrary to the original hypothesis, CM did not score significantly higher than UM on MCP Trial 1, although CM did perform significantly better than UM on MCP Trial 2. As hypothesized, controls also obtained significantly higher scores on the TOMM when compared to CM and UM. Contrary to the original hypothesis, CM did not perform significantly better than UM on either TOMM Trial 1 or 2. The finding that controls performed at near-ceiling levels on the TOMM is in line with results obtained by Huskey (2005) and Tombaugh (1996; 1997). As expected, the performance of controls on the TOMM correlated very highly with their performance on the MCP.

The near-ceiling performance of controls on the MCP was complimented by the high MCP scores obtained by clinical patients with pronounced memory deficits. Notably, 16 patients not currently involved in litigation achieved an average of 45.56 correct on Trial 1 (91%) and an average of 47.00 correct on Trial 2 (94%). This sample included a 58-year-old man who sustained a basilar skull fracture and diffuse axonal injury as the result of a high-speed motor vehicle accident. According to the patient's medical records, he was in a coma for approximately 2.5 months and underwent many neurosurgical procedures to repair portions of his brain. Despite performing in the range of severe impairment on all memory measures given during neuropsychological testing, he obtained an MCP Trial 1 score of 50 out of 50 and an MCP Trial 2 score of 49 out of

50. Another striking example of the ability of the MCP to be robust to the effects of brain injury was found in the performance of a 23-year-old man who sustained a moderate brain injury as the result of a motor vehicle accident. Despite performing in the moderate-to-severe range on measures of memory, his MCP performance revealed a score of 49 on both Trials 1 and 2. The MCP was also found to be resistant to the effects of other neurological impairment, as exemplified by the test performance of a patient with HIV dementia. This individual, despite poor performance on measures of executive functioning and impairment on a measure of verbal memory, achieved an MCP Trial 1 score of 42 and a Trial 2 score of 47. The MCP was also found to be effective in patients with a history of attention deficit hyperactivity disorder (ADHD) and learning disability (LD), as patients diagnosed with these disorders also performed well on the test.

The high scores of the mixed-clinical sample on the MCP corroborate aforementioned research showing that visual pictures work well as test stimuli in SVT's, as they appear difficult to participants while, at the same time, are quite easy. The high performance of the mixed-clinical group on the MCP also is in-line with work from Nickerson (1965, 1968) and Shepard (1967) showing that individuals have a high capacity for encoding and retrieving visual information. The current findings support aforementioned research showing that visual memory is a robust cognitive ability, even in individuals with severe forms of acquired brain injury (Freed, Corkin, Growdon, & Nissen, 1989; Hart & O'Shanick, 1993; Huppert & Piercy, 1976, 1978, 1979; Kopelman, 1985; Park, Puglisi, & Smith, 1986; Winograd, Smith, & Simon, 1982).

The MCP and TOMM were compared in terms of face validity, as high face validity has been shown to be an important trait in a successful SVT (e.g., DenBoer, Hall, Jacobsen, and Hoffman, 2006; Huskey, 2005; Huskey & Hall, 2003; Tan, Slick, Strauss, & Hultsch, 2003). The original hypothesis that the MCP would demonstrate improved face validity as a genuine measure of memory when compared to the TOMM received partial support. Although the MCP and TOMM were found to demonstrate relatively equivalent face validity across all participant groups, the MCP did receive significantly fewer endorsements as a standardized measure of memory on PEQ2 and received lower endorsements as a malingering-detection measure when compared to the TOMM. These results lend support for the possibility that, given further research with various study populations, the MCP may demonstrate significantly improved face validity when compared to the TOMM. These results add to the undersized literature base examining the face validity of neuropsychological measures (Huskey, 2005; Huskey & Hall, 2003; Kafer & Hunter, 1997; Rees, Tombaugh, Gansler, & Moczynski, 1998; Tan, Slick, Strauss, & Hultsch, 2003; Tombaugh, 1997).

In addition to comparing the face validity of the MCP and TOMM, the present study also compared the sensitivity and specificity of the two tests. The importance of the study of the sensitivity and specificity of malingering-detection measures has been recently emphasized through published research (Greve & Bianchini, 2004; 2007) and policy statements (Bush et al., 2005). Using the empirically-derived cutoff score of MCP Trial 2 < 44, the MCP, when used alone, accurately identified the majority of simulated malingerers. As hypothesized, the sensitivity ratings of the MCP turned out to be significantly better than those of the TOMM. Contrary to the original hypothesis, the

MCP and TOMM were not significantly different in terms of specificity, with neither test demonstrating any false positive errors when using cut-off score classification.

The finding that the MCP demonstrated improved sensitivity in comparison to the TOMM is significant for multiple reasons. According to a recent survey of practicing neuropsychologists, the TOMM was listed as the most frequently-used malingering-detection instrument (Sharland & Gfeller, 2007). In the same survey, the TOMM was also rated as the most accurate measure for detecting suboptimal effort, with 79% of neuropsychologists surveyed being familiar enough with the TOMM to provide ratings on how well they thought this measure classified patients (as compared to only 29% and 33% of respondents being familiar enough with the VSVT and the CARB to classify the utility of these tests, respectively). These results are consistent with the survey results of Slick, Tan, Strauss, and Hultsch (2004) and Shandera, Hall, DenBoer, and Crouse (2004), who found that the TOMM was the most frequently-used malingering-detection instrument and the highest ranked SVT in terms of detection accuracy.

As hypothesized, controls provided more consistent responding on the MCP and the TOMM. In contrast to the previous hypothesis, CM did not display significantly more consistent responding than UM, although the responding of both groups on the MCP was significantly less consistent than controls, who displayed a very high response consistency. This result pattern was also found on the TOMM, where CM did not display significantly more consistent responding than UM, although the responding of controls on the TOMM was significantly more consistent than CM or UM. The response consistency findings reported above are in line with those of Huskey (2005), who found significant group differences in response consistency between controls and both UM and

CM on TOMM Trials 1 and 2, whose consistency of responses did not differ from one another. Huskey (2005) and Schultz (2000) highlight the importance of incorporating response consistency data in the results of malingering-detection measures.

The large effect sizes obtained in the current study are commiserate with other research in the area of clinical neuropsychology. Specifically, the large effect sizes obtained in the current study were in line with those obtained by Huskey (2005), whose work yielded high effect sizes using similar neuropsychological measures. Specifically, Huskey's work yielded effect size estimates typically exceeding .40 and power ranging from .92 to 1.0 (p. 71).

As hypothesized, visual inspection revealed that mixed-clinical patients displayed consistent responding on the MCP and TOMM. In contrast to the original hypothesis, the response consistency of non-litigating patients was significantly lower than that of controls, although the response consistency of non-litigating patients was significantly greater than that of simulated malingerers. Despite the differences between the groups, it should be emphasized that both controls and clinical patients demonstrated high response consistency on the MCP.

