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DISSIMULATION OF MENTAL RETARDATION AND TRAUMATIC BRAIN INJURY ON THE WAIS-III

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ABSTRACT

Dissimulation of Mental Retardation and Traumatic Brain Injury on the WAIS-III

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Since Atkins v. Virginia (2002), there has been increased concern that inmates will feign mental retardation (MR) to avoid the death penalty. However, very little research on malingering diction for mental retardation has been conducted, forcing most clinicians to rely on methods derived for malingered traumatic brain injury (TBI). This lack of research may lead to increased false positive rates. Limited research suggests that intelligence tests may hold promise for identifying malingered MR and malingered TBI. Therefore, developing malingering scales for most popular measure of intelligence, the WAIS-III, should provide the most effective and efficient measure for identifying persons feigning cognitive deficits. The current study investigated several research questions related to the factors just described. First, does malingering change based on the clinical group to be feigned? Second, will participants change their malingering performance based on type of secondary gain? Can malingering detection methods developed on the WAIS-R generalize to the WAIS-III, and will these methods be effective for identifying malingered MR. Finally, can the theory behind the Digit Span=s effectiveness as a malingering indicator be supported empirically? The results suggest that malingerers will use similar malingering strategy regardless of clinical group or malingering motivation. New discriminate function equations were developed to identify malingerers based on the clinical group being feigned and malingering motivation. Using unique combinations of malingering measures and subtest scores produced correct classification rates ranging from 91 to 80% with low false positive rates. Most of the established malingering measures developed and validated with the WAIS-R and TBI malingerers did not meet statistic significance when applied to the current group malingering participants regardless of clinical population being feigned or malingering motivation. Finally, malingerer=s perception of the Digit Span test was empirically shown to moderate malingering performance. Clinical recommendations, study limitations, and the direction for future research are discussed.

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CHAPTER 1

INTRODUCTION

Weighting a defendant's life against a victim=s justice creates an unenviable position for judges and jurors, and has been a controversial topic of debate. This consideration becomes particularly controversial when the defendant=s competency is in question, which has elicited strong emotional reactions from proponents and protesters of the death penalty. Proponents of the death penalty argue that victims suffer regardless of the intention or capacity to understand consequences. Therefore, victims deserve justice, which includes punishment of the person who committed the crime. Protesters, on the other hand, feel persons deemed incompetent are incapable of understanding right from wrong, and can not appreciate the consequences of their actions. Thus, without the ability to understand their actions, or the consequences of their actions, persons should not be held to the same accountability as someone who volitionally commits the same crime. Instead of the death penalty, persons should be rehabilitated and isolated from the general population in mental health facilities.

While not to the same degree, strong emotions are also elicited from civil litigation. Litigation for compensation, seemingly insignificant when compared to the ramifications of the death penalty, has fascinated Americans for decades. Many people are becoming irritated with the apparent increase of frivolous lawsuits. However, most people also understand that many litigants would be left devastated by personal injury if not for compensation. Victims would not have any opportunity to recuperate, rehabilitate, or regain any semblance of their original life without the resources provided by compensation. Thus, to avoid injustice for true victims, compensation for negligence appears unavoidable until a better system is proposed. Therefore, even though the consequences may not be life and death, litigation also has important implications and consequences.

A common aspect to both civil and criminal deliberations is the neuropsychological evaluation. Persons claiming mental retardation as a defense often undergo an evaluation to assess competency to stand trial. In this case, competency assessments are typically conducted by a professional, often a neuropsychologist, trained in intelligence testing and malingering detection. Similarly, individuals in civil litigation, claiming to have suffered cognitive deficits from brain trauma, also undergo evaluations by neuropsychologists. In this situation, cognitive deficits that may have resulted from injury are being measured. Neuropsychologists are necessary because MR and TBI are two conditions that could incapacitate a person (mentally) and serve as either a mitigating factor in death penalty cases or moderate future capability.

In either legal context, there is often a powerful incentive to perform poorly during the neuropsychological assessment, i.e., malinger in order to support personal injury, disability, worker=s compensation, or criminal defense claims (Wong, Lerner-Poppen, & Durham, 1998). Malingering and dissimulation are terms used to describe a patient=s behavior when trying to increase secondary gains (i.e., compensation), or escape prosecution, by faking symptoms to imply impairment. In other words, malingering can be conceptualized as a deception intended to create an impression of illness (Lees-Haley, 1986). The Diagnostic and Statistical Manual for Mental Disorders- Fourth Edition (DSM-IV; American Psychiatric Association, 1994) defines malingering as Athe intentional production of false or grossly exaggerated physical or psychological symptoms motivated by external incentives@ (pp. 296-297).

Because of a recent Supreme Court ruling (Atkins v. Virginia, 2002), which proclaimed the use of capital punishment on individuals with mental retardation was a violation of the eighth amendment, some victim rights advocates worry that death row inmates will now feign mental retardation (MR) to avoid the death penalty. Despite these concerns, the actual prevalence rate of malingered mental retardation is likely less than one might think because most States= legislation defines mental retardation as having manifested during childhood. This provision makes malingering extremely hard for defendants without documentation of MR during childhood. However, there are individuals who evince borderline IQ scores (70-80) and have questionable developmental histories. Regardless of whether these individuals have MR or not, external circumstances that decreased motivation (i.e., impoverished or abusive environment) will likely lead to decreased IQ scores and ensuring a diagnosis of MR. The DSM-IV acknowledges this area of uncertainty by providing IQ ranges instead of fixed and stable cutoff quotients. Thus, for low average IQ individuals with low developmental histories who would not typically be diagnosed with MR (due to an IQ less than 75), could be unduly diagnosed with any factors leading to a decrease in motivation. Furthermore, the precedence of Atkins v. Virginia (2002) may lead to additional constitutional laws banning the execution of persons who have incurred head trauma prior to the offense. Such judgments are likely the next step in the debate over capital punishment in the U.S., and interpretation of the eighth amendment of the constitution. More precisely, the concern is the eighth amendment will be applied to all defendants of lower culpability, not just defendants with MR. Thus, it is important consider how such a ruling could influence a defense strategy that encourages feigning or exaggeration of intellectual deficits, and institute ways of clearly separating persons who malinger such deficits from actual cases of MR.

Even though the prevalence rate of malingered MR may be low, the prevalence rate of malingered cognitive deficits may be as high as 66% among individuals involved in compensable personal injury litigation (Bollich, McClain, Doss, & Black, 2002; Greiffenstein, Baker, & Gola, 1994; Heaton, Smith, Lehman, & Voit, 1978; Johnson & Lesniak-Karpiak, 1997; Rogers, 1997). Litigation appears to fuel motivation to malinger. Reitan and Wolfson (1997) found litigating patients have less recovery following head injury in comparison to non-litigating patients. In addition, cognitive deficits in patients with mild traumatic brain injury (MTBI) tend to substantially improve following successful litigation and compensation, which suggests that a significant percentage of patients exaggerate the severity of their cognitive deficits in order to gain compensation (Binder & Rohling, 1996). As a result, much emphasis has been placed on ensuring appropriate compensation due to attempts in the U.S. and elsewhere to reduce medical care costs and insurance premiums (Franzen, Iverson, & Mcracken. 1990). Even more important, correctly differentiating TBI and malingering patients ensures genuine cases of TBI receive the compensation they deserve.

While guidelines have been proposed that describe when to suspect malingering (Binder, 1990; DSM-IV, 1994; Greiffenstien, Baker, & Gola, 1994), the unequivocal detection of malingering behavior has proven to be difficult for a number of reasons. First, the fundamental constraint in identifying malingering behavior has been the problem of criterion validity (Cercy, Schrentlen, & Brandt, 1997). While rough estimates have been made, the true prevalence of the behavior is unknown (Nies & Sweet, 1994). To obtain perfect discrimination, the base-rate (incidence in the population) must be the same as the selection ratio of the decision model. Wiggens (1980) stated, AAs the base rates and selection ratio become more discrepant from each other, the potential for making optimal decisions becomes more and more constrained@ (p. 247). Because the goal of a person who malingers is to go undetected, they will rarely admit to it, which constrains information regarding base rates. Consequently, it is difficult to demonstrate the external validity of malingering detection techniques proven in the laboratory. While less than ideal, epidemiological studies that provide base rates may have to come after extraordinarily powerful and sophisticated methods are developed that can be reasonably assumed to unequivocally detect malingering. Convergent validity from many experiments showing high efficacy with malingering detection may establish the means by which epidemiological studies can be conducted confidently.

While the criterion validity issue has proven challenging to neuropsychologists, there are several other issues that pose equally difficult challenges. Coaching has been shown to effect test performance (Franzen & Martin, 1999; Youngjohn, Lees-Haley, & Binder, 1999), and many persons in criminal investigations or litigation receive some form of coaching, usually from an astute and eager lawyer (Lees-Haley, 1986). The term coaching refers to educating a litigant or defendant on a particular diagnosis or test taking strategy. Inadequate objective assessment measures are also problematic. In terms of brain damage, not all forms are readily apparent or detectable by modern imaging techniques (PET, MRI, and fMRI), which could give professionals an objective measurement of neuronal damage. One example is axonal shearing, which rarely appears in imaging techniques, yet causes deficits by impairing neuronal transmission (Zilmmer & Spiers, 2001).

Another challenge facing neuropsychologists is that tests of malingering are often simplistic, and individuals can easily find strategies to avoid detection. Persons who malingerer might be able to figure out these unsophisticated procedures while less apt malingerers might be easily coached to avoid detection. Thus, the unsophistication of many of these tests for malingering leaves neuropsychologists vulnerable to making erroneous judgments in regard to the validity of neuropsychological test results.

Finally, practical limitations hamper the detection of malingering. Many of the assessments specifically made for detecting malingering come from the forensic psychology discipline, and only give information on test taking motivation, not neuropsychological functioning. Therefore, the administration of these tests requires added time and stress that psychologists, clients, and third-party payers may not be willing to accept. Moreover, the ensuing fatigue from a longer battery of tests may affect the validity of assessment results. Many clinicians would rather rely on clinical judgment than add the time and cost of more tests. However, clinical judgment has not been empirically shown to be superior to other methods (Ruff, Wylie, & Tennant, 1993). Because of these limitations, Bernard, Houston, and Natoli (1993) have urged that popular standardized neuropsychological tests should incorporate malingering detection scales. This way, the validity of the test can be assessed easily along with the interpretation of the test. Unfortunately, these advances appear to be slow in coming. Etcoff and Kampfer (1996) argue that psychologists and medical doctors simply, and all to often, differentiate actual MTBI and malingered symptoms of MTBI based on patient reported symptomology, controversial neurological tests, or ostensibly abnormal neuropsychological test results. All of these techniques have been shown to be vulnerable to malingering for one reason or another, and may lead to improper decision-making.

Although these challenges to symptom validity assessment highlight the need for more efficient and sophisticated malingering detection methods, improving the specificity of methods is also important because of the severe consequences for misdiagnosis. In criminal proceedings, a defendant may be imprisoned, denied mental health care, or even put to death based on clinician misdiagnosis. On the other hand, a defendant who escapes detection (when malingering) not only avoids due justice, but essentially violates the victim=s loved ones once again. Misdiagnosing civil litigants may not hold the grave consequences as criminal proceedings, but the ramifications are also important. A litigant falsely classified as malingering could be unfairly denied compensation and a dissimulating litigant who goes undetected could receive undue compensation. By taking steps to reduce the challenges psychologists face, accurate determinations of symptom validity should increase. Thus, discovering and validating malingering detection methods that are robust to the challenges facing psychologists is an important first step to improving accuracy.

Several methods have been proposed to detect malingering, and each has strengths and weaknesses. One method is the qualitative scoring approaches. The goal with this type of method is to identify qualitative aspects of test taking that discriminate malingerers from actual clinical populations rather than examining quantitative indexes (i.e., total scores from WAIS-III subtests). For example, the qualitative approach would identify a potential malingerer by identifying approximation answers that are close to the correct answer, but wrong. However, most clinical populations (i.e., MTBI) rarely make this type of error. Instead, actual MTBI patients either simply get the question right or do not know that answer. Another method, which is similar to qualitative methods, is pattern analysis. The pattern analysis approach adds valuable information for detecting malingered performance that is not reflected in quantitative scores. For example, examining the strengths and weaknesses of a participant across subtests measuring diverse cognitive domains can help identify feigned test performance. Simply comparing these profiles or using discrepancy scores can help neuropsychologists make accurate discriminations. A third method that has enjoyed success at identifying malingered performance is simply to examine the magnitude of error. If test results are exaggerated, it demonstrates intention to show deficits and invalidates responses. A fourth method is the forced choice technique, which uses binomial probability statistics to infer test-taking motivation. This technique is similar to multiple-choice tests because clients are forced to choose a single response from two or more answers. Malingerers are identified when their percentage of correct scores are statistically too low to have occurred by chance (significantly below 50% when two answers are provided). Other techniques include personality tests with validity indicators and symptom validity tests pertaining to the accuracy of claimed deficits. Thus, there are various methods exist for identifying malingering, but which technique is most appropriate may depend on specific situations and individuals. Little research has been conducted on which method is indicated based on situational variables and the optimal approach may be to simultaneously apply all or some of the methods during the clinical assessment.

One method that increases efficiency and has proved sensitive to malingering is to develop test indexes using qualitative, quantitative, and pattern analysis methods. The present study applies the approaches to one of the most widely used tests of brain function, the Wechsler Adult Intelligence Scale- Third Edition (WAIS-III; Wechsler, 1997), which despite its widespread use has received relatively little attention in the malingering literature. The WAIS-III measures diverse intellectual abilities and cognitive functions. Deriving classification procedures for malingering on the WAIS-III is important for several reasons. First, the WAIS-III is likely to be used in most assessments of cognitive functioning. Second, the WAIS-III is comprised of many different subscales, which lends themselves nicely to: 1) the examination of malingering strategy across different cognitive domains, 2) the assessment of efficacy for different detection techniques, and 3) the identification of subtest appeal to malingerers. In other words, identifying what makes a particular subtest attractive to someone who is feigning deficits. Finally, successful malingering on the WAIS-III would require knowledge of impaired performance patterns across all subtests and their interactions. This complexity should make malingering difficult for even well trained malingerers. While malingering studies on the WAIS BIII have been conducted, most research has been conducted with older versions of the WAIS, and validation studies on the most recent version are lacking. Given that 32% of the items were changed from the WAIS-R to the WAIS-III, the WAIS-III needs to be evaluated in its own right. Furthermore, there is a paucity of research investigating the moderating and mediating variables behind subtest selection, so much improvement can be made to any existing malingering scales utilized on the WAIS.

In sum, malingering indexes derived from neuropsychological tests is desirable because it may reduce the need for additional symptom validity testing. Despite this efficiency, using different scoring procedures across multiple subtests could potentially become laborious. Thus, to fully streamline malingering detection, it is important to identify the subtests on which malingerers prefer to demonstrate impairment, and identify the most effective method of malingering detection for use with those particular subtests. Identifying the factors behind malingerers= decisions to choose one subtest over another should not only increase assessment efficiency, but allow for the more powerful and sophisticated measures to be developed. While many malingering scales typically examine scores that are below expectation for clinical populations, few actually examine subtest selection criteria. This study is designed to validate detection techniques developed for the WAIS-R for use with the WAIS-III, and identify which methods are indicated for specific subtests and populations. To do so, this study will attempt to identifying 1) which subtests and indexes within the WAIS-III specific types of alingerers perform insufficiently on, 2) which subtests they perform sufficiently on, 3) the behavior and responses malingerers use to demonstrate impairment (due to mental retardation or brain trauma), and 4) why they chose the particular subtest, index, behavior, and response.

CHAPTER 2

LITERATURE REVIEW

In the following section, literature relevant to the current proposal is reviewed. These sections include: 1) MR, Competency, and Criminal Law 2) Civil Litigation 3) Traumatic Brain Injury, 4) Neuropsychological Assessment, 5) Detecting Malingering, 6) Ability of the WAIS to Detect Malingering, and 7) The Effects of Coaching on Malingering Detectability.

Mental Retardation, Competency, and Criminal Law

On the night of August 16, 1996, Daryl Atkins and William Jones were under the influence of alcohol and marijuana. Despite having no money, the two men decided that they would need more alcohol to keep the evening going. This decision would lead to a senseless criminal act, and eventually a landmark Supreme Court ruling. Outside a convenience store around midnight, the two men abducted Eric Nesbitt with a semiautomatic handgun, robbed him of his money, forced him to an ATM machine in Nesbitt=s truck (where cameras captured the event on videotape) and withdrew even more money from Nesbitt=s account. The pair then took Mr. Nesbitt to an isolated location where they shot him eight times. The videotape from the ATM led to the capture and arrest of Atkins and Jones, who subsequently confessed to the abduction, robbery, and murder.

Each defendant confirmed the account of the other, with the exception of who pulled the trigger. Jones made a plea agreement to reduce his charges and escape the death penalty in return for testimony against Atkins. Jones testified that Atkins pulled the trigger on Nesbitt, and that he tried to prevent Atkins from killing the man by wrestling with Atkins for the gun, resulting in the accidental shooting of Atkins in the leg. Atkins, on the other hand, testified that Jones was the shooter, and accidentally shot Atkins in the leg as he freely shot the semiautomatic handgun. Jones=s testimony was more coherent than Atkins=s testimony, and was determined by the jury to be more credible. The jury decided there was sufficient evidence to establish Atkins=s guilt, and he was subsequently convicted and sentenced to death.

The sentence was appealed all the way up to the Supreme Court of Virginia based because Atkins was mentally retarded, but each attempt failed. The Court avowed the death penalty sentence and rejected Atkins=s defense claims. The Virginia Supreme Court ruling cited Penry v. Lynaugh (discussed below) as influencing its decision to reject Atkins=s appeal. Thus, Atkins= defense team appealed to the U.S. Supreme Court in a final effort to spare his life. The decision by the U.S. Supreme Court on Atkins= appeal marked a powerful shift in the interpretation of the eighth amendment, which states cruel and unusual punishment is unconstitutional under federal law. Upon certiorari (Latin for Ato be informed,@ and is the name given to appellate proceeding for reexamining the actions of a lower appeals court), the U.S. Supreme court reversed and remanded Virginia=s Supreme Court ruling. The reverse and remand not only spared Atkins= life, but established a new precedence for treatment and sentencing of defendant=s with mental retardation (Atkins v. Virginia, 536 U.S. 304, 2002). How the

Supreme Court eventually granted certiorari to Atkins v. Virginia is interesting and shall be discussed next, along with other important background to help understand how the U.S. Supreme Court eventually determined this landmark decision.

In the Atkins trial, the U.S. Supreme Court determined that executing mentally retarded defendants was excessive punishment, but the Court had not ruled this way in previous trials. The Eighth Amendment draws its meaning from Athe evolving standards of decency that mark the progress of an evolving society@ (Atkins v. Virginia, 536 U.S. 304, 2002). Thus, in previous Supreme Court rulings, defendants had been unsuccessful at demonstrating that societal standards condemn the practice of executing persons of limited intellectual functioning. For example, in an earlier Supreme Court ruling (Penry v. Lynaugh, 1986), the Court ruled against John Paul Penry, a mentally retarded man sentenced to death in the state of Texas. Penry=s defense team argued that he should not be executed because to execute him would be excessive punishment according to current national consensus. At the time, however, only two states (Georgia and Maryland) specifically prohibited the execution of defendants with mental retardation. According to the Court, two States did not establish a national consensus against capital punishment for defendants with mental retardation, and concluded that such executions did not violate the eighth amendment. The court further justified their ruling by noting the eighth amendment did not specify or explicitly address criminal defendants identified as having mental retardation. Since the Penry ruling, 17 States have adopted legislation prohibiting the execution of inmates with mental retardation, which likely prompted the court to reexamine the issue.

A decade after Penry v. Lynaugh, the U.S. Supreme Court granted certiorari to

McCarver v. North Carolina to reexamine issue of whether executing inmates with mental retardation violated the Eighth Amendment. However, the case never made it to the Supreme Court because the Governor of North Carolina (Michael Easley) signed a bill into State law prohibiting the execution of defendants with mental retardation. While the McCarver case became moot (Sloan, 2003), it is important because it indirectly led to the Supreme Court granting certiorari to Atkins v. Virginia. The Supreme Court permitted all amici curiae briefs filed in the McCarver case to be refilled in the subsequent Atkins v. Virginia trial. The briefs strongly influenced the Court=s decision regarding a new national consensus.

The most influential brief was prepared by Harold Hongju Koh and his colleagues. While conducting research for the amicus brief, Koh and his colleagues wrote they were surprised to discover that the U.S. was the only country in the world still executing persons with mental retardation (Koh, 2003). China, who conducts more executions than any other country in the world, had long since banned the execution of people with mental retardation (dating all the way back to imperial times). The last country to allow such executions besides the U.S. was Kyrgyzstan, who placed a moratorium on the practice in 1999 and plans to abolish all executions by the year 2010 (Koh, 2003). Because the U.S. stood alone in allowing the execution of mentally retarded defendants, Koh=s first argument in the brief was that such executions violated international law. Our laws in regard to human rights are partially determined by international standards. Thus, the U.S. was not in accordance with international standards. He went on to argue that the practice of executing inmates with mental retardation was now banned by most states, and therefore, the criteria of Aunusual@ punishment under the eighth amendment had been met.

The Supreme Court agreed, citing the large number of states enacting prohibitions of such executions and the rarity of such executions in states that do permit the death penalty for mentally retarded inmates. The Court further cited that such executions were not only opposed by religious and professional organizations, but also by the world community. Thus, the court determined that a new national consensus had been established and the execution of persons with mental retardation represents excessive punishment that is cruel and unusual, and therefore violates the Eighth Amendment.

Another factor in the Court=s decision was the competency of the defendant. The Court stated that deficiencies possessed by individuals with mental retardation (in respect to information processing, communication, abstract reasoning, impulse control, and understanding of others) puts into question whether the death penalty=s retribution and deterrence justifications were applicable to such offenders (Atkins v. Virginia, 536 U.S. 304, 2002). Moreover, the Court questioned whether such deficiencies put persons with mental retardation at special risk for wrongful execution.

Despite the landmark reversal and remand, the ruling in Atkins v. Virginia does not eliminate the execution of mentally retarded inmates across all States, and several factors contribute to the likelihood that a defendant with mental retardation could still easily be tried and convicted of capital punishment. The first factor comes from the Supreme Court ruling itself. Criminal law ' 93.3, head note: 6 (Atkins v. Virginia, 536 U.S. 304, 2002) affirms that not all persons claiming to be mentally retarded will fall within the range of offenders with MR whose execution is prohibited by the Eighth Amendment. In other words, individuals who are borderline MR may still be tried and prosecuted as it will be up to each State to determine whether that particular defendant is competent and due protection under the Eighth amendment. Therefore, the enforcement of the constitutional restriction is left to each State. In fact, the Court was careful to state that some persons with MR, who display deficiencies and impairments, may not warrant exemption from criminal sanctions (criminal law ' 69; head note 7; Atkins v. Virginia, 536 U.S. 304, 2002). In essence, the Supreme Court left the definition of mental retardation up to each individual State, which produces variation from State to State as to what level of intellectual competency and functioning constitutes competency to stand trial and sentencing for capital punishment. This variation is further compounded by the different psychological instruments each state finds appropriate to assess individuals with suspected or known mental retardation (Downing, 2002). Thus, the likelihood that a defendant could be convicted and sentenced to death depends upon which State the offense occurred.

Downing (2002) wrote an excellent review of the differences among State definitions of mental retardation. Some of the highlights of her review will be discussed below and clearly demonstrate that States differ on 1) IQ cut off levels for determining retardation, 2) definitions of adaptive functioning, and 3) age of onset of impairment. All three criteria are determining factors for diagnosing mental retardation according to most authoritative standards such as the DSM-IV (1997; APA) and the American Association of Mental Retardation (AAMR). Currently, Arizona and Arkansas use an IQ of 65 while most other states use a cutoff of 70. Some States, however, do not even use IQ in their definition of mental retardation (Colorado, Georgia, Indiana, and Kansas). Even within the majority of States who use an IQ of 70 or below as part of their definition of mental retardation, variability exists in defining level of impairment in adaptive functioning. Even further variation among states is included when adding age of onset to the mix. For example, Kentucky, New Mexico, Nebraska, and Washington do not state an age of onset in their definition. They make reference to manifestation during a developmental period. North Carolina, South Dakota, and Tennessee, however, define mental retardation as impairment manifesting before the age of 18, while in Maryland impairments must occur before the age of 22.

The variation among States= definitions of mental retardation produces different classification systems for similar individuals. For instance, a defendant might be determined mentally retarded in one state, and subsequently protected from capital punishment under the Eighth Amendment, but executed if convicted in another State. Downing (2002) presented a hypothetical situation where a defendant was first diagnosed with mental retardation at 19. This hypothetical person would be executed in North Carolina, South Dakota, and Tennessee, but not Maryland. If the hypothetical defendant was first diagnosed at 23, then he would be executed in Maryland, North Carolina, South Dakota, and Tennessee, but not Kentucky, New Mexico, Nebraska, or Washington. This variation might lead to increased rates of malingering in particular States where younger defendants do not have to have an established history of MR.

The second factor increasing the likelihood that a mentally retarded defendant could slip through Atkins v Virginia is the classification of mental retardation (i.e., mild, moderate, profound) often confuses politicians, judges, and juries. This is a very important consideration because Criminal law ' 93.3, head note 6 (Atkins v. Virginia, 536 U.S. 304, 2002) clarifies that not all persons claiming to be mentally retarded will fall within the range of offenders with mental retardation whose execution is prohibited by the Eighth Amendment. Thus, a classification by an expert witness that a defendant is Amildly@ mentally retarded may be mislead judges and jurors to find the defendant competent, because he or she only has mild impairment. In other words, mild MR (approximately a full scale IQ of 50-70; DSM-IV, 1997) is a misleading term because laypersons tend to believe the actual impairment of the person with MR is mild, which is not true (Sloan, 2003). Mild MR refers to the level of impairment a person with MR has in comparison to the population of persons with MR (roughly 2% of the U.S. population), rather than in comparison to the population of persons with no impairment. In fact, mild MR translates into academic skills no higher than the sixth grade and an IQ ranking below 98% of the population (Sloan, 2003). Thus, impairment defined as mild is quite substantial when compared to persons without MR.

Beyond differences with state definitions and semantic misunderstanding of technical jargon, another complication States must consider is the Flynn Effect. The Flynn Effect (named after James Flynn, who researched this phenomenon) is the title of a century long trend in IQ scores. The trend is that average IQ scores have continually risen. In just one generation, the average IQ could increase 5 to 25 points (Flynn, 1998; Kanaya, Scullin, & Ceci, 2003). Thus, efforts have been made to counter act this trend by periodically renorming tests after making them harder. Renorming typically occurs every 15 to 20 years to reset the mean to a standard score of 100. This effort, however, may have several implications for persons with mental retardation.

One major implication is the year in which a defendant was assessed. An inmate determined to possess an IQ just above a State=s cutoff in a year toward the end of a test=s norming cycle may actually be mildly, or borderline mentally retarded. Kenya, Scullin, and Ceci (2003) investigated longitudinally the IQ records of school children with borderline (a little above 70 IQ) and mild mental retardation and found an average decrease of almost six points when retested with renormed tests. Furthermore, these children were more likely to be classified as having MR. Thus, an inmate determined to have an IQ just above a State=s cutoff during the end of a norming cycle would likely meet the State=s cutoff standard and be assessed as mildly retarded if tested again shortly after the renorming period. Similarly, another implication of the Flynn Effect is that many states require documented impairment occurring during childhood. An inmate tested with old norms during childhood may have eluded a proper assessment of his or her ability resulting in a lack of documented childhood impairment. Obviously, this lack of documentation would adversely affect the defendant=s case.

While a lack of awareness regarding the Flynn Effect could potentially weaken, or strengthen, a case, knowledge of the Flynn Effect could impact the legal strategy of defendants and prosecutors. Clearly, both sides will argue the Flynn Effect adversely affected their position and will argue for retesting. More likely, each side will attempt to locate archival data coinciding with the norming cycle that best helps their case (Kanaya et al., 2003).

Finally, a fourth factor putting MR defendants at risk for execution is that persons with MR pose unique challenges to their own defense. Sloan (2003) listed several characteristics that persons with MR possess that hinder appropriate assessment. First, people with MR tend to be led very easily. This places them at a distinct disadvantage upon questioning from investigators and prosecutors. Second, persons with MR are often embarrassed about their limitation and try to cover it up to the best of their ability. Third, many persons with mental retardation often try to please persons of authority. This is understandable as most have had to rely on persons of authority for their entire life, whether it be a family member placed in charge of their well being, a social worker, teacher, or residential housing staff. Finally, people with MR have a diminished capacity for helping their defense counsel and making decisions in their best interest. Whereas a person of average intellectual capacity may be able to coherently and more effectively state facts and recall event pertaining to the situation in question, persons with mental retardation cannot, and therefore, are disadvantaged when it comes to formulating a defense.

These factors, when combined, significantly increase the possibility that a person with mental retardation may be executed despite the Supreme Court=s ruling in Atkins v Virginia. In the wrong State, with poor documented history, and an IQ test given at the end of norming cycle, a clearly mentally retarded individual could easily be convicted of a capital punishment crime. Ways to decrease this possibility are relatively straight forward, but, as with any legal proceeding, are also easier said than done. However, if State governments imposed a standard definition of mental retardation and diagnostic assessment guidelines, such as the diagnostic criteria from the AAMR or DSM-IV, then both the validity and reliability of such assessments would be increased across the U.S. To further increase validity and reliability, States could utilize the same standardized assessment instruments, such as the WAIS-III and Vineland, or any other standardized measures of IQ and adaptive functioning accepted by the majority of mental health professionals. The Flynn Effect must also be taken into consideration. One potential solution to address the Flynn effect may be to create a regression equation, based upon the research data of Flynn and other researchers (Flynn1984, 1987, 1998; Kanaya et al.., 2003) that could be used to estimate the increase in IQ points of the defendant (based upon the norming cycle of the test and assessment date). In addition, educating judges, attorneys, and juries about the nature of mental retardation and its implications for criminal issues (i.e., easily led, tendency to please authority figures, etc.) should produce better decision-making in regard to the competency of MR defendants.

Beyond the measures presented above, taking steps to rule-out malingering and insufficient effort should also increase the accuracy of assessment and diagnosis of persons with mental retardation. Applying strategies from forensic and neuropsychological research to demonstrate the validity of test results should add confidence to determinations of competency, intelligence, and daily functioning ability. These strategies have largely been used in civil litigation regarding head injury or defendant claiming to be not guilty by reason of insanity, but the benefits of incorporating such measures also appears warranted in cases where intelligence and competency are in question. Incorporating malingering measures may also help ease the concerns of death penalty and victim rights advocates. For example, many argued that after the Atkins v Virginia decision, appellate courts would be over run with death row inmates seeking a stay of execution based upon their mental capacity. Quoting Dianne Clement, president of the Houston-based victim rights group Justice For All, AThey opened a Pandora=s box that is going to be never ending. We will flood our appellate courts in paper, and I don=t know if they=ll ever recover@ (Houston Chronicle, June 21, 2002, Sect A, p. 1). The fear is that potentially hundreds of appeals from death row inmates will now claim they are mentally retarded. Sophisticated and powerful malingering detection methods may provide assistance in identifying frivolous claims and ease concerns of victim rights advocates.

In sum, adding standardized diagnostic instruments, assessment criteria, and sophisticated malingering measures to the assessment processes would not only help appease the concerns of opponents of the death penalty and advocates of the mentally retarded, but would likely help to appease victims rights and death penalty advocates as well.

Competency to Stand Trial

When the Supreme Court ruled in Atkins v. Virginia, Nevada initially threatened to not acknowledge the decision, although the Governor eventually complied. Despite this initial protest, Nevada=s statutes on capital punishment in regard to MR are in line with many States across the country. Because of Nevada=s representativeness of other states, Nevada constitution will be reviewed to better understand current competency investigations for most States. The review is by no means exhaustive or accurate for all States, but should help the reader better understand what rights defendants are entitled and the process of going through a competency assessment.

According to the U.S. constitution, the defendant=s awareness and ability to participate in the criminal proceedings must be functional and intact if the defendant will stand trial. In Nevada, only psychologists and psychiatrists are allowed to make this determination. Nevada Revised Statutes ch. 193.210 states that a defendant is competent if he or she is not diagnosed with MR and is at least fourteen years of age. As an aside, a child as young as eight can stand trial if it is determined that the child understands the distinction between Agood and evil@ (Nevada Revised Statutes 193.210, 194,010). Persons deemed to be incompetent cannot be tried, sentenced, or punished while they remain incompetent (Nevada Revised Statute 178.400). Obviously, the preceding statement was intended to address the legal competency of defendants who were found to be impaired as a result of mental illness, as MR is permanent and does not remit. The competency issue can be raised when a defendant is brought up for trial or at the time of sentencing. When doubts arise about the defendant=s competency, the criminal court must suspend the trial or sentencing procedure until the question of competency is resolved.

In Nevada, psychologists can be asked to evaluate defendants and testify about their competency to waive their rights to remain silent, to counsel, and to be judged by a jury trial (in cases not involving the death penalty). Furthermore, psychologists may be asked to make determinations as to the competency of defendants during the arrest, stages of the investigation, and at trial. These rights are guaranteed under both U.S. and Nevada constitutions. Nevada, however, is one of the few states where there is no provision for the prosecutor to request that a psychologist or psychiatrist evaluate the defendant and determine whether to proceed with charges for a criminal offense or divert to the mental health system. Thus, the defense team must ensure this action is taken, and prosecutors must proceed with prosecution if this action is not taken. Nonetheless, a few entities can provide such services with the consent of the prosecutor and defendant. In cases where a defendant is mentally ill and the criminal court believes the defendant to be a danger to him or herself, or a danger to others, the criminal court can order an evaluation. Under these circumstances, charges can be dropped if the defendant=s competency cannot be restored (Nevada Revised Statute chapter. 178.425, 178.460).