The notion that a computerized testing format may greatly add to the face validity of malingering-detection measures is supported by the difference observed between tests in PEQ2 certainty ratings. Among participants, all of whom had been informed about the presence of malingering-detection instruments, controls provided the MCP with the lowest certainty rating, meaning that controls ranked the MCP the highest in terms of face validity rating of any test in the current study. Specifically, the MCP achieved a low mean rating of 2.71 (0 = not a malingering measure, 10 = very certain test is a

malingering measure), an appreciably lower score than the certainty ratings provided by controls for the TOMM (mean = 3.57). The face validity rating obtained by the MCP was also notably better than the rating provided for standard measures of memory, such as the CVLT-II (mean = 4.36) and Family Pictures (mean = 3.63). The certainty ratings for the TOMM and MCP were relatively equivalent when these ratings were provided by CM and UM, as both tests demonstrated relatively equivalent face validity when compared to standard measures of neuropsychological functioning. In addition to supporting previous hypotheses about the face validity of the MCP, these results exemplify that the overwhelming majority of participants viewed the MCP as a genuine test of memory, lending further credence to the notion that the test has high utility as a new SVT.

Contrary to the previous hypothesis, control participants did not display significantly quicker response latencies for either correct or incorrect responses on the MCP compared to both UM and CM. Simulated malingerers from both groups did not have slower response latencies on items in which they responded incorrectly, also contrary to the original hypothesis. Similarly, CM did not have faster response times on items in which they responded correctly or incorrectly. Contrary to the hypothesis, the response latencies of CM were not found to be slower than those of controls on items in which they gave incorrect responses. Although many of previous hypotheses were not supported, CM did display similar response times on items in which they obtained correct responses. Also supporting the previous hypothesis, controls displayed relatively similar response latencies for correct and incorrect items. Overall, response latency did not appear to be an effective variable in distinguishing controls from simulated malingerers.

It may be reasonable to assume that the lack of utility of response latency found in the current study was due in large part to the complex and detailed nature of the digital pictures used. Specifically, it is thought that the complex nature of the digital photographs caused all participants (even control participants) to take increased time while viewing them, resulting in little between-group differences noted on this variable. It is further thought that response latency may not have been effective in differentiating malingerers from non-malingerers due to the nature of the MCP instructions. Given that participants are not asked to answer quickly during either recognition phase of the MCP and are not informed that their responses are being timed, it is not surprising that the findings of Experiment 1 show a high degree of variance in response latency.

Although the future utility of response latency as a differentiating variable cannot be fully evaluated based on the results of the current study, it is possible that response latency may not be an effective variable in differentiating malingering and non-malingering performance due primarily to the complex nature of the majority of photographs used in the MCP and the similar-pairing format used in the recognition trials of the test. The combination of these two properties may have resulted in increased time spent evaluating the photographs for all participants. Additionally, response latency may not be an effective variable in clinical patients due to the fact that processing speed appears to deteriorate significantly as a result of aging and/or neurological impairment (e.g., Sliwinski & Buschke, 1997).

In addition to response latency and response consistency, the MCP contains several unique features not found in many other SVTs. These features include 1) the use of complex digital photographs as test stimuli, 2) the pairing of these pictures with

similar pictures during the recognition phase, and 3) the presence of multiple indices of client effort on the test. Although it is impossible to know for certain if the digital photographs had a significant effect on the face validity of the measure, it is reasonable to assume that the nature of the photographs contributed significantly to the improved face validity of the MCP in that the complex nature of the photographs made the learning portion of the measure appear like it was a challenging test of visual memory. It is notable that all SVTs currently on the market employ simple test stimuli (e.g., line drawings of common objects, numbers). It may be that the simple nature of the stimuli employed by these tests allows potential malingerers to recognize these instruments as malingering-detection measures.

In addition to the unique features of the MCP, it may be reasonable to assume that the computerized nature of the test was influential in influencing participants' view of the measure as a legitimate test of memory. In fact, it is notable that the MCP, the only computerized measure in the study battery, received the lowest rating as a malingering-detection measure of any test, with this result occurring after participants had been informed about the presence of malingering-detection measures. Given the fact that many present-day SVT's exist in a computerized format (e.g., VSVT, CARB, WMT, TOMM – Computerized Version (Tombaugh, 1998)), it is reasonable to assume that the computerized nature of malingering-detection measures may aid in improving the face validity of these measures.

Another main purpose of this study was to examine the effect of coaching on the test performance of controls, CM, and UM. Previous research has demonstrated that participant coaching has a significant effect on neuropsychological test performance (e.g.,

Hanlon-Inman & Berry, 2002; Heaton, Smith, Lehman, & Vogt, 1978; Lees-Haley & Dunn, 1994; Martin, Gouvier, Todd, Bolter, & Niccolls, 1992). Corroborating findings from Kerr et al. (1990), Martin, Gouvier, Todd, Bolter, and Niccolls (1992), and Hiscock, Branham, and Hiscock (1994), the results of the present study revealed that even relatively minimal coaching regarding the common symptoms of brain injury provided to malingerers was enough information to produce significant decrements in test performance. As hypothesized, controls obtained near-ceiling performance on the MCP (as well as the TOMM), while CM demonstrated significantly worse performance. Similar to the work of Huskey (2005), the different additional coaching instructions received by CM did not appear to significantly affect their performance, as the scores of CM and UM did not differ on the overwhelming majority of measures.

Given that past research has found that beliefs regarding head injury may impact malingerers' test performance, another goal of Experiment 1 was to measure participants' perceptions of head injury. As hypothesized, participants (regardless of group designation) endorsed the following symptoms as most strongly associated with head injury: "memory problems," "attention problems, difficulty concentrating, slowed-thinking, *and/or* decrease in problem-solving abilities," although participants did not endorse these symptoms at as strong a rate of "4 or 5," as previously hypothesized. As hypothesized, "anxiety, depression, temper is lost easily, *and/or* irritability" was the symptom least strongly associated with head injury, receiving an average rating of 2.18. In contrast to the original hypothesis, "language problems, speech problems, *and/or* trouble finding the correct word" received a high average endorsement as a common symptom of head injury. This responding is consistent with previous research detailing

lay-persons knowledge about the sequelae of mild head injury (Aubrey, Dobbs, & Rule, 1989). Given that memory impairment is a common complaint for both real patients and malingerers (Cercy, Schretlen, & Brandt, 1997; Suhr & Gunstad, 2000), these findings support the effort to have the MCP appear like a genuine measure of memory.

In addition to the between-group comparisons mentioned previously, the scores of litigating and non-litigating patients were also compared. Visual inspection of the data obtained in Experiment 2 revealed that non-litigating patients achieved higher scores on the MCP than patients currently involved in litigation. This finding lends support for well-established research that the simple presence of litigation has a substantial negative effect on a participant's performance on cognitive tests (Green, Rohling, Lees-Haley, & Allen, 2001). In contrast to the original hypothesis, visual inspection of Table 13 revealed that response latencies of litigating and non-litigating patients were relatively equivalent for correct and incorrect responses on MCP Trial 1 and Trial 2, with no major systematic between-groups differences noted. In contrast to the original hypothesis, visual inspection of Table 13 revealed that litigating patients did not display significantly longer response latencies on MCP items in which they provided incorrect answers. Similarly, when matched for head injury severity litigating patients did not display longer response latencies on either correct or incorrect items than non-litigating patients.

Limitations of the Present Study

The primary limitation in this research study is the relatively small sample size of the mixed-clinical group. Although data from approximately 28 patients was gained, only 18 of these patients had demonstrable memory deficits. The low sample size of this group contributed to the lack of diagnostic diversity found in the patient sample, as the

sample was composed primarily of TBI patients. Ideally, a much larger population of patients with diverse neurological impairments would be obtained.

An additional limitation in Experiment 1 may be the limited nature of the incentive for dissimulation provided. Notably, the incentive offered to participants for successfully convincing the examiner that they are malingering was only two experimental credits. Although this incentive (in conjunction with the participant instructions) did indeed shape the performance of simulated malingerers, it is possible that the use of a greater incentive (e.g., monetary reward) may have had a stronger effect on individual performance. Given that the incentive's "payoff" was somewhat distal in nature (i.e., experimental credits are turned in at the end of every semester), an additional improvement to Experiment 1 may be to provide a more immediate incentive (e.g., $10 cash at the immediate conclusion of the study). Although financial limitations prevented using money as an incentive, it is possible that a more immediate, non-monetary reward could have been used. Even if a financial reward could have been used, it should be noted that this award would pale in comparison to the substantial incentives (e.g., workers' compensation, disability pay, veterans' benefits, etc.), offered for successful "real world" malingering.

An additional consideration for Experiment 1 is that participants had only approximately 5 minutes to prepare for their task. Participants in Experiment 1 were not informed before they arrived at the study that they might be asked to fake non-existing cognitive impairment and were therefore not able to access information on brain injury or to educate themselves as to which tests might measure client effort during neuropsychological assessment. Given that the participants in Experiment 1 were

Introduction to Psychology students without a history of head injury, it is unlikely that any participant had a significant knowledge of realistic brain injury symptoms and presentation. Research has shown that when participants are given a 24-hr. period in preparation for their dissimulation task and have access to the Internet, they are able to produce much more sophisticated malingering (Rees & Tombaugh, 1996). It is probable that "real life" patients who are feigning head injury for significant financial gain may have increased opportunity to practice the patient role and are therefore more likely to be more successful in their efforts at presenting this role.

Future Clinical and Research Directions

The two experiments in the present study are an important contribution to the area of malingering research and symptom validity testing. They also spurn multiple ideas for future research. For example, an interesting expansion to this study would be to examine malingering strategies in combination with the previously-employed face validity and coaching manipulations. It is possible that some malingerers may monitor their performance more carefully on measures they believe are malingering tests, particularly if they have been coached on how to behave during the experiment. Combining these aspects may shed further light on ways to distinguish between successful and unsuccessful malingerers. Edens et al. (2001) were the first to investigate and compare the strategies of successful versus unsuccessful malingerers malingering strategies, Although this has been more recently investigated by Huskey (2005) and Tan, Slick, Strauss, and Hultsch (2002), future research should examine the use of different malingering strategies on the MCP.

As cited by Huskey (2005), asking participants about the purpose of each test immediately after they have taken the measure may yield different results then the method of asking participants at the conclusion of the study. Given that it may have been difficult for participants to remember accurately their subjective experience of each test while they were taking it, inquiry into the purpose of each test at immediate completion of the measure would allow for a more accurate depiction of participant's feelings about the purpose of each test. A potential disadvantage to doing this is that, after receiving the first inquiry, it may prime the participant to focus on the purpose of each subsequent test while taking it. This potential manipulation would have to be randomly assigned among participants as well as counterbalanced between groups. Specifically, half of the participants could be asked about the purpose of the test immediately after they have taken each test, while the other half could be asked about the purpose of each test at the conclusion of the study.

It would also be interesting to provide information to participants both before and after the study regarding the presence of malingering tests (order counterbalanced and randomly assigned between groups), as done by Huskey (2005) and Johnson and Lesniak-Karpiak (1997). The latter researchers found that warning malingerers as to the presence of malingering tests prior to neuropsychological testing produced more sophisticated malingering, although it should be noted that other researchers have failed to find a significant difference between warned and naïve malingerers on select SVT's (e.g., Gunstad & Suhr, 2004). A recent survey of the effort-assessment practices of practicing clinical neuropsychologists found that the majority of the respondents rarely if ever provided a warning that SVTs would be administered (Sharland & Gfeller, 2007).

As malingerers become more sophisticated in their dissimulation, it will be important for neuropsychologists (particularly those in the forensic arena) to employ more sophisticated approaches to detecting potentially-successful malingerers. While measures such as the TOMM have proven to be highly efficacious for malingering detection, there is growing evidence to suggest that more sophisticated malingerers may escape detection by this test (DenBoer & Hall, in press). Although the TOMM may be improved by the use of consistency scores, it may also be possible that the test's "half-life" may be drawing near. Specifically, due to the clinical and research popularity of the TOMM over the last decade and the substantial increase in availability of the internet (as well as other SVT's), this measure has become significantly more visible, with documented cases of attorneys and litigating patients researching the TOMM (and other SVT's) prior to forensic neuropsychological evaluation (Victor & Abeles, 2004).

Given the long length of most neuropsychological evaluations, there is a need for current symptom validity testing to be of a shorter duration. As mentioned previously, clinicians cannot afford to devote almost an hour out of a six-hour neuropsychological assessment to testing for client effort. Time limitations for neuropsychological evaluation have forced clinicians to use fast, although less than ideal, symptom validity measures (e.g., Rey-15 Item Test). In response to the need to make SVT's of shorter duration, some clinicians have chosen to use abbreviated versions of popular SVT's, such as abbreviated versions of the PDRT (Gunstad & Suhr, 2004) and TOMM (Horner, Bedwell, & Duong, 2006). Exemplifying the need for shorter SVTs, clinicians have also begun to administer only Trial 1 of the TOMM, with this procedure showing high specificity (Gavett, O'Bryant, & McCaffrey, 2004). This finding replicates previous

findings from a sample of TBI litigants (Gavett, O'Bryant, Fisher, & McCaffrey, 2003) and participants from various clinical samples reported in the TOMM manual (Tombaugh, 1996). As the average time to complete the MCP was only 12 mins, the MCP may meet the need for a highly effective and efficient SVT.