After competency assessments have been conducted, a competency hearing in open court is held where the judge receives the expert=s report of the full examination. In Nevada, there must be two experts (psychologist or psychiatrist) appointed to examine the defendant. During the hearing, prosecutors and defense attorneys may introduce evidence and cross-examine one another=s witnesses. The court then decides the legal competency of the defendant. When the defendant is found to be competent, the trial or sentencing is allowed to proceed (Nevada Revised Statute 178.420).

In cases where the defendant is ruled to be incompetent by the court, the defendant will be committed to the custody of the Mental Hygiene and Mental Retardation Division (MHMRD; Nevada Revised Statute 178.450). The defendant is held in custody by the MHMRD until such time as the court orders the release of the defendant or until he or she can return to stand trial or be sentenced. The MHMRD must report on the defendant=s competency status at six-month intervals from the time of commitment. The status report includes assessments of the defendant=s danger to self or others and the probability of the defendant=s ability to regain competence to stand trial or sentencing in the near future. In cases involving MR, where there is no likelihood of recovery, the determination of a defendant=s danger to self or other does not have to meet the same criteria.

In this section we have reviewed issues concerning MR and competency to stand trial. Federal and State laws were reviewed in regard to sentencing of defendants with MR and arguments were made as for adding standardized assessments of MR are important. Furthermore, arguments were made as to why malingering detection methods are important for these assessments. Interestingly, the courts do not currently provide the same protection from capital punishment to individuals with TBI. However, commonalities between MR and TBI do exist, particularly with regard to cognitive deficiencies, which call into question whether the death penalty=s retribution and deterrent justification were applicable to such defenders (Penry v. Lynaugh, 1989). A second issue is the lack of information regarding malingering of mental retardation. To date, few studies have directly examined this issue. However, some insight might be gained from the TBI literature. Most studies examining malingering during civil litigation have focused on feigning of TBI symptoms. Thus, in the next section, information regarding civil litigation will be reviewed.

Head Trauma and Civil Litigation

To this point, the discussion has focused on criminal proceedings, the death penalty, and mental retardation. However, other legal proceedings involve the WAIS-III, neuropsychological assessment, and test validity. In fact, studies of malingering are more prevalent for civil litigation cases than for criminal investigations. This is likely due to the shear number of litigation cases where malingering could benefit the litigant. To better understand this specific area of malingering detection, the following section reviews TBI and the typical neuropsychological assessment of TBI.

One of the most prevalent sources of litigation involves head trauma Each year, approximately 373,000 cases of traumatic brain injury are reported in the United States (TBI; Zasler & Martelli, 2003), and 2,000,000 cases reported worldwide (Gualtieri, 1995). Many of these cases will enter into litigation for compensation of their injuries.

This becomes especially true when there are cognitive, physical, or affective abnormalities that persist after the injury and interfere with day-to-day functioning. Therefore, neuropsychologists often play a significant role in civil litigation of TBI.

In cases of mild traumatic brain injury (MTBI), damage usually occurs at the microscopic neuronal level, which hinders the ability of objective medical techniques to confirm the presence of brain damage. Many cases of MTBI will go undetected by sophisticated neuroimaging procedures, such as magnetic resonance imaging (MRI), because these techniques can only detect gross neuronal damage. Not only do neuroimaging techniques lack sensitivity and specificity at the microscopic level, these techniques do not determine presence and severity of cognitive deficits resulting from the neuronal damage (Iverson, 1995). Thus, even in cases where no objective medical evidence exists that cerebral damage has occurred, significant damage may be present, so litigants are typically referred to neuropsychologists for psychometric testing.

In these cases, neuropsychological assessment is necessary to determine the severity and type of cognitive deficit, as well as the level of functional impairment, and assessment results often determine the amount of damage awarded to litigants. Obviously, this medico-legal context places pressure on patients to perform at suboptimal levels, which is potentially problematic in more ways than the person being awarded undue compensation. If real deficits exist, a proper assessment may not be valid, and treatments that may be available for the litigant may be overlooked. Thus, rehabilitation that may be effective may not be instituted, or the wrong treatment employed. Also, undue compensation strains limited healthcare resources and diminishes the credibility of neuropsychological evidence and the profession.

To understand the issues facing neuropsychologists in this context, it is important to understand what TBI is, how it is assessed, and ways neuropsychologists have assessed whether there is a presence of true damage, or if impairments are being exaggerated or outright feigned. The following sections review these topics.

Traumatic Brain Injury

TBI occurs frequently and is a significant public health problem. As mentioned previously, estimates of TBI can be as high as 2,000,000 new cases each year (Gualtieri, 1995). Most of these (80%) are mild traumatic brain injury (MTBI; Zasler & Martelli, 2003). Most frequently caused by motor vehicle accidents, MTBI victims are typically males 15-24 years of age. The term concussion is still widely used by laypersons to describe a fluctuating state of consciousness occurring after a head injury. Concussion is a largely out-dated term, however, and concussions are now referred to as closed head injury (CHI) or traumatic brain injury (TBI). Similarly, the term postconcussive syndrome is out-dated, and has been replaced by mild head injury or minor traumatic brain injury (Gasquoine, 1997). These syndromes describe a symptom complex that includes poor concentration, memory loss, anxiety, depression, irritability, dizziness, sleep disturbance, and fatigue.

Overview of memory disorders

By far, the most commonly reported symptom of TBI is memory impairment, which can be referred to as amnesia. There are two main categories of amnesia, retrograde and anterograde amnesia. Retrograde amnesia refers to difficulties remembering events prior to some traumatic event. Anterograde amnesia refers to an inability to form new memories after a traumatic event. Therefore, retrograde amnesia is indicative of retrieval impairments and Anterograde amnesia is indicative of encoding impairments. While both types of amnesia are distinct categorically, it is common to observe both in a patient suffering from TBI.

Individuals who suffer a concussion typically experience retrograde amnesia, i.e., they forget events prior to the concussion. How far back the amnesia affects memories is usually dependent on the severity of the concussion. However, the majority of memories are only erased temporarily. Older memories typically return first because the typical pattern of recovery starts with the distant past and works forward. The first few memories are not generally placed in the correct chronological order and often memories are fused together as they are recovered. As more memories are recovered, an AIsland of Remembering@ occurs where groupings of memories can be placed in a chronological order with missing gaps of time between them. As more memories are recovered, the time gaps decrease and the islands of memories come together until memory is largely restored. How much recovery takes place is variable based on severity of trauma and individual differences. However, one homogenous trait is that the last few minutes prior to trauma are rarely recovered. This may be because only a shallow level of processing has occurred in short-term memory that didn=t allow for storage in long-term memory.

Two studies empirically demonstrating the permanent loss of memory just before a traumatic event are Yarnell and Lynch (1970) and Squire et al.., (1975). Yarnell and Lynch (1970) conducted an informative field study experiment on retrograde amnesia by waiting at football games for a concussion to occur, and then immediately asking the player who suffered the concussion what play they had just run. Players were able to correctly state the play they just ran immediately following the concussion, but only a few minutes afterward, players were unable to recall the specific play.

Electroconvulsive therapy (ECT) used to treat depression uses electric currents to create a convulsive reaction in the brain and loss of consciousness ensues. Retrograde amnesia typically occurs as a side effect of this procedure. Squire et al.. (1975) performed a classic experiment on patients undergoing ECT. Squire and colleagues tested patients= knowledge for names of TV shows aired between 1957 to 1972. This test was given before undergoing ECT, soon after the procedure, and six months after the procedure. When patients were tested soon after receiving ECT therapy, there was a marked memory deficit for TV shows broadcast within the previous four years, but not beyond. When tested six months later, patients had as good a memory for the names of TV shows as before the procedure, but could not remember being wheeled into the ECT room. This study not only demonstrated that permanent memory loss usually occurs for memories just before a trauma, but the Aislands of memory recovery@ that occur afterward.

Anterograde amnesia tends to be a more severe than retrograde amnesia, and refers to the inability to form new memories after a traumatic event. Anterograde amnesia is severe because it is typically caused by permanent brain damage. The most common etiologies of anterograde amnesia are damage to the temporal lobe, hippocampus, mammilary bodies, and ventralmedial thalamic nuclei. Other causes of anterograde amnesia include Alcoa Aneucrysin, Herpes, and Korsakoff=s disorder. The following case study reflects a clinical picture of presenting problems often seen in anterograde amnesia.

A famous case of anterograde amnesia was patient HM. HM was first presented by

Brenda Milner in 1966. HM did not suffer from memory deficits until he was eight years old. It was at this age that HM began to experience epileptic seizers that gradually became more frequent and debilitating. By the time HM was 27 years old, he was experiencing 300 epileptic seizers a day. This rate was far too dangerous to continue unabated, so doctors decided to remove the focal point of the brain responsible for the seizures (areas of the temporal lobe and hippocampus). After the surgery, HM was no longer able to form new memories. Interestingly, HM is able to learn even though he cannot remember doing so. HM=s short-term memory stores and preoperative LTM functioning appeared to stay intact, allowing HM to perform normally on IQ testing and quickly learn new motor skill tasks. In fact, learned motor skill tasks appear to be retained, which surprised doctors. Therefore, HM=s procedural memory remained intact despite severe impairment in declarative memory. It turns out that implicit learning ability remains intact for many anterograde amnesic patients.

A memory disorder related to, yet distinct from, malingering is known as the Ganser syndrome. Ganser syndrome is mostly observed in forensic settings, or in cases of severe trauma, and may be related to dissociative disorders. Individuals suffering from Ganser make approximate answers test questions. For example, a patient suffering from Ganser syndrome may claim that 2+2=5. S. J. Ganser first described the symptom of approximate answers, or vorbeireden, in 1898 when explaining a syndrome observed in three prison inmates awaiting trial (Sanford, Drobb, & Meehan, 2000). Ganser syndrome is very uncommon, but worth discussing as it is a memory disorder that is often confused with malingering. Very little has been learned about Ganser syndrome since it was first described in 1898, although this may be a function of available research, which is almost nonexistent. Some concern has been voiced that Ganser patients may be misidentified as malingering (Sanford, Drobb, & Meehan, 2000). However, this is actually unlikely to occur as Ganser patients can be identified through other means and symptoms. A thorough and competent assessment by a neuropsychologist should rule out malingering in cases of Ganser Syndrome.

Traumatic Brain Injury Classification

Most forms of TBI are of the closed head injury (CHI) type, meaning the skull is not fractured, crushed or penetrated. In fact, the majority of Amild@ traumatic brain injuries (MTBI) are CHI (90%). The term Amild@ head injury should not be confused as a reference of head injury severity, as it often simply denotes the amount of time a patient was unconscious. MTBI is classified as a loss of consciousness (LOC) of less than 20 minutes and an admitting Glasgow Coma Scale (GCS) score ranging from 13-15. Using a 3-15 point scale, the GCS assesses eye-opening, verbal, and motor responses. Higher GCS scores indicate better responding.

TBI from CHI typically takes two forms: primary injury and secondary effects. Primary injuries are those caused at the time of impact and are a direct result of the blow to the head. Many studies demonstrate cerebral damage occurs opposite of the impact site (contra coup) because the brain moves and collides against the opposite side of the cranial vault due to momentum. Injury to the temporal poles and prefrontal cortex are also common because of the brain=s position in the skull. Secondary effects are common sequelae from the primary injury. An example of secondary effects is brain damage caused by intracerebral swelling. The total amount of damaged neural tissue in CHI represents the combined effects of these primary and secondary mechanisms.

While lacerations, contusions, edema, and other forms of macro brain damage are observable using neuroimaging techniques, many forms of microscopic brain damage are not. This is a complicating factor in the detection of malingering because without modern imaging techniques (PET, MRI, and fMRI) that give professionals an objective measure of accrued damage, more subjective must be used. One example of microscopic brain damage is axonal shearing, which does not appear in imaging techniques, yet causes cognitive deficits as a result of impaired neuronal transmission. Axonal shearing occurs when force or momentum causes stretching or twisting of neuronal axons and accounts for brain damage in up to 3 million people (Zillmer & Spiers, 2001). Axons that project down from the cortex to the lower brain structures (brain stem) are particularly susceptible to shearing because the lower structures of the brain maintain relatively fixed while upper structures (including the cortex) have more freedom to move. Momentum of the head during accidents can cause shifting of the upper brain structures, while lack of lower structure movement focuses undue stress on axons connecting the two regions. If the stretching and twisting of axons is severe enough, they will break, producing significant neurocognitive deficits. In fact, axonal shearing from whiplash can account for up to a 14-point loss on the Full-scale IQ index of the Wechsler Adult Intelligence Scale-Revised (Parker, 1996).

Evidence has also emerged that at least part of MTBI symptoms can arise from temporary changes in cerebral blood flow and neurochemical function. Currently, there are no convenient methods for monitoring either dysfunction. Because varieties of brain trauma such as axonal shearing, temporary cerebral blood flow change, and neurochemical dysfunction are common, we cannot rule out brain trauma based on negative neuroimaging results alone. Individuals who malinger have been able to take advantage of the neuroimaging shortcomings. Until more refined imaging becomes available, psychometric methods for detecting malingering behavior remain essential. Neuropsychological tests can be highly sensitive to the behavioral and cognitive sequelae of TBI, and can be effectively used to diagnose its presence in the absence of definitive medical evidence.

Persons suffering from TBI typically display symptoms from three categories: (physical symptoms, cognitive deficits, and behavioral changes). Physical symptoms tend to include headaches, dizziness, nausea, positional vertigo, noise intolerance, sleep disturbance, blurred vision, fatigue, poor coordination, and reduced alcohol intolerance. Cognitive disturbances tend to include forgetfulness, reduced mental processing speed, excessive mental fatigue, disruptions in train of thought, poor concentration, and increased distractibility. Behavioral changes typically reported are lowered frustration tolerance, emotional labiality, depression, diminished libido, anxiety, and sleep disturbance. Although longer LOC is typically associated with more severe physical and cognitive symptoms, symptoms typically resolve within a few weeks (Hugens-Holtz et al.., 1988). If any one symptom persists significantly longer than a few weeks, the patient will usually be diagnosed with postconcussive syndrome. The modal number of post-concussive symptoms is two (Gasquoine, 1997).

Base-rates for persons experiencing MTBI symptoms longer than one year are very low (1.9%-5.8%; Murrey, 2000), although other studies have shown larger base-rates for litigating patients (Binder & Rohling, 1996). Most persons with postconcussive syndrome symptoms or MTBI recover in 1-3 months, with no permanent brain damage, yet clinicians have reported that small percentages of their patients with MTBI have persistent symptoms and signs of brain damage, which suggest permanent damage has occurred. While the percentage of these patients is small, these patients represent a clinical population of significant interest. These are the patients most likely to misidentified as malingering neuropsychological deficits when litigating for compensation for permanent disability. Recall from earlier discussions that acceleration and deceleration forces are believed to strain and axons within the CNS resulting in stretched and damaged nerve fiber. Sometimes referred to as diffuse axonal damage, axonal shearing typically shows up negative on neuronal imaging assessing for structural damage. Thus, negative imaging results combined with low prevalence for persistent symptoms increases the likelihood that that this population will be misclassified. In addition, because such a small percentage of MTBI cases result in permanent brain damage, this patient population is often overlooked and much about their neuropsychological profile remains unclear. Recent studies, however, have emerged that are beginning to provide clinicians with preliminary information on MTBI patients who have suffered permanent brain damage.

One such study was conducted by Reitan and Wolfson (1999). The authors examined persistent neuropsychological sequela of mild traumatic head trauma by comparing normal controls, patients with objective cerebral tissue damage, patients with no objective tissue damage whose post-traumatic symptoms have remitted, and patients without objective tissue damage whose post-traumatic symptoms have persisted. All participants were given the Halstead-Reitan Neuropsychological Test Battery and the General Neuropsychological Deficits Scale was used as the dependent measure. All four groups scored significantly different from one another on this measure. Patients with objective brain damage had the highest GNDS score (M= 52.11, SD= 19.39) followed by patients with persistent symptoms (M= 38.20, SD= 15.70), remitted symptoms (M= 26.56, SD= 13.34), and normal controls (M= 17.20, SD= 8.14) respectively. While the remitted symptom group performance barely exceeded the cutoff score for identifying brain damage, all three brain trauma groups had mean scores in impaired ranges. As expected, normal controls did not exceed the cutoff score of 25/26. In essence, the typical MTBI group scored closer to normal controls while the MTBI with persistent symptoms scored closer to the objective brain damage group. This finding would be expected as permanent brain damage is expected to produce more neuropsychological sequela than temporary brain damage. It is important to note that factors such as litigating status were controlled for in this study. Therefore, motivation to perform insufficiently should not have been a moderating factor in the results, and all groups were expected to have put forth their best effort. Therefore, the results suggest that a small subgroup of MTBI patients do endure persistent symptoms from MTBI.

The Reitan and Wolfson (1999) study was consistent with previous literature demonstrating a small group of MTBI patients endure persistent symptoms. Leininger et al.. (1990) discovered persistent neuropsychological impairment in series of MTBI patients with self-reported persistent symptomology. It should be noted, however, that most of these patients were involved in litigation during the assessment. Obviously, litigation status an potentially confound true symptom reporting. Barth, Gideon, Sciara, Husey, et al.., (1983) also discovered a wide range of impairment on various Halstead-Reitan subtests at three months post injury. This study showed that persistent neuropsychological deficits were not restricted to memory and attention, but rather, were likely diverse and more wide spread.

Although permanent brain damage is the latent variable underlying persistent post-concussive symptoms, several moderating variables may also add to the persistence of post-concussive symptom complex. Variables such as personality factors, emotional factors, and motivational factors often complicate the assessment procedure. Demographic variables such as age, psychiatric disorder, and substance abuse have not been significantly correlated with symptom persistence (Alves et al., 1993). In fact, the only demographic variable that has been associated with persistence of MTBI symptoms is sex. Despite a lack of studies examining sex differences in baseline symptomology, significantly higher rates of self-reported symptoms after MTBI have been found in females (Gasquoine, 1997). Theories as to why women have higher rates of persistent symptomology are lacking, but arguments for why higher rates of depression and pain disorders occur in women are likely applicable (i.e., socially more acceptable for woman to voice health concerns and discomfort, hormonal or genetic differences/predisposition, etc.).

Contrary to intuition, personality characteristics have not been definitively associated with symptom persistence. Only one study (Keller and Butcher, 1991) has reported on the average personality profile of a group of participants with persistent postconcussive symptoms. This study suggests that higher elevations on the hysteria (Hy), Hypochondriasis (Hs), and Depression scales of the Minnosota Multiphasic Personality Inventory- Second Edition (MMPI-2; Hathaway and McKinely, 1989) may be common.

Psychological factors such as a genetic propensity for neuroses, depression, and psychoses may lead to a Ascape-goat motive.@ Here, the patient holds the injury responsible for preexisting anxiety and depression (Lishman, 1988). Similarly, Mittenberg and his colleagues (1992) speculated that expectation might contribute to symptom persistence. Other researchers suggest that depression, anxiety, and anger sustain, not develop into, persistent MTBI symptomology (Kay, 1993; Ruff et al., 1993). Gasquoine (1992) demonstrated that emotional distress was significantly correlated with self-reports of cognitive and behavioral changes, but not severity of brain damage. A difficult differential diagnosis for clinicians to make is anxiety from postconcussive symptom complex, and posttraumatic stress disorder (PTSD). Because head trauma is often the result of a traumatic incidence, PTSD must always be considered, especially when avoidance behaviors are noted. Furthermore, some studies have reported depressive reactions have been associated with lesion location and such reactions may be due more to neurologic sequelae than psychological reaction (Jorge et al., 1993). That is not to say psychological factors do not produce prolonged symptoms. In fact, somatization disorders have not been clearly differentiated from prolonged postconcussive symptomology, and could be one-in-the-same.

One last moderating variable is motivation. It is largely believed that compensation strongly influences the persistence of symptoms. In fact, non-litigating cases of persistent symptomology is almost non-existent (Youngjohn et al., 1995). The rebuttle to this argument, of course, is that one would only litigate if symptoms were persistent. Gasquoine (1997) also suggests that obtaining referrals for neuropsychological service is more difficult for non-litigating patients, and this difficulty may contribute to the lower prevalence rate. Nonetheless, MTBI symptoms have been demonstrated to be higher when an employer is being sued (Rutherford, 1989). Because the belief that most litigating patients are exaggerating or feigning injury is so prevalent, direct assessment of symptom validity has increased significantly. Despite increased testing, prevalence rates for poor motivation during testing varies greatly (15-66%) and no simple relationship postconcussive symptoms and poor motivation has been succinctly demonstrated. Thus, many variables must be considered during the neuropsychological assessment in order to obtain the clearest diagnostic picture. Separating actual neurological damage from psychological, personality, and motivational factors should aid clinicians not only in giving correct diagnoses, but appropriate treatments.

While persistent symptoms of MTBI are very low after one-year, the seriousness of MTBI symptoms cannot be overstated. Sequelae of TBI can be life changing due to difficulties in family relations, expensive medical costs, legal struggles, and lengthy rehabilitation procedures. TBI is also the leading cause of death in young men (Price & Stevens, 1997). The staggering costs associated with TBI are taxing on an already overburdened healthcare system. An appropriate assessment of TBI is the likely the best service a psychologist can give patients experiencing MTBI symptoms. Because a thorough assessment is also the most effective way to discriminate between actual symptoms and feigned (or exaggerated) symptoms, the following section reviews the assessment of TBI.

The Neuropsychological Assessment

MTBI is still poorly understood because no ideal diagnostic systems currently exists. As a result, the assessment of MTBI poses significant challenges. To understand the actual impairment and disability, the clinician must conduct a careful examination, be well versed in the current literature, and be hypervigilant of moderating factors. The assessment MTBI is rarely conducted without considering the possibility of malingering. Rarely are persons assessed in clinical practice who have not been referred by a lawyer for litigation purposes. Thus, the assessment of TBI is lacking if malingering measures are deficient, if measures are lacking, or dissimulation patterns are not well understood. Course and symptoms of symptoms associated with different brain injury typologies must be well understood by the examiner to determine exaggerated symptoms relative to expected results. Absurd symptoms, obvious dramatic improvements and changes in behavior and function outside of examination, and below chance performance on forced-choice tests all characterize exaggeration. The following outlines the normal steps in a neuropsychological evaluation for someone being assessed for head trauma who is in litigation.

Diagnostic differential

Except for post-concussive disorder, the DSM-IV has no classification scheme for TBI, and therefore defaults to generic schemes such as NOS categories for dementia, amnestic disorder, or personality change. Using DSM-IV diagnostic criteria, Somatoform Disorders, Factitious Disorders, Major Depressive Disorder, Post Traumatic Stress Disorder, and Dissociative Disorders are differential diagnoses that can potentially be confused with malingering. Malingering is defined in the DSM-IV as intentional feigning of physical or psychological deficits in order to receive some form of secondary gain. Unlike the other differential diagnoses, malingering is not a DSM-IV axis diagnosis, but rather, a V code (V65-2). Somatoform Disorders are typically conceptualized as being motivated by unconscious and involuntary processes. Factitious Disorders are differentiated from malingering because motivation for feigned illness is to assume the sick role rather than to attain external incentives such as money. Major Depression is often characterized by diminished motivation, reduced cooperation, cognitive slowing, and diminished concentration. Excessive somatic complaints such as headaches and health worries may also complicate the diagnostic assessment. Persons with PTSD or Dissociative Disorders may have altered recall for traumatic events. Lack of cooperation, avoidance, and non-disclosure may represent manifestations of anxiety. Furthermore, bizarre behaviors, irritability, mood disturbance, concentration difficulties, memory failures, and delayed onset of symptoms could be misinterpreted as malingering (Bordini, Chakins, Ekman-Turner, & Perna, 2002,).

When to Suspect Malingering

While guidelines describing when to suspect malingering are available, very few guidelines have been proposed for detecting malingering. The void has left a wealth of empirical studies uncategorized and disheveled. A myriad of studies have been performed with no collecting principle for how to best use a strategy in particular circumstances. Thus, this section reviews when to suspect malingering, and the strategies to detect malingering. Throughout the review of strategies, special attention will be given to when a particular strategy may be most effective, although no guideline is proposed.

Binder (1990) asserts that malingering should be suspected whenever test results may be related to financial gain. Greiffenstien, Baker, and Gola (1994) propose a more stringent method by asserting individuals claiming to have suffered MTBI are suspect when two or more of the following criteria are met: 1) two or more severe impairments identified on neuropsychological instruments; 2) an improbable history for etiology of observed symptoms; 3) claims of total disability in occupational or social roles; and 4) claims of remote memory loss. Finally, the DSM-IV exerts that malingering should be suspected with any combination of: 1) Medicolegal context of presentation (e.g., the person is referred by an attorney to the clinician for examination); 2) Marked discrepancy between the person=s clinical stress or disability and the objective findings; 3) Lack of cooperation during the diagnostic evaluation and in complying with the prescribed treatment regiment; 4) The presence of antisocial personality Disorder. (p. 297).

Assessment of performance is often dichotomized into motivated or malingering, but this is often not broad enough. Inclusions of exaggeration and response bias may be helpful when conceptualizing performance. Malingering models include pathogenic, criminologic, and adaptational (see Rogers, 1990, 1997 for an extensive review of these models). Pathogenic models purport malingering behavior is caused by latent psychological disorders. This model states that malingering is the result of tensions between conscious production of symptoms and unconscious character pathology. It is believed that anxiety causes boundary blurring between conscious and unconscious defenses, resulting in more pronounced malingering signifiers (LoPiccolo, Goodkin, & Baldewicz, 1999). The criminological model views malingering as a behavior performed by bad people, in bad situations (Bordini et al.., 2002; Rogers, 1997). This model is inferred in the DSM-IV description of malingering, but is not well supported empirically. An alternative perspective, the adaptational model, suggests that persons who malinger can be conceptualized as consciously engaging in a cost-benefits analysis influenced by the probability of success (Rogers, 1997).

A recent model proposed by Slick, Sherman, and Iverson (1999) has gained popularity among researchers investigating malingering. They define malingering of neuropsychological dysfunction as Athe volitional exaggeration or fabrication of cognitive dysfunction for the purpose of obtaining substantial material gain, or avoiding or escaping formal duty or responsibility. Substantial material gain includes money, goods, or services of nontrivial value (e.g., financial compensation for personal injury). Formal duties are actions that people are legally obligated to perform (e.g., prison, military, or public service, or child support payments or other financial obligations). Formal responsibilities are those that involve accountability or liability in legal proceedings (e.g., competency to stand trial)@ (p.552).

Their model specifies an incremental degree of certainty related to brain injury verses malingering based on the convergence of multiple sources of information. Slick et al. suggest performance should be classified as definite, probable, or possible malingering and provide four criteria to determine the appropriate classification. Criterion A states there must be considerable substantial external incentive. Criterion B states exaggeration or fabrication of neuropsychological test data must be demonstrated. This can be accomplished through several methods: 1) below chance performance on one or more forced choice test, 2) positive indication of malingered performance from instruments designed for malingering detection, 3) neuropsychological test results that are inconsistent with accepted models neuropsychological function, 4) inconsistent performance from two or more similar neuropsychological tests, 5) two or more neuropsychological tests that are discrepant with at least one reliable collateral informant, or 6) poor performance on two or more standardized tests that=s inconsistent with documented neurological or psychiatric history. Criterion C regard inconsistencies in the patient=s self-reported symptoms that suggest a deliberate attempt to exaggerate or fabricate cognitive deficits (i.e., self-reported history is discrepant with documented history, known patterns of brain functioning, behavioral observations, information obtained from collateral informants, or there is evidence of exaggerated or fabricated psychological dysfunction). Finally, Criterion D states behaviors meeting criteria B and C were the result of Aan informed, rational, and volitional effort aimed at least in part towards acquiring or achieving external incentives as defined in Criteria A@ (p. 553). Thus, B or C cannot be accounted for by psychiatric, developmental, or neurological disorders.

Malingering Detection Methods

In order to make classifications from Slick et al., information must be taken from neuropsychological test data, self-report, observational and collateral data, symptom inconsistency, and evidence of exaggerated or feigned psychological dysfunction. A thorough assessment can typically be achieved by integrating diverse methods of evaluation and other source data. The underlying assumption is that consistency of problems across procedures is more difficult to feign than any one procedure alone. In fact, clinicians and researchers have generally incorporated a combination of approaches when malingering is suspected. Personality tests are often equipped with malingering scales, and have been in use for many years. Cutoff techniques and forced choice tests were developed to detect motivation and are used often in forensic psychology. Norms are often available on psychometric tests for many populations, including TBI patients, which neuropsychologists use for comparison purposes. In this section, each of these approaches will be discussed.

Self-report and Collateral Interview

Clinical interview data provides information regarding current and historical complaints as well as a basis for comparison with psychometric and behavioral observations. Information is obtained regarding injuries and parameters such as LOC (loss of conciousness), RA (length of retrograde amnesia), PTA (post-traumatic amnesia) onset of symptoms, frequency, severity, intensity, impact of symptoms in daily functioning, changes over time, etc. Observations made during the interview can reveal behavioral inconsistencies or the presence of old scars in an individual denying prior injury. The clinical interview may also reveal inconsistencies, which raise the suspicion of malingering. Collateral interviews are also helpful in the assessment process for eliciting complaints the patient may be hesitant to self-report, or determining the legitimacy of self-reported complaints.

Record Review

A review of prior records is also important for establishing premorbid functioning and previous medical conditions. Records obtained from paramedics may contain critical information that could only be noted by first responders. These records can establish basic expectations about the degree of injury based on length or loss of consciousness, retrograde and anterograde amnesia, post-traumatic seizures, and other medical complications associated with head injuries. Examination of ongoing post-accident records can reveal marked inconsistencies between self-report of symptoms and documentation of previous similar complaints. A balanced review of records should not only consider what was included in the record, but what information is missing or suspect in its own right. If critical information is absent, their usefulness for malingering detection is substantially diminished.

Personality Test Variables

One technique that has been commonly used to detect malingering is to examine the validity scales from common personality inventories such as the Minnesota Multiphasic Personality Inventory (MMPI). The MMPI and other inventories are often administered as a routine part of neuropsychological evaluations, and so information from them is often available when attempting to identify malingering. Because personality inventories typically have validity scales that readily identify malingering and other response styles, numerous studies have been conducted on their ability to detect malingering or Faking bad and there is a wealth of literature pertaining to their effectiveness (Bagby, Buis, and Nicholson, 1995; Berry, Baer, et al.., 1991; Carson, 1969; Rogers et al.., 1995). It is because of this wealth of empirically validating research, and the ease of administration, that many neuropsychologists in clinical practice use personality inventories when malingering is suspected.

Common scales to detect malingering on the MMPI-2 include the Infrequency (F) Scale, the Back Infrequency (Fb) Scale, the Infrequency minus Correction scale (F B K), the Dissimulation (Ds) Scale, Infrequent Psychopathology scale (Fp) and the Fake-Bad (FB) Scale. The most common scale used to identify malingering is the F scale (and Fb Scale), which was designed to identify deviant responding to items. Sixty items are analyzed and constitute the F scale while 40 items constitute the Fb Scale. While the two scales ostensibly measure the same construct, the purpose for having both is to compare differences in motivation from the first half of the test from the last part of it. Typically, F Scales with T scores above 100 are observed when the test taker is faking bad. With malingerers, one should not only observe an elevated F scale, but observe an elevated Fb Scale as well because they should be motivated to answer consistently. Lewis, Simcox, and Berry (2002) examined F and FB scales using 64 participants undergoing forensic evaluation and report optimal cut scores cut scores for F and FB were T=108 and T=107 respectively. Both cut scores produced hit rates above 90 percent.

Another common approach to detect malingering with the MMPI is to subtract the F scale from the (K) Scale, which was created to detect either faking good or defensiveness. High K scores are indicative of faking good. Because faking good is inconsistent with malingering, one would expect to observe large differences between these two scales. Carson (1969) suggested that a score of eleven or higher on this scale (subtracting raw score K from raw F score) was sensitive to faking bad. However, Graham (2000) has suggested not enough research on this index has been conducted and more needs to be done before definitive cut-offs are suggested.

More research is also needed on scales Ds, FB, and Fp. The Ds (Gough, 1954) is comprised of items seemingly indicative of psychopathology. However, individuals with true psychopathology rarely endorse these items. Unfortunately, several studies have found that the Ds Scale is not as effective as the F Scale alone (Bagby, Buis, and Nicholson, 1995; Berry, Baer, et al., 1991; Rogers et al., 1995). Research on the FB, which was developed to detect faking bad among personal-injury patients, has also been disappointing (Graham 2000; Rogers et al., 1995). Storm and Graham (2000) report that the Fp is the best scale of the three for detecting analogue malingering, which is consistent with previous research (Arbisi & Ben Porath, 1995, 1997, 1998).

While the MMPI-2 has been shown to be an effective tool for detecting people who fake bad, its use is not appropriate for the current investigation due to the design of the study. It would be interesting, however, to investigate personality profiles of known malingerers. In this sense, one would have the added benefit of matching a personality profile to a suspected malingerer as well as looking at the validity scales. While research has correlated antisocial personality traits to persons who malinger (Clark, 1997; DSM-IV, 1994), probabilistic statements are not possible and further research is certainly needed in this area. Nonetheless, the MMPI-2=s contribution to the detection of malingering over the years has been abundant, and therefore, deserving of mention.

Symptom Validity Tests

Symptom Validity Testing (SVT) involves the use of a two-alternative (or more) forced choice. The technique has been developed specifically for malingering detection and test taking motivation, and is popular among psychologists researching malingering detection methods. This form of testing is referred to as forced choice because it asks patients to choose only one correct answer from two choices on any particular item. According to binomial probability statistics, individuals should correctly answer at least 50% of test items correct by chance alone, similar to a coin flip. Thus, a patient who answers only 10% of items correctly would be suspected of malingering because even random responding should result in 50% correct responses. SVT enjoys certain advantages such as face validity, discriminate validity, and empirically derived cutoff scores (Bordini, 2002; Rogers, 1997). However, the length and repetitive nature of these tests can cause some patients to tune out, become annoyed, stop attending, and can negatively impact performance scores (Bordini, 2002). Also, many people are able to figure out this simplistic approach to malingering detection, and if they don=t, lawyers could easily coach them. Therefore, the reliability and validity of any simplistic measure must therefore remain in question. Another limitation to the forced choice procedure is that incorporating them into a battery adds time and expense to the assessment process without adding beneficial neurologic or cognitive information.