Given the increasingly difficulty of malingering detection, clinicians and researchers are supplementing the use of specialized malingering-detection instruments with the use of validity coefficients in standard neuropsychological measures. Validity coefficients have been developed with many standard neuropsychological measures, including the CVLT-II (Greve, Curtis, Bianchini, & Ord, 2007), WAIS-III Digit Span (Heinly, Greve, Love, Brennan, & Bianchini, 2004), the Grooved Pegboard Test, the Finger Tapping Test, and the Grip Strength Test. Additionally, the Minnesota Multiphasic Personality Inventory – second edition (MMPI-2) has demonstrated adequate sensitivity and specificity in the detection of malingered neurocognitive dysfunction in TBI patients (Greve et al., 2004), although it should be noted that other research has found more modest associations between specialized measures of feigned memory impairment and MMPI-2 validity scales (Slick, Hopp, Strauss, & Spellacy, 1996).

Additional research should attempt to further validate the MCP using ethnically, geographically, and diagnostically-diverse patient populations. In terms of diagnositic diversity, additional experiments need to be conducted that include litigating TBI patients, nonlitigating TBI patients, and patients with different severity of acquired brain injury. Patients with various medical conditions (e.g., hypertension) and neurological impairments other than TBI also need to be examined. For example, a key patient population to examine is Alzheimer's disease (AD). As an example, future versions of

the MCP may be validated in patients with Hepatitis C infection. The use of symptom validity measures has already begun to be conducted in patients with Hepatitis C infection, finding that 3 of 14 (21.4%) Hepatitis C patients presenting for neuropsychological assessment failed the WMT, with failure on this test accounting for 41% of the variance observed in neuropsychological test performance that was outside of normal limits (Manansala et al., 2004).

In addition to patients with various medical problems, the MCP should be validated with children and adolescents, with and without brain injury. Data has begun to be collected with this population, with results showing that child and adolescent patients (n = 8, mean age = 10 years) exhibited better performance than adult litigating adults on the MCP, with children obtaining an average MCP Trial 1 score of 43.63 (SD = 6.14) and an average MCP Trial 2 score of 45.50 (SD = 6.95). Although it is anticipated that children and adolescents will serve as a useful group against which to compare the scores of adult patients performing below suboptimal effort, a child and adolescent normative sample would also be useful in that research has begun to highlight the possibility of malingering in this population (Donders, 2005). For example, Lu and Boone (2002) reported a case of suspected malingering of cognitive symptoms in a 9-year-old child involved in litigation regarding a head injury obtained by being struck by a car. Further information on pediatric and adolescent malingering, respectively, can be found in Faust, Hart, and Guilmette (1988) and Faust, Hart, Guilmette, and Arkes (1988).

In addition to obtaining a more diverse patient sample in terms of age, it is also necessary to obtain a more diverse patient sample in terms of race and ethnicity. Given the rise of research literature suggesting that racial background may have a significant

effect on neuropsychological test performance (e.g., Kennepohl, Shore, Nabors, & Hanks, 2004; Manly, Jacobs, Touradji, Small, & Stern, 2002; Shadlen et al., 2006; Schwartz et al., 2004), it will be important to validate the MCP with participants of diverse racial backgrounds, including (but not limited to) African-Americans, Hispanics, Asian-Americans, and Native Americans. In addition to measuring the effects of race and ethnicity, it may also be important to measure the effects of acculturation status on participants' performance on the MCP, as research has shown that this can be a greater determinant of performance on measures of neuropsychological functioning than race (Manly, Byrd, Touradji, & Stern, 2004; Manly et al., 1998).

In addition to diagnostic and racial diversity, it may also be important to examine geographical differences in MCP performance. It is of note that many photographs employed in the MCP are pictures of nature scenes, with these pictures taken primarily in the Rocky Mountain region of the United States. Given this, it is possible that some of the participants in our study (the overwhelming majority who lived in the same city that many of our pictures were taken), were able to identify select scenes that were included among the test stimuli and thus demonstrated better performance. Due primarily to the robustness of visual memory, it is anticipated that significant test performance differences between participants living in rural and urban locations will not be found, although normative development of the MCP with participants in all regions of the United States is needed.

Future research comparing the MCP with other popular SVT's may also be useful. Specifically, future scientific endeavors may focus on comparing the sensitivity and specificity of the MCP with other major malingering-detection measures, such as the

WMT, CARB, and VSVT. Additionally, research comparing the MCP and validity indicators from standard neuropsychological measures (i.e., the CVLT-II, Wisconsin Card Sorting Test) may also be of benefit.

Recent work by DenBoer and Hall (in press), found that select malingerers are able to simulate deficits on standard neuropsychological measures yet escape detection on tests of malingering. Future empirical investigation should examine the prevalence of successful brain-injury simulation among simulated malingerers in Experiment 1. It is notable that the results of the present study revealed the partial presence of successful brain injury simulation on both the MCP and TOMM, with 46 simulated malingering participants performing above the cutoff score for suboptimal effort on the MCP (35%) and 28 simulated malingerers performing above the empirically-derived cutoff score for the TOMM (22%). However, it should be noted that the only a small percentage of participants who scored above the cut-off scores on either the TOMM or the MCP suppressed their scores relative to controls on neuropsychological measures, a criteria for successful brain injury simulation. These results are generally in line with those of DenBoer and Hall (in press), who found that 29 of 91 simulated malingerers (32%) were successful in escaping detection by the TOMM.

Successful brain-injury simulation has serious clinical implications for the validity and future role of neuropsychological assessment. Additionally, successful malingering has significant financial costs to society as well. Specifically, false claims that are undetected have serious societal consequences, such as increased insurance premiums and the reallocation of funds to individuals who are undeserving of such monetary benefit (Bordini, Chawkins, Eckman-Turner, & Perna, 2002). Additionally, in the judicial

system malingerers may achieve additional secondary gain by avoiding a prison-term for treatment-based rehabilitation (Fredrick, Crosby, & Wynkoop, 2000).

The results of Experiment 1 emphasize the challenging nature of malingering detection and push for the further development of malingering detection measures with greater sensitivity and specificity. Future research may also focus on improving the detection of malingering by combining the MCP with other well-validated SVT's. This may serve to reduce the possibility of successful malingering. In fact, post-hoc analysis of data from the current study found that the use of multiple malingering–detection instruments (i.e., MCP + TOMM) substantially reduced the occurrence of successful brain-injury simulation.

Conclusion

The results of the current study demonstrated that the MCP, when compared to the current gold-standard malingering-detection measure, the TOMM, displayed improved sensitivity and equivalent specificity and face validity. Notably, a group of mixed-clinical patients with demonstrable memory deficits did very well on the MCP, further supporting its potential worth as a useful measure of malingering-detection. In addition to the computerized format and many unique features of the test, the MCP's use of response consistency appeared to be effective in differentiating individuals giving their best effort from simulated malingerers. In addition to displaying very good psychometric characteristics, the MCP also demonstrated increased efficiency of administration, further lending support for the potential usefulness of this measure. Although further development and validation with diverse clinical samples is certainly needed, these

results emphasize the strong empirical promise and potential clinical application of the MCP.

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Appendix A

Medical History Form

PLEASE FILL OUT THIS MEDICAL AND HEALTH HISTORY QUESTIONNAIRE.

Date_____ Age_____ Sex _____ Race _____ #_____

Were there any known difficulties with your birth? Yes No
If yes, describe_____

Do you have a vision problem that requires corrective lenswear (e.g., glasses)? Yes No

Education
Did you ever have to repeat any grades? Yes No

Were you ever placed in special education classes? Yes No

What is the highest grade you have completed? _____
(e.g., if you are a college freshman you have completed 12 yrs. of ed.)

Medical and Health History

	Yes	No
1. Have you ever been diagnosed with any neurological condition? If so, please list: _____	____	____
2. Have you ever had a blow to your head in which you were unconscious for longer than 30 minutes?	____	____
3. Are you currently experiencing significant problems with your mood (anxiety and/or depression) or any other psychiatric condition? If so, please list: _____	____	____
4. Are you currently receiving treatment for your mood (anxiety and/or depression) or any other psychiatric condition?	____	____
5. Have you ever felt you should cut down on your drinking/drug use?	____	____
6. Have you ever been annoyed by people that criticize your drinking/ drug use?	____	____
7. Have you felt bad or guilty about your drinking or drug use?	____	____
8. Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover?	____	____
9. Do you often drive under the influence of alcohol/drugs?	____	____

Appendix B

Instructions for Controls – Experiment 1

Please follow these instructions for the remainder of the experiment *without* letting the examiner know what you have been told to do! When you finish reading these instructions, sign at the bottom indicating that you have read them and understand your task. Then, place this signed sheet back into the envelope, seal it, place and X over the seal, and wait for the examiner to return. You will be asked about these instructions later on.

You are about to take some cognitive tests that examine mental abilities such as attention, memory, thinking and reasoning skills, and your ability to think quickly. Your task is to perform to the best of your ability, answering all questions in as honest a fashion as you can.

While the examiner is out of the room, remember to sign this sheet, place it in the envelope, seal it, and place an X over the seal of the envelope before the examiner returns. Please wait for the examiner to return.

Again, do not let the examiner know what these instructions have told you to do. Your performance on the tests should be the only way someone could figure it out.

Thank you very much for your participation.

I have read these instructions and will do my best to follow them for the remainder of the experiment.

_____

(Signature)

Appendix C

Instructions for Uncoached Malingerers – Experiment 1

Please follow these instructions for the remainder of the experiment *without* letting the examiner know what you have been told to do! When you finish reading these instructions, sign at the bottom indicating that you have read them and understand your task. Then, place this signed sheet back into the envelope, seal it, and wait for the examiner to return. You will be asked about these instructions later on.

You are about to take some cognitive tests that examine mental abilities such as attention, memory, thinking and reasoning skills, and your ability to think quickly. While responding to the tests, please pretend that you have experienced brain damage from a car accident involving a head-on collision. You hit your head against the windshield and were knocked out for 15 minutes. Afterwards, you felt "dazed" so you were hospitalized overnight for observation. Because the driver of the other car is at fault, you have decided to go to court to get money from the person responsible. During the next few months following the accident, the negative effects from your head injury disappear. Your lawsuit has not been settled yet, and your lawyer has told you that you may get more money if you look like you are still suffering from brain damage.

As you pretend to be this car accident victim, try to respond to each test as a patient who is trying to appear brain damaged in order to get money from the lawsuit. Thus, your performance on the tests should convince the examiner as well as the people involved in deciding the outcome of your lawsuit that you are still suffering from brain damage. *If you succeed in convincing the examiner that you have suffered a brain injury, you will receive two additional experimental credits, for a total of 6 credits.*

During the time that the examiner is out of the room, you may prepare for the examination. Please wait for the examiner to return. Remember to sign this sheet, place it in the envelope, seal it, and place and X over the seal of the envelope before the examiner returns. Again, do not let the examiner know what these instructions have told you to do. Your performance on the tests should be the only way someone could figure it out.

Thank you very much for your participation.

I have read these instructions and will do my best to follow them for the remainder of the experiment.

_____

(Signature)

Appendix D

Instructions for Coached Malingerers – Experiment 1

Please follow these instructions for the remainder of the experiment *without* letting the examiner know what you have been told to do! When you finish reading these instructions, sign at the bottom indicating that you have read them and understand your task. Then, place this signed sheet back into the envelope, seal it, and wait for the examiner to return. You will be asked about these instructions later on.

You are about to take some cognitive tests that examine mental abilities such as attention, memory, thinking and reasoning skills, and your ability to think quickly. While responding to the tests, please pretend that you have experienced brain damage from a car accident involving a head-on collision. You hit your head against the windshield and were knocked out for 15 minutes. Afterwards, you felt "dazed" so you were hospitalized overnight for observation. Because the driver of the other car is at fault, you have decided to go to court to get money from the person responsible. During the next few months following the accident, the negative effects from your head injury disappear. Your lawsuit has not been settled yet, and your lawyer has told you that you may get more money if you look like you are still suffering from brain damage.

As you pretend to be this car accident victim, try to respond to each test as a patient who is trying to appear brain damaged in order to get money from the lawsuit. Thus, your performance on the tests should convince the examiner as well as the people involved in deciding the outcome of your lawsuit that you are still suffering from brain damage. In order to convince these individuals, your brain damage must be *believable. If you succeed in convincing the examiner that you have suffered a brain injury, you will receive two additional experimental credits, for a total of 6 credits.*

Try to produce the most severe problems that you can *without* making it too obvious to the examiner. Major exaggerations, such as remembering absolutely nothing, are easy to detect. If the examiner does not believe that you have any problems you will not get any money for your head injury. People who have a head injury often have problems paying attention, cannot remember things as well, and do not learn things as easily as they did before their injury. They also think a little slower than they used to. Keep this in mind when taking the tests. Remember you are to try to mimic the performance of persons who are truly brain damaged.