Similar to forced choice tests, other tests have been specifically designed to assess a client=s conscious, or sometimes unconscious, motivation. These tests are used when malingering is suspected and generally must be added to the clinical neuropsychological evaluation. The tests are often constructed to hide their actual purpose. While the tests are quite simple, they often appear much more difficult than they actually are. Therefore, when participants score poorly, it becomes apparent that the participant is scoring poorly on purpose. To illustrate, the Rey=s Memory Test (RMT; Rey, 1964) asks patients to remember 15 items that are presented in a five-row, three-column format. While fifteen items seems difficult (or even impossible considering the STM=s memory capacity of about seven units) the task takes advantage of chunking techniques that actually makes the test quite easy for anyone except the severely brain damaged. The examiner stresses the fact that there are fifteen items to promote the idea that it is a difficult task. However, in actuality, the patient only needs to remember three or four items to effectively remember the rest (through the process of chunking). Patients are asked to look at Figure 1 for ten seconds. Subject are then given a 10-15 second delay and then asked to reproduce as many of the figures as they can on a separate sheet of paper. The test can be scored in many ways (Lezak, 1995) such as scoring for omission or additions (Paul et al.., 1992) and perseverative substitutions or reversals (Goldberg and Miller, 1986). However, the most common way to score this test is to count the correct number of recollections. Scores falling below nine are indicative of malingering.

A	B	C
1	2	3
a	b	c
"	G	Δ
I	II	III

Figure 1. Rey 15 Item Test

Neuropsychological Test Data

Technical aspects of test construction and empirical knowledge about the nature of normal and impaired memory may provide a wealth of information, which can be helpful in assessing the reliability and validity of test performance. Neuropsychological instruments can be used to assess the consistency of performance across tests, within measures, expected differences between recall and recognition measures, obtained versus expected serial position effects, and consistency over serial reassessments. However, it is important to remember that results must be considered in the context of the psychometric property of the test, base-rates, situational factors, medication, appropriate expectations for the disorder, and other moderating factors such as age, education, relevant history, and injury severity. Meyers, Galinsky, and Volbrecht (1999) examined cutoff levels for several neuropsychological tests to assess their efficacy as a malingering detection instrument. Researchers hypothesized malingerers would make more errors on neuropsychological tests. Therefore, cutoff scores could be established that effectively discriminated malingering from actual brain injured patients. Meyers and colleagues established cutoff scores for the Judgment of Line Orientation test, the Token Test, the Dichotic Listening test, and a 20-item forced choice test. Simulated malingerers made more significantly more errors than control such that 100% specificity and 95% sensitivity was observed when all tests were used together. They also found that simulated malingerers performed significantly worse than mild head injured patients who were non-litigating. Unfortunately, these actors were naïve to effective malingering, in that they were not provided specific information regarding TBI or test taking strategy. An interesting finding, when looking closer at the post-hoc data, was that litigating mild head injury patients and severe head injured patients performed very similarly on these tests, while normal controls and non-litigating mild head injured patients performed similarly. The significant difference between the two mild head injury groups was litigation status. While considered neuropsychological, these tests have to be administered together to enjoy the high sensitivity and specificity, which may limit efficiency. Nonetheless, Meyers and colleagues demonstrated that a cutoff score can be an effective strategy for identifying (naïve) malingering, and can be incorporated into neuropsychological tests easily.

Comparative Strategies

Other research studying malingering utilizes neuropsychological test scores of individuals who simulate malingering instead of specific tests for malingering. Norms have been useful to neuropsychologists because consistent, or inconsistent, patterns of responding can be identified. For example, the magnitude of error strategy, which focuses on exaggerated deficits, has been an effective tool in identifying malingered responses. Because naïve malingerers (NM; malingerers without self-education or coaching) have demonstrated a tendency to exaggerate symptoms beyond that expected of MTBI patients (Franzen & Martin, 1999; Youngjohn, Lees-Haley, & Binder, 1999). While identifying exaggerated deficits is an effective strategy, it is also the oldest and best-known method of malingering detection, which makes it vulnerable to sophisticated malingerers (SM; malingerers who have prepared themselves for testing, or been coached). In fact, several studies have shown that SMs are virtually impossible to detect when using this procedure (Lees-Haley, 1985; Lees-Haley, 1986, Ruff, Wylie, & Tennant, 1993; Zielinski, 1994). Because many people are smart-enough to realize that playing-up symptoms may expose them, this technique may be compromised if used alone. Furthermore, this technique has not been shown to reliably demonstrate sensitivity or specificity on all neuropsychological tests. Therefore, actual TBI patients may be at greater risk for being misidentified as malingering and many individuals feigning cognitive disturbances may go undetected.

The magnitude of error strategy can examine quantitative or qualitative scores (e.g. total categories on the Wisconsin Card Sorting Test) for excess errors inconsistent with norms for a given population. A more sophisticated application of comparing norms has been to subject scores to a discriminate function analysis (DFA). DFA uses multiple quantitative or qualitative scores to essentially develop a regression equation that differentiates groups (malingerers vs. non-malingerers). This approach may be more difficult for malingerers to decode because it accounts for both neurocognitive deficits and sparing, thus requiring the malingerer to perform poorly on some tests, but not on others in a way that is consistent with TBI.

Summary

Assessment of TBI and malingered cognitive deficit should involve a comprehensive history, consideration of medication effects, review of pre- and post-accident records and diagnostic studies, clinical interview, neurological and neuropsychological evaluations, and collateral sources of information. It should be noted that some difficulties related to TBI might not be apparent until patients return to former roles (i.e., employment). Fluctuations related to other external sources, sleep difficulties, pain levels, medication changes, or fluctuations in general health status also need to be considered and ruled out. If limitations in the assessment were present, they need to be stated and expressed. Statement should be included that infer a diagnosis of malingering does not rule out all medical, neurological, and psychological disorders. If comorbid disorders are present, than they should be included in the report as well. Re-evaluations of brain-injured patients should reflect consistent performance. Markedly decreased scores in a medicolegal context and in the absence of other intervening variables (i.e., depression) increases the likelihood that deficits were malingered or highly exaggerated. When compairing scores it is also important to consider practice effects, reggresion to the mean, confidence intervals, comparability of tests, rapport, sleep, pain, medication, and setting variable. The following review describes each study, the neuropsychological instrument used, the detection techniques used, and the limitations that will be addressed for the current study.

Malingering and Mental Retardation

Empirical studies examining malingering detection have largely focused on TBI, and studies examining MR are virtually nonexistent (Hayes, Hale, & Gouvier, 1997). Thus, many techniques to detect feigned test performance are based on techniques to detect feigned TBI, which may not be relevant for detecting faked intellectual impairment. This problem is important because many people are concerned there will be increased appeals because of Atkins v. Virginia. This concern places pressure on examiners to empirically demonstrate an inmate has MR or is faking, but they may not have the appropriate instruments to make such decisions.

The scarcity of empirical literature regarding malingered MR places inmates who actually have MR at risk for being misidentified as feigning their intellectual status. For example, some recent studies have found that standard malingering tests are inappropriate for use with MR patients. Hays, Emmons, and Stallings (2000) reported that their sample of participants with MR demonstrated significantly higher perseveration and confabulation errors on the Rey 15 Visual Memory Test, resulting in significantly more wrong answers. Similarly, Goldberg and Miller (1986) found that nearly 40% of their sample of patients with MR failed the Rey-15 (had 8 or fewer correct), and would thus be classified as malingering. The authors also reported errors were largely due to perseveration. While incorporating perseveration into malingering detection strategy may be one way to enhance malingering detection, no empirical study has examined perseveration as a qualitative marker for discriminating actual MR from feigned MR. Thus, the Rey 15 should not be used to discriminate actual and feigned MR.

The Rey 15 is not the only malingering instrument that should not be used. Other tests specific to malingering identification have also been found ineffective for use with MR defendants. Hayes, Hale, and Gouvier (1997) report the Dot Counting Test (Lezak, 1995), Memory for 15-Items Test (Lezak, 1995), and the M-Test (Bearber, Marston, Michelli, & Mills, 1985) did not contribute anything to the identification of malingering when used in their sample of inmates with MR. These studies suggest the usefulness of traditional malingering measures for defendants with MR should not be used until they are renormed or revised in some way as to enhance their efficacy.

It may be best, however, not to use traditional malingering test with persons who are mentally retarded at all. Very limited research may suggest intelligence tests may be more effective at discriminating feigned and actual MR. Baroff (2003) argues that the WAIS-III should be the primary instrument for evaluating MR in capital punishment cases because it is less likely to produce erroneous results than other tests. Using a malingering test designed after typical intelligence tests, Schretlen and Arkowitz (1990) report promising hit rates for identifying. Thus, intelligence tests appear to be more promising at identifying persons feigning MR, while reducing the likelihood of false positives.

Incorporating a malingering profile specific to MR into intelligence tests such as the WAIS-III appears to be the most promising strategy for effectively identifying feigned results from valid ones when assessing the intellectual abilities in competency evaluations. However, traditional malingering tests continue to be used. Keyes (2004) wrote an enlightening article demonstrating the dangers of this mistake. Due to the Atkins decision, the Mississippi Supreme Court recently ruled that all defendants with MR applying for clemency under Atkins must be given the MMPI-2 in an attempt to rule out malingering. This requirement places defendants with MR at risk for being falsely identified as malingering for several reasons. Sadly, one only needs to read the instruction manual for the MMPI to understand why. First, the MMPI requires an eighth grade reading comprehension. An eighth grade reading level is rare in this population. Second, the manual states participants must be able to understand test instructions, comply with requirements, and record personal attributes in a reliable manner. However, this test has 567 items. It is unlikely that persons with MR will be able to listen, attend, or comprehend all items for the length of the test. Finally, the MMPI specifically states it is not intended for used with learning disabilities, TBI, and neurological impairment. Thus, any results obtained through the MMPI are automatically invalid and should not be interpreted. As can be seen through this one example, concerns that inmates will try to capitalize on the Atkins decision has put inmates with MR at risk for being misidentified as malingering. Because, traditional malingering methods continue to be inappropriately applied to persons with MR, it is important to identify appropriate malingering detection strategies for this population. Furthermore, it appears an appropriate place to begin researching malingering methods for persons with MR would be on intelligence tests and not traditional malingering tests.

Malingering Detection with the WAIS

Much research on malingering detection has been conducted over the last few decades. During this time, examining the usefulness of detection markers within neuropsychological instruments has become popular. The WAIS tests have long been recognized as the most widely used individually administered psychological test of cognitive function by psychologists (Greve, Bianchini, Mathias, Houston, & Crouch, 2003; Guilmette, Faust, Hart, & Arkes, 1990). Much of the research on malingering detection strategies using the WAIS focused on the WAIS-R, but researchers (reviewed below) are beginning to examine strategies with the WAIS-III. Investigations of malingering detection strategies typically use discriminate function analysis (DFA) to demonstrate classification rates with a particular technique. The primary purpose for using a DFA is to predict group membership based on a set of predictor variables. Several studies have attempted to demonstrate the sensitivity and specificity of WAIS malingering indexes using a DFA. These studies, and the efficacy of their DFA, are discussed below.

Only a few detection strategies have been developed thus far, and they include qualitative scoring (Brooks & Rawlings, 1990), pattern analysis (Heaton et al., 1978; Mittenberg, Theroux-Fichera, Zielinski, & Heilbronner, 1995), and identification of specific subtest indicators within a large battery of tests (Bernard, 1990; Greffenstein, Baker, & Gola, 1994; Iverson & Franzen, 1994, 1996). The following section reviews the empirical literature regarding the different techniques of malingering detection applied to the WAIS.

Qualitative Studies

Qualitative strategies differ from traditional methods of malingering detection in that qualitative analyses examine the aspects of an error rather than the amount of errors. Rawlings and Brooks (1990) were the first to apply qualitative strategies to the WAIS-R. Qualitative analysis on both the WAIS-R and WMS-R revealed 15 errors that are commonly made by analogue malingerers (five of which came from the WAIS-R), and five errors typically made by actual brain injured patients (all of these errors were from the WAIS-R). In 1993, Rawling published the Simulation Index-Revised (SI-R), which provided scoring criteria for the 20 errors. The calculation of the SI-R is relatively simple. Each occurrence of a simulation error counts as one point while each occurrence of a head injury error subtracts one point. The summed number of points constitutes the SI-R.

It is important to note that the SI-R is not purely a WAIS malingering detection method. Thus, to use the SI-R, the WMS must be administered as well. Only four subtests from the WAIS-R contribute to the SI-R. These subtests are Digit Span, Arithmetic, Picture Completion, and Object Assembly. While most subtests contributing to the simulation score come from the WMS and not the WAIS, only WAIS subtests are used to score the head injured criteria. Simulation criteria from the WAIS subtests included primacy errors (errors in the first or second digit on Digit Span Forward), Capitulations (recalling less than 60% of a string of digits), Impossible errors (Ganser-like approximations on Arithmetic), Dubious derangements (implausible picture arrangements), and Overtime (correct Object Assembly taking not longer than two minutes over time limit).

Rawlings and Brooks found that a cut score of greater than two on the SI produced perfect classification rates for suspected malingerers and actual TBI patients. Upon validation, a 95% classification rate was achieved. Similarly, Rawlings (1992) achieved a 94% hit rate, but this rate was significantly reduced when only examining WAIS and WMS protocols (some protocols used symptom validity tests in addition to WAIS protocols). Milanovich, Axelrod, and Millis (1996) did not find the SI-R to be as specific when using a mixed sample of 338 male neuropsychiatric patients. The overall specificity of the SI-R was 62%, and the high false-positive rates led the researchers to suggest the SI-R should only be used for investigation with TBI patients, as it=s usefulness for neuropsychiatric patients may be limited. This makes intuitive sense as the SI-R was developed and designed for identifying feigned cognitive impairment in patients presenting with TBI. Another suggestion made by the authors was to raise the cut score to five or greater. Relative to their TBI sample, a cut score of five or greater would produce a positive simulation hit in only 3.5% of the other neuropsychiatric patients. Unfortunately, the subtests most responsible for the high false positive rates came from the WAIS-R, which suggests the WAIS-R subtests may be less effective with the qualitative methods developed by Rawlings and Brooks than WMS subtests. Thus, it appears the SI-R needs further validation before it utilized in practice, especially with psychiatric patients.

Another study examining qualitative measures from the WAIS-R was conducted by Trueblood in 1994. Trueblood=s qualitative methods were similar to the SI-R and included analyzing approximate answers, bizarre responses, scatter on subtest performance, inconsistent performances across similar tasks, clustering, and intrusions. Similar to Milanovich et al., (1996) Trueblood found qualitative methods applied to the WAIS-R were not effective at discriminating suspected malingerers from other litigating matched control brain injured participants.

Thus, studies investigating qualitative methods of malingering detection with the WAIS-R have been somewhat disappointing. Rawlings and Brooks initially found promising results with the simulation index, but these results were not fully supported with subsequent validation. Furthermore, Trueblood found that qualitative methods were no better than chance. It is possible that these studies did not apply the appropriate qualitative scoring procedures, and identifying new aspects of errors may be quite effective when applied to the WAIS. It is also possible that their experimental design produced limitations that interfered with the effectiveness of qualitative measures. For example, Trueblood=s control group of litigating TBI patients may not be undeniably distinct from his sample of suspected malingers and questionable validity patients. It is possible that matched controls were simply more sophisticated than the suspected malingerers, and therefore passed the symptom validity test used to create the groups. In fact, Trueblood=s study has been criticized because his control group had significantly higher full-scale IQs than his suspected malingering group (Axelrod & Rawlings, 1999, Mittenberg, et al., 1995). This is an important point because, theoretically, qualitative techniques may be more sophisticated than other techniques and subsequently harder to malinger. Thus, the lack of discrimination by qualitative methods may be the result of both groups malingering the same way qualitatively, but the control group was sophisticated enough to not be detected by the other measures used to create the groups. It would be interesting to compare the qualitative measures from both the malingering group and control group to a non-litigating control group and neurologically normal group. In any case, more research on qualitative techniques applied to the WAIS appears warranted before this technique is dismissed. Regardless, the research to date suggest qualitative methods applied to the WAIS-R, and presumably the WAIS-III, have limited effectiveness for malingering detection applied to the WAIS.

Pattern Analysis

The pattern analysis approach has enjoyed better classification rates than qualitative techniques. While similar to the qualitative method, the pattern analysis method uses normed scoring profiles from conventional neuropsychology measures to discriminate people who malinger from actual TBI patients. Conversely, qualitative methods examine the types of errors made on specific tests rather than the relationship between scores. For example, examining the rate of forgetting words from a word list as a function of time would be considered pattern analysis. Qualitative analysis would consider which words in the list were forgotten first, or how many synonyms of list words were recalled in place of the actual word.

DFA has been widely used on the WAIS, WAIS-R, and more recently, WAIS-III to examine normed scoring patterns of specific populations. One of the first malingering studies examining neuropsychological test performance was conducted by Heaton, Smith, Lehman, and Vogt (1978). The investigators examined Wechsler Adult Intelligence

Scales (WAIS; Wechsler, 1945), Halstead Reitan Neuropsychological Battery (HRNB; Reitan & Wolfson, 1993), and Minnesota Multiphasic Personality Inventory (MMPI; Butcher, Dahlstrom, & Graham, 1989) testing performances from a sample of analogue malingerers and compared those performances to a control group of head trauma patients. While clinicians have long been aware that unusual test results should raise suspicion as to the validity of those results, determinations of malingering were largely left up to clinical judgment.

Heaton et al. (1978) demonstrated that this approach may be lacking efficacy and more standardized measures may be warranted. The authors sent completed neuropsychological test data to 10 neuropsychologists, who made "blind" judgments as to whether each was produced by a malingerer or by an actual head-injured patient. The neuropsychologists' accuracy for identifying analogue malingerers ranged from chance, to 20% better than chance. The poor hit rate was disappointing and suggested neuropsychologists needed a better way to determine the validity of test results.

Heaton hypothesized that the neuropsychologists had difficulty because the global level of impairment, as measured by IQ and the Impairment Index, were similar between the two groups. When the same profiles were examined using pattern analysis of the data, the authors were able to achieve near perfect discrimination. The authors found that patients with brain damage performed worse than simulators on tests of adaptive functioning, but better on tests of sensory and motor function. Heaton=s DFA based on the battery of test results correctly classified 100% of the head injured and 94% analogue malingerers. These classification rates were significantly higher than the classification rate produced by clinical judgment. Unfortunately, when Heaton=s DFA was applied to a subsequent group of litigants suspected of malingering the classification rates dropped significantly and were comparable to the hit rates of the blind neuropsychologists.

Subsequent studies have provided mixed results. Goebel (1983) reported comparable hit rates to Heaton=s simulated malingerer group, but Thompson and Cullum (1991) were unable to replicate these findings. Despite the mixed findings, and poor hit rate with actual litigants, Heaton et al. were one of the first groups to demonstrate that validity indicators within the WAIS, and provided a powerful new method for identifying suboptimal performance and overt malingering. Much research with actual clinical populations and simulated participants has been conducted since Heaton=s study, and the area of malingering detection within neuropsychology has become exceedingly popular.

Trueblood (1994) found using DFA to examine the pattern of scoring across subtests was effective at discriminating his sample of simulated malingerers from controls, and produced significantly better discriminations than qualitative methods. Using DFA, Trueblood identified five WAIS-R indicators (Digit Span, Vocabulary, Picture Completion, Digit Symbol, and an estimated v. obtained IQ difference score) that significantly differed between groups. Trueblood was able to achieve an overall classification rate of 80%. These findings suggest that the WAIS-R may be effective at discriminating malingerers from non-malingerers when the pattern analysis approach is applied.

One of the most cited and replicated studies using pattern analysis was conducted by Mittenberg, Theroux-Fichera, Zielinski, and Heilbronner (1995). The authors examined two pattern analysis methods applied to the WAIS-R. The first was a theoretically derived Vocabulary- Digit Span subtest difference score. Persons with head trauma perform relatively normal on the Vocabulary and Digit Span subtests, but persons who malinger head trauma symptoms were hypothesized to selectively feign more deficits on the Digit Span subtest (rationale for this hypothesis is discussed in the Digit Span section). Thus, large discrepancies should be indicative of invalid performance.

The second method used by Mittenberg and colleagues was to examine subtest performance using DFA. Mittenberg and colleagues examined the effectiveness of these two methods by comparing 67 non-litigating head injured patients to 67 age, IQ, and occupation matched participants instructed to malinger head trauma symptoms. DFA from seven WAIS-R subtests produced a 74% correct classification rate, which improved to 79% on cross validation. The Vocabulary-Digit Span difference score classified 71% of the participants, which remained the same upon cross validation. A difference score of 1.53 was reportedly the most effective cut score. The results from this study garnered a lot of attention, but the use of simulated malingerers was a definite limitation. It is difficult to confidently generalize findings from simulated malingerers to actual malingerers in clinical practice. Thus, several researchers have conducted validation studies using actual clinical populations (Axelrod & Rawlings, 1999; Greve, Bianchini, Mathias, Houston, & Crouch, 2003; Millis, Ross, & Ricker,1998; Williams & Carlin, 1999).

Millis et al. (1998), with a group of financially compensable mild head injury participants, found comparable results to Mittenberg et al. (1995). For the seven subtest DFA, Millis and colleagues obtained a 90% classification rate, which is actually higher than in the original study. The Vocabulary, Digit Span, and Similarity subtests were found to be the most important subtests for discriminating probable malingerers from actual head injured patients. When Mittenberg=s DFA coefficients were applied, the sensitivity and specificity rates dropped slightly. The difference may be due to the different populations used (Millis et al., 1998). The Vocabulary-Digit Span difference score did not perform as well as the seven subtest DFA. A cut off score of two classified 79% of participants, which is significantly less than the 90% rate produced by the DFA, but quite comparable to the rate achieved by Mittenberg and colleagues.

Axelrod and Rawlings (1999) examined the false-positive rates for the two algorithms developed by Mittenberg et al., (1995) and the five indicators algorithm proposed by Trueblood, (1994). Mittenberg=s DFA produced overall specificity rates ranging from 76% to 93% and produced significantly less false positives than Trueblood=s algorithm. The authors also found that practice effects did not influence the algorithm in terms of specificity. The authors applied the algorithms to data from brain-injured patients (n = 76) who had either been tested with the WAIS-R twice in one year or four times in one year. Regardless of the practice condition, the classification rates produced by the all three algorithms remained about the same. The authors concluded the use of Mittenberg=s DFA to identify malingering appears to minimize the rate of false positives, which makes it a more attractive method for malingering detection.

Using Mittenberg et al.=s Vocabulary-Digit Span difference score, Williams and Carlin (1999) were able to establish base rates of malingering in vocational and disability applicants. The authors examined WAIS-R performances from 50 disability applicants and 50 applicants for vocational assistance and found 30% of both groups had a Vocabulary-Digit Span difference score of two or greater. Interestingly, the FSIQ and Verbal IQ scores for those identified as malingering were significantly higher than the non-malingering group. Thus, while the difference score produced two groups that are consistent with reported base rates, the pattern performance did not fit or make intuitive sense. Williams and Carlin suggest that one explanation for the confusing pattern of results is that better malingerers may be smarter people. It is a smarter malingering strategy to fake deficits selectively rather than globally. Thus, higher overall IQ scores might be expected with specific subtests showing impaired performance. Higher IQs, however, may not apply to criminal defendants claiming amnesia. Cima, Merckelback, Hollnack, and Knauer (2003) found defendants claiming amnesia had significantly lower IQ scores than their control group. Thus, higher IQ scores may a factor in the type of malingering, and not malingering overall. Conversely, the lower IQs may be a reason why these participants were caught and convicted. Persons with higher IQs may be better at malingering, and probably are less likely to get caught or convicted.

Greve, Bianchini, Mathias, Houston, and Crouch (2003) were among the first to conduct a validation study of Mittenberg=s techniques applied to the WAIS-III. The authors calculated Mittenberg=s DFA and VocabularyBDigit Span difference score on archival data from 65 patients with TBI (28 meeting criteria for at least probable malingering and 37 non compensation seeking controls). The archival data consisted of both WAIS-R and WAIS-III tests, but no differences were observed based on the two versions of the test. This suggests that Mittenberg=s approaches may be valid and comparable on the newer version as well. Two groups (malingered neurocognitive deficit and control) were created based on criteria proposed by Slick, Sherman, and Iverson (1999). For both the DFA and Vocabulary-Digit Span difference, sensitivity, specificity, and predictive power were examined at varying cut-off levels. Several findings were reported. First, the probable malingerers performed significantly worse on standard measures of intellectual and memory function. This finding is somewhat different than in previous studies where malingerers produced comparable scores on many subtests and global scores (Heaton et al., 1978; Mittenberg et al. 1995). No explanation was given for this difference, but since both versions of WAIS were comparable, it is not likely due to the WAIS-III. Second, sensitivity for the DFA averaged about 50% and specificity averaged about 80% when different levels of TBI severity were examined. The false positive rate was a little higher than 10%, which exceeds the general acceptable limit of false positives (Millis, Putnam, Adams, & Ricker, 1995). Interestingly, Greve et al. demonstrated that a positive indication of malingering produced by DFA was significantly more associated with the probable malingering group than the control group, even when FSIQs were within normal limits. This finding suggested a positive DFA in combination with financial compensation may be a good indicator of malingering even when a patient=s IQs wouldn=t suggest the patient is suppressing their true cognitive ability. However, the authors caution that more research is required before more confidence can be placed on this single indicator. A third finding from this study was the Vocabulary- Digit Span difference score produced higher false positive rates than the DFA regardless of the cutoff score used. Furthermore, sensitivity and specificity rates were generally poorer than observed with DFA. Moreover, the combined DFA and difference score did not produce better classification rates than the DFA alone. Thus, in this study the DFA out performed the difference score, which was similar to what Millis et al. (1998) observed in their validation study. Nonetheless, the authors were able correctly classify 90% of their sample using DFA and 79% of their sample using the difference score. Thus, it appears Mittenberg=s approaches may be effective at helping clinicians determine the legitimacy of test results.

While Mittenberg=s difference score is one example of a discrepancy measure indicative of malingering on the WAIS, others exist as well. For example, one of Trueblood=s (1994) five malingering indicators was an observed-predicted IQ difference score. His malingering and questionable validity sample had significantly lower Barona Index (Barona, Reynold, & Chastain, 1984) predicted FSIQs than were obtained on the WAIS-R. More recently, Demakis, Sweet, Sawyer, Moulthrop, Nies, and Clingerman (2001), also examined how well the discrepancy between predicted and obtained WAIS-R scores discriminate persons presenting with insufficient effort. The authors instructed 27 participants to use insufficient effort and compared their WAIS-R scores to 48 participants with moderate to severe TBI. The results of this study were encouraging. Participants displaying insufficient effort demonstrated greater discrepancy scores (i.e., predicted IQ--obtained IQ) than TBI patients. Three IQ estimates were used in the study (Barona Index, Best 3, Oklahoma Premorbid Intelligence Estimation; OPIE). The Barona Index produced the largest predicted-observed discrepancy scores, but DFAs using the three discrepancy scores produced comparable classification rates. The Barona Index had the highest overall hit rate at 79%, but the lowest classification rate was 71% (Best 3). Thus, the predicted-obtained discrepancy score also appears to be promising for use with the WAIS-R; however, no study to date has examined discrepancy scores with the WAIS-III. One might expect that WAIS-III discrepancy scores would be less than those obtained by the WAIS-R given research pertaining to the Flynn Effect.

In sum, pattern analysis appears to be an effective method for indicating malingering and insufficient effort on WAIS subtest. Pattern analyses applied to the WAIS include Trueblood=s five indicators, Mittenberg=s DFA, Mittenberg=s Vocabulary-Digit Span difference, and predicted-obtained IQ difference score. Most research using pattern analysis has been conducted on the WAIS-R, but limited research with the WAIS-III suggests these methods may be generalizable (Greve et al., 2003). Caution should be maintained, however, as there is an obvious need for validation studies with the WAIS-III.

Individual Index and Subtest Performance

In this section, we examine the utility of individual scores from WAIS subtests or indexes. While it is not recommended that determinations of malingering be based on individual scores, there is utility in examining these scores. It is well recognized that persons who malinger are typically selective of the type of test on which they choose to fake deficits, and typically do not malinger deficits across the entire battery of tests. Furthermore, this selectivity tends to increase as the level of sophistication increases. Thus, examining only one test within a battery of tests increases the likelihood of making a false negative judgment. On the other hand, if a subtest looks attractive to potential malingerers for demonstrating impairment, individual subtests can serve as an effective indicator (red flag). Single tests can also provide insight into the selection criteria of persons who malinger, which may be useful for creating more efficient and sensitive methods of detection. Mittenberg et al. (1995) reported that scores from nine of 11 subtests on the WAIS-R were identical between simulated malingerers and head trauma patients. The simulated malingerers, however, performed better on the Similarities subtest of the WAIS-R while suppressing performance on the Digit Span subtest. Thus, examining individual subtests does yield useful information, and much research has been conducted that investigates single subtests from the WAIS. One subtest has been investigated more than any other is the Digit Span subtest.

The Digit Span test requires subjects to verbally repeat a sequence of numbers that is spoken to them by an examiner. There are two conditions to this test: a Digits Forward condition and a Digits Backward condition. Digits Forward is administered first, and tends to measure an examinee=s ability to focus attention. The digits backward condition requires more working memory ability. Each section (forward and backward) contains seven items, and each item has two trials. Item 1 of each section begins with two trials of a two-digit string of numbers. The string of digits gets longer with each successive item. In other words, the length of the sequence gets longer if the subject gets at least one trial correct. The test is discontinued when both trials within an item are failed. Because Digit Span has been demonstrated to be less sensitive to brain damage, and persons with TBI often perform within normal limits on this test (Baddeley, & Warrington, 1970; Butler, Retzlaff, & Vanderploeg, 1991; Cermak & Butters, 1972, 1973; Greiffenstein et al., 1994), it has become a popular subtest to investigate. It may be that the Digit Span test appears attractive to person malingering memory deficits because it looks like it should be a sensitive measure of memory. Thus, low scores from persons in litigation should indicate motivation to feign impairment because this pattern of scoring is inconsistent with persons who have actually sustained TBI. This theory has led to several investigations of the Digit Span test, most of which has been positive.

One of the first investigations of the Digit Span=s effectiveness for identifying persons malingering cognitive deficits was conducted by Greiffenstein, Baker, and Gola

(1994). Based on the magnitude of error method, the authors created the Reliable Digit Span (RDS) approach. The RDS uses raw scores rather than the age corrected scaled scores. It is calculated by summing the highest (successfully) completed item of Digits Forward with the highest (successfully) completed item of Digits Backward. To successfully complete an item, the participant must not make an error either trial of that item. For example, if a participant=s highest completed Digits Forward item was item 3, then the participants digits Forward RDS score would be four because each trial in item 3 consists of a string of four numbers. If the second item of Digits backward was the last item to have both trials successfully completed, then the participant=s Digits Backward RDS score would be three because each trail in this item contains a string of three digits. Thus, the RDS total score would be seven (Digits Forward + Digits Backward). Greiffenstein and colleagues found that their sample of probable malingerers had an average RDS score of 6.7 compared to non-litigating TBI participants whose average RDS score was 8.8. Thus, a RDS score of seven was suggested to indicate malingering. The cut score produced 70% sensitivity and 73% specificity, with less than 10% false positives.

Validating these findings, Greiffenstein, Gola, and Baker (1995) again showed that probable malingerers obtained an average RDS score of 6.6 and non-litigating participants averaged a RDS score of 8.75, which is remarkably similar to their previous study. While sensitivity of the RDS appeared to improve in the second study (70% in study one and 86% in study two), the specificity decreased (73% to 57%). This decrease in specificity was especially troubling due to the increased false positive rate. The specificity in the second study falls well short of the 90% standard set by Millis (1992) and used by most investigators conducting malingering research, including Greiffenstein et al. (1994, 1995).

To further validate the RDS method of malingering detection, Meyers and Volbrecht (1998) examined actual TBI litigants and compared their performance on the RDS to a group of nonlitigating persons with TBI. Both groups were remarkably similar except in education, which reportedly did not influence RDS performance. Meyers and Volbrecht found that the litigating group performed significantly worse on the RDS than the nonlitigating group. Using a cutoff score of seven, 4.1% of non-litigating participants were classified as malingering and 49% of litigating participants as malingering. Because the actual base-rate of malingered performance is unknown in this sample, the correct classification rates can only be estimated. Using a forced choice test to establish a base rate of submaximal performance, the RDS demonstrated 95% sensitivity and 78% specificity. The findings from this study were comparable to the findings reported by Greffenstein et al. (1995), and provide converging evidence for the effectiveness of RDS as an indicator of insufficient effort.

Mathias, Greve, Bianchini, Houston, and Crouch (2002) were the next to investigate the effectiveness of RDS (Greiffenstein et al., 1994). RDS scores were calculated from 24 litigants meeting Slick et al.=s (1999) criteria for probable malingered neurocognitive deficit (MND) and 30 control patients not meeting criteria for MND. Sensitivity, specificity, and predictive power were examined using varying RDS cutoff scores. Results indicated that specificity was excellent (90% or better) for all cut scores of seven or below. Classification accuracy for the RDS was also excellent. An RDS cut score of five was extremely sensitive to MND, producing a positive predictive power index of one regardless of base rate. The predictive power indexes are essentially the confidence index that a test result is accurate. A score of one indicates 100% confidence (for a review, see Hennekens & Buring, 1987; Mathias et al., 2002). Cut scores of six and seven were also effective, enjoying specificity rates higher than 90%. Thus, false positive rates for these cut scores were below 10%. As reported in previous studies, a cut score of seven was most effective (67% sensitivity and 93% specificity), and was recommended by the authors. Mathias et al. concluded that the RDS was effective at detecting MND in TBI. But, what about other populations?

Similar to Mathias et al. (2002), Duncan and Ausborn (2002) also examined and cross-validated previous studies using the RDS (Greiffenstein et al., 1995, 1996; Meyers & Volbrecht, 1998). Unlike Mathias et al., who used TBI participants, Duncan and Ausborn used archival WAIS-R data from prison inmates (N=187). Based on previous psychological examinations, inmates were separated into malingering and control groups and compared based upon RDS scores, F-Scale scores from the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989), and the Negative Impression Scale (Morey, 1991). Results supported the use of RDS. The authors suggest a cut score of seven was clinically more relevent for criminal pretrial or presentencing populations. The cut score of seven had 67.9% sensitivity and 71.6% specificity. While the sensitivity was remarkably similar to Mathias et al.=s (2002), there appears to be a significant drop in specificity (71.6% v. 93%). This difference in specificity may be due to population, motivation, or sophistication. The average grade level for inmates identified as malingering was eighth grade and their average FIQ was 70. The MND group from Mathias et al.=s sample had an average education of 12.5 years and FIQ of 80.

Education level and FIQ also differed between Mathias=s control group and Duncan and Ausborn=s control group. Since the control groups from both studies scored significantly higher WAIS-R indexes, it is likely that both malingering groups were purposefully performing more poorly than their actual ability. Thus , the theoretical underpinning of the RDS method (magnitude of error) appears valid and reliable for varing populations.

The purpose of Larrabee=s (2003) study was to identify patterns of performance from a comprehensive neuropsychological battery that included the RDS. Twenty-four participants meeting criteria for malingered neuro-cognitive dysfunction and 27 participants with moderate to severe TBI were used in the study. Larrabee found that using a cutoff score of seven for the RDS correctly identified 50% of his malingering sample and 93.5% of his moderate to severe closed head injury group. No participant from the CHI group scored below seven on the RDS. Cutoff scores from five individual tests, including Digit span, correctly identified 87.5% of malingerers, and 88.9% CHI group. Combining the derivation and cross-validation samples produced 87.8% sensitivity, 94.4% specificity, and combined hit rate of 91.6%. Thus, Larrabee=s findings were similar to other investigations regarding the RDS sensitivity and specificity when used individually, or within a larger battery of tests.

Iverson and Franzen (1994, 1996) also found the Digit Span subtest to be an effective indicator of malingering. The authors, however, investigated the Digit Span subtest age-corrected scaled scores instead of using raw data like the RDS method. Participants consisted of 20 student and 20 psychiatric inpatients who were instructed to malinger symptoms of TBI. These participants were compared to a control group of patients with closed head injuries instructed to perform to the best of their ability. In the first study

(1994), a cut score of four or less correctly classified 82.5% of the simulated malingerers and 95% of patients with TBI. Furthermore, when the age-corrected Digit Span scale cutting score (<4) was combined with the Knox's Cube Test total score and the RMT raw scores (for words and faces), DFA resulted in a 98% overall correct classification rate and 100% correct classification rate on cross-validation. Thus, the Digit Span subtest was used effectively in combination with other tests (pattern approach), or alone (indicator method). These findings were consistent with Iverson and Franzen=s following study. Here, the authors report a scaled score of four correctly classified 77.5% of malingerers and 100% of TBI patients. Moreover, the cut score resulted in no false positives. Combining all cutting scores in the second study resulted in a 92.5% hit rate for participants instructed to malinger and a 100% hit rate for memory-impaired participants instructed to try their best. Thus, Iverson and Franzen demonstrated that the Digit Span subtest was useful for detecting malingering when employed in a variety of different strategies.

While the Digit Span subtest was retained in the WAIS-III, there remains a paucity of research examining the Digit Span subtest in the latest version of the WAIS. Thus, Iverson and Tulsky=s (2001) documented WAIS-III Digit Span performance patterns in the WAIS-III=s standardization sample and in selected clinical groups. The purpose was to generate norms for clinicians to use for interpreting unusual Digit Span performances from persons involved in litigation. Digit Span test scores were collected and examined from 22 patients with TBI, 33 patients with chronic alcohol abuse problems, 12 patients with Korsakoff=s syndrome, 24 patients with left temporal lobectomies, 16 patients with right temporal lobectomies, and 38 patients with Alzheimer=s disease. Based on test performance patterns from these sample groups, Iverson and Tulsky made several recommendations (based abnormal performances occurring in approximately 5% or less of the subjects). The first indicator of malingering was a Digits Forward scaled score of five or less combined with a Backward scaled score of four or less. This scoring pattern was rare for the clinical groups and would likely reflect purposeful suppression of true ability. The second indicator pertained to litigants under 55 years old. A longest span forward of four or less for these individuals should raise suspicion. This finding was similar to studies examining the RDS (Greffenstein et al., 1994, 1995; Meyers & Volbrecht, 1998). Similarly, a longest span backward of two or less was rare and may indicate potential malingered deficit. Finally, a VocabularyBDigit Span difference score of five or greater (Mittenberg et al., 1995) indicates malingered deficits.

Sophisticated Malingering and the WAIS

Sophistication of the litigant with regard to their approach to malingering is an interesting area of research that has not garnered a lot of attention with the WAIS, but is being considered more regularly in investigations of malingering using other tests. Sophistication refers to knowledge of neuropsychological tests and the clinical population to be simulated. Vickery, Berry, Dearth, Vagnini, Baser, Cragar, and Orey (2004) found persons who experienced a head injury were no better than neurologically normal controls at faking brain damage. Vickery et al.=s results are consistent with other reports that have failed to find a significant effect of head injury on ability to malinger successfully (Hayes, Martin, & Gouvier, 1995; Inman & Berry, 2002; Ju & Varney, 2000; Rees et al.., 1998). Thus, factors that assist one to feign believable deficits appears not to include experience, which is counter intuitive. However, other studies suggest providing malingerers with information about TBI may compromise malingering detection effectiveness (Youngjohn, 1995). Even in Vickery=s study, both head injury and malingering instructions resulted in depressed scores on standard neuropsychological tests. The effect sizes for these two variables were large and quite comparable, emphasizing the importance of ruling out malingering as an explanation for impaired scores on testing.

One study examining whether WAIS performances could be changed by information given to participants was conducted by Johnson, Bellah, Dodge, Kelley, and Livingston (1998), who looked at the effects of simply warning malingerers that psychologists could easily catch them. Using the magnitude of error approach to compare differences on the Full, Performance, and Verbal IQ index scores from the WAIS-R, the authors hypothesized that simulated malingerers who were simply warned that their malingering would be detected would perform better than simulated malingerers with no warning. Significant differences were observed between the control group and the malingering groups, but not between simulated malingerers who were warned and simulated malingerers who were not. Thus, simply warning malingerers they will be detected, without providing effective strategies, does not appear to aid malingerers escape detection through symptom exaggeration reduction. Interestingly, it was observed that warning improved the performance of coached malingerers. This finding suggests there may be an interaction effect between warning and sophistication. Erdal (2004; reviewed in the next section) came to similar conclusions in her investigation of motivation type and level of sophistication.

While little has been done in terms of researching sophistication and malingering detection with the WAIS, research pertaining to coaching and sophistication is increasing. The literature pertaining to this area of malingering detection will be reviewed next.

The Effects of Coaching on Malingering Detectability

The sensitivity of malingering detection can vary based on the malingerer=s level of sophistication. One way a litigant can become sophisticated at malingering is through adequate coaching. Coaching can be conceptualized quite literally as someone aiding the litigant to perform better at demonstrating deficits in concordance with a particular disorder (i.e., TBI or MR), and it creates a significant barrier for neuropsychologists examining the validity of test performance. Because many persons in litigation receive some form of coaching, usually from an astute and eager lawyer (Lees-Haley, 1986), a very real impact has been felt in clinical settings. Therefore, the following section extensively reviews how coaching can occur, and the impact it has on neuropsychological testing.

How Coaching Occurs

Plaintiff attorneys can account for much of the coaching given to litigants. The role of the plaintiff attorney is to present the client(s) in a manner most conducive to maximizing legal compensation. Because our legal system is also set up to compensate attorneys based on a contingency, attorneys benefit from representing their clients with vigor. In fact, Wetter and Corrigan (1995) have shown that the majority of law students and practicing attorneys report they would engage in coaching their clients. Therefore, the legal system itself likely facilitates the coaching problem.

Specifically, Price and Stevens (1997) argue that three major problems with the American legal system contribute to this problem. First, certain ethics codes have been relaxed, which resulted in a proliferation of commercials and advertisements for injury related legal services. Second, the seemingly endless potential for compensation awards can, and has, blinded (if not seriously biased) some attorneys from carefully examining whether or not their client may be malingering. Third, coaching a plaintiff can be defended by lawyers as Apreparing@ a client for evaluations by mental health professionals. The level of coaching can range from describing the evaluation process to training on how to respond to specific tests during the evaluation. Based on these three factors, it is likely that coaching will remain problematic for neuropsychologists assessing the validity of a patient=s claim of impairment.

Compounding this problem, many people who would malinger are motivated to educate themselves on the clinical nature of cognitive impairment after head trauma to better present feigned impairments in a believable manner. Many sources of valuable information are readily available. Individuals may acquire knowledge from union colleagues, fellow workers, family members, prior litigation experiences, and medical descriptions of syndromes discussed commonly in today=s media (Lees-Haley, 1986; Lees-Haley, 1997). Malingerers involved in protracted litigation have often gone through numerous medical and psychological examinations, thereby learning what doctors are looking for through their experiences. Malingerers may also receive information through well-intentioned support groups (Lees-Haley, 1997). Persons can learn through the experiences of support group members who are generally eager to share their experiences in detail. Interestingly, malingerers may not necessarily be helping themselves by learning everything they can about a clinical population, a topic that will be discussed in detail below.

Investigations of Sophisticated Malingering

Before discussing research involving the sophistication of malingerers, it is important to review the different types of sophistication studies that are typically conducted. A Apure@ coaching study provides explicit instructional sets for how to best perform in the testing situation overall or on specific tests (Erdal, 2004; Inman et al.., 1998). Other simulated malingering studies on coaching are warning studies, which are slightly different from pure coaching studies. In warning studies, less information on strategy is given to the participant. Instructions in warning studies suggest that participants not display deficits in an obvious manner or detection will be likely (Arnett et al.., 1995; Inman, Vickery, Lamb, Edwards, & Smith, 1998; Johnson & Lesniak-Karpiak, 1997; Killgore & DellaPietra, 2000; McKinzey, Podd, Krehbiel, Mensch, & Trombka, 1997; Slick, Hopp, Strauss, & Spellacy, 1996; Suhr & Gunstad, 2000). Obviously, coaching and warning can lead to more sophisticated malingering. Often these sophisticated malingerers are then compared to naïve malingerers (NM) who have no education as to the cognitive strengths and weaknesses of a given population.

Common sense would suggest that NMs are easier to identify than SMs. While this presumption is valid in many instances, a surprising number of studies have found this presumption not to be true (Arnett, Hammeke, & Schwartz, 1995; Hayward, Hall, Hunt, & Zubrick, 1987; Schwartz, Gramling, Kerr, & Morin, 1998). These studies found that medical students, registered nurses, and medical doctors were either equal in the magnitude of, or more deliberate in, feigning deficits on neuropsychological tests than

NM with less knowledge TBI. Disturbingly, Schwartz et al. (1998) found lawyers were the better at simulating head injured patients on neuropsychological tests than medical doctors working with TBI patients. Thus, it appears that too much knowledge of a clinical population may actually be a detriment to examinees attempts to malinger.

Other studies suggest that coaching is quite effective at moderating malingering performance to less detectible levels of impairment (Martin, Bolter, Todd, Gouvier, & Niccolls, 1993); Rose, Hall, & Szalda-Petree, 1995; Rose, Hall, Szalda-Petree, & Bach, 1998). Martin, Bolter, Todd, Gouvier, and Niccolls (1993) compared SM, NM, control, and TBI groups. Significant differences were observed between groups, with normal controls performing significantly better than all other groups on the Multi-Digit Memory Test (MDMT). Furthermore, TBI patients performed significantly better than the SM, who performed significantly better than NM. Adding more blocks of delayed recognition trials appeared to increase the efficacy of the MDMT to detect SM. This technique may help detect more SM and should be investigated further. In general, this study suggests that sophisticated malingerers do perform differently than naïve malingerers in that they are harder to detect because of the coaching they received. This has very real implications and necessitates further research.

Similarly, Dunn, Shear, Howe, and Ris (2003) examined the effect of different levels of sophistication (coached, informed, coached and informed, naïve, and control) on ability to escape detection using the Computerized Assessment of Response Bias-97 (CARB-97) and the Word Memory Test (WMT). Results indicated that SM performed less well than the control group, but better than NM, suggesting SM are more difficult to detect. Interestingly, results also indicated that informing participants of typical sequelae from TBI produced worse performance on tests, and did not help the participants to avoid detection. The opposite effect was found for coached malingerers, who were given specific instructions on how to best avoid detection. This finding is consistent with other research (Arnett, Hammeke, & Schwartz, 1995; Hayward, Hall, Hunt, & Zubrick, 1987; Schwartz, Gramling, Kerr, & Morin, 1998) suggesting that too much clinical knowledge may compromise malingering on neuropsychological tests. However, Martin et al. (1993) and Dunn et al. (2003) demonstrate that coaching can be quite effective at enabling malingerers to escape detection. Thus, it is important for tests to be sensitive enough to detect even sophisticated malingerers.

An issue regarding test sensitivity, in terms of SM, is the length of the malingering index. Several studies have shown that single tests designed for malingering detection make SM challenging due to limited opportunity for demonstrating deficits. For example, Binks, Gouvier, and Waters (1997) tested the effectiveness of SM on the Dot Counting Test. Results indicated that, while SMs and NMs were significantly discriminated from controls, both performed similarly, and not necessarily consistent with actual litigating participants. Similarly, DiCarlo, Gfeller, and Oliveri (2000) discovered a surprisingly large proportion of their participants were easily detectible using the WMS-R despite 97% having acknowledged using the strategies given to them (i.e., making errors only on difficult items and getting at least 50% correct on forced choice tests). In both of these studies, limited opportunities to demonstrate impairment was credited with potentially limiting the differences between SM and NM.

Unfortunately, this strategy is impractical for real clinical settings. Rarely are single tests given, especially if they are not primarily neuropsychological in nature. Single tests designed specifically to detect malingering do not adequately measure cognitive ability, which is the core purpose behind the neuropsychological assessment. Thus, even if limiting opportunities for malingerers to use sophisticated strategies increases malingering detection sensitivity, it is an unpractical method for real world clinical practice. Furthermore, multiple detection techniques and multiple collateral sources reduce false-positive errors. Most studies recommend using at least one SVT and applying malingering detection methods to neuropsychological instruments. One other reason using a single test is not indicated for malingering detection is because larger batteries, while giving malingerers more opportunities, may actually possess better overall sensitivity. For example, Franzen and Martin (1996) found that their SM participants were still easily detectible regardless of the type of instrument used, but neuropsychological instruments had better sensitivity than the short malingering instruments. Thus, instruments such as the WAIS-III may possess better sensitivity for detecting SM than shorter instruments specifically designed for malingering detection despite more opportunity to apply malingering techniques.

Another consideration is that malingerers may not be able to significantly change their malingering strategies based on neurological disorder. Thus, the length of the test may have less to do with the lack of differences between SM and NM than once thought. For example, Klimczac, Donovick, and Burright (1997) found that SMs used similar strategies to feign impairment regardless of the disease being feigned. The researchers randomly assigned participants into five groups: informed multiple sclerosis malingerers, informed brain damaged malingerers, uninformed multiple sclerosis malingerers, uninformed brain damaged malingerers, and normal control. After administration of standard neuropsychological tests, no significant differences were observed between malingering groups, but malingering groups did perform significantly worse than normal controls. Because comparisons were not being made to individuals with actual brain damage or multiple sclerosis, no statement can be made about the vulnerability of neuropsychological tests to SM when differentiating malingerers from actual neurological patients. However, these results provide insight into malingering strategies in general, which appear to primarily emphasize suppressing actual ability.

More recently, Erdal (2004) discovered that malingering strategy does change based on motivation. Erdal compared two groups of simulated malingerers, one consisting of compensation seeking malingerers and the other, malingerers trying to get around legal prosecution. She found that compensation seeker were more flagrant at presenting their deficits, which reflected their willingness to take more risks. Erdal also found an interesting interaction effect. The coached malingerers avoiding legal action, who were warned about exaggerating deficits, were more effective at escaping detection than malingerers avoiding legal action who were only coached. However, the warning effect for coached malingerers in the compensation condition appeared ineffective at producing better test performance. These participants performed as poorly as those in the other coaching conditions. This warning effect was consistent with Johnson and Lesniak-Karpiak (1997), who suggested that coached and warned participants are more likely to temper their malingering behavior on tasks involving memory.

Thus, even persons with knowledge of a clinical population appear to have difficulty feigning deficits in the correct pattern on neuropsychological and malingering instruments (Arnett, Hammeke, & Schwartz, 1995; Hayward, Hall, Hunt, & Zubrick, 1987; Martin & Franzen, 1996; Schwartz, Gramling, Kerr, & Morin, 1998). This may have to do with motivation or the type of malingering instruction given. Providing litigants with strategies to avoid detection rather than information about clinical symptoms appears to help persons malinger more effectively (Arnett et al.., 1995; Erdal, 2004; Inman, Vickery, Lamb, Edwards, & Smith, 1998; Johnson & Lesniak-Karpiak, 1997; Killgore & DellaPietra, 2000; McKinzey, Podd, Krehbiel, Mensch, & Trombka, 1997; Slick, Hopp, Strauss, & Spellacy, 1996; Suhr & Gunstad, 2000). These findings, however, disregard the clinical interview that is a standard part of clinical assessment practices, where knowledge of symptomology is an important factor. Therefore, the optimal knowledge level remains unknown for optimal malingering, at least in terms of malingered TBI symptomology. In conclusion, it would appear that providing facts about a clinical population=s strengths and weaknesses are qualitatively different from providing test-taking strategies and this distinction is rarely made in studies examining sophisticated malingering. It may be that clinical knowledge is important for the interview and test knowledge is important for test taking.

Summary

To summarize, TBI has been shown to be a prevalent source of litigation, and there is much incentive to feign or exaggerate neuropsychological deficits in order to acquire more financial compensation. Because objective medical evidence of TBI is often lacking, neuropsychologists have been used to identify malingered behavior through testing. Much research has gone into developing techniques that can aid the neuropsychologist in making determinations of valid test performance, and several guidelines for when to suspect malingering have been published. While most research has focused on TBI and malingering, malingering behavior can be caused from other sources of secondary gain, such as escaping legal prosecution or reducing sentencing. In fact, the recent Atkins v. Virginia Supreme Court ruling (2002), has stirred up controversy over the sentencing of persons with intellectual deficits because some critics suggest death row inmates may feign mental retardation to escape the death penalty. Thus, it is important to demonstrate that robust methods for detecting malingering are available for whatever the motivation may be.

Discovering malingering detection strategies that are robust to all sources of malingering behavior would be ideal. However, two studies suggest the type of secondary gain may influence malingering strategy more than the clinical syndrome being feigned. Thus, one type of malingering detection method may not be applicable to all types of malingerers. The literature to date would suggest that malingerers may use different strategies based on the motivation for malingering, but may use similar strategies when malingering different disorders. A related consideration specific to individuals with MR is the appropriateness of currently available strategies given the limited intellectual resources of individuals with MR. Certainly, tests like the MMPI are inappropriate because they require a reading level that many with MR do not possess. Other tests, such as the Word Memory Test may have similar limitations. A recent study suggests the WMT performance is positively correlated with reading ability in children. Restricted range of test scores that are characteristic of the MR population may also decrease utility of WAIS based techniques by decreasing variability in test scores between MR malingers and those with MR. Thus, one strategy to detect all types of malingering is likely unrealistic and is necessary to determine which methods are effective for a malingerer with a specific type of motivation and disorder. To date, there is a paucity of literature regarding this issue.

The general literature regarding level of sophistication and detectability has been somewhat contradictory. One explanation for the contradictory findings is that the studies may have been using two qualitatively different types of sophisticated malingerers. The first type of sophisticated malinger would be the participant who is educated on the syndrome and symptomology of a particular disorder. This type of sophistication not only appears ineffective for eluding detection, but may actually hinder efforts at avoiding detection. The second type of sophisticated malingerer is the participant who has been educated on how best to take the assessment tests or test taking strategy. This type of sophistication appears effective at reducing malingering detection hit rates by reducing test sensitivity. Thus, it is important to identify detection strategies that are most resistant to this latter type of sophistication. It may prove effective to assimilate procedures requiring symptom knowledge into neuropsychological tests. Such procedures would require a sophisticated malingerer have to know about symptomology, which should make that person more likely to exaggerate those specific symptoms and be detected. However, it is premature to introduce this method of malingering detection in clinical practice until further research has demonstrated the effectiveness of this procedure.

The core issue in terms of motivation or type of sophistication is determining which detection methods are most effective with each type of malingerer. Because various types of methods may be required, an efficient way to utilize these methods would be to apply them all to one test that is often used with most populations. One such test that is widely used in almost all neuropsychological evaluations, and especially TBI and MR, is the WAIS-III. Thus, applying these malingering detection methods to the WAIS-III is an obvious and practical choice. Over the years, several malingering detection methods have been developed for the WAIS. DFAs, pattern analyses, qualitative measures, and subtest indicators have been investigated with general success. However, these techniques have overwhelmingly been adopted for use in cases of suspected feigned neurocognitive deficit following TBI. Identifying whether one or all of these techniques can be applied to identify feigned MR is very important given recent concerns over the potential of death row inmates to malinger this population. If a method for detecting feigned MR is identified, then it becomes equally important to identify which method is most effective at identifying feigned symptoms for that particular clinical population. In order to fully understand which method to use, it is important to better understand what motivation changes in terms of strategy and detectability. Finally, coaching can be a detriment to these strategies. Thus, it is also important to identify which strategies may be most vulnerable to sophisticated malingering.

These topics have led to three main research questions. First, are WAIS malingering indexes developed on, and for, TBI populations effective at identifying individuals malingering MR? In other words, does the effectiveness of malingering detection vary based on the type of clinical syndrome being malingered? To answer this question, a malingered MR group will be compared to a malingered TBI group, as well as groups of individuals with actual MR and TBI. Both malingering groups will have the same motivation (to avoid legal persecution) so as not introduce an addition source of variation. The two groups will be compared to determine whether they use different malingering strategies, and if so, which detection strategies are most effective for a particular group. The second research question addresses whether different secondary gains (to gain money or to escape legal punishment) truly moderate malingering strategy. To answer this question, two groups of TBI malingerers will be compared. The first group will be asked to simulate TBI for financial compensation and the second group will be asked to malinger TBI in order to avoid capital punishment. Malingering strategy will be compared and the best method for identifying each type of malingerer will be identified. The third research question pertains to the WAIS and asks whether malingering strategies developed for the WAIS-R are generalizable to the most recent version of the WAIS, the WAIS-III. To answer this question, several strategies developed for detecting malingered neurocognitive performance on the WAIS-R will be applied to the WAIS-III and analyzed for effectiveness.

Thus, the ultimate purpose for the proposed investigation is to improve the existing knowledge base regarding the identification of malingered neurocognitive deficit. The proposed study will enhance this knowledge base investigate various methods for identifying individuals who feign deficits in order to gain monetary compensation or escape legal repercussions. This information should lead to better sensitivity and specificity of pre-established detection methods and improve efficiency. Furthermore, increasing sensitivity and specificity should reduce false positive rates, which is an important aspect to malingering detection. In addition, higher correct classification results may ensure proper consequences are ascribed for criminal actions and proper compensation is awarded in civil proceedings. These actions could eventually lead to a reduction of 1) claim denials to actual MTBI patients, 2) healthcare costs and insurance premiums, and 3) legal costs to tax payers. Not only will this study examine and validate the effectiveness of these methods with the WAIS-III, this study will also examine the theory behind several of these strategies. For example, Mittenberg et al.=s Vocabulary-Digit Span difference score is based on the theory that malingerers don=t realize both subtests are equally insensitive to the effects of head trauma.

Hypotheses

Based on the literature review, several hypotheses were made. The first research question asked should malingering detection methods change based on the type of clinical population being malingered. It was hypothesized that, given the same motivation, persons feigning TBI and MR will use the same strategies to demonstrate cognitive impairment and avoid legal repercussions. Klimczac et al (1997) demonstrated persons malingering MS and TBI used the same strategy when the same motivation for malingering was presented. While MS and MR are very different in regard to clinical presentation and symptomology, so are MS and TBI. Thus, it is likely that malingerers will use the same strategies, as past research would suggest.

The second research question asked whether different secondary gains (to gain money or to escape legal punishment) would effect malingering strategy, and if so, what changes in malingering detection can be made to enhance psychologist=s ability to detect malingering? It was hypothesized that malingerers will perform differently based on their malingering motivation. It is thought that persons feigning deficits to gain financial compensation will be more willing to take the risk of getting caught, and therefore not be as subtle with their impaired performance. Thus, participants feigning TBI for monetary compensation should perform worse on the WAIS-III than participants feigning TBI to avoid the death penalty. There is considerably less to lose from being caught feigning deficits to get money than getting caught feigning deficits to avoid the death penalty. Moreover, the reward of a lot of money is significantly higher than the reward of spending the rest of your life in prison or mental institution. Thus, higher payout, plus lower penalty, equals more likelihood to feign to much impairment to ensure perception of the impairment by the psychologist and less concern regarding the likelihood that these behaviors may also make easier to get caught. These performance differences based on motivation have been demonstrated previously by Erdal (2004), but no validation study has ever been conducted to verify this phenomena.

The third research question asked whether malingering strategies developed for the WAIS-R are generalizable to the most recent version of the WAIS, the WAIS-III. It is hypothesized that these detection methods will be generalizable to the WAIS-III. Thus, Qualitative measures, Pattern analysis measures, subtest indicators, and DFA will be effective at identifying malingered performance from non-malingered performance. It is further hypothesized that DFA will be the most effective method in terms of overall classification rates. DFA has generally been shown more effective at classifying malingered performances than other methods (Axelrod & Rawlings, 1999; Greve et al., 2003; Milis et al., 1998; Mittenberg et al., 1995). Thus, Mittenberg=s DFA should outperform the methods in terms of correct classification rates and.

The fourth research question asks, do persons who malinger actually believe the DS is a test of memory, and if so, how does it effect DS performance? Many investigators have developed malingering strategies for the DS test based on this theory. Greffenstien et al.=s RDS, Mittenberg et al.=s difference score, and Iverson and Franzen=s magnitude of error research were all based on this theory. While this theory is presumed valid, and effectively explains why malingerers may choose this subtest to malinger on, no study to date has empirically demonstrated what malingerer=s perception of the DS is, or even if it is attractive to malingerers to feign deficits on compared to other subtests of the WAIS. It is hypothesized that some effect (either moderation or mediation) would be present and identified through statistical analysis. Perception of the DS test is believed to be a moderator or mediator because malingerers would need to be using memory deficits to demonstrate TBI in order for this perception to effect DS performance. However, no specific hypothesis was made regarding whether malingerer=s perception of the DS would be a moderator or mediator factor.

The reason DS perception was examined in this study is the mass attention it has received in the malingering literature as compared to the other subtests of the WAIS-III. However, to this point, it is only assumed that it is attractive to malinger on because it looks like a memory test, and it is assumed people feigning TBI will feign memory impairment. However, if DS is not attractive to malingerers to feign impairment on it compromises the utility of this subtest as a malingering instrument no matter how reliable it may be. In other words, what good is it if relatively few people use it to feign impairment? We may catch the 1% of people who do malinger on it with amazing reliability, but if we miss the remaining 99% of malingerers because they didn=t that test particularly attractive to malinger on, it provides little in the way of catching malingerers. Thus, the final research question asks, is the DS test worth the attention it receives? It is hypothesized that persons feigning TBI will endorse using memory impairments as much or more than any other strategy to show cognitive impairment. Furthermore, persons feigning TBI will endorse selecting the DS test to feign impairment on more than other tests from the WAIS-III.

CHAPTER 3

METHODS

Participants

One hundred participants were recruited for the simulated malingering and normal control groups from the Psychology Department subject-pool. Participants were randomly assigned to one of four groups: malingering TBI to avoid the death penalty (TBICRM), malingering TBI to gain financial compensation (TBICVL), malingering mental retardation to avoid the death penalty (MRCRM), and normal control (NC). Thus, each group contained 25 participants. Participants were between 18 and 65 years of age, with roughly equal numbers of male and female participants. Participants were excluded from the study if they had a history of head injury, neurological disorder, severe mental disorder, significant visual impairment, mental retardation, or any other condition that would have negatively effected performance on the neuropsychological measures.

In addition to simulated malingerers recruited from the Psychology Department subject-pool, archival data from patients with mild to moderate TBI and MR were included for comparison purposes. These participants were also men and women between the ages of 18 and 60. Psychologists working within, or collaboratively with, the Psychology Department provided the archival data. To protect confidentiality, identifying information was removed from the neuropsychological protocols prior to being turned over to the investigator. Exclusion criteria for the TBI group required that patients not be involved in litigation during the time of testing. If this condition could not be satisfied, participants were included if they had documented corroborating medical evidence of TBI with minimal secondary gain and symptom validity testing results were negative. MR participants met current DSM-IV criteria for mild mental retardation. Mild MR was selected because it is the category of persons with MR that would be difficult to distinguish from malingerers. Mild MR data was collected from a local psychologist who evaluated persons with MR living independently or in group home services.

In total, 165 participants were used to create six groups for the current study. All groups were of equal size except for group one, which had significantly more participants than the rest. Group one consisted of persons who were diagnosed with mental retardation (n = 40). Group two consisted of TBI patients (n = 25). Group three was a simulated malinger group asked to perform as if they had a head injury to avoid criminal prosecution (n = 25). Group four was a simulated malingerer group asked to perform as if they had a head injury to gain financial compensation. Group five was a simulated malingerer group asked to perform as if they had mild mental retardation to avoid prosecution (n = 25). Finally, group six was comprised of neurologically normal controls (n = 25). Table 1 shows demographic variables by group.

Table 1

Demographics by Group

	MR	TBI	TBICRM	TBICVL	MRCRM	NC	Total
N	40	25	25	25	25	25	165
Age							
M	32.80	32.16	22.08	22.88	20.52	21.36	25.98
SD	11.63	12.89	06.89	08.8	03.57	04.97	10.44
Sex							
M	18(45%)	17(68%)	10(40%)	11(44%)	06(24%)	14(56%)	76(46%)
F	22(55%)	08(22%)	15(60%)	14(56%)	19(76%)	11(44%)	89(54%)
Race							
A	00(0%)	00(0%)	03(12%)	03(12%)	06(24%)	01(4%)	13(8%)
AA	07(18%)	04(16%)	03(12%)	04(16%)	02(8%)	02(8%)	22(13%)
C	27(66%)	07(28%)	14(56%)	13(52%)	13(52%)	18(72%)	92(56%)
L	04(10%)	14(56%)	04(16%)	04(16%)	04(16%)	02(8%)	32(19%)
ME	01(3%)	00(0%)	01(4%)	00(0%)	00(0%)	01(4%)	03(2%)
NA	00(0%)	00(0%)	00(0%)	01(4%)	00(0%)	00(0%)	01(>1%
O	01(3%)	00(0%)	00(0%)	00(0%)	00(0%)	01(4%)	)
							02(1%)

Note: MR = Mental Retardation; TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; A = Asian, AA = African American, C = Caucasian, L = Latino(a), ME = Middle Eastern, NA = Native American, O = Other

Measures

Wechsler Adult Intelligence Scale

The WAIS-III is an individually administered clinical instrument used to assess multiple domains of intelligence and cognitive function. The WAIS battery is comprised of 14 subtests (11 main and 3 optional). Subtests contribute to the calculation of three intelligence quotients (IQ) and four Index (factor) scores. The three IQs are calculated by using specific subtests from the eleven main subtests. IQs receive the most interest from referral sources and are required for diagnosing MR. WAIS-III IQs are reported as Verbal IQ (VIQ) Performance IQ (PIQ), or as an overall Full-Scale IQ (FSIQ). IQ scaled scores have a mean of 100 and a standard deviation of 15. Calculation of Index scores requires contributions from the main subtest as well, but also requires contributions from the optional subtests. The four index scores reflect verbal intelligence (Verbal Comprehension Index; VCI), perceptual intelligence (Perceptional Organizational Index; POI), working memory (Working Memory Index), and processing speed (Processing Speed Index; PSI).

Subtest, Index, or IQ score has strengths and limitations when it comes to conveying information in regard to cognitive function. Subtests provide specific analysis of select cognitive strengths (or weaknesses) because they provide domain specific information. The FSIQ, on the other hand, best represents overall functioning and general intelligence (g). Index scores fall in-between subtests and IQ scores on this continuum of specificity.

Description of WAIS-III Subtests

Picture Completion Subtest

The Picture Completion (PC) subtest consists of 25 pictures. Each picture is shown to the examinee, who must name or point to an important missing part of the picture. The examinee has just 20 seconds to name the missing part each time a picture is presented. The PC subtest contributes to the PIQ and POI as it is a measure of perceptual ability and visual attention rather than verbal ability.

Vocabulary Subtest

Vocabulary (V) requires examinees to provide definitions for words that are presented verbally and visually. Word definitions recognized by standard dictionaries are acceptable. The examiner presents each word verbally while a stimulus book presents the word in written form. Each successive word that is presented becomes more difficult. Thus, the subtest is discontinued after 6 successive errors by the examinee. This subtest is a measure of verbal comprehension.

Digit Symbol/Coding Subtest

Digit Symbol/Coding (CD) presents a series of random numbers (1-9), and each number has a corresponding symbol. Using a key, the examinee must draw the symbol underneath its corresponding number. The score is based on how many correct symbols were drawn in two minutes. CD is considered a measure of processing speed but also requires motor ability, visual attention, and memory.