During the time that the examiner is out of the room, you may prepare for the examination. Please wait for the examiner to return to the room. Remember to sign this sheet, place it in the envelope, and seal the envelope before the examiner returns. Again, do not let the examiner know what these instructions have told you to do. Your performance on the tests should be the only way someone could figure it out.

Thank you very much for your participation.

I have read these instructions and will do my best to follow them for the remainder of the experiment.

_____

(Signature)

Appendix E

Patient Information and Scoring Form

Dissertation Experiment 2

Participant ID#: _____ Date Tested: _____

Demographic Information:
Age: _____ Highest Level of Education Completed: _____ years
Sex: _____ Ethnicity: _____

A. Head Injury Information (traumatic brain injury):

1a. Nature/location of traumatic brain injury:

1b: Date of traumatic brain injury: _____
(if multiple, most recent tbi)

2a. Current symptoms experienced as the result of traumatic brain injury:

2b: How long symptoms have been experienced for: ____ days
____ weeks
____ months
____ years

3. Glasgow Coma Scale (GCS): _____

4. Estimated Loss of Consciousness (LOC): _____ minutes
_____ hours
_____ days

5. Estimated Post-traumatic amnesia (PTA): _____ minutes
_____ hours
_____ days SEVERITY RATING: mild
moderate
severe

6. *Head-injury history (tbi):*
Length of time (from the present) when head injury was sustained:

Incident 1:	Incident 2:	Incident 3:
_____ days	_____ days	_____ days
_____ months	_____ months	_____ months
_____ years	_____ years	_____ years

B. Head Injury Information (neurological disorder):

1a. Name and nature of neurological disorder:

1b: Date first diagnosed with neurological disorder: _____

2a. Current symptoms experienced as the result of neurological condition:

2b. How long symptoms have been experienced for: ____ days
____ weeks
____ months
____ years

SEVERITY RATING: mild
moderate
severe

Findings from Radiological Scans (*see medical records):*
MRI: CT:
Other: EEG:

Appendix F

Head Injury Sequelae Questionnaire (HISQ) - Experiment 1

The following are symptoms that are sometimes associated with a head injury. Please read each group of symptoms and decide how common you believe the symptoms occur following a head injury. Please circle the number on the scale below each group of symptoms, ranging from 1 (Not at all associated with head injury) to 5 (Strongly associated with head injury).

1) Memory Problems

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

2) Motor Problems ***and/or*** Coordination Problems

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

3) Attention Problems, Difficulty Concentrating, Slowed-Thinking, ***and/or*** Decrease in Problem-Solving Abilities

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

4) Language Problems, Speech Problems, ***and/or*** Trouble Finding the Correct Word

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

5) Anxiety, Depression, Temper is lost easily, ***and/or*** Irritability

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

6) Fatigue, Insomnia, Bothered by Noise, ***and/or*** Bothered by Light

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

7) Dizziness, Blurred Vision, ***and/or*** Headaches

1 2 3 4 5
(Not at all Associated) (Moderately Associated) (Strongly Associated)

Appendix G

Post-Experimental Questionnaire 1

1. Please summarize the instructions you were given by the examiner at the beginning of this experiment:

_____

_____

_____

2. Please rate the effort you put in to do the best you could on the measures in this study:

1	2	3	4	5	6	7	8	9	10
No effort at all				Moderate Effort					Maximum Effort

3. Indicate how hard you tried to follow the instructions you were given at the beginning of the experiment by circling the number that best describes your effort.

1	2	3	4	5	6	7	8	9	10
Didn't try at all				Tried moderately hard					Tried very hard

4. Indicate how successful you think you were in producing the results asked of you in the instructions by circling the number that best describes your success.

1	2	3	4	5	6	7	8	9	10
Not at all Successful				Somewhat Successful					Very Successful

5. Indicate how familiar you are with the effects that are often associated with a head injury by circling the number that best describes your familiarity.

1	2	3	4	5	6	7	8	9	10
Not at all Familiar				Somewhat Familiar					Very Familiar

6. What do you think the test with 50 line-drawings of common objects was designed to measure? (Please write only one purpose for the test)

_____

7. What do you think the test with different numbers in circles (connected in dot-to-dot fashion) was designed to measure? (Please write only one purpose for the test)

_____

8. What do you think the test with different numbers and letters in circles (connected in dot-to-dot fashion) was designed to measure? (Please write only one purpose for the test)

_____

9. What do you think the test with different numbers and symbols (the test that provided a key matching symbols with numbers) was designed to measure? (Please write only one purpose for the test)

_____

10. What do you think the test that asked you to remember numbers forwards and backwards was trying to measure?

_____

11. What do you think the test asking you to remember lists of words in a list and repeat them back to the examiner was trying to measure?

_____

12. What do you think the computer test asking you to remember digital photographs was designed to measure?

_____

13. What do you think the test asking you to remember pictures of a family doing things was designed to measure?

_____

Appendix H

DO THIS SURVEY SECOND – COMPLETE QUESTIONNAIRE 1 BEFORE THIS

Post-Experimental Questionnaire 2

It is possible that some of the tests you took today were designed to detect if someone is faking brain damage, while others are tests typically administered to test cognitive abilities such as memory, attention, and speed of information processing. Please put a check by any test that you took today that seemed as if it were designed to detect whether someone is faking brain damage. **IF** you mark a test, please indicate how certain you are that the test was designed to detect faked brain damage by circling the number that best describes your certainty.

_____ Remembering line-drawings of common objects (booklet test)

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Numbers in circles (connected in dot-to-dot fashion)

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Numbers *and letters* in circles (connected in dot-to-dot fashion)

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____Matching numbers and symbols (the test that provided the number and symbol key)

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Remembering words in a list and then repeating them back to the examiner

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Remembering numbers forwards and backwards

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Remembering pictures of a family doing things

1 2 3 4 5 6 7 8 9 10
Not at all Certain Somewhat Certain Very Certain

_____ Remembering complex digital photographs (computer test)

1	2	3	4	5	6	7	8	9	10
Not at all Certain					Somewhat Certain				Very Certain

Appendix I

SUBJECT INFORMATION AND CONSENT FORM – UNIVERSITY OF MONTANA

TITLE
Memory for Complex Pictures (MCP) 1: Development and Validation of a Digital Test of Memory Malingering at the University of Montana

INVESTIGATORS
John DenBoer, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-6347
Dr. Stuart Hall, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-5667

Special Instructions to the potential subject
Thank you for considering to participate in this study. This consent form may contain words that are unfamiliar to you. If the contents of this form are unclear, please ask the person who gave you this form to explain it to you.