Similarities Subtest

Similarities (S) is comparable to an analogies test except that instead of presenting a word and asking for analogous word, the S subtest presents two words or concepts and asks how they are alike. Thus, the S subtest requires mastery of concepts and meanings and contributes to the VIQ and VCI.

Block Design Subtest

Block Design (BD) has examinees reproduce designs presented visually in a stimulus book using square blocks. Each block has two red sides, two white sides, and two sides that are half red and half white. The difficulty level of each pattern to be reproduced increases with each successful completion of the previous design. The designs start with a simple two block design and progress to more complicated nine block designs. The BD subtest appears to be a good measure of visual-perceptual abilities.

Arithmetic Subtest

Arithmetic (A) presents the examinee with a series of arithmetic problems that progress in difficulty with each successive completion of an item. The examinee must do the arithmetic mentally and respond orally as use of paper and pencil are not allowed. The A subtest contribute to the VIQ and WMI because it requires examinees to hold verbal information in temporary storage until it can be fully processed.

Matrix Reasoning Subtest

Matrix Reasoning (mr) is constructed of four types of nonverbal tasks: pattern completion, classification, analogy, and serial reasoning. The mr requires the examinee to inspect a matrix presented in the stimulus book and chooses, from five options, an answer that best completes the matrix. The mr contributes to the calculation of PIQ and POI.

Digit Span Subtest

Digit Span (DS) is composed of two parts. The first part presents the examinee with a list of orally read numbers. The examinee must repeat the list of numbers back to the examiner in order to pass that item. Each item contains two trials of a string of numbers of a specified length. The test is discontinued when both trials in an item cannot be successfully repeated back to the examiner. Until that point, the items continue to get more difficult. The second part of DS requires the examiner to repeat the string of numbers in reverse of the order it was presented. Again, each item has two trials and the sting of numbers in each item get progressively longer. The DS subtest contributes to the calculation of VIQ and WMI as this subtest requires examinees to hold information in temporary storage until the task is complete.

Information Subtest

Information (I) requires an oral response from the examinee based on questions pertaining to factual information. This subtest is intended to measure the examinee=s knowledge of common events, objects, places, and people. The I subtest is used to calculate an examinee=s VIQ and VCI.

Picture Arrangement Subtest

Picture Arrangement (PA) presents a set of picture cards that tell a story when placed in the correct order. The cards are presented to the examinee in a standardized mixed up order and the examinee must place them into a specified logical sequence within a certain time limit. PA contributes solely to the PIQ as it does not load onto any of the four indexes.

Comprehension Subtest

Comprehension (C) is the final standard subtest. It requires that examinees respond orally to questions that require solutions to everyday problems. It measures the examinee=s understanding of concepts and social practices. C, similar to PA, does not load onto any of the four index scores, but contributes to the VIQ.

Symbol Search Subtest

Symbol Search (SS) is an optional subtest that does not contribute to the calculation of IQ scores. SS does, however, load onto the PSI as it is a good measure of processing speed. The SS subtest has subjects examine a target group (two symbols) and a search group (five symbols). The examinee=s task is to indicate whether either of the target group symbols match the search group symbols. The examinee must do so within a specified time limit (120 seconds).

Letter-Number Sequencing Subtest

Letter-Number Sequencing (LN) is optional on the WAIS-III. It is a good measure of auditory working memory and sensitive to many neurological conditions. Thus, the LN loads onto the WMI, but does not contribute to the calculation of IQ scores. The LN subtest requires examinees to sequentially order a series of numbers and letters orally presented to them in a random order. Not only must the participants remember the numbers and letters, they must also order the numbers in numerical and then sort the letters into alphabetical order.

Object Assembly Subtest

The last subtest to be reviewed is Object Assembly (OA). OA has examinees properly assemble mixed up puzzle pieces into correct form, which depicts common everyday objects. OA does not contribute to either IQ scores nor index scores.

Verbal Comprehension Index

The VCI is a measure of acquired knowledge and verbal reasoning. It is considered a Apurer@ measure of verbal ability than the VIQ (WAIS-III Technical Manual, p. 186) because it does not include the DS, C, or A subtests. The working memory aspect, and other attributes, of these subtests may dilute the construct of verbal comprehension and, therefore, are better applied to other indexes.

Perceptual Organization Index

The POI reflects an examinee=s nonverbal fluid reasoning, attention to detail, and visual/motor integration. It is a better measure of these aspects than the PIQ, which also relies on the timed tests used for processing speed.

Working Memory Index

This index is composed of scaled scores from the auditory presentation of A, DS, and LN subtests. Low scores on this Index may reflect specific or general difficulties in attending to information, holding/processing information in memory, and formulating responses to information.

Processing Speed Index

This index is a measure of an examinee=s ability to process visual information quickly. The WAIS-III Technical Manual (The Psychological Corporation, 1997) suggests discrepancies between the PSI and POI can reveal effects of time demands on problem solving, which may be important information when assessing examinee=s who may by learning disabled or have attention difficulties.

Verbal IQ

The VIQ is a reflection of an examinee=s acquired knowledge, verbal reasoning, and attention to verbal stimulus. Items from subtests that contribute to this scale were presented auditorily and visually, but the examinee must generate verbal responses.

Performance IQ

The PIQ reflects an examinee=s fluid reasoning, spatial processing, attentiveness to detail, and visual-motor integration. Unlike VIQ, which taps more of the examinee=s acquired knowledge, the PIQ measures an examinee=s ability to figure out novel problems.

Full Scale IQ

The FSIQ is the overall summary score reflecting an examinee=s estimated level of intellectual functioning. It is the combination of VIQ and PIQ, and considered the most representative score of global intellectual functioning (Psychological Corporation, 1997).

Standardization and Psychometric Properties

Regardless of what method is used to determine performance (subtests, index, or IQ), all scores are compared to, and reported in terms of, age-corrected scaled scores. The standardization sample for the WAIS-III consisted of 2,450 adults ranging from 16 to 89 years of age. Thirteen age groups were created from this sample, most of which have 200 per group (except the oldest two groups, which have 150 and 100 respectively). Participants were recruited from across the United States and were medically and psychiatrically screened before participation. According to U.S. census data, the standardization sample was representative of the U.S. population in terms of race, sex, and education.

Average reliability coefficients for WAIS-III subtests range from .82 to .93, with DS, V, I, and MR enjoying the best reliability coefficients. Average IQ and Index reliabilities are generally better than subtest reliability, ranging from .88 to .97. This is to be expected as the IQ scores and Index scores summarize an examinee=s performance on a broader range of ability than subtests, which are more specific. The WAIS-III also enjoys better reliability coefficients than its predecessor the WAIS-R. Test-retest stability coefficients for subtests, Index scores, and IQ scores are generally good, ranging from .70s to .90s across age groups. Mean IQ scores on retest are typically two to three points higher than the original administration, suggesting the WAIS-III is somewhat vulnerable to practice effects. Interrater reliability coefficients are very high for the WAIS-III, averaging in the high .90s. This is expected due to the extensive scoring criteria for the WAIS-III.

Criterion validity for the WAIS-III has been demonstrated through correlations with various intelligence and achievement instruments. VIQ, PIQ and FIQ correlated .94, .86, and .93 respectively with the WAIS-R IQs (Wechsler, 1987), suggesting the two instruments measure the same constructs. Other supportive evidence of WAIS-III criterion validity was observed through acceptable correlations with the WISC-III (Wechsler, 1991), Standard Progressive Matrices (Raven, 1976), the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1986), and the Wechsler Intellectual Acheivment Test (WIAT, Wechsler, 1996). Thus, the criterion validity appears to be well established for the WAIS-III.

The construct validity of the WAIS-III has been demonstrated through convergent and divergent validity studies. One inter-correlation examination (WAIS-III Technical Manual, 1997) suggested that many subtests were correlated, which supports the contention that the WAIS-III accurately reflects general intelligence. The pattern also indicated that subtests measuring a specific cognitive domain correlated higher with other subtests measuring that specific domain than subtests measuring different cognitive domains. In general, this pattern holds true throughout the different age groups. Similarly, divergent validity was evidenced through low correlations among subtests purported to measure different cognitive domains. This evidence supports not only the two domain measures reflected through IQ scores (VIQ and PIQ), but the four Index domains as well. Further support for the validity of the Index scores was obtained through exploratory and confirmatory factor analysis (see WAIS-III Technical Manual for a thorough review). Thus, the WAIS-III appears to have well-established reliability and validity.

The WAIS-III has demonstrated psychometric properties suggesting it is a reliable and valid measure of various cognitive abilities. The large and representative standardization sample for the WAIS-III strengthens its ability to accurately reflect the cognitive ability of diverse groups of examinees. Furthermore, simple, objective, and standardized administration and scoring procedures makes for easier comparison and analyses of participants while reducing measurement error. Thus, the WAIS-III is an ideal instrument for clinical assessment and research. Because of its vast popularity, the WAIS-III is the perfect instrument for the current study.

Post-test Questionnaire

After administration of the WAIS-III, a posttest questionnaire was given to participants. This questionnaire served several purposes. First, it provided a manipulation check to assure that participants performed as instructed. Second, the questionnaire assessed the participant=s choice of malingering strategy, why they chose a particular subtest to feign deficits, and what deficits they tried to feign. Third, the post-test questionnaire allowed investigators to determine empirically how the TBI malingerers were perceiving the Digit Span Subtest. Finally, the questionnaire assessed the participant=s conceptualization of the clinical population they were asked to simulate. This questionnaire allowed investigators to assess whether participants changed strategy based on clinical population, motivation, and perception. This information may be useful for developing new indexes designed for malingering detection.

Procedures

UNLV student participants learned of the study from the Psychology department=s on-line Subject-pool listings. Volunteer participants visiting the Psychology

Department=s Subject-Pool web site signed up for a scheduled individual appointment. Prior to the initiation of any study procedures, informed consent was obtained (consent forms can be seen in Appendix I).

Rogers (1993) described guidelines for analogue studies to better simulate real world malingerers, which were used in the current study. These guidelines include: 1) clear instructions of what is expected from the experimental group, 2) use of sufficient incentives, 3) allowing malingerers sufficient time to prepare an adequate strategy, and 4) debriefing after the study to gauge the participant=s compliance and comprehension. The current study tried to meet these proposed guidelines to ensure generalizability.

Following the informed consent procedure, subject-pool participants were interviewed briefly to rule out prior head trauma or other neurological conditions. Participants were then randomly assigned to one of four groups that differed based on specific malingering instructions (Rogers= first guideline). Participants then received the standardized instruction specific to the group for which they were assigned (see Appendices II through V for instructions). Each participant then took a brief five-item manipulation check questionnaire. The questionnaire measured the participant=s comprehension of the instructions just reviewed. In order to continue with testing, the participant had to satisfactorily answer all test items (see Appendix VI-IX for manipulation check questionnaires).

There were three different simulated malingering groups. The first instruction was for the malingered TBI deficits group whose motivation was for financial compensation (TBICVL; see appendix II). The participants were provided with a scenario for why they were being tested for head injury, and some strategies for effective malingering. The information conveyed in the instructions set is already available to the public and does not compromise test security. The second malingering group received instructions to malinger TBI in order to escape capital punishment (TBICRM; see appendix III). The instruction set was identical to that for the third group, except that the third group of participants was instructed to simulate mental retardation in order to avoid capital punishment (MRCRM; see appendix IV). The experimental groups were designed to represent sophisticated malingerers, i.e., those who have insight into malingering detection methods. Sophisticated malingerers were used to examine the robustness of malingering detection methods used in the current study because, in theory, they should be the most difficult to detect. Furthermore, because past research has demonstrated that too much clinical knowledge actually hampers attempts to avoid detection (Erdal, 2004), only test taking strategy was provided to the experimental malingerers. The fourth, fifth, and sixth groups were TBI, MR, and normal control sample. The instructions for the normal control (NC) group asked participants to try their best (see appendix V). Thus, four groups (TBICVL, TBICRM, MRCRM, and NC) consisted of 25 participants, and all participants were recruited from the psychology department=s subject pool. Actual MR and TBI group archival data was collected from assisting psychologists.

Individual participants were not paid for their participation in this study. However, four $50.00 awards were given to participants recruited from the Psychology Department Subject Pool (see instructions). The first award was given to one simulated malingerer who Abest@ simulated TBI for financial compensation. The second award was given to the participant who best simulated TBI to avoid prosecution. Winners from these groups were compared to the average index scores obtained by the actual TBI participants. The third award was given to the participant who best simulated MR to avoid prosecution. Again, this participant had the most comparable scores to that of the actual MR group participants. Finally, a fourth award was given to the participant in the NC group who demonstrated the best overall performance on the WAIS as measured by IQ scores. These incentives were in accord with Rogers= second guideline, and were intended to increase motivation and obtain optimal performance from those participating in the study. This technique has been used in previous studies (Erdal, 2004; Greffenstein et al., 1994; Iverson & Franzen, 1994, 1996; Martin et al., 1993; Rogers, 1993) because it increases optimal malingered performance and, at least in the case of civil litigation, increases external validity. The award was not used to solicit participants into the study, and no mention of the award was made during the recruiting phase. Participants were informed after consenting to participate.

No identifying information was placed on test materials in order to protect the anonymity and confidentiality of participants. Instead, test materials were given a four-digit code. The master list of contact information for each code was kept in a locked cabinet by the primary investigator. Subject pool participants received up to three hours of research credit to compensate the hours of participation (no participant participated for more than three hours). No compensation was offered to the actual MR or TBI participants as their data was archival, and all identifying information had been removed prior to being received by the investigator in order to ensure confidentiality.

Following the informed consent, receipt of research credits, and presentation of instructions, participants were administered the WAIS-III. The average administration time for the WAIS-III was approximately 90 minutes. Experimental malingerers took longer or shorter due to the strategy they choose to feign deficits. Time was allotted for a break during the testing and for questions after the examination; however, participants routinely elected to skip breaks and continue with testing. In accordance with Rogers= (1993) fourth guideline, a posttest manipulation check questionnaire was conducted after the administration of the WAIS-III to confirm which subtests the participants elected to malinger deficits on, why they chose a certain subtests, and the strategy they used to feign deficits on those subtests (see Appendix X). All participants were then debriefed and given contact information for future questions or concerns (Appendix XI).

Malingering Measures

The malingering measures that were used in this investigation came from the WAIS-III malingering literature, and included qualitative methods described by Binder and Rohling=s Simulation Index- Revised (1993), Mittenberg=s (1995) Vocabulary-Digit Span (V-DS) difference score, Greffenstien=s (1994) Reliable Digits Score (RDS), and DFA (Mittenberg, 1995). Table 2 summarizes each malingering measure used in the current study.

Binder and Rohling=s qualitative methods for the WAIS include Overtime Correct Responses on Picture Completion, Block Design, Arithmetic, Picture arraignment, and Object Assembly, as well as Digit Span Primacy Errors (DS-P) and Capitulations (DS-C). For Overtime scoring, one point was assigned for each item of a subtest that exceeded the time limit. To remain consistent with Binder and Rohling=s Simulation Index-Revised (1993), an item was discontinued if the participant took more than two minutes beyond the time limit of an item. Thus, overtime scores were given only if the participant took longer than the time limit, but less than two minutes over time limit. The qualitative examination of the DS subtest included scoring Primacy Errors (errors on the first or second digit of Digit Span Forward) and Capitulations (recalling less than 60% of a string on Digits Forward). One point was assigned for each occurrence. Other DS measures included the Vocabulary-Digit Span (V-DS) difference score (Mittenberg et al., 1995) and RDS (Greffenstien et al., 1994). The V-DS difference score was calculated by simply subtracting the DS scale score from the V scaled score. A difference of more than two reflects suspect motivation because both tests are considered Ahold@ tests that are equally resistant to head injury.

The RDS is calculated by summing the highest (successfully) completed item of Digits Forward with the highest (successfully) completed item of Digits Backward. To successfully complete an item, the participant must not make an error on either trial of that item. For example, if a participant=s highest completed Digits Forward item was item 3, then the participants Digits Forward RDS score would be four because each trial in item 3 consists of a string of four digits. If the second item of Digits Backward was the last item to have both trials successfully completed, then the participant=s Digits Backward RDS score would be three because each trail in this item contains a string of three digits. Thus, the RDS total score would be seven (Digits Forward + Digits Backward).

Finally, Mittenberg et al=s (1995) DFA ws calculated by summing the weighted product of seven subtests and a constant. The algorithm is as follows: DS (-0.3288678) + V (0.171452) + A (-0.07195667) + C (-0.08107555) + S (0.1580098) + PC (-0.07994288) + DSC (0.0780321) + 0.9695551). The DFA was designed such that positive scores reflect malingered performance and negative scores represent valid performance.

Table 2

Description of Malingering Measures

Measure	Description
Digit Span- Primacy (DS-P).	An error on either the first or second digits are wrong. One point for every trial where this occurs.
Digit Span- Capitulations (DS-C).	Recalling less than 60% of a string (either by omission or wrong order). One point for each trial.
Overtime Object Assembly (OTOA).	1-point for every trial with a correct overtime response, but not more than 2-minutes over the time limit.
Overtime Picture Completion (OTPC).	1-point for each correct response that was made over the time limit.
Overtime Block Design (OTBD).	1-point for each correct response made over the time limit.
Overtime Arithmetic (OTA).	1-point for each correct response made over the time limit.
Discriminate Function Analysis-Mittenberg (DFA-M).	DS (-0.3288678) + V (0.171452) + A (-0.07195667) + C (-0.08107555) + S (0.1580098) + PC (-0.07994288) + DSC (0.0780321) + 0.9695551).
Vocabulary-Digit Span Difference (V-DS).	Record the difference score of the two subtests (scaled scores)
Reliable Digit Span (RDS).	Longest string forward + longest string backward.

Analyses

Data Entry and Screening

Malingering measures were derived using the aforementioned procedures. Two examiners scored all test protocols to ensure accuracy. Following data entry, descriptive statistics were calculated for each variable, including frequency counts and skewness and kurtosis statistics. Descriptive statistics for each of the variables were examined in order to detect out-of-range values, evaluate the presence of outliers, and inspect the distribution of each of the major variables.

Preliminary Analyses

Prior to testing the main hypotheses of the study, groups were compared on important demographic variables to rule out the possibility that these variables might influence performance on the malingering indexes. Analysis of variance (ANOVA) was used to compare groups on age. The Chi-Square statistic was used to identify sex and race.

Evaluation of Main Hypotheses

Several statistical procedures were used to evaluate the hypotheses. The first and second hypotheses were evaluated by comparing group performances. The first hypothesis stated that malingerers would not change their malingering strategy based on the clinical population. Erdal, (2004) and Klimczac et al (1997) demonstrated that persons malingering different clinical populations used similar malingering strategies when a similar motivation for malingering was provided. Thus, TBI and MR malingering groups were compared using multivariate analysis of variance (MANOVA). It was hypothesized that TBI and MR malingering groups would demonstrate similar malingering performance because their malingering motivation was the same (avoid capital punishment). Thus, no significant differences on the MANOVA were expected.

Hypothesis Two stated that simulated malingerer participants for this study would change their malingering strategy based on their malingering motivation because persons feigning deficits to gain financial compensation would be more willing to risk detection. These persons would have less to lose from being caught than criminal defendants, and would receive more financial compensation based on their level of impairment. Thus, consistent with Erdal (2004), different performance patterns based on malingering motivation should be evident. Therefore, the two groups of TBI malingerers (malingering for financial gain or to avoid criminal prosecution) were compared and analyzed using MANOVA to investigate group differences. The MANOVA for Hypothesis Two was expected to show significant group differences on Subtest, Index, IQ, and Malingering variables.

As mentioned above, the first and second hypotheses were analyzed using multivariate analysis of variance (MANOVA) to evaluate score differences between groups on subtests, Index/IQs, pattern analysis, and qualitative malingering measures. The overall F test is the first item to examine when analyzing results of MANOVA. This is the test of the null hypothesis (that there are no differences in the means of dependent variables). There are at least four significance tests for multiple dependents that use the F distribution (Hotelling Trace, Wilks Lambda, Roy=s Largest Root, and Pillai=s Trace). However, Olson (1976) found Pillai=s Trace to be the most robust of the four tests. Thus, Pillai=s Trace was the test of significance used in this study. Significant Pillai=s trace tests were subsequently followed with analysis of variance (ANOVA) to evaluate specific dependent variable differences.

These analyses should provide insight into the factors influencing malingering performance. For example, significant differences between the two TBI malingering groups will indicate the malingering motivation influenced performance because they were trying to simulate the same clinical population. In the same vein, significant differences observed on the dependent variables of malingerers feigning TBI to avoid criminal prosecution and malingerers feigning MR for the same reason will provide strong evidence that people change their performance based on the clinical population they are trying to feign. Even if no differences are found among any of the malingering groups, it suggests that malingerers will use the same strategy regardless of the clinical group or motivation and is valuable information. In the only other possible scenario, if participants who malinger TBI for financial compensation differ from participants feigning mental retardation to avoid criminal prosecution, but neither group differs from participants who malinger TBI to avoid criminal prosecution, the most reasonable conclusion would be that both the clinical group affiliation and malingering motivation influence malingering performance.

These first two sets of hypothesis were meant to address the research questions regarding whether different malingering detection strategies should be employed for specific malingering groups. To further address this question, several DFAs were conducted. These DFAs evaluated whether different sets of scores (Subtests, IQ/Indexs, and Other scores) would have different classification rates when discriminating each type of malingering group from its respective clinical population. Different equations for each group should be the result of two factors. The first factor is that actual clinical populations will perform differently from one another. Thus, malingerers using the same strategy (regardless of clinical population) would produce different discriminate function scores when compared to actual TBI and MR patients. The second factor is that malingering motivation should produce different subtest scoring patterns such that two malingering groups would produce different discriminate scores when compared to the same clinical population (TBI patients). Therefore, three DFAs were expected to produce the most specific and sensitive classification rates for each malingering group (TBICVL, TBICRM, and MRCRM).

DFA is used to predict group membership from a set of predictor variables. In general, a linear discriminant equation ($D1 = a + b1X1 + b2X2 + Y + BpXp$) is constructed such that groups differ as much as possible on discriminate scores. Weights are determined in such a way that performing an ANOVA on each subjects= discriminate score produces the largest ratio of between groups sum of squares and within groups sum of squares. The value of this ratio is the Eigenvalue.

For the current study, Wilks lambda was used to test the null hypothesis that malingering and patient populations have identical means on their discriminate scores. Wilks lambda is the ratio of summed squares within group over the total sum of squares, which means the smaller the Wilks lambda, the greater the doubt cast on the null hypothesis. Chi square was used to obtain the exact significance level and canonical correlations provided information regarding the amount of variance in the grouping variable explained by predictor variables. Essentially, canonical correlations are equivalent to eta in an ANOVA, and are obtained by subtracting the Wilks lambda from one.

Each DFA consisted of two groups: a malingering group and its associated clinical group (i.e., TBICRM and TBI, TBICVL and TBI, and MRCRM and MR). Participants were classified using Fisher=s classification function coefficients. For each subject a discriminate score was computed for each group, and the subject was then classified into the group for which each participant=s discriminate score was the highest. Computation of the subjects first discriminate score (D1) was made by multiplying the participant=s scores on particular malingering measures by the indicated coefficients, and then summing them with a constant. For the participant=s next discriminate score (D2) the same procedure was used with the coefficients for Group 2. If D1 was greater than D2, then the participant was classified into Group 1. However, if D2 was greater than D1, then the participant was classified into Group 2.

A classification table was then calculated to show correct classification rates. Significance is determined by comparing the correct classification rate to what would be expected by chance. With two groups, simple random classification of half the participants into group 1 and half into group 2 should result in 50% correct classification rate. Classification rates derived from the DFAs were compared in order to determine which method possesses the greatest specificity and sensitivity. Chi-square was used to determine significant differences among DFAs. The best variables for group discrimination were identified through stepwise function analysis. Then, the variable combinations were analyzed to determine sensitivity and specificity.

The third hypotheses stated Qualitative Scores (DS Primacy errors, Capitulations, and overtime responses), Pattern Analysis measures (V-DS difference score), subtest indicators (RDS), and DFA (Mittenberg et al, 1995) would be effective at identifying malingered performance from non-malingered performance, but, DFA would be the most effective method in terms of overall classification rates. DFA has generally been shown more effective at classifying malingered performances than other methods (Axelrod & Rawlings, 1999; Greve et al., 2003; Milis et al., 1998; Mittenberg et al., 1995). Chi Square was used to determine if classification rates from each method was significant.

The fourth hypothesis predicted that malingerers= perceptions of the DS test would moderate or mediate their performances on the test. Specifically, participants who perceived the test as a measure of memory would perform more poorly on the test. To test this hypothesis, participants who malingered TBI (regardless of motivation) were asked what they believed the DS test measured and what strategies they used to malinger on the WAIS-III. Malingerers= perception of the DS was examined to determine if it moderated or mediated DS test performance. A moderator variable is one that affects the strength or direction of the relationship between two variables (Baron & Kenny, 1986). Thus, the statistical test of moderation must measure the differential effect of the independent variable on the dependent variable as a function of the moderating variable. With categorical predictor and moderator variables, the test of choice is 2 x 2 ANOVA (Baron & Kenny, 1986).

The moderator variable examined was TBI malingerers= (both motivations) perception that the DS subtest measured memory. Two levels of this variable were used: 1) belief that DS measured memory impairment, and 2) belief that DS measured something other than memory. The independent variable was malingering strategy. The independent variable had two levels: 1) were memory impairments used to feign TBI, or 2) some other strategy. Mean Digit Span scaled scores were used as the dependent measure.

As previously mentioned, malingerers perception of what DS measures was also examined to determine if this factor had mediating effects of Digit Span test performance. A variable is a mediator when it actually accounts for the relationship between the independent variable and the dependent variable, not just enhance or influence the relationship (Baron & Kenny, 1986). Mediation occurs when it is demonstrated that the independent variable affects the mediator, which in turn affects the dependent variable. However, the independent variable=s effect on the dependent variable must reduce when the mediator is controlled. It is recommended by Judd and Kenny (1981) that a series of regression equations be used to show this relationship. In the regression equations used here, malingering strategy (using memory to show impairment or another form of cognitive deficit) was used as the independent variable, perception of the Digit Span test was the mediating variable, and the Digit Span scaled score was the dependent variable. The first regression model examined the relationship between malingerer=s strategy and Digit Span perception. The second examined the relationship between malingering strategy and Digit Span scaled scores. The third regression examined the relationship between malingering strategy and Digit Span scaled scores when Digit Span perception was controlled in the analysis.

To analyze whether Digit Span was generally perceived to be a test of memory, all UNLV participants were asked about their perception of the test. These responses were subject to chi square analysis to determine if a particular perception of this test was more common. Reported malingering strategy was also subject to chi square analysis to determine if malingerers favored memory strategies. If malingerers report using memory deficits to demonstrate impairment on the test significantly more than other malingering strategies, and they selected the Digit Span test more than other tests to show impairment, then it suggests the Digit Span as a good test for TBI malingering detection.

CHAPTER 4

RESULTS

Preliminary Analyses

Examination of the data for out of range values, outliers, and non-normal distributions indicated that all of the variables were normally distributed and there were no outliers. Not all MR or TBI participants completed the entire WAIS-III. Thus, when variables were missing, the score was typically dropped from the analysis. For example, Object Assembly had to be left out of analyses involving comparisons to clinical populations because this subtest was routinely not administered. However, Digit Span Primacy errors and Capitulations were still analyzed despite a few clinical population protocols with insufficient recordings to calculate these scores. Thus, groups of roughly of equal size were still compared in the analyses despite a couple of missing data points. It was felt the analyses were still of sufficient power given the low number of groups and variables as compared to the number of participants.

Descriptive statistics for each groups' demographic variables is presented in Table 1. These variables include age, sex, and race. Education level was not reported in the analyses or Table 1 because this information was missing for the MR and TBI participants. However, all participants in the malingering and NC groups were underclassmen in college with approximately 12-13 years of education.

ANOVA with subsequent post hoc comparisons was used to examine group differences for age. This analysis showed that groups differed significantly in regards to mean age ($F(5, 164) = 11.4$, $p < 0.001$). Subsequent post hoc analysis (Scheffe) indicated that the MR and TBI groups were significantly older than the subject-pool groups (malingering groups and NC). There were no significant differences observed between group one and two (actual MR and TBI), and no differences were noted between any of the subject pool groups. This was expected because the sample of participant recruited for the malingering groups and NC groups were college freshman. Thus, their average age was approximately 10 years younger than the average age of the two clinical groups.

Chi square analyses were used to examine differences between groups for the demographic variables of sex and race. Frequency data is also presented in Table 1. For both sex and race, the chi square statistic was significant. For sex, ($\chi 5 = 11.165$, $df = 5$, $p = 0.048$), for race ($\chi 5 = 55.514$, $df = 30$, $p = 0.003$). The proportion of males to females is higher for the TBI group, which reflects most epidemiological studies on sex differences and acquired brain injury (Gronwall, 1991; Gualtieri, 1995; Guilmette, Faust, Hart, & Arkes, 1990). The difference in race resulted from significantly more Latino participants in the TBI group than other groups.

Hypothesis One

The first hypothesis was evaluated with MANOVA and stated no differences in performance would be observed between TBI and MR malingerers. Differences on standard WAIS-III scores (Subtest, Index, and IQ) were compared as were performances on Malingering indexes, (Digit Span Primacy Errors and Capitulations, Overtime Scores, Reliable Digit Span, Vocabulary-Digit Span difference score, and Mittenberg=s discriminate score). Tables 3 and 4 show the descriptive statistics for each group= performance on the various measures. Figures 2 through 4 show the pattern of performance by groups across Standard score and Malingering variables.

The first MANOVA examined group differences on Subtest Scaled scores, and was not significant, $\underline{F}$ (21, 28) = 1.48, $\underline{p}$ = .161. This suggests no significant differences in performance on standard scores between these two groups were observed. The second Pillai=s Trace, which examined Malingering Index scores was also not significant, $\underline{F}$ (10,39) = 1.44, $\underline{p}$ = .202. Thus, no differences in performance were observed between TBICRM and MRCRM on any of the examined variables. Figure 5 shows just how similar the performances of these two malingering groups were across the WAIS-III subtests.

TBICRM and MRCRM mean scores were then compared to NC to ensure that malingerers were performing differently from control. When TBICRM standard scores were compared to NC, the MANOVA was significant, $\underline{F}$ (21, 28) = 5.82, $\underline{p}$ < 0.001. Subsequent univariate comparisons revealed that TBICRM and NC significantly differed on every standard score beyond the $\underline{p}$ < 0.002 level. Thus, the two group's= performances were quite different. When MRCRM standard scores were compared to NC, the Pillai=s Trace was also significant $\underline{F}$ (21, 28) = 11.46, $\underline{p}$ < 0.001. Subsequent univariate analyses showed that MRCRM and NC significantly differed on every standard score at the $\underline{p}$ < 0.001 level. Both malingering groups clearly performed different from NC, which shows that persons in the malingering groups were used similar malingering strategies on every single standard score and using effort on every test to demonstrate impairment.

Table 3

WAIS-III Subtest Scores (Mean and Standard Deviation)

	MR		TBI		TBICRM		TBICVL		MRCRM		NC	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
V	4.20	1.27	9.04	2.85	8.84	3.58	9.68	2.36	7.08	3.16	12.40	2.72
S	4.90	1.30	8.12	2.30	6.88	2.19	7.88	2.07	5.80	1.94	10.52	1.92
A	3.18	1.48	7.92	2.61	7.16	3.59	8.16	3.39	5.64	4.02	11.20	2.29
DS	5.20	1.84	8.60	2.04	6.72	3.04	6.72	2.64	5.56	2.65	11.28	2.87
I	4.95	1.63	8.32	2.67	8.68	3.51	10.04	2.11	6.96	2.89	11.48	2.40
C	3.40	0.84	8.84	3.12	8.84	3.24	9.96	2.01	7.40	3.34	12.64	2.33
LN			8.00	2.65	8.04	3.55	8.52	2.77	6.76	3.64	11.76	1.94
PC	5.60	1.65	8.76	2.99	5.28	2.61	5.64	2.12	4.36	2.56	9.96	2.44
DC	4.43	1.45	6.84	2.70	4.96	2.73	5.48	2.77	4.36	2.48	10.88	2.44
BD	5.15	1.66	8.16	2.72	7.64	3.21	7.92	2.69	7.32	3.09	12.40	2.53
MA	4.72	1.45	9.44	2.89	6.52	3.71	8.36	3.29	5.64	3.46	12.12	1.97
PA	5.55	1.71	8.08	2.78	6.72	2.59	7.96	2.59	7.32	3.72	10.88	2.51
SS			6.71	2.94	5.92	3.56	5.52	2.12	4.56	3.08	11.24	2.40
OA			7.83	2.64	7.72	2.19	7.56	1.96	7.28	2.82	10.32	3.05

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See pages 97-102 for explanation of WAIS-III score codes

Table 4

WAIS-III IQ and Index Scores (Mean and Standard Deviation)

	MR		TBI		TBICRM		TBICVL		MRCRM		NC	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
VIQ	66	4	91	11	87	16	92	10	79	14	111	11
PIQ	70	6	92	16	76	14	81	11	74	15	108	9
FIQ	65	4	91	11	81	16	87	11	75	15	111	9
VCI		4	92	12	90	15	93	17	81	13	108	12
POI		6	92	13	80	16	82	19	75	14	109	10
WMI		4	88	13	83	18	85	21	76	19	108	10
PSI			83	12	77	15	74	16	72	12	106	12

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See pages 97-102 for explanation of WAIS-III score codes

Similar results were found on the Malingering Index scores. When TBICRM Malingering Indexes were compared to NC, the MANOVA was significant F (10,39) = 3.65, p = .002. Subsequent analyses revealed three of the nine scores were significantly different between the two groups. The Reliable Digit Span F (1, 48) = 31.47, $p < 0.001$, Overtime Picture Completion F (1,48) = 6, p = 0.018, and Mittenberg's Discriminate Function score- Mittenberg F (1, 48) = 5.53, p = 0.023 significantly differed between TBICRM and NC. Finally, the Pillai=s trace analyzing group differences between MRCRM and NC was also significant, F (10, 39) = 3.28, p = 0.004.

Table 5

WAIS-III Malingering Scores (Mean and Standard Deviation)

	MR		TBI		TBICRM		TBICVL		MRCRM		NC	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
OTPC	0.00	0.00	0.24	0.72	0.36	0.70	0.76	1.83	1.24	1.90	0.44	0.71
OTBD	0.08	0.27	0.54	0.93	0.52	1.00	0.32	0.56	0.60	0.91	0.36	0.57
OTA	0.00	0.00	0.08	0.28	0.20	0.65	0.24	0.66	0.40	0.96	0.08	0.28
OTPA	0.00	0.00	0.21	0.83	0.12	0.33	0.00	0.00	0.20	0.50	0.00	0.00
DS-P	1.65	1.08	1.15	0.99	1.36	0.91	1.04	0.84	1.40	1.15	0.92	0.81
DS-C	1.40	1.06	1.55	1.19	1.00	0.91	0.92	0.81	1.16	1.25	0.68	0.85
DF-M	0.15	0.75	-0.48	0.85	0.02	0.99	0.19	0.74	0.22	1.02	-0.65	1.33
RDS	7.30	1.64	10.32	2.34	9.32	2.94	9.20	2.02	7.76	2.55	12.52	1.98
V-DS	0.93	2.51	0.44	2.71	2.12	2.54	3.28	2.26	1.60	2.63	1.12	4.44

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See Table 2 (pg. 110) for explanation of WAIS-III Malingering Score codes.

Subsequent analyses showed that Digit Span- Capitulations ($\underline{F}$ (1, 48) = 4.28, $\underline{p}$ = 0.044), Reliable Digit Span ($\underline{F}$ (10, 39) = 30.71, $\underline{p}$ < 0.001), and Discriminate Function Analysis- Mittenberg ($\underline{F}$ (1, 48) = 3.28, $\underline{p}$ = 0.026) significantly differentiated MRCRM and NC. Thus, malingerers clearly differed from NC, but not from each other. This provides strong evidence that malingerers use the same pattern of performance to demonstrate impairment regardless of the clinical group they seek to feign.

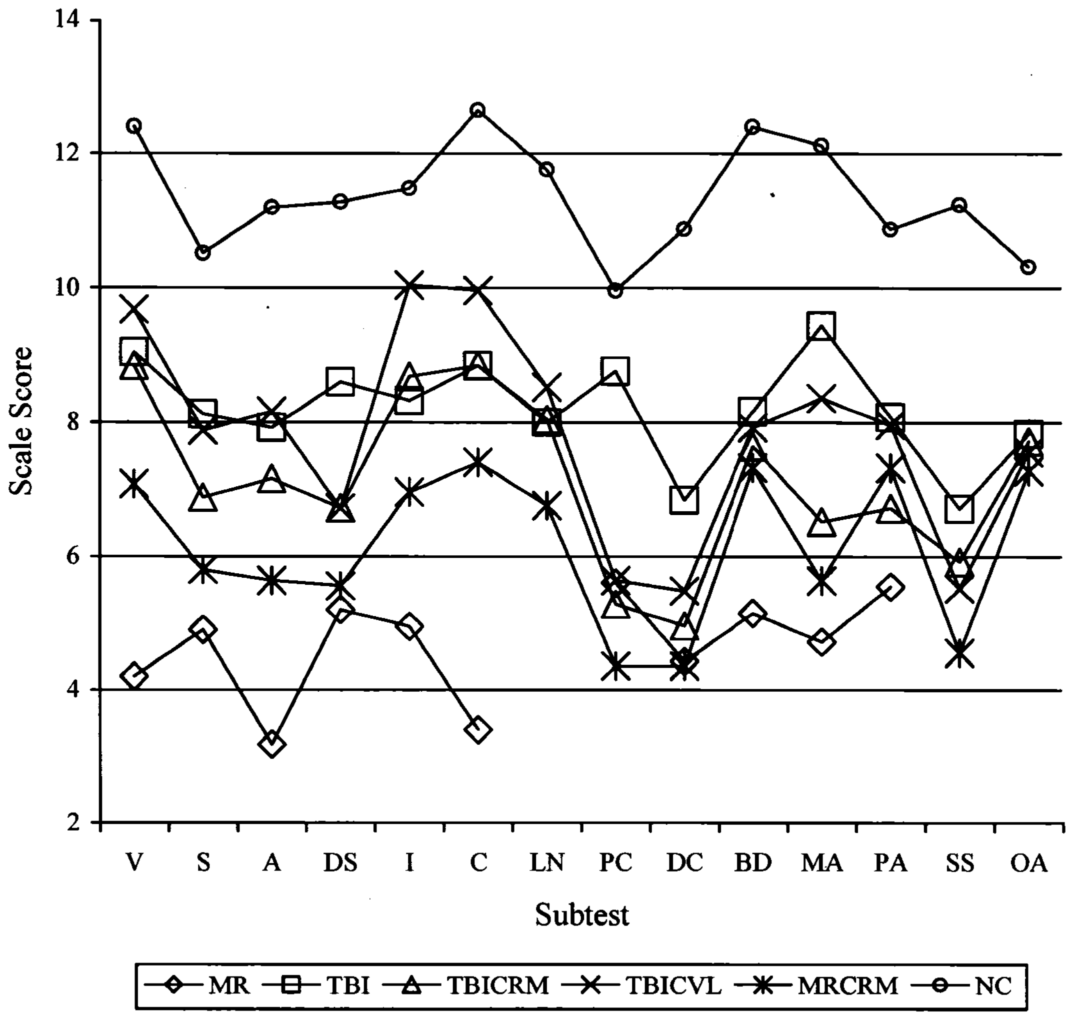

Figure 2. Plot of Mean Subtest Scores by Group

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See pages 97-102 for explanation of WAIS-III score codes

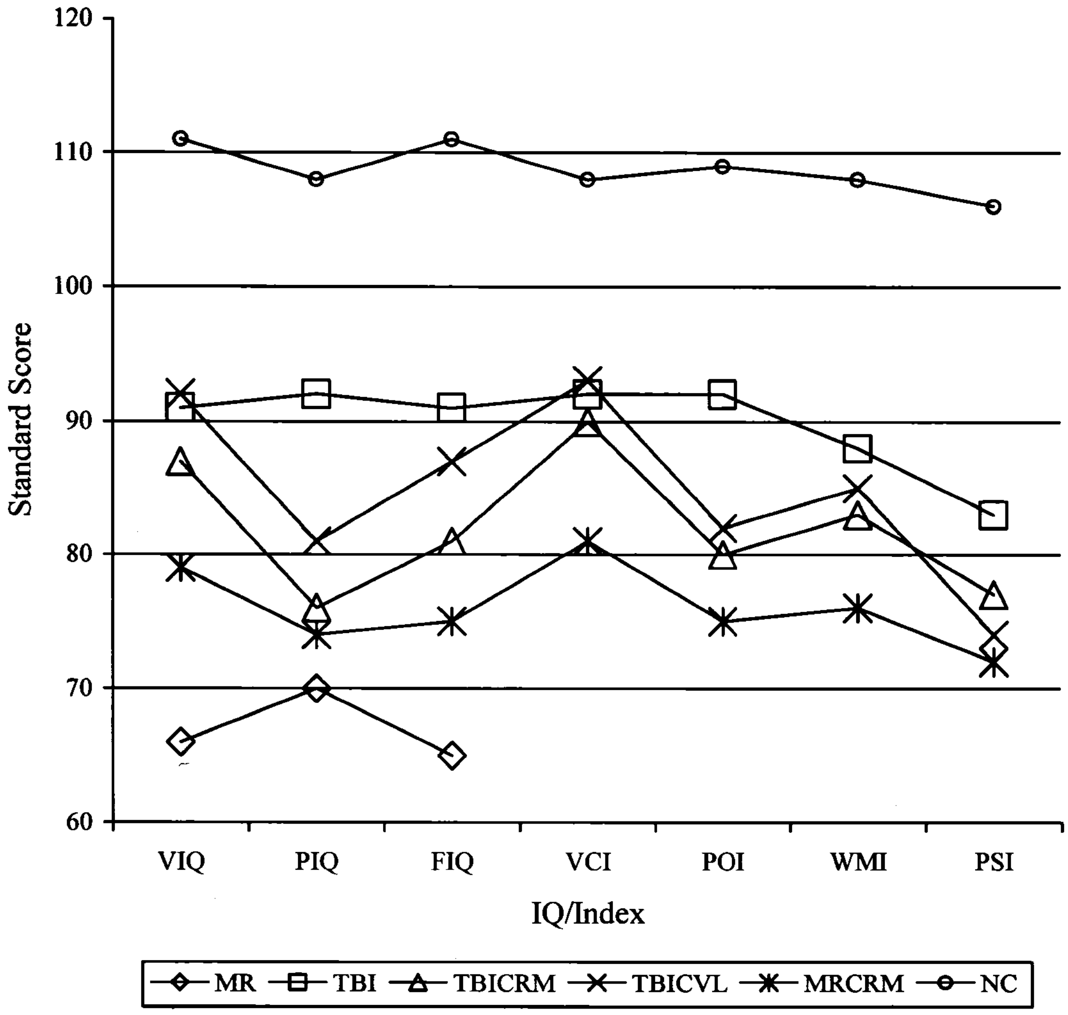

Figure 3. Plot of Mean IQ and Index Scores by Group

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See pages 97-102 for explanation of WAIS-III score codes

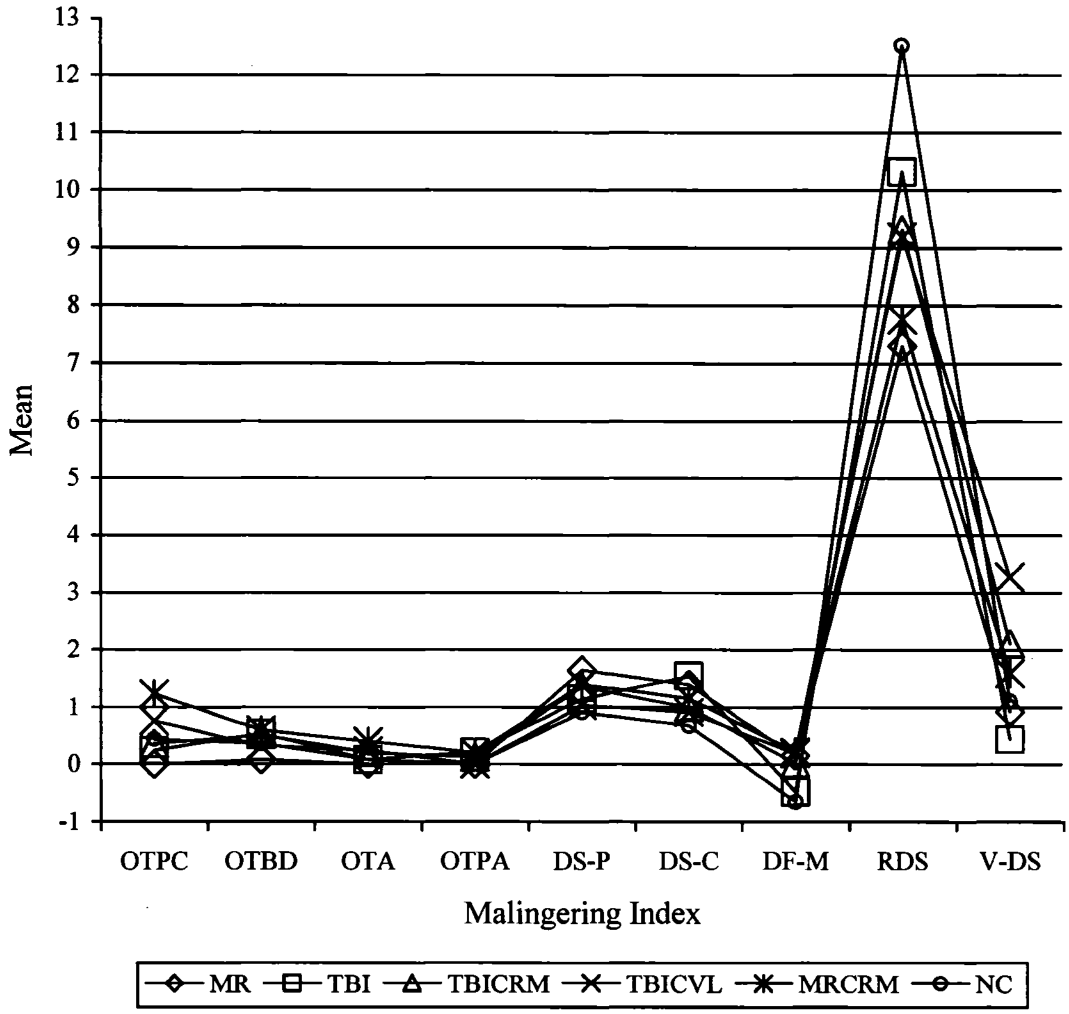

Figure 4. Plot of Mean Malingering Variable Scores by Group

Note: MR = Mental Retardation Group; TBI = Traumatic Brain Injury Group; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; MRCRM = Mental Retardation Criminal malingering; NC = Normal Control; See Table 2 (pg. 110) for explanation of WAIS-III Malingering Score codes.

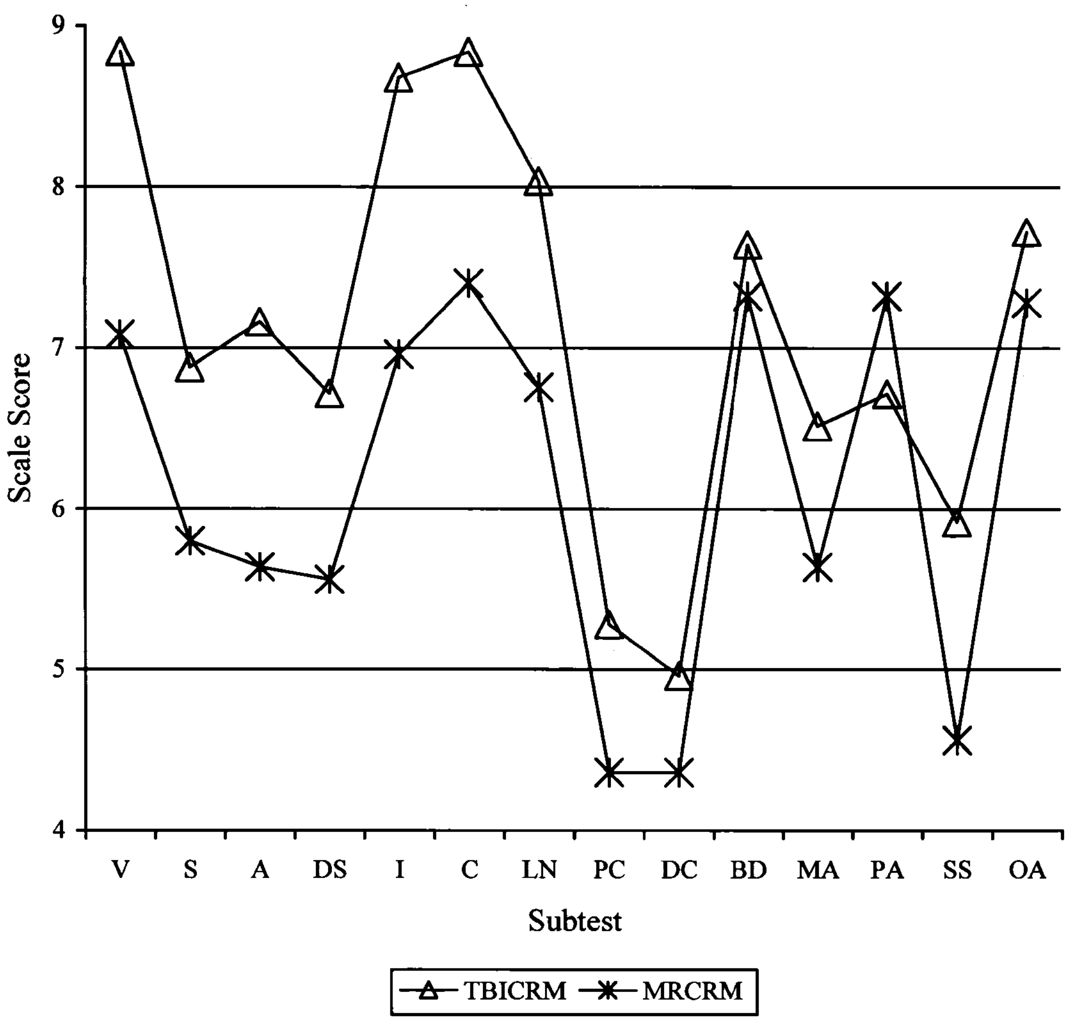

Figure 5. Plot of Mean TBICRM and MRCRM Subtest Scores

Note: TBICRM = Traumatic Brain Injury Criminal Malingering; MRCRM = Mental Retardation Criminal malingering; See pages 97-102 for explanation of WAIS-III score codes

Finally, each malingering group was compared to its respective clinical group to assess for differences in performance. For these analyses, optional subtests and Index scores were excluded as not enough data was available from TBI and MR participants. The first analysis examined group differences between TBI and TBICRM on WAIS-III scores. The MANCOVA was significant (F (14, 32) = 2.11, $p < 0.05$). Age, Sex, and Race were covaried in the analyses because of significant differences on these variables between groups. Subsequent analyses showed Performance IQ, Full Scale IQ, Picture Completion, and Matrix Reasoning all differed by group at the $p < 0.05$ level.

It should be noted that most variables approached significance, and when Age, Race, and Sex were not controlled in the analysis, many more variables were found to be significant. This suggests two things. First, demographic variables affected malingering performance. Second, there is a trend indicating pattern of performance differences between the two groups. This difference may be subdued secondary to sample size. With more participants, these differences would likely be flushed out.

The MANCOVA was also significant for the Malingering Indexes (F (9, 31) = 2.81, $p < 0.05$). However, subsequent analyses revealed only one variable accounted for the significant difference (Digit Span- Capitulations). Nonetheless, the performance of TBICRM was found to be different from actual TBI participants on Standard and Malingering variable scores.

MANCOVA was also used to compare scores from MR and MRCRM. Comparing MRCRM to MR yielded significant differences when comparing standard scoring and malingering variables. For standard scoring variables, the Pillia=s Trace was highly significant for differences based on group membership, F (14, 47) = 4.21, $p < 0.001$.

Upon subsequent analyses, the standard scoring variables found to significantly differ based on group membership were Verbal IQ, Full Scale IQ, Vocabulary, Similarities, Arithmetic, Information, Comprehension, and Block Design. MR and MRCRM also differed on Malingering variables, $\underline{F}$ (9, 52) = 6.68, $\underline{p} < 0.001$. Subsequent analyses revealed groups differed on Overtime Picture Completion, Overtime Block Design, and Vocabulary-Digit Span difference score. Therefore, MRCRM performed differently than MR on Standard scoring and Malingering variables.

Finally, a step-wise DFA was used explore variable effectiveness for identifying malingerers feigning specific groups. This analysis explores the pattern of performance to provide insight into effective malingering detection variables. The first DFA explored pattern of performance differences between TBI and TBICRM. As can be seen in Table 6, TBICRM was significantly discriminated from TBI. Two variables (Picture Completion, Digit Span- Capitulations) correctly classified 80% of group members, $\underline{\chi 5}$ (2, $\underline{N}$ = 44) = 17.69, $\underline{p} < .001$, $\underline{\Lambda} = .65$, canonical correlation = .59. The correct classification rate did not appreciably change upon cross validation. When NC was added to the DFA, all three groups were again significantly classified with three standard variables (Full Scale IQ, Information, and Digit Symbol-Coding), $\underline{\chi 5}$ (2, $\underline{N}$=73) = 6.21, $\underline{p} < .05$, $\underline{\Lambda} = .91$, canonical correlation = .293. While the overall correct classification rate dropped slightly (78%), the sensitivity and specificity rates remained similar.

Patterns of performance from MR and MRCRM were also examined with DFA, and better classification results were observed $\underline{\chi 5}$ (6, $\underline{N}$ = 65) = 69.33, $\underline{p} < .001$, $\underline{\Lambda} = .32$, canonical correlation = .83. Six variables correctly classified 91% of MR and MRCRM (Vocabulary, Comprehension, Picture Completion, Block Design, Overtime Block

Design, and Overtime Picture Arrangement). This classification rate did not change upon cross-validation. When NC participants were added into the analyses, the DFA again significantly classified 91% of the participants from the three groups with six variables (Full Scale IQ, Comprehension, Digit Symbol- Coding, Block Design, Overtime Block Design, and Overtime Picture Arrangement), $\chi 5$ (5, N = 90) = 41.17, p < .001, Λ = .61, canonical correlation = .62. Tables 9 through 11 show the group classifications and discriminate functions.

In summary, hypothesis one was supported. Malingerers feigning different clinical groups (TBI and MR) with the malingering motivation (to avoid capital punishment) demonstrated similar performances on Standard and Malingering scoring measures. Malingering groups performed similarly to each other, but they performed significantly different from NC participants and clinical group participants suggesting it would be possible to discriminate malingerers from these two groups. Thus, a DFA was conducted, and found to be effective at discriminating TBI and MR malingerers, with a motivation to avoid capital punishment, from their respective clinical groups and NC. 80% of TBICRM and TBI group members were correctly classified in the analysis, as were 91% of MRCRM and MR group members.

Table 6

Classification Results for TBI & TBICRM

	GROUP	TBI	TBICRM	Total
Count	TBI	15	5	20
	TBICRM	4	21	25
Percent	TBI	75	25	100
	TBICRM	20	80	100

Note: TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal malingering

Table 7

Discriminate Functions for TBI & TBICRM

	TBI	TBICRM
Picture Completion	1.225	0.749
Digit Span- Capitulations	2.110	1.293
Constant	-7.700	-3.318

Note: TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal malingering

Table 8

Classification Results for TBI, TBICRM, & NC

	GROUP	TBI	TBICRM	NC	TOTAL
Count	TBI	16	5	4	25
	TBICRM	3	20	2	25
	NC	2	0	23	25
Percent	TBI	64	20	16	100
	TBICRM	12	80	8	100
	NC	8	0	92	100

Note: TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal malingering; NC = Normal Control

Table 9

Classification Results for MR & MRCRM

	GROUP	MR	MRCRM	TOTAL
Count	MR	40	0	40
	MRCRM	6	19	25
Percent	MR	100	0	100
	MRCRM	24	76	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation criminal malingering

Table 10

Discriminate Functions for MR & MRCRM

	GROUP	
	MR	MRCRM
Vocabulary	.307	.939
Comprehension	.461	1.156
Picture Completion	1.087	.434
Block Design	.538	1.070
OT- Block Design	1.788	4.493
OT- Picture Arrangement	4.045	8.684
Constant	-6.620	-15.371

Note: MR = Mental Retardation; MRCRM = Mental Retardation criminal malingering; OT = Overtime

Table 11

Classification Results for MR, MRCRM, & NC

	GROUP	MR	MRCRM	NC	TOTAL
Count	MR	40	0	0	40
	MRCRM	6	17	2	25
	NC	0	0	25	25
Percent	MR	100	.0	.0	100
	MRCRM	24	68	8	100
	NC	.0	.0	100	100

Note: MR= Mental Retardation; MRCRM= Criminal Malingering; NC= Normal Control

Hypotheses Two

The second hypothesis examined differences in malingering performance produced by the malingering motivation. Two TBI malingering groups with different motivations for malingering were compared. The first group feigned TBI to gain financial compensation and the second feigned TBI to avoid capital punishment. The first MANOVA examined the group differences on Standard WAIS-III scores. The Pillai's Trace did not meet significance, $\underline{F}$ (21, 28) = .97, $\underline{p} > 0.05$. The WAIS-III subtest scores from TBICRM and TBICVL can be seen in Figure 6. Thus, malingerers appeared to perform similarly on standard scores despite differing motivations.

To assure groups were performing different than NC, scores from TBI malingerers were compared to NC participants using MANOVA. The first MANOVA compared the TBICVL and NC on Standard scores. The Pillai=s Trace was significant $\underline{F}$ (21, 28) = 2.69, $p < 0.001$. Subsequent analyses revealed that all Standard score variables significantly differed at the $p < 0.002$ level or greater. Thus, NC performed significantly higher than TBICVL and TBICRM on every variable.

The second MANOVA compared groups on malingering indexes and also did not meet significance $\underline{F}$ (10, 39) = .77, $\underline{p} > 0.05$. When NC was added to the MANOVA, The Pillai's Trace was significant, $\underline{F}$ (20, 128) = 2.14, $\underline{p} = 0.006$. Subsequent analyses revealed NC participants had, on average, higher Reliable Digit Span scores, lower occurrences of Picture Arrangement Overtime responses, and lower DFA- Mittenberg coefficients than malingering participants. Thus, malingerers performed significantly different from NC on subtests and malingering measures.

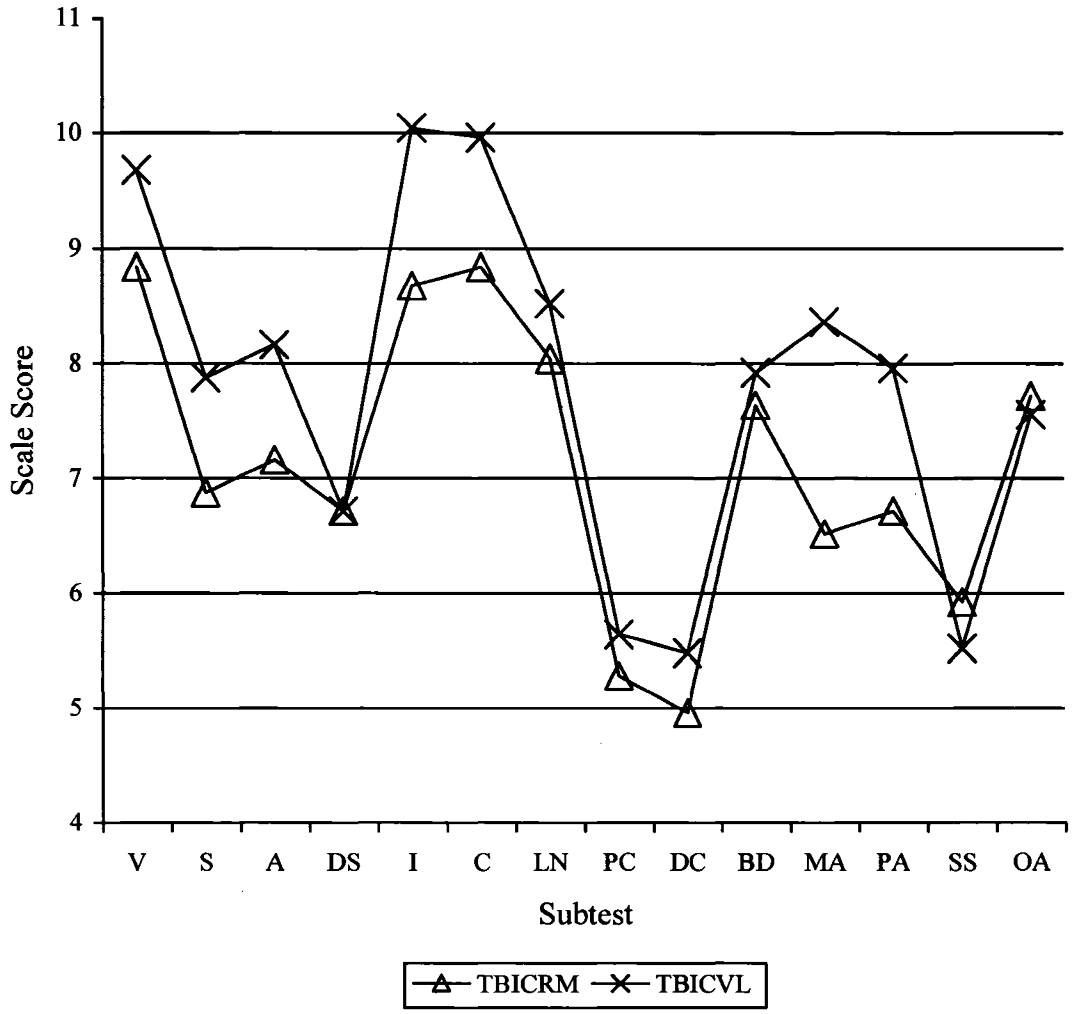

Figure 6. Significant Mean Subtest Differences by Malingering Motivation

Note: TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; See pages 97-102 for explanation of WAIS-III score codes

Comparing malingered TBI standard scores to actual TBI patients, while co-varying age, sex, and race, resulted in a significant Pillia=s Trace, $\underline{F}$ (28, 114) = 1.71, $\underline{p} < 0.001$. Subsequent analyses showed that TBI and TBI malingering subjects significantly differed on Digit Span, Picture Completion, Matrix Reasoning, and Performance IQ at the $\underline{p}$ <

0.05 level. Examining mean scores differences from standard scores revealed that TBI patients had higher scores than TBI malingerers. Significant differences were not observed on malingering indexes between TBI and TBI malingering participants, $\underline{F}$ (18, 112) = 1.54, $\underline{p} > 0.05$. Thus, TBI malingering groups performed differently than TBI participants on standard scores, but not malingering indexes.

Similar to the first hypothesis, a step-wise DFA was used explore variable effectiveness, based on correct classification rates, for identifying malingerers feigning TBI for financial compensation (TBICVL). Actual TBI patients and malingered TBI to avoid the death penalty (TBICRM) was conducted during hypothesis one and was not repeated here. As can be seen in Table 12, four variables (Picture Completion, Digit Symbol- Coding, Overtime Picture Arrangement, and Digit Span- Capitulations) significantly discriminated TBI and TBICVL participant with a correct classification rate identical to that of TBI and TBICRM (80%), $\underline{\chi 5}$ (4, $\underline{N}$ = 50) = 32.26, $\underline{p} < .001$, $\underline{\Lambda} = .45$, canonical correlation = .74. Upon Cross-validation, however, the correct classification rate fell to 72% as a result of increased false positives for malingering and actual TBI. Table 13 shows the four variable=s classification coefficients for TBI and TBICVL.

When NC was added to the analysis, three variables (Full Scale IQ, Information, and Digit Symbol- Coding) produced a correct classification of 76% (69% on cross-validation), $\underline{\chi 5}$ (2, $\underline{N}$ = 74) = 9.07, $\underline{p} < .05$, $\underline{\Lambda} = .87$, canonical correlation = .36. Despite a lower overall correct classification rate, sensitivity and specificity rates remained relatively consistent. Table 14 shows the correct classification rate for TBI, TBICVL, and NC.

Table 12

Classification Results for TBI & TBICVL

	GROUP	TBI	TBICVL	TOTAL
Count	TBI	18	7	25
	TBICVL	3	22	25
Percent	TBI	72	28	100
	TBICVL	12	88	100

Note: TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation Malingering

Table 13

Classification Function Coefficients for TBI & TBICVL

	GROUP	
	TBI	TBICVL
Picture Completion	2.050	1.285
Digit Symbol-Coding	1.181	.847
OT- Picture Arrangement	4.135	2.138
Digit Span Capitulations	4.997	2.985
Constant	-18.419	-8.011

Note: TBI = Traumatic Brain Injury; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; OT = Overtime responses

Table 14

Classification Results for TBI, TBICVL, & NC

	GROUP	TBI	TBICVL	NC	TOTAL
Count	TBI	16	5	4	25
	TBICVL	6	18	1	25
	NC	2	0	23	25
Percent	TBI	64	20	16	100
	TBICVL	24	72	4	100
	NC	8	.0	92	100

Note: TBI = Traumatic Brain Injury; TBICVL = Traumatic Brain Injury Civil Litigation Malingering; NC = Normal Control

In sum, participants feigning the same clinical population (TBI) did not change their malingering performance when malingering motivation was changed. Both groups performed significantly different from normal controls and clinical controls. Using DFA, TBI malingerers were significantly discriminated from clinical and normal controls.

Hypothesis Three

The third research question asked whether malingering strategies developed for the WAIS-R would be generalizable to the most recent version of the WAIS, the WAIS-III. It was hypothesized that these detection methods should be generalizable, and effective at discriminating malingerers from actual patient populations. Specifically, Qualitative measures, Pattern Analysis measures, subtest indicators, and DFA would be most effective at identifying malingered performance when financial gain is the malingering motivation because these measures were specifically developed to identify feigned performance for this type of motivation. It was further hypothesized that DFA will be the most effective method in terms of overall classification rates. To answer the research question, classification rates from each method were used to determine the sensitivity and specificity of each method. Furthermore, specific types of malingering were examined to determine the particular strengths and weaknesses of each method.

Qualitative variables from Axelrod and Rawlings (1999) were the first malingering variables to be tested. Because the Simulation Index requires scores from the WMS to be correctly scored and interpreted, the effectiveness of these variables were examined using DFA. These variables included Overtime Responses, Digit Span Primacy Errors, and Digit Span Capitulations. Note, Overtime Responses from Object Assembly were left out of the analysis due a large amount of missing data points from MR and TBI populations. A step-wise DFA was used to examine the effectiveness of these variables. Classification results can be seen in Table 15.

Comparing TBI patients to TBICRM revealed Qualitative scores significantly classified the two groups, $\underline{\chi5}$ (2, $\underline{N}$ = 44) = 10.06, $\underline{p} > .01$, $\underline{\Lambda} = .78$, canonical correlation = .47. The correct classification rate was 67% and did not change on cross-validation. Forty nine percent of TBI participants were misclassified, as were 20% of the TBICRM participants. The TBI group lost six participants due to missing data on Digit Span protocols. However, these variables were not removed from the analysis because classification rates were negatively affected in the absence of these variables, $\underline{\chi5}$ (4, $\underline{N}$ = 48) = 2.46, $\underline{p} < .05$, $\underline{\Lambda} = .95$, canonical correlation = .23. When Overtime responses were analyzed alone, the correct classification rate fell to 62% and 58% on cross-validation.