Purpose
The purpose of this study is to investigate the ability of some tests to determine different types of performance. By signing below, you are giving your voluntary consent to participate in this research study.

Procedures
As a participant, you will be administered some tests that examine mental abilities such as attention, memory, thinking and reasoning skills, and your ability to think quickly. Your answers to these questions, as well as your performance on the testing measures, will be completely confidential. The session will last approximately two hours and will take place in Skaggs Building 237.

Risks/Discomforts
As a participant, it is expected that the amount of discomfort you experience will be minimal. It is possible, however, that some of the questions on the questionnaire may cause you to feel uncomfortable or sad. Additionally, you may feel frustrated at times while completing the different tests. If these feelings occur, feel free to discuss them with the examiner and to contact the principal investigator or faculty supervisor at the numbers provided above.

Benefits
Participating in this study may benefit you by 1) providing you with 4 experimental credits (with the possibility of an additional 2 experimental credits) and 2) giving you exposure to scientific research in psychology. Your participation will also provide very beneficial information to professionals working in the field of psychology.

Confidentiality
The information you provide will be held strictly confidential by the research examiners (**see limits of confidentiality below*). Your name will not be marked on the test answer sheets and questionnaires. However, if you agree to participate in this study, you will need to sign this form, which will be kept locked up and separate from all testing and questionnaire materials. We will

have you note your age, gender, race, and years of education for demographic purposes, but this personal identification information will not be attached to this form that contains your name. All demographic information will be separated from your individual responses, and will be used for data analysis purposes only. You will be assigned a participant number that will be used to help us keep your data sheets organized. The information that you provide will be read only by the principal investigator (John DenBoer, M.A.), the faculty supervisor (Dr. Stuart Hall), and the research assistants involved in testing. Your test and questionnaire responses will be kept a minimum of 5 years after the study has ended; however, this sheet containing your name and phone number will be destroyed at the conclusion of the study. The data from this study will be used for research publication purposes, as well as presented at an academic conference.

*****_There are conditions under which confidentiality may be breached. If you indicate wanting to harm yourself or someone else, this informed consent form will be given to a member of the clinical faculty who will contact you. Because of this, we also require that you provide your name and phone number below._

Name (print) _____ Phone _____

Although there is minimal risk associated with your participation in this study, The University of Montana requires that the following paragraph be included in all consent forms.

"In the event that you are injured as a result of this research you should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University or any of its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A., Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University's Claims representative or University Legal Counsel. (Reviewed by University Legal Counsel, July 6, 1993)."

Voluntary Participation/Withdrawal
Your participation in this study is entirely voluntary, and you may withdraw without penalty or any negative consequences. If you choose to withdraw, all your records will be destroyed, and the data you provided will not be used in this study. If you decide to withdraw from this experiment, you will still receive your experimental credits.

Questions
If you have questions about this study now or during this session, please ask the examiner. Additionally, you may contact the principal investigator (John DenBoer, 243-2367) if you have any further questions about the study. We will not be able to give you extensive feedback regarding your responses during testing; however, you will be provided with additional information at the conclusion of the study. This information will be presented in the form of a debriefing form. If you have any questions regarding your rights as a research participant, you may contact the UM Institutional Review Board Chair at 243-6670.

Subject's Statement of Consent
I have read the above description of this study and have been informed of the benefits and risks involved. All of my questions have been answered to my satisfaction, and I have been provided with the contact information for the principal investigator and the faculty supervisor in the event that I have concerns or questions in the future. By signing below I voluntarily agree to participate in this study and give my consent to the examiners to use the information I provide for the purposes of this experiment.

Printed Name of Participant	
Participant's Signature	Date
Examiner's Signature	Date

Appendix J

ADULT SUBJECT INFORMATION AND CONSENT FORM – BRIDGES/NEUROCARE

TITLE
Memory for Complex Pictures (MCP) 2: Development and Validation of a Digital Test of Memory Malingering at Community Bridges and Montana Neurocare

INVESTIGATORS
John DenBoer, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-6347
Dr. Stuart Hall, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-5667

Special Instructions to the potential subject
Thank you for considering to participate in this study. This consent form may contain words that are unfamiliar to you. If the contents of this form are unclear, please ask the person who gave you this form to explain it to you.

Purpose
The purpose of this study is to investigate the ability of some tests to determine different types of performance. By signing below, you are giving your voluntary consent for you to participate in this research study.

Procedures
As a participant in this study, you will be administered a test that examines your memory ability. This test will take no more than 30 minutes to complete. Your performance on this measure will be completely confidential.

Risks/Discomforts
As a participant in this study, it is expected that the amount of discomfort you experience will be minimal. It is possible, however, that you may feel frustrated at times while you complete this test. If you experience this feeling or others, feel free to discuss them with the examiner and to contact the principal investigator or faculty supervisor at the numbers provided above.

Benefits
Although your participation in this study offers you no direct monetary benefit, your participation will provide very beneficial information to professionals working in the field of psychology.

Confidentiality
The information you provide during this study will be held strictly confidential by the research examiners (*see limits of confidentiality below). Your name will not be marked on the test answer sheets and questionnaires. However, if you agree to participate in this study, you will need to sign this form, which will be kept locked up and separate from all testing and questionnaire materials. We will have you note your age, gender, race, and years of education for demographic purposes, but this personal identification information will not be attached to the form that contains their name. All demographic information will be separated from their individual responses and will be used for data analysis purposes only. You will be assigned a participant

number that will be used to help us keep your data sheets organized. The information that you provide will be read by only the principal investigator (John DenBoer, M.A.), the faculty supervisor (Dr. Stuart Hall), and the research assistants involved in testing. Your test and questionnaire responses will be kept a minimum of 5 years after the study has ended; however, this sheet containing your name and phone number will be destroyed at the conclusion of the study. The data from this study will be used for research publication purposes, as well as presented at an academic conference.

*****_There are conditions under which confidentiality may be breached. If you indicate wanting to harm yourself or someone else, this informed consent form will be given to a member of the clinical faculty who will contact you. Because of this, we also require that you provide your name and phone number below._

Name (print) _____ Phone: _____

Although there is minimal risk associated with your participation in this study, The University of Montana requires that the following paragraph be included in all consent forms.

"In the event that you are injured as a result of this research they should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University or any of its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A., Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University's Claims representative or University Legal Counsel. (Reviewed by University Legal Counsel, July 6, 1993)."

Voluntary Participation/Withdrawal
Your participation in this study is entirely voluntary and you may withdraw without penalty or any negative consequences. If you choose to withdraw, your records will be destroyed and the data they provided will not be used in this study.