Comparing TBI patients to TBICVL again revealed that Qualitative scores significantly discriminated the two groups, $\underline{\chi 5}$ (2, $\underline{N}$ = 44) = 7.78 $\underline{p}$ > .05, $\underline{\Lambda}$ = .825, canonical correlation = .418. The correct classification rate was 64% and did not change on cross validation. Table 16 shows this classification. As can be seen in Table 16, 42% of the TBI patients were misclassified, as were 32% of the TBICVL participants.

When MR patients were compared to MRCRM, the Qualitative scores significantly discriminated the two groups, $\underline{\chi 5}$ (1, $\underline{N}$ = 65) = 12.39 $\underline{p}$ < .001, $\underline{\Lambda}$ = .82, canonical correlation = .424. The correct classification rate was 77%, which did not change on cross-validation. Table 17 shows the classification of each participant in this analysis. Thus, Qualitative variables were able to significantly discriminate MR malingerers with better classification than TBI malingerers, although sample size may have affected the significance value of DFA with TBI malingering.

The next analyses examined the Pattern analysis method developed by Mittenberg (Vocabulary-Digit Span difference score; 1995) for the WMS-R. TBICRM and TBICVL groups were collapsed into one group because no differences were found between groups. When TBI and TBI malingering were compared using a cut score of two, a little more than fifty percent of participants were correctly classified and the chi square did not meet significance $\underline{\chi 5}$ (1, $\underline{N}$=75) = 0.96, $\underline{p}$ > .05.

Table 15

Classification Results from TBI and TBICRM Using Qualitative Variables

	GROUP	TBI	TBICRM	TOTAL
Count	TBI	10	9	19
	TBICRM	5	20	25
Percent	TBI	51	49	100
	TBICRM	20	80	100

Note: TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal Malingering

Table 16

Classification Results for TBI and TBICVL with Qualitative Variables

	GROUP	TBI	TBICVL	TOTAL
Count	TBI	11	8	19
	TBICVL	8	17	25
Percent	TBI	58	42	100
	TBICVL	32	68	100

Note: TBI = Traumatic Brain Injury; TBICVL = Traumatic Brain Injury Civil Litigation

Table 17

Classification Results for MR and MRCRM with Qualitative Variables

	GROUP	MR	MRCRM	TOTAL
Count	MR	40	0	40
	MRCRM	15	10	25
Percent	MR	100.0	.0	100
	MRCRM	60	40	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering

Approximately half of both groups were misclassified. Thus, Vocabulary-Digit Span difference score performed at the level of chance when comparing TBI to TBI malingerers and a cut score of two. When comparing the groups using a cut score of three, classification rates improved slightly (61%), but again the classification did not meet significance, $\chi 5$ (1, N=75) = 1.44, $p > .05$. Using a cut score of two with MR and MRCRM, the Vocabulary-Digit Span difference score did not meet significance, $\chi 5$ (1, N= 65) = 0.04, $p > .05$. When the cut score was increased to three, the classification rate fell slightly, and did not meet significance, $\chi 5$ (1, N=65) = .30, $p > .05$. Approximately half of the participants from both groups were misclassified regardless of the cut score. The classification rates for Vocabulary-Digit Span difference score can be seen in Tables 18 through 21.

To further analyze the effectiveness of this malingering detection variable, the Vocabulary-Digit Span difference score for each participant was used in a DFA to identify malingered performance from clinical populations. This method significantly discriminated TBI from malingered TBI, $\chi 5$ (1, N=75) = 10.7, $p < .001$, $\Lambda = .863$, canonical correlation = .37. However, the correct classification rate was low 67%, and did not change upon cross validation. It should be noted that absolute values were not used in the analyses. When absolute values were used, the classification rate dropped to 54% and did not meet significance. The Vocabulary-Digit Span difference score in a DFA also significantly discriminated MR from MRCRM, $\chi 5$ (1, N=65) = 15.595, $p < .000$, $\Lambda = .779$, canonical correlation = .47. Interestingly, the correct classification rate was similar for MR and MRCRM as compared to the correct classification rates of TBI patients and TBI malingerers (66%). This classification rate did not change upon cross validation. Tables 22 and 23 show these classification rates. Despite, less than optimal sensitivity and specificity, the Vocabulary-Digit Span difference score was effective at discriminating malingerers from non-malingering participants.

Table 18

Classification Results for TBI and TBI Malingerers with a V-DS Cut Score of 2

	GROUP	VALID	MALINGERING	TOTAL
Count	TBI	15	10	25
	TBI-MAL	24	26	50
Percent	TBI	60	40	100
	TBI-MAL	48	52	100

Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering; V-DS = Vocabulary-Digit Span Difference Score

Table 19

Classification Results for TBI and TBI Malingerers with a V-DS Cut Score of 3

	GROUP	VALID	MALINGERING	TOTAL
Count	TBI	11	14	25
	TBICVL	15	35	50
Percent	TBI	44	66	100
	TBICVL	30	70	100

Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering; V-DS = Vocabulary-Digit Span Difference Score

The final analyses for the third hypothesis examined the effectiveness of Mittenberg=s (1995) DFA. Mittenberg suggested positive function scores were indicative of malingered performance. Each participant was classified using this procedure.

Table 20

Classification Results for MR and MRCRM Using V-DS Cut Score of Two

	GROUP	VALID	MALINGERING	TOTAL
Count	MR	23	17	40
	MRCRM	10	15	25
Percent	MR	57.5	42.5	100
	MRCRM	40	60	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering; V-DS = Vocabulary-Digit Span Difference Score

Table 21

Classification Results for MR and MRCRM Using V-DS Cut Score of Three

	GROUP	VALID	MALINGERING	TOTAL
Count	MR	22	18	40
	MRCRM	12	13	25
Percent	MR	55	45	100
	MRCRM	48	52	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering; V-DS = Vocabulary-Digit Span Difference Score

TBICRM and TBICVL groups were collapsed into one group because no differences were found between groups. The results for TBI and malingered TBI groups were significantly discriminated using Mittenberg=s DFA, $\chi 5$ (1, N = 75) = 3.945, p <.05.

Table 22

Classification Results for TBI and Malingered TBI Using V-DS in DFA

	GROUP	TBI	TBI-MAL	TOTAL
Count	TBI	16	9	25
	TBI-MAL	16	34	50
Percent	TBI	64	36	100
	TBI-MAL	32	68	100

Note: Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering; V-DS = Vocabulary-Digit Span Difference Score

Table 23

Classification Results for MR and MRCRM Using V-DS

	GROUP	MR	MRCRM	Total
Count	MR	28	12	40
	MRCRM	10	15	25
Percent	MR	70	30	100
	MRCRM	40	60	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering; V-DS = Vocabulary-Digit Span Difference Score

The correct classification rate was 63 percent. MR and MRCRM, however, were not significantly classified using this DFA, $\underline{\chi 5}$ (1, $\underline{N}$ = 65) = .402, $\underline{p} > 0.05$. The correct classification rate was 45 percent. These results are presented below in Table 28 and 29.

The next analyses examined the subtest indicator approach. In particular, Greffenstien=s (1994) Reliable Digits Score was evaluated. Again, TBICRM and TBICVL groups were collapsed into one group because no differences were found between groups. The Reliable Digit Span score did not significantly classify any malingering group from their respective clinical group. The cut point found to be most effective was a Reliable Digit Span score of seven, which is consistent with Greffenstein et al (1994). The Chi square statistics for TBI and malingered TBI, and MR and MRCRM, were $\underline{\chi 5}$ (1, $\underline{N}$ = 75) = 0.57, $\underline{p} > .05$ and $\underline{\chi 5}$ (1, $\underline{N}$ = 65) = 1.7, $\underline{p} > .05$ respectively. Classification rates were below chance due to poor malingering sensitivity, as can be seen in Tables 24 and 25.

Similar to the previous analyses, the actual Reliable Digit Span score was entered into a DFA to further examine the usefulness of this score for identifying malingered responses. This procedure significantly discriminated TBI and malingered TBI groups, $\underline{\chi 5}$ (1, $\underline{N}$ = 75) = 5.92, $\underline{p} < 0.05$, $\underline{\Lambda}$ = .922, canonical correlation = .28. However, the correct classification rate was low (63%), and did not change upon cross validation. MR was also significantly discriminated from MRCRM, $\underline{\chi 5}$ (1, $\underline{N}$ = 65) = 4.645, $\underline{p} < .05$, $\underline{\Lambda}$ = .928, canonical correlation = .268. The correct classification was better for this analysis than for the two previous (74%). However, this rate fell to 66% upon cross validation. Tables 26 and 27 show the classification from the DFAs using the Reliable Digit Span score.

While the performance of the Mittenberg=s DFA was below expectations, the pattern of better discrimination for TBI malingering than MR was expected because this DFA was developed using patients with TBI and matched controls feigning TBI. In summary, the malingering measures examined in the third hypothesis generally performed below expectations for malingered TBI and MR discrimination.

Table 24

Classification Results for TBI and Malingered TBI Using RDS

	GROUP	TBI	TBI-MAL	TOTAL
Count	TBI	23	2	25
	TBI-MAL	43	7	50
Percent	TBI	92	8	100

	TBI-MAL	86	14	100

Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering; RDS = Reliable Digit Span

Table 25

Classification Results for MR and MRCRM Using RDS

	GROUP	MR	MRCRM	Total
Count	MR	26	14	40
	MRCRM	20	5	25
Percent	MR	65	35	100
	MRCRM	80	20	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering; RDS = Reliable Digit Span

Thus, Hypothesis Three was not supported. However, the malingering variables helped classify MRCRM from MR patients in the first hypothesis. Moreover, Qualitative variables showed promise for use with when malingered MR is in question. Therefore, some utility for the measures still exists despite poor performance when used alone.

Table 26

Classification Results for TBI and Malingered TBI Using RDS in DFA

	GROUP	TBI	TBI-MAL	TOTAL
Count	TBI	18	7	25
	TBI-MAL	10	15	25
Percent	TBI	72.0	28.0	100.0

	TBI-MAL	40.0	60.0	100.0

Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering; RDS = Reliable Digit Span

Table 27

Classification Results for MR and MRCRM Using RDS in DFA

	GROUP	MR	MRCRM	TOTAL
Count	MR	36	4	40
	MRCRM	15	10	25
Percent	MR	90.0	10.0	100.0
	MRCRM	60.0	40.0	100.0

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering; RDS = Reliable Digit Span

Table 28

Classification Results for TBI and Malingered TBI Using Mittenberg=s DFA

	GROUP	TBI	TBI-MAL	TOTAL
Count	TBI	17	8	25
	TBI-MAL	20	30	50
Percent	TBI	68	32	100
	TBI-MAL	40	60	100

Note: TBI = Traumatic Brain Injury; TBI-MAL = Traumatic Brain Injury Malingering

Table 29

Classification Results for MR and MRCRM Using Mittenberg=s DFA

	GROUP	MR	MRCRM	TOTAL
Count	MR	16	24	40
	MRCRM	12	13	25
Percent	MR	40	60	100
	MRCRM	48	52	100

Note: MR = Mental Retardation; MRCRM = Mental Retardation Criminal Malingering

Hypothesis Four

It was hypothesized that malingerer=s perception of Digit Span will moderate performance such that when Digit Span is viewed as a test of memory, malingerers will perform more poorly than when it is not viewed as a test of memory. Here, the moderator variable under investigation was TBI malingerers= (both groups) perception that the Digit Span subtest was a measure of memory. Malingerers identified their perception of the test during post-test questioning.

Two levels of each variable were used in the analysis: 1) belief DS measures memory impairment, and 2) DS measures something other than memory. Because the two malingering groups were collapsed into one, the total number of participants was 50. Of these participants, 12 (24%) reported they used impaired memory as a strategy to feign TBI impairment. Thirty eight (76%) participants reported that they used another deficit to demonstrate impairment secondary to TBI (i.e., slow processing speed, poor attention, etc.). Thirty one participants (62%) perceived the test to measure memory, while 19 participants (38%) perceived the test to measure something other than memory. The independent variable examined in the analyses was malingering strategy. The independent variable=s two levels were whether the malingerer used memory impairment to feign TBI or whether they used some other strategy. Mean Digit Span scaled scores were used as dependent variables.

As Figure 7 shows, there was a significant interaction between memory impairment strategy and belief that DS was a test of memory, $F(1, 46) = 5.21$, $p < 0.05$. Participants who were using memory impairment to feign TBI performed better on the Digit Span test if they didn't perceive it as a test of memory. When they believed Digit Span measured memory, they performed significantly worse on the subtest. Furthermore, when malingerers used a strategy other than memory impairment to feign TBI, they performed better on the Digit Span test when they perceived it to be a measure of memory than when they perceived it to measure something else.

In order to be confident in the moderator=s effect, a one-way ANOVA comparing Digit Span scores from malingering strategies was examined. This procedure was performed because if there are no significant differences between using memory impairment or another type of impairment to show head injury deficits, then the interaction can only be explained by perception of Digit Span as a test of memory. In fact, this is what was found. The Digit Span means were not significantly different, $F(1, 48) = .111$, $p > .05$. Thus, consistent with theory, performance on the Digit Span subtest appears to be moderated by the belief that Digit Span measures memory when TBI malingerers are using memory impairment strategies.

When the pattern of subtest performance is graphed for each group, different patterns can be seen for the Digit Span subtest. Figure 8 clearly shows TBI patient=s mean Digit Span score was higher than their Arithmetic or Information mean scores. This makes a spike when graphed because Digit Span comes after Arithmetic and before Information. Malingerer=s mean score, however, was lower for Digit Span than Arithmetic or Information making resulting in a dip when graphed. The only other subtest to show a directional difference when graphed was the Matrix Reasoning subtest. However, only TBICRM showed the directional difference, not TBICVL. The difference in scores between TBI malingerers and patients was statistically different, $\underline{F}$ (2, 72) = 5.73, $\underline{p}$ < 0.01. Even TBI malingerers who believed Digit Span measured something other than memory, and did not feign memory impairment to demonstrate impairment, performed worse than actual TBI patients. Thus, Digit Span appears to be a good indicator validity. However, it should be noted that TBI malingerers performed worse than TBI patients on a variety of WAIS-III subtests, so this finding was not unique to Digit Span. Thus, a repeated measure ANOVA was performed on WAIS-III subtests.

Mediation was also examined to rule out alternative hypotheses. A variable is a mediator to the extent that it accounts for the relationship between the independent variable and the dependent variable. Establishing mediation happens when the independent variable is shown to affect the mediator, which in turn affects the dependent variable. Furthermore, the independent variable=s effect on the dependent variable must be reduced when the mediator is controlled. It is recommended by Judd and Kenny (1981) that a series of regression equations be used to show this relationship. Thus, a regression equation where memory strategy was used as the independent variable and belief that Digit Span was a memory test as the mediating variable was examined, which is the first step in establishing mediation.

The regression was a very poor fit ($R^2adj = .002$), and the overall relationship was not significant, $F(1, 48) = 1.113$, $p > 0.05$. Because the first parameter for establishing mediation was not met, no further regression equations were analyzed. Given the interaction effect between memory strategy and belief regarding what Digit Span measures, DS belief appears to moderate performance on the Digit Span performance rather than mediate Digit Span performance. Thus, if one is going to use memory impairment to feign TBI, then it makes sense they would show more impairment on tests they believe measure memory.

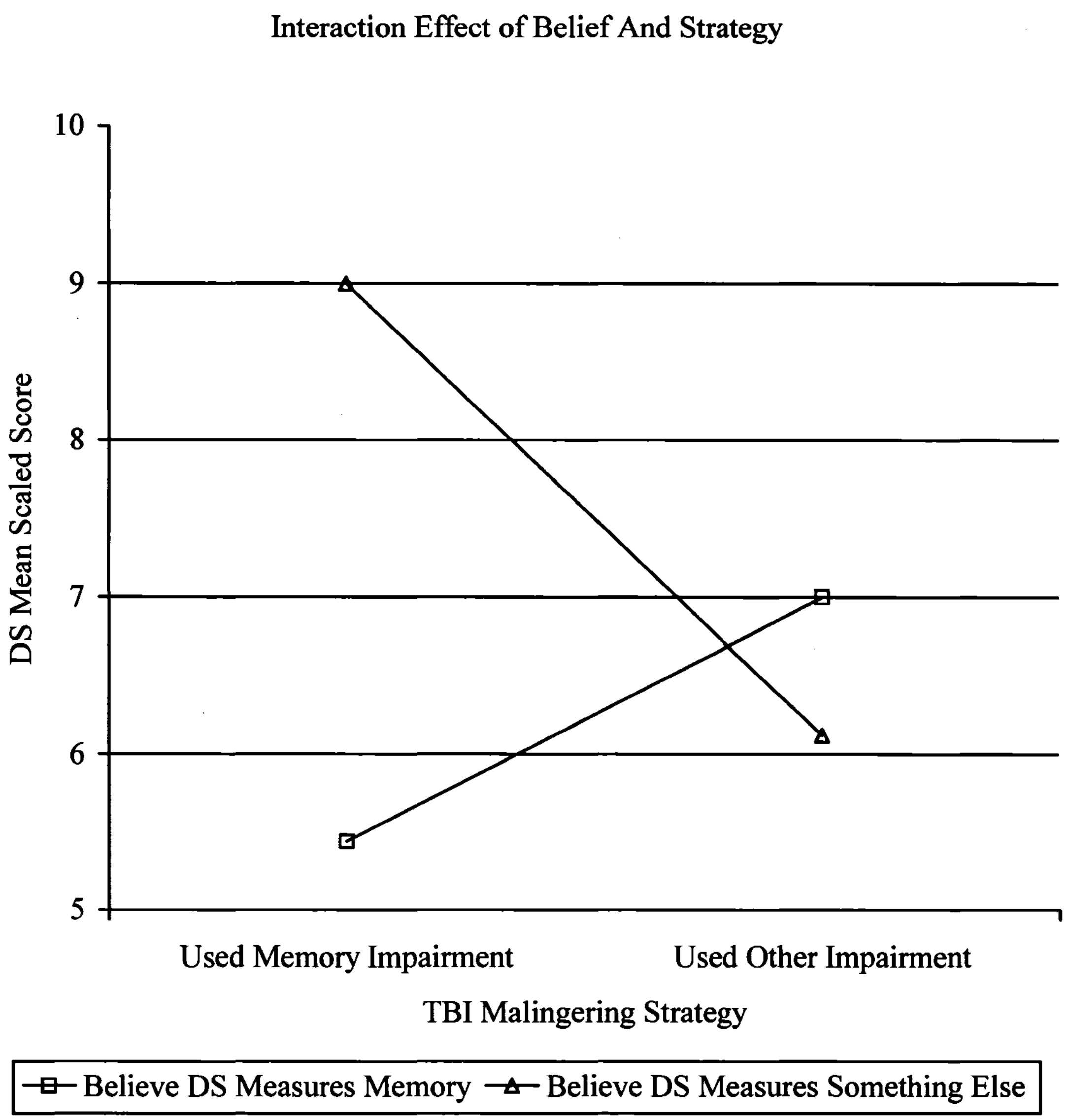

Figure 7. Significant Interaction Effect of Digit Span (DS) Perception and Malingering Strategy.

Note: TBI = Traumatic Brain Injury

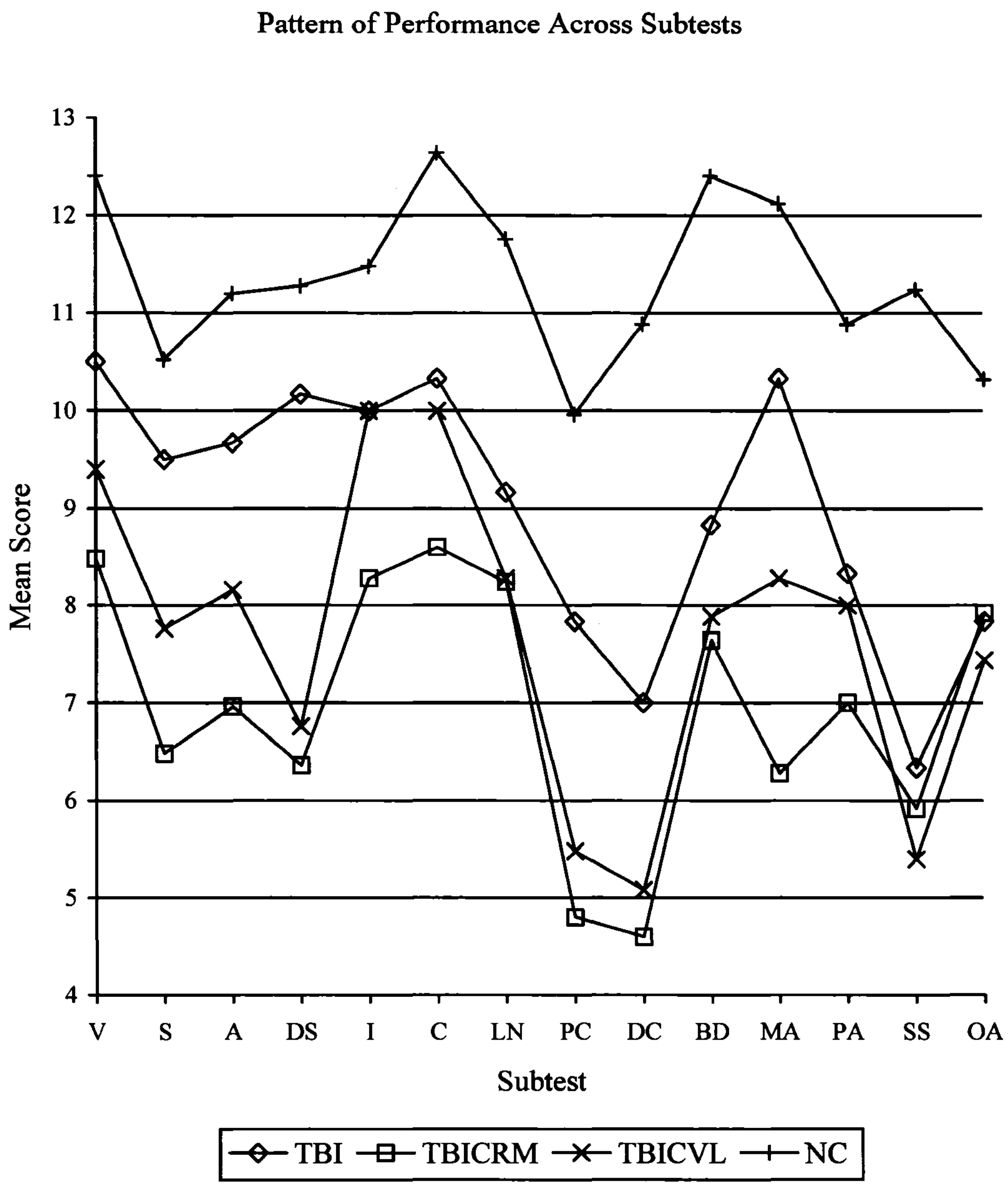

Figure 8. Plotted Subtest Means for Groups

Note: TBI = Traumatic Brain Injury; TBICRM = Traumatic Brain Injury Criminal Malingering; TBICVL = Traumatic Brain Injury Civil Litigation; NC = Normal Control;See pages 97-102 for explanation of WAIS-III score codes

CHAPTER 5

DISCUSSION

The hypotheses were partially supported. Hypotheses one and four were strongly supported while hypotheses two and three were partially supported. Results from this investigation appear to suggests that malingerers will use similar strategies to feign cognitive impairment, and their pattern of performance is different from actual clinical populations and normal controls Previously published methods for malingering detection using the WAIS-R significantly identified malingering, but fell short in terms of acceptable levels of sensitivity and specificity (hypothesis three). However, DFA appears to be best method for identifying malingering. Finally, the DS subtest appears to moderate malingerer's performance (hypothesis four). Each hypothesis and associated findings are discussed below in further detail.

Hypothesis One

The first hypothesis stated that persons with the same motivation to feign traumatic brain injury (TBI) and mental retardation (MR) would perform similarly on the WAIS-III measures. The hypothesis was based on previous research (Erdal, K., 2004; Klimczac et al, 1997) and was generally supported. Malingerers feigning different clinical populations (TBI and MR) with the motivation to avoid capital punishment demonstrated very similar performances on standard scores and malingering measures. Furthermore, the malingering groups performed similarly to each other, but significantly different from normal controls (NC). This suggests that both malingering groups were feigning impairment because the NC participants were likely representative of malingerer's true performance abilities, and the feigned impairment performance was similar. Thus, the clinical population did not appear to change the way malingerers feigned impairment on the WAIS-III.

While it seems illogical that malingerers feigning different clinical populations would perform similarly on neuropsychological tests, this has been a consistent finding in the limited research examining this aspect of malingering. For example, Klimczac et al. (1997) found that participants who feigned Multiple Sclerosis performed similarly to participants malingering TBI. So, why doesn't clinical population affect malingering performance? One explanation is that malingerers are not as sophisticated as widely speculated. They might be poor judges of the type of mistakes clinical populations generally make on neuropsychological tests. Thus, they simply perform below their true ability on everything. Examining the pattern of performance across subtests revealed all three malingering groups performed significantly worse than the NC group. Therefore, they feigned impairment on every subtest, so this explanation appears to have some merit.

Malingerers, however, did not evidence the same amount of impairment across tests, which suggest they were selective about which tests to increase their impaired performance. This pattern suggests the malingering strategy used by both groups was to simply identify subtests believed to be sensitive to impairment rather than identify specific strengths and weaknesses of clinical populations. In other words, it is likely that the malingerers identified tests that they believed would be more difficult for someone with decreased cognition rather than identifying specific tests that would be more difficult for a specific population with cognitive deficits. Thus, they performed impaired on all tests, but even more impaired on certain tests. What were these tests that malingerers thought would be difficult? On verbal tests, malingerers generally performed better on Vocabulary, Information, Comprehension, and Letter-Number Sequencing than Similarities, Arithmetic, and Digit Span. While it is easy to surmise how they would perceive Similarities and Arithmetic as more difficult than Vocabulary due to the higher order cognitive processes involved, it is more difficult to explain why they would perform better on Letter-Number Sequencing than Digit Span. On performance tests, malingerers generally performed worse on tests of processing speed, abstraction and attention, than they did on tests of perceptual abilities. Thus, malingerers likely assume these cognitive processes are particularly difficult for persons with compromised cognitive abilities.

Given the similar scores between malingering groups, this strategy of identifying tests sensitive to cognitive impairment in general, as opposed to domain specific cognitive deficits associated with a particular clinical population, appears to be a reasonable explanation for the malingering results. Thus, it should be easy to use this misguided logic to identify malingerers from their respective clinical controls because they would not be demonstrating the similar pattern of performance that would be expected. Thus, discriminate function analysis was used to classify malingerers from actual clinical participants. Based on the pattern of performance theory alone, it would be expected that MR malingerers would be easier to classify because actual participants with MR tend to demonstrate a flat performance pattern reflective of global deficits. As expected, DFA was found to be effective at discriminating both TBI and, in particular, MR malingerers. Eighty percent of TBI malingerers and actual TBI participants were correctly classified in the analysis, as were 91% of MR malingerers and MR group members.

Malingering groups were not given extensive information on how persons with TBI or MR generally perform on the WAIS-III, which might have contributed to their impaired performance on all tests, with particular increased feigning on tests perceived to be more difficult. However, past evidence suggests malingerers would not have changed their performance even if they were provided with elaborate clinical information. For example, even the most sophisticated malingerers such as doctors, nurses, medical students, psychology graduate students, psychologists, and even patients with TBI have all been found to be no better than lay-people at feigning deficits. All were found to use the similar strategies (Arnett et al., 1995; Franzen & Martin, 1997; Hayward et al., 1987; Schwartz et al, 1998). These populations have much more extensive training, experience, and knowledge of TBI and MR than could possibly be given to study participants. Thus, similar performances by TBI and MR malingerers cannot simply be explained away by lack of detailed instructions on clinical group.

Erdal (2002) suggested that providing clinical information to simulated malingerers actually produces worse malingering performance than simply giving simulated malingerers test taking strategies. The only instruction method consistently shown to affect malingering performance is providing test-taking strategy. Providing information such as performing consistent on similar tests and tempering the amount of impairment across tests does seem to make a difference on test performance (Arnett et al., 1995;

Bernard, McGrath, & Houston, 1993; Erdal, 2004; Franzen & Martin, 1997; Hayward et al., 1987; Klimczac et al, 1997; Schwartz, Gramling, Lawson Kerr, & Morin, 1998). This method of instruction was used in the current study to demonstrate the power of malingering detection strategies developed.

Another reason the amount of clinical information was purposefully limited was that it was important to assess participant=s perception of a given population=s ability in order to create the most stringent method of malingering detection. By limiting the amount of information on clinical groups, it becomes easier to understand their conceptualization of the clinical group and their natural tendencies to feign deficits, which may provide new insight on developing new detection strategies. Although not meeting statistical significance, there was a consistent trend in which MR malingering participant's average standard WAIS-III scores fell below the average standard score of TBI malingering participants. This suggests that there may have been some insight into clinical performance, but this is only speculation since comparisons did not meet statistical significance. Group sizes were consistent with previous studies, and statistical power was felt to be adequate. Nonetheless, increased sample size might have improved the power of the analyses, which may have flushed out potential differences between the malingering groups.

The performance of malingerers was different from the performance of normal controls and clinical controls. This suggests malingerers complied with instructions and performed below their true abilities, and may accurately reflect participant=s perception of persons with mild TBI and mild MR. Comparing malingered TBI participants to avoid capital punishment (TBICRM) to patients with actual TBI showed clear differences in performance. TBICRM participants scored significantly worse on several Standard scores (Similarities, Digit Span, Picture Completion, Digit-Symbol Coding, Matrix Reasoning, and Perceptional Organization Index) and one Malingering score (Digit Span Capitulations). Thus, TBICRM participants tended to fall into the magnitude of error trap on these tests despite clear instruction to avoid this type of performance.

Interestingly, malingerers feigning MR to avoid capital punishment (MRCRM) had the opposite problem. They generally performed better than the MR participants. Specifically, for the Standard scores, Vocabulary, Similarities, Arithmetic, Information, Comprehension, Block Design, VIQ, PIQ, and FIQ were all found to be significantly higher for the malingering group than the clinical group. Unfortunately, the WAIS-III optional tests were not administered to the MR participants, so these subtests and the Index scores were not included in the analysis. However, considering approximately half of the subtests were significantly different, it is likely that the optional subtests and Indexes would also show similar differences.

There are two potential reasons for malingerer=s overestimation of MR cognitive ability. First, as described by Sloan (2003), the connotation of Amild@ mental retardation is misleading. It suggests that the MR is generally mild in terms of the general population rather than mild in terms of the mental retardation population. When considering the latter, mild mental retardation means that a person is performing below 98% of the general population on intellectual measures, is performing at below a sixth grade level, and generally needs some form of assistance with activities of daily living. Thus, the term mild is misjudged leading to performances that are better than actual MR performances on the WAIS.

The second factor that may have inflated the malingered MR performances was that the instructions provided information on the strategies typically used to detect malingering, such as identifying exaggerated responses and insufficient effort. Participants may have interpreted this instruction as saying they should not perform too impaired. It was important to keep the instructions between TBI and MR as similar as possible in order to isolate the independent variable by controlling for other factors so modifying the instruction set was difficult to justify. However, it is likely that a combination of misinterpreting the descriptor Amild,@ and the cautions listed in the instruction set, inflated MRCRM performance on the test. Subsequent studies should be able to flush out the contributions of these factors to determine their true impact on malingered MR performance.

There was also supporting evidence that MR malingerers would perform differently than MR despite the instruction set and perception of the word mild. MR and MRCRM differed on malingering variables, which was not expected to be as influenced by those instruction sets or descriptors as much as intrinsic conceptualizations of specific MR errors. Subsequent analyses revealed groups differed on Over-time (OT) Picture completion, OT Block Design, and Vocabulary-Digit Span difference score. The directional difference was that malingerers made significantly more correct Overtime responses than persons with MR suggesting they viewed processing speed as a core deficit specific to MR. While this conceptualization is true, it=s clear that MRCRM misjudged typical performance pattern of this population because significant differences were discovered.

Malingerers were particularly poor at estimating the vocabulary skills of persons with

MR. They consistently performed well above patients with MR on these subtests, and in particular, Vocabulary and Comprehension. However, malingerers were better estimating MR performance skills such as processing speed tasks. Therefore, it is recommended that vocabulary tests (except verbal reasoning tests) or processing speed tests receive special attention when reviewing the validity of test performance when MR is questioned.

The DFA results for all comparisons of malingering vs. clinical populations were particularly significant because the variation between within group members becomes amplified when group sizes are decreased, which leads increased difficulty when classifying groups. When larger groups are studied, it typically increases the sensitivity of the DFA. Thus, the results from all the DFA comparisons appear particularly strong given that most groups consist of 25 participants and the method of detection appears particularly sensitive.

In terms of detecting malingered MR, results from the DFA were particularly significant due to the scarcity of literature examining malingering detection when feigned MR is suspected. This study was the first to provide evidence that the WAIS-III can be used effectively to identify malingered MR. Due to Atkins v. Virginia (2002), many victims rights advocates have expressed concern that prisoners on death row will simply feign MR to avoid capital punishment. The results from this study suggest that it is unlikely that prisoners will successfully feign impairment. While preliminary, the results suggest inmates may not demonstrate adequate levels of impairment to feign MR. Further studies with prison populations will be necessary before blind generalizations from college student performances can be applied to prison inmates.

This is an important consideration because the sample of college student used in this study differed considerably on many demographic variables when compared to the typical prison inmate. For example, while the sample group used in the study was racially diverse, inmate populations tend not to be. African American and other racial groups tend to be over represented in prison, which was not controlled for when creating groups for the study. Other differences include education and mean intelligence levels, age, and socio-economic backgrounds. It is unclear how these factors might influence malingering behavior, but it is important to think about these differences when external validity is being considered.

A particularly important line of research would be to explore how intelligence levels and socio-economic background affect malingering behavior. It remains unclear if having low intelligence makes malingering MR easier or more difficult. On the one hand, it might be difficult for persons high intelligence to present as having low intelligence because they can=t consistently suppress intelligence in all cognitive domains. On the other hand, persons of low intelligence may not be sophisticated enough to figure out effective strategies to avoid detection. Understanding this concept would provide new insight into developing tests and significantly change how investigators construct research samples.

While considering these factors, it is important to remember that the results showed persons with MR will have a low probability of being misclassified. High specificity is an important consideration when examining malingering detection methods. Especially since empirical studies examining malingering have focused exclusively on feigned TBI, and malingering detection methods based on this population will likely be applied to identify feigned MR without the proper validation studies (Hayes, Hale, & Gouvier, 1997). Thus, these techniques may not be relevant for detecting faked intellectual impairment. The scarcity of empirical literature regarding malingered MR places inmates who actually have MR at risk for being misidentified as feigning their intellectual status. For example, Hayes, Hale, and Gouvier (1997) report the Dot Counting Test (Lezak, 1995), Memory for 15-Items Test (Lezak, 1995), and the M-Test (Bearber, Marston, Michelli, & Mills, 1985) did not contribute anything to the identification of malingering when used in their sample of inmates with MR. Hays, Emmons, and Stallings (2000) reported participants with MR are more likely to perform similarly to malingering samples on the Rey 15 Visual Memory Test. Similarly, Goldberg and Miller (1986) found that nearly 40% of their sample of patients with MR failed the Rey-15 (had 8 or fewer correct), and would thus be classified as malingering. Keyes (2004) has eloquently explained how persons with MR are continually placed at risk due to the lack of available methods specific to malingering detection with this population.

These findings from this study were consistent with the literature because MR participants did score much lower on WAIS-III subtests than any other group. Since most methods of malingering detection are based on the magnitude of error method, which is effective for identifying TBI malingering, MR patients are placed at much higher risk of misclassification when feigned MR is suspected. Thus, the Rey 15 and other methods of malingering detection using the magnitude of error approach should not be used to identify malingered mental retardation. With validation, the discriminate function coefficients developed in this investigation should prevent situations similar to the one described by Keyes in Mississippi from occurring again. Unfortunately, traditional malingering methods using the magnitude of error approach continue to be inappropriately applied to persons with MR. Thus, it is important to quickly validate the equation developed in this study, and to continue developing specific detection for feigned MR instead of trying to use a one size fits all approach to malingering detection.

The results from this investigation also lend credence to the notion that intelligence tests should be used instead of malingering tests to identified feigned performance. For example, Baroff (2003) argued that the WAIS-III should be the primary instrument for evaluating MR in capital punishment cases because it is less likely to produce erroneous results than other tests. Using a malingering test designed after typical intelligence tests, Schretlen and Arkowitz (1990) reported promising hit rates for identifying feigned MR. Given the results from this study, the WAIS-III appears to be the best method for identifying persons feigning MR, while reducing the number of false positives.

Hypothesis Two

The second hypothesis stated that malingering participants would change their performance subsequent to varying malingering motivation. However, hypothesis two was not supported as participants feigning TBI did not change their malingering performance when malingering motivation was varied. It is likely that the malingering strategy described in hypothesis one led to similar performances between the two groups and overrid the justification principle presented by Erdal (2004) and others. Erdal (2004) had previously shown that malingerers in her study were more likely to change their performance based on malingering motivation than clinical population. She explained her results through behavioral attributions and self-justification. In other words, when someone has external justification such as financial gain, they will be more likely to lie and cheat, particularly if they attribute their behavior as being due to another person=s negligent actions. In contrast, if someone=s motivation to malinger is to avoid responsibility for a situation, external justification is low and they will be less likely to malinger. Thus, malingerers would change the magnitude of impairment they display based on risk and reward.

This theory was not supported by the findings from this investigation. However, the design of the study may have inadvertently undermined the results as malingering for one's life is highly justifiable. When malingering for your life, you have less to lose by being identified as malingering because you will die regardless of whether you are caught or are not found to be impaired. Thus, the only way to spare one=s life is to make it clear that one is impaired. Therefore, taking more risk in being caught by demonstrating more impairment is justifiable. However, to create a more benign avoidance condition that would have more adequately reflected less justification would have entailed creating additional groups. The main focus of this study was to examine malingered MR performance in death penalty situations. Thus, using a more benign avoidant justification for TBI malingering was not efficient.

It is likely that using such a justifiable avoidance motivation produced similar justification levels for malingering as financial gain. With comparable levels of justification, and similar strategy used (show impairment on all subtests with particularly low scores on tests perceived to be more cognitively challenging), similar risk was taken and similar results were observed. Of course, this is merely speculation and further research is required before such statements can be made with real confidence.

It may also be interesting to investigate what drives justification. It may make sense to identify the variables that influence level of justification, and determine how they can be manipulated to make malingered responses easier to identify. For example, one such variable might be arousal. Simulated malingerers were asked to put themselves in the position of someone who needed to malinger effectively to spare his or her life. While no real danger existed, simply imagining such as situation is likely to produce higher arousal levels than imagining a less emotionally charged situation. Higher arousal may lead to increased attributions of urgency and subsequent malingering justification. If so, it becomes important to examine the relationship of these variables to develop methods to increase the sensitivity malingering detection. Studies using pharmacological, physical, and mental manipulations of arousal could be an exciting new line of research in malingering detection.

Recall from the first hypothesis that TBICRM and MRCRM were found to perform differently from normal controls and clinical groups. Similarly, TBICVL participants were also found to perform significantly different from normal control and TBI participants. TBICVL were found to perform worse than NC participants all standard scores, the Reliable Digit Span score, and Mittenberg=s DFA coefficient score (NC scored higher on Reliable Digit-Span and lower on Discriminate Function Analysis-Mittenberg). Thus, malingering groups performed significantly different from NC on standard scores, and some malingering scores.

Comparing TBI malingerers to TBI patients revealed significant differences on Picture Completion, Digit Symbol Coding, Processing Speed Index, Digit Span Capitulations and Vocabulary-Digit Span difference variables. Thus, TBI malingering groups were shown to perform differently than TBI patients on standard and malingering scores. Thus, a step-wise DFA was used explore variable effectiveness for identifying malingered TBI when seconday gains involve financial compensation. Four variables (Picture Completion, Digit Symbol- Coding, Overtime Picture Arrangement, and Digit Span- Capitulations) significantly discriminated TBI and TBICVL participant with a correct classification rate identical to that of TBI and TBICRM (80%). When NC was added to the analysis, three variables (Full Scale IQ, Information, and Digit Symbol-Coding) produced a correct classification of 76%.

The sensitivity and specificity rates were comparable to previous studies using DFA (Heaton et al, 1978; Mittenberg, 1995; Trueblood, 1994), with less variables. Using fewer variables makes the efficiency of computation better with less potential for making a scoring error. The results validate the use of DFA and the WAIS-III as an effective method for identifying malingered or insufficient effort. However, it is important to note that this method of malingering detection should be used as an aid for identification, and not as a means for diagnosing. However, using DFA in combination with guidelines suggested by Slick et al (1999) can significantly increase confidence making a malingering diagnosis.

Hypothesis Three

The third hypothesis stated that malingering detection methods originally developed for the WAIS-R would generalize to the WAIS-III and TBICVL participants, but not with MRCRM participants. The methods under study were qualitative variables from (Axelrod & Rawlings, 1999), pattern analysis methods (Mittenberg et al., 1995), subtest indicators (Greffenstein et al., 1994). Even more specifically, it was thought that

Mittenberg=s DFA (Mittenberg et al., 1995) would produce the most specific, and sensitive method for identifying malingered TBICVL.

These methods were chosen because they were developed for two reasons. First, all were developed for the WAIS-R, validated on the WAIS-R, well known, and likely to be applied to the WAIS-III without validation for such a generalization. Thus, the intent was to validate the use of these methods on the WAIS-III. The second reason was that the WAIS-III is likely to be used in cases where MR is in question. There is a significant lack of malingering tests specifically designed to maximize specificity with this population, and psychologists will likely use these tests, which were developed for feigned TBI. This increases the potential for poor classification and creates a dilemma for psychologists asked to determine validity of MR in patients where malingering is a potential. Thus, while no author made claim that these methods should be used for any other group than malingered TBI and using the WAIS-R, they are likely to be employed when feigned MR is suspected and used with the WAIS-III.

In sum, the third hypothesis was partially supported. With the exception of Mittenberg=s DFA, previous malingering detection methods were generally found to not meet significance for effective discrimination. While it was hypothesized that the DFA would out perform the other methods, it was not expected that the methods would perform as poorly with this study=s sample of participants as was observed. When these methods (except for Mittenberg=s DFA) were entered into DFA, they generally met significance for discriminating groups, but sensitivity and specificity remained low. Qualitative variables may be helpful for diagnosing actual MR and Pattern Analysis hold some promise for identifying malingered MR, but in general, these methods should be used with caution and skepticism.

Thus, it is not recommended that these malingering measures be used alone to identify feigned test performance on the WAIS-III. Such use would likely lead to many false positives and false negatives. If modified, however, these methods may provide additional sources of evidence for malingered performance. It is not clear why these measures underperformed on the WAIS-III as compared to the WAIS-R. However, differences among participants, malingering instructions, and changes made to the WAIS may have contributed to the poor performance. Unfortunately, many malingering indexes do not hold up in validation studies, and the results of this study were consistent with that trend.

For example, Rawlings and Brooks found that a cut score of greater than two on the Simulation Index produced perfect classification rates for suspected malingerers and actual TBI patients. Upon their own validation, a 95% classification rate was achieved. Later, Rawlings (1992) was able to achieve a 94% hit rate, but when other researchers conducted validation studies these classification rates dropped significantly. Milanovich et al., (1996) found the overall specificity of the Simulation Index-Revised was 62%, with a high number of false-positives. This classification was remarkably close to the classification rate observed in the current study. In this study, neither malingered TBI group was significantly discriminated from the TBI participants, but malingered MR participants were significantly classified. Upon closer examination of the results, however, it was apparent that the larger number of actual MR participants influenced this significant classification result. Participant with actual MR were correctly classified while sensitivity rates for malingered MR were below chance. However, the large number of correctly classified clinical controls boosted specificity rates enough to produce significant findings. Had there been equal numbers of MR and MRCRM, this significant result would likely have changed.

In fairness to the Simulation Indicator, it was not used as directed by Rawlings and Brooks as the WMS scores were absent. These variables may be more effective when scored with WMS scores, as intended, and there still may be some usefulness for qualitative variables if used in conjunction with DFA. This technique was particularly astute at identifying MR performance, which may be helpful for difficult diagnostic cases. When malingering is not in question, qualitative variables may be useful for assisting the clinician to rule out competing diagnoses (TBI, Autism, etc), or help in other circumstances when the clinical picture is compromised or unclear. Further research in this area may be fruitful for identifying very sensitive diagnostic instruments. Nonetheless, the qualitative WAIS variables Rawlings and Brooks suggested were sensitive were not particularly good at correctly classifying malingerers, and classification rates were consistent with other validation studies. Thus, qualitative variables clearly under performed in this study and their use in clinical settings should be extremely cautioned.

When the Vocabulary-Digit Span difference score (V-DS; Mittenberg, et al., 1995) was used to identify the malingered sample, it=s correct classification rates did not meet significance. Thus, the V-DS was entered into a DFA to maximize its potential for identifying malingering. Used this way, TBI participants were significantly discriminated from TBICRM and TBICVL with a correct classification rates in the mid 60s. V-DS also significantly discriminated MR from MRCRM with similar classification results. Thus, using the V-DS in a DFA helped classification results approach that found in Mittenberg et al=s original study and subsequent validation studies.

In Mittenberg=s original study the Vocabulary-Digit Span difference score classified 71% of the participants using a difference score of 1.53 and several researchers have conducted validation studies with similar classification rates. Millis et al., 1998 found the Vocabulary-Digit Span difference score, with a cut off score of two, classified 79% of participants and Axelrod and Rawlings (1999) found specificity rates to 76%. Greve et al., (2003) finding difference score classified 79% of their sample. Thus, the V-DS underperformed when compared to these studies. Thus, the V-DS does not appear to be as effective when used with the WAIS-III as compared to the WAIS-R. This would appear to be a result of changes made to the WAIS-III as participant samples were comparable and administration and scoring are straightforward. Caution should be used when applying the V-DS to the WAIS-III.

When the Reliable Digit Span (RDS; Greffenstien, et al., 1994) was examined using a cut score of seven, classification rates were no better than chance due to poor malingering sensitivity. Thus, as with the qualitative variables and V-DS, the RDS was entered into a DFA to further examine the usefulness of this score for identifying malingered responses. This technique significantly discriminated TBI and malingered TBI groups, but the correct classification rate was low (63%), and did not change upon cross validation. MR was also significantly discriminated from MRCRM, and the correct classification improved to 74%. Unfortunately, this rate fell to 66% upon cross validation, essentially making it no better than for TBI. Therefore, the sensitivity and specificity of this method was less than optimal.

These findings were significantly different from Greiffenstein and colleagues original study that found a RDS score of seven produced 70% sensitivity and 73% specificity, with less than 10% false positives. Greiffenstein et al=s classification results have been validated in several follow-up studies (Greiffenstein, et al., 1995, Larrabee, 2003; Mathias et al, 2002; Meyers & Volbrecht, 1998). Thus, the results from this study are not congruent with findings from most studies examining the RDS. This would indicate that a mistake was made in this study or the RDS is not appropriate for the WAIS-III. However, the RDS is a simple and straight forward measure to score, and results were scored twice by two individual scorers, so this first explanation appears unlikely. Thus, it appears likely that changes made to the WAIS may have affected the RDS classification in some way. However, the Digit Span test has not changed significantly from one version to the next, so this explanation appears weak as well. A third explanation for these results is that malingering motivation played a role in reducing classification rates.

This third explanation appears plausible. The results from this study were consistent with Duncan and Ausborn (2002), who examined TBI participants using archival WAIS-R data from prison inmates at criminal pretrial or presentencing. The inmates were suspected of malingering based on other malingering indicators. The authors found a cut score of seven had 67.9% sensitivity and 71.6% specificity. These results may have been consistent with the current study because of the population. Half of the malingered TBI group and all MR malingered MR group participants were asked to feign deficits to avoid criminal responsibility, which is very similar to the motivation of Duncan and Ausborn=s population.

Thus, the motivation to malinger may affect specificity and sensitivity rates on the

RDS. Therefore, the RDS may be similarly effective on the WAIS-III, but more research on malingering motivation and RDS needs to be conducted. While the RDS significantly discriminated malingerers from all three malingering groups (when used in DFA), it is not recommended that the RDS be used, on its own, to identify suspected malingering. However, the RDS score (when used in a DFA) may add supporting evidence when other forms of malingering detection are used.

The final method examined was Mittenberg=s (1995) DFA. The DFA results for TBI and TBICRM were identical to TBI and TBICVL. Thus, they were examined together as one group. The groups were significantly discriminated with a correct classification rate of 64 percent. As expected, MR and MRCRM were not significantly classified using Mittenberg=s DFA (correct classification rate was 45 percent). It was expected that this particular method of malingering detection would be more effective at discriminating TBI malingerers from actual TBI patients than for MR groups, and this result was observed. Although other methods may had comparable classification rates for TBI and malingered TBI when used in a DFA, head-to-head- comparisons clearly demonstrate that Mittenberg=s DFA was the only method to significantly classify malingers without modification. Therefore, this aspect of the hypothesis was supported, despite disappointing classification rates.

The classification rate from this study is different from that reported in the original Mittenberg study (79%). There are a couple of explanations which may explain this discrepancy, but each explanation has potential limitations. The first explanation would be that instruction sets for the two studies were sufficiently different enough to produce differences in performance that resulted in different classification rates. However, instruction sets used in both studies involve the same scenario in which a person was injured in an automobile accident and is trying to get more financial compensation by exaggerating deficits. No pertinent clinical information was provided in either instruction set, and both sets caution against exaggerating deficits in an identifiable way. Other similarities include the length of the instruction set and the educational level and style for each instruction set was written. Thus, the instruction sets were sufficiently similar and do not appear provide a reasonable explanation for the observed differences in classification rates.

A second explanation would be that clinical or malingering samples differed in some meaningful way. In terms of the clinical groups, Mittenberg et al=s sample generally had higher education levels (15.6 vs. 11 years), but age, race, sex, and even region of country from which each clinical group was assembled (both samples were collected in South Florida) were not significantly different. Both groups had varying levels of severity, in terms of classified head injury, documented objective evidence of brain injury, and were not involved in litigation. Thus, the groups were quite similar in every respect except for education level. However, it is unclear as to what affect this may have had on performance.

Examining IQ scores from each group showed that only minimal differences occurred between the two groups. On Full Scale, Verbal, and Performance IQs, the Mittenberg et al group=s means were 91, 94, and 98 respectively, with standard deviations ranging from 11 to 12. Mean Full Scale, Verbal, and Performance IQs for the current study were 93, 94, and 94 respectively, with standard deviations ranging from 17 to 22 (see page 125). Thus, it is difficult to argue that the education level effected performance in some meaningful way globally. Nonetheless, educational differences may play a role in some unanticipated manner that produced differences in the observed classification rates.

There was a significant difference in terms of age when examining the malingering groups from the two studies. Mittenberg et al=s malingering sample was 33.7 years-old on average (SD = 11.2) while the average age for the current study was 22.4 (SD = 7.2). While the age variable was controlled in the MANCOVA examining differences in performance between TBI and TBI malingerers, the age variable could not be controlled for in the DFA due to limitations in the statistical software package for the current study. Thus, differences in age between Mittenberg et al=s malingering group and the current study=s malingering group may also explain some of the discrepancy in classification rates between the two studies.

A third consideration is that changes made to WAIS-R have changed the test enough to effect test performance on various subtests. This, explanation is related to the rationale for examining the DFA on the WAIS-III in the first place. The WAIS-III administration and scoring manual clearly details these changes (Wechsler, 1997, pp. 8B14), which include: Updating of norms; Extension of the age range to 89 years (WAIS-R upper limit was 74 years); Modification of items; Updating artwork on Picture Completion, Picture Arrangement, and Object Assembly; Extension of floor; Decreased reliance on timed performance for computing Performance IQ (by replacing Object Assembly with Matrix Reasoning and by decreasing the number of items with time-bonus points); Enhancement of fluid reasoning measurement by adding Matrix Reasoning subtest; Strengthening the framework based on factor analysis; Statistical linkage to other measures of cognitive functioning and achievement; Extensive testing of reliability and validity.

Because of these changes, it was necessary to examine Mittenberg et al=s DFA (as well as the other measures of malingering created on the WAIS-R) when applied to the WAIS-III. In terms of Mittenberg et al=s DFA, it does appear that the changes have decreased it=s sensitivity and specificity. Of these changes listed above, modification to items throughout the test, and adding Matrix Reasoning, Symbol Search, and Letter-Number Sequencing best account for changes in performance reflected in discrepant classification rates. In particular, Matrix Reasoning, a 26-item test examining visual reasoning abilities, was a significant contributor to many of the DFAs examined in this study.

Other evidence that changes made to the WAIS-R may have decreased the effectiveness of the Mittenberg et al DFA comes from validation studies examining the DFA on the WAIS-R. These studies generally supported the DFA=s effectiveness and reported encouraging classification rates. Millis et al. (1998) obtained a 90% classification rate, which is actually higher than in the original study. Greve et al (2003) also demonstrated that a positive indication of malingering produced by DFA was significantly more associated with the probable malingering group than the control group. While the latter finding was also found in the current study, there was a clear drop in the reliability of this measure when compared to Greve et al. Again, the drop in classification rate may be due to different malingering instructions or different population, but it would also stand to reason that the different version of the WAIS-III does impact the effectiveness of this method. Thus, it is not recommended that Mittenberg=s DFA be used to identify malingered performance on the WAIS-III.

Significantly better results were obtained with DFA coefficients developed on the

WAIS-III in the current study. While validation for these coefficients are necessary before they are used in clinical practice, they appear to show more promise at effectively discriminating malingered performance on the WAIS-III.

Hypothesis Four

The final hypothesis addressed the theory that the Digit Span subtest (DS) is generally perceived by malingerers to be a test of memory, and therefore, an ideal test for demonstrating impairment secondary to TBI. However, because DS is a measure of working memory, persons with actual TBI have relatively normal performance on this subtest. Greffenstien et al=s (1994) Reliable Digit Span, Mittenberg et al=s (1995) Vocabulary-Digit Span difference score, and Iverson and Franzen=s (1994; 1996) magnitude of error research were all based on this theory. While this theory is presumed valid, no study to date has empirically demonstrated the malingerer=s perception of the DS subtest, or whether malingerers will change their performance based on their perception of the test. This study attempted to be the first to empirically demonstrate the theory behind the effectiveness of DS through analysis participant=s perception and subsequent performance.

Specifically, it was hypothesized that malingerer=s perception of DS will moderate their performance, such that when DS is viewed as a test of memory, malingerers will perform more poorly than when it is not viewed as a test of memory. Thus, perception was viewed as a moderating variable. ANOVA was used to determine if perception was a moderating variable. As hypothesized, the results showed a significant interaction between memory impairment strategy and perception that DS was a test of memory.

Participants who were using memory impairment to feign TBI performed better on the DS test if they didn=t view it as a test of memory. However, when DS was viewed as a test of memory, they performed significantly worse on the subtest. Furthermore, when malingerers used a strategy other than memory impairment to feign TBI, they performed better on the DS test when they perceived it to be a measure of memory than when they perceived it to measure something else. Thus, consistent with theory, performance on the DS subtest appears to be moderated by the belief that DS measures memory when TBI malingerers are using memory impairment strategies.

Converging support was evident by graphing the pattern of subtest performance. DS was one of only two variables that were shown to be different in the pattern of subtest performance when TBI was compared to TBICRM and TBICVL. The only other subtest to show a directional difference when graphed was the Matrix Reasoning subtest. However, only TBICRM showed the directional difference, not both malingering groups as with DS. The difference in scores between TBI malingerers and patients was statistically different. Even TBI malingerers who believed DS measured something other than memory, and did not feign memory impairment to demonstrate impairment, performed worse than actual TBI patients. This finding was expected given the results supporting hypothesis one. Thus, DS appears to be a good indicator of validity.

To provide further evidence that the perception of the DS is a moderating variable on DS performance, DS was also tested to see if it was a mediating variable, which would compromise the existing explanation for the perception effect, that DS perception would simply enhance or weaken the existing relationship between malingering strategy and performance. Thus, a regression equation where memory strategy was used as the independent variable and perception of DS was the mediating variable was examined (the first step in establishing mediation). However, the regression was a poor fit, and the overall relationship was not significant. Given the interaction effect between memory strategy and perception of DS, DS perception appears to moderate performance on the DS performance rather than mediate DS performance, which supports the theory for why DS may be an effective indicator of TBI malingering performance.

These results are preliminary, as this is the first study to examine this DS perception theory empirically. Validation studies will be required to have confidence in these validity and reliability of these results. Thus, despite the promise, it would be prudent to remain skeptical until validation studies can be conducted. Furthermore, if validation studies are performed only with simulated malingerers, the validity of these results will remain in question. This is important to note because methods of malingering detection designed to capitalize on this finding may not demonstrate efficacy for real world malingerers. Still, the results are unique, promising, and provide an initial platform to begin further investigation into the relationship of strategy, perception, and performance.

Summary and Conclusions

The purpose for the current study was to examine the effectiveness of current malingering strategies for the WAIS-III, and to develop specific malingering measures for mental retardation such that the current risk for misidentification as malingering is reduced. The results from this study were promising and suggest the WAIS-III can be used as a powerful and efficient tool for discriminating mental retardation, traumatic brain injury, and likely many different types of malingerers in clinical and legal settings.

Results were consistent with previous studies demonstrating the effectiveness of the WAIS to detect malingered performances (Axelrod & Rawlings, 1999; Greffenstein, 1994; Heaton et al, 1978; Mittenberg, 1995). However, this study expanded upon past research by probing the how and why this tool can be effective. The findings provided insight into the strategy that malingerers, in general, may use to feign a specific clinical populations.

With the Atkins v. Virginia Supreme Court ruling, it was imperative that more research in this area be conducted. There remains woefully sparse empirical evidence to suggest psychologist and other professionals could effectively identify malingered mental retardation from actual mental retardation when there is motive to malinger. This leads to increased concern that persons with actual mental retardation might be misidentified as malingering, and persons malingering mental retardation could avoid detection. This concern is especially important when considering borderline IQ scores. In addition to the lack of empirical studies in this area, several factors contribute to the likelihood that persons with MR would be misidentified. Such factors include the Flynn effect, differences in State criteria for MR, lowered capacity to provide a defense, and being easily lead by others. Thus, a major concern addressed by this study was to provide empirical evidence for an effective strategy to identify malingered MR performance from actual MR performance.

While it is imperative to that research aimed at identifying effective malingering detection strategies for malingered mental retardation continues, this study brought the scientific, clinical, and forensic communities one step closer to this goal by developing a highly sensitive and specific algorithm for identifying feigned mental retardation.

Clearly, admissibility standards set by the Daubert trial (Hom, 2003) can not be met until sufficient validation of the findings has been conducted, and the findings are generally accepted by the scientific community. However, this study provides a platform from which to launch further investigations in this area and clinicians now have empirical evidence to suggest sensitive and specific identification of malingered mental retardation can be achieved with minimal risk to actual mental retardation patients. Continued research should provide better methods and insight into malingered mental retadation, which will further protect those who are vulnerable due to limited intellectual capacity. While the DFA was supported empirically, malingering strategies are notorious for under achieving in validation studies, thus there should be only guarded optimism for this DFA until validation studies are conducted.

Pattern analysis may be another effective indicator of malingered mental retardation because malingerers varied the amount of impairment across subtests, which is not typically seen with persons who actually have mental retardation. These persons typically show a flat profile when subtests are graphed, reflecting uniformly impaired cognitive deficits (Allen, Caron, & Kern, 2004; Caron, Allen, & Kern, in press; Caron, Neubauer, Kern, & Allen, 2004; WAIS-III Technical Manual, 1997). Although the Vocabulary-Digit Span score was not as effective as hypothesized for this population, persons malingering mental retardation clearly over-estimated the vocabulary skills of persons with mental retardation. Using some form of pattern analysis with this subtest should produce adequate classification results and should be investigated further.

This study also provided evidence that discriminate function analysis (DFA) should be considered as the detection method of choice anytime malingering is suspected. DFA clearly outperformed all other methods of malingering detection. Mittenberg=s DFA clearly outperformed other methods when TBI malingering was used, and the other methods clearly improved when they were entered as variables into a DFA. The DFAs for each malingering group developed for this study demonstrated the highest sensitivity and specificity rates. While the number of participants in each group was felt to be adequate, the sample sizes were small, and suggest the sensitivity and specificity of the algorithms were quite powerful. The consistent effectiveness of the algorithms across samples suggests the findings were not spurious. Thus, DFA appears to be the best tool psychologists have to effectively differentiate malingerers from other populations, and clinical and forensic setting should strongly consider incorporating DFA equations into the standard practice of malingering detection.

Because it appears that DFA is the best method for malingering detection, research in this area should concentrate on creating and validating DFA equations for specific populations. There is much work to do in this line of research. Consider the amount of different populations that will need to be considered for each potential malingering scenario (i.e., Schizophrenia, Munchausen=s by proxy, postpartum depression, etc). When multiplying all the potential malingering motivations or justifications by the amount of potentially malingered populations, this task appears daunting.

In addition to the effectiveness of DFA, this method should also be considered because of its efficiency. DFA is efficient because it is already incorporated into the neuropsychological exam, thus additional testing is not required. This is clearly preferable to the added time, cost, and effort to administer separate test to identify malingering. Thus, there appears to be little reason for clinical and forensic settings not to adopt the DFA method of malingering detection once equations have been appropriately investigated and psychometric properties are available.

While results from this study did not provide further support for the justification model, it is justifiably an effective tool for predicting the amount of impairment a malingerer will demonstrate on testing. It is reasonable to assume that the more justification to malinger deficits the more risk one is willing to take in demonstrating cognitive deficits.

Finally, this study was the first to empirically demonstrate that the perception of the Digit Span test was effective for identifying malingered TBI because their perception of it moderates their performance. Capitalizing on this finding by increasing the misperception of the test in some way should enhance clinician's ability to detect malingering. For example, modifying instructions to say "this is a test of memory, which is often effected by TBI" could increase the level of impairment shown on this test by malingerers. In addition to further investigations in ways to maximize the Digit Span's sensitivity, there should be further investigations into the how and why malingering detection methods are effective in general. Understanding these relationships will only enhance the understanding of malingering behavior and make it easier for clinicians to identify malingered performance.

While there were many exciting findings, there were also some limitations to this study. Perhaps the largest limitation is that simulated malingerers were used instead of actual malingerers. This has been the largest criticism of malingering studies in general because it compromises the generalizability of findings. The DFAs created in this study may not generalize to real world malingerers because they may not reflect important demographic, personality, and genetic variables that constitute the average real world malingerer.

This issue is of particular concern when it comes to evaluating malingered mental retardation performance. Simulated malingerers in this study were overwhelmingly young with very high IQs (as estimated by the normal control sample). It is not likely that someone malingering mental retardation would have such IQs in the range of the analogue malingerers from this study because background information would reveal they could not possibly have mental retardation. This discrepancy leads to a very important question regarding the findings. How does IQ affect malingered performance? This question is especially pertinent in regard to mental retardation.

It is important to understand how actual IQ affects malingered MR performance. Does having a lower IQ make malingering behavior more believable or more difficult? It could be argued that malingering would be easier for persons with lower IQ because they can be more subtle, with less repression of their true abilities than someone with a superior IQ. On the other hand, persons with lower IQs may not be sophisticated enough to malinger effectively or in a believable fashion. Coaching would be more difficult as well. These are important questions to consider and investigate. Understanding the effect of IQ on malingered MR performance will improve methodology and eventually sensitivity.

In addition to IQ differences, other factors also may impede the generalization of test results to real world populations. One important factor is demographic back ground. While malingering groups in this study were racially diverse with equal numbers of men and women, this does not reflect most death row inmate populations, which are predominantly African American and male. It remains to be determined if racial differences in the number of appeals based on suspicion of MR will be occur, but given the discrepancy of African Americans on death row, future studies would be well served to create more representative samples.

In addition to IQ, sex, and race, age might also be another demographic variable to consider when analyzing data and making generalization to various populations. The samples used in this study were invariably in their very low twenties. The average age of death row inmates and persons malingering TBI for financial gain may also be quite different from actual malingerers. Other barriers to generalizability may include differences in arousal level, actual financial gain, and other differences related to the laboratory settings as compared to clinical settings. The point is that participants in this study may not accurately reflect the malingering behavior of actual malingerers, which compromises the generalizability of these findings.

However, no one really knows what actual malingers look like because people who malinger will not identify themselves for obvious reasons. This is why so many researchers continue to use simulated malingerers. While there are obvious limitations to this approach, it is a necessary first step in developing adequate malingering measures for clinical use. Furthermore, the limitations of using suspected malingerers from clinical cases are rarely discussed in malingering literature and may lead false confidence in the generalizability of the findings. For example, using suspected malingerers in studies may spuriously self-select people who may be very poor at malingering, which may not be representative of the greater population malingerers. In addition, samples tend to be small, leading to greater likelihood spurious results. Analogue studies tend to be more robust to these limitations. Thus, despite the limitations associated with analogue studies, they remain an important facet of malingering research. Confidence in external validity should come as result of combined research methods utilizing both analogue studies and clinical cases.

Perhaps the process of identifying effective malingering detection methods could model those set fourth by the Food and Drug Administration for pharmaceutical research. Medications must go through several Aphases@ before they can be marketed physicians to prescribe to the general public. Using this model, a phase one study could be an exploratory laboratory study with simulated malingerers. Phase two might consist of validation studies conducted in other laboratories, Phase three would consist application of the method to archival clinical data from highly suspect test performance and lots of secondary gain to profiles without secondary gain potential. Phase four would consist of use in clinical and forensic settings with continual monitoring of performance. Allowing clinicians the means to report adverse events (AE) such as false positives should be incorporated into the phase four testing, with a national database similar to that of Food and Drug Administration for reported AEs. Eventually, there would be enough research and evidence to confidently support the efficacy of certain methods in clinical practice, and would certainly exceed legal standards.

Until such time, the use of techniques developed in the laboratory need to be cautiously and judiciously incorporated into clinical use along with several other measures of invalid performance to ensure optimal sensitivity and specificity. While perfection is a lofty goal that appears impossible and a long way off, through continued research and inventive ideas, it does seem possible to make some significant strides toward maximizing the classification of malingered behavior.

APPENDIX I

INFORMED CONSENT

Study Title: Detection of Malingering Using the WAIS-III

General Information: Joshua Caron, M.A., and Daniel Allen, Ph.D., from the Department of Psychology at UNLV, are seeking participants for a study that examines new techniques for identifying individuals faking brain damage or mental retardation during civil or criminal litigation. You are invited to participate in this research study.

Procedure: If you volunteer to participate in this study, you will be interviewed and then be administered one examination designed to test thinking abilities. For this examination, you will be asked to complete a number of different tasks such as providing definitions of common words, remembering numbers, solving math problems, and solving puzzles. During the interview, the examiner will ask you general questions such as your age and years of education, along with questions regarding your medical history. At the beginning of the study, you will be provided with instructions that will tell you how to complete the tests. In some cases, you will be asked to give your best performance, and in other cases you will be asked to perform like someone who has brain damage or mental retardation. The total time needed to complete this research project is approximately 2.5 hours, although it may take you less time to complete the study.

Benefits of Participation: By participating in this study, you will gain a research participation credit for every hour of research participation. Participation time in this study is expected to be approximately 2.5 hours. You may also receive a $50.00 award based on how well you perform in the study.

Risks of Participation: There is a chance you may experience some mental fatigue or minimal anxiety during the assessment. To decrease the chance of fatigue and anxiety, one