Questions

If you have any questions about this study now or during the study session, please ask the examiner. Additionally, you may contact the principal investigator (John DenBoer, 243-2367) if you have any further questions about the study. We will not be able to give you extensive feedback regarding your responses during the study; however, you will be provided with additional information at the conclusion of the study. This information will be presented in the form of a debriefing form. If you have any questions regarding your rights as a research participant, you may contact the Institutional Review Board Chair at The University of Montana at 243-6670.

Statement of Consent
I have read the above description of this study and have been informed of the benefits and risks involved. All of my questions have been answered to my satisfaction, and I have been provided with contact information for the principal investigator and the faculty supervisor in the event that I have concerns or questions in the future. By signing below I voluntarily agree to participate in this study and give my consent to the examiners to use the information provided for the purposes of this experiment.

Printed Name of Participant	
Participant's Signature	Date
Examiner's Signature	Date

Appendix K

SCRIPT – BRIDGES/NEUROCARE

TITLE
Memory for Complex Pictures (MCP) 2: Development and Validation of a Digital Test of Memory Malingering at Community Bridges and Montana Neurocare

INVESTIGATORS
John DenBoer, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-6347
Dr. Stuart Hall, Dept. of Psychology, The University of Montana, Missoula, MT 59812, 243-5667

"I am asking people if they could like to participate in a research study I am conducting. As a participant in this study, you will be administered a test of memory. This measure will take no more than 30 minutes to complete. Your performance on this measure will be completely confidential. You are free to withdraw from this study at any time without penalty of any sort. As a participant in this study, it is expected that the amount of discomfort you experience will be minimal, although you may feel frustrated at times while completing this test. Although your participation in this study offers you no direct monetary benefit, your participation will provide very beneficial information to professionals working in the field of psychology. Your decision to participate or not will not affect your treatment in any way. Do you have any questions about the study?"

Appendix L

Debriefing Statement – Experiment 1

Thank you for participating in this study. Throughout the course of this experiment, you may have had questions regarding the nature or purpose of this study. If your still have these questions, the experimenter will be glad to answer them for you at this time. The purpose of this study was to investigate the ability of a neuropsychological test to differentiate people that are faking a neuropsychological deficit from individuals who are performing normally. **Due to your ability to follow the instructions throughout this experiment, you received the 2 additional credits, for a total of 6 experimental credits in all.**

Your answers to these questions, as well as your performance on the testing measures, will be kept completely confidential.

Although a slight amount of discomfort is normal, if you experienced a significant amount of discomfort during the course of the experiment, please address your concerns to the experimenter at the present time. If you feel uncomfortable doing so, you may contact the principal investigator, John DenBoer, at 243-2367, the faculty supervisor of the project, Dr. Stuart Hall, at 243-5667, or the chair of IRB, Sheila Hoffland, at 243-6670.

IMPORTANT:
We request that you not discuss the details of this experiment with anyone who may be a future participant in the study. Thank you for your cooperation.

Appendix M

Debriefing Statement – Experiment 2

Thank you for participating in this study. Throughout the course of this experiment, you may have had questions regarding the nature or purpose of this study. If your still have these questions, the experimenter will be glad to answer them for you at this time.

Your answers to these questions, as well as your performance on the testing measures, will be kept completely confidential.

Although a slight amount of discomfort is normal, if you experienced a significant amount of discomfort during the course of the experiment, please address your concerns to the experimenter at the present time. If you feel uncomfortable doing so, you may contact the principal investigator, John DenBoer, at 243-2367, the faculty supervisor of the project, Dr. Stuart Hall, at 243-5667, or the chair of IRB, Sheila Hoffland, at 243-6670.

Appendix N

Role-Play Termination Instructions

If you have received instructions to pretend like you sustained brain damage, at this point in the study please **stop** following your instructions. From this point forward in the study please provide your personal and honest responses to all questions. Thank you.

Appendix O

The Glasgow Coma Scale*

Eye Opening Response	Spontaneous – open with blinking at baseline	4 points
	Opens to verbal command, speech, or shout	3 points
	Opens to pain, not applied to face	2 points
	None	1 point

Verbal Response	Oriented	5 points
	Confused conversation, but able to answer questions	4 points
	Inappropriate responses, words discernable	3 points
	Incomprehensible speech	2 points
	None	1 point

Motor Response	Obeys commands for movement	6 points
	Purposeful movement to painful stimulus	5 points
	Withdraws from pain	4 points
	Abnormal (spastic) flexion, decorticate posture	3 points
	Extensor (rigid) response, decerebrate posture	2 point
	None	1 point

Total Score = 3 -15

*this measure to be used only for individuals over the age of 5 years of age

Appendix P

Ten Commonly Used Qualitative Signs and Symptoms of Malingering on Tests of Cognitive Abilities*

1. Any disability that is disproportionate with the severity of the injury or illness.

2. Recognition scores that are relatively lower than recall scores on tests such as list learning.

3. Disproportionately impaired attention relative to learning and memory scores (e.g., WAIS-R Attention/Concentration Index lower than the General Memory Index).

4. Failing easy items and passing more difficult ones (e.g., higher scores on backward vs. forward digits; on Trails B vs. Trails A; on difficult paired associates vs. easy paired-associates).

5. Unusually high frequency of "I don't know" responses.

6. Discrepancies between scores on tests measuring similar processes such as verbal or visual learning.

7. Inconsistencies between memory complaints and behavior observed during the test or outside the testing situation.

8. Near misses or approximate answers.

9. Pronounced decrements in delayed recall.

10. Inconsistent pattern between scores on tests and those expected from neurological illness or injury.

Appendix Q

Percent of Correct Responses for Different Clinical Groups on the MCP

	Number of Correct Responses								
Trials	50	49	48	47	46	45	44	43	< 43
Adult Mixed-Clinical Patients									
Trial 1	21.4%	14.3%	7.1%	7.1%	14.3%	7.1%	0.0%	0.0%	27.0%
Trial 2	21.4%	14.3%	7.1%	7.1%	14.3%	14.3%	14.3%	0.0%	7.1%
No Cognitive Impairment (NCI)									
Controls									
Trial 1	43.8%	37.5%	14.6%	2.1%	0.0%	0.0%	2.1%	0.0%	0.0%
Trial 2	75.0%	16.7%	8.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fake Cognitive Impairment									
Uncoached Malingerers									
Trial 1	2.2%	4.3%	6.5%	4.3%	0.0%	2.2%	0.0%	0.0%	80.4%
Trial 2	10.9%	2.2%	2.2%	2.2%	0.0%	2.2%	0.0%	0.0%	80.4%
Coached Malingerers									
Trial 1	2.1%	2.1%	0.0%	0.0%	2.1%	0.0%	8.3%	2.1%	83.0%
Trial 2	2.1%	2.1%	6.3%	0.0%	4.2%	2.1%	2.1%	4.2%	77.0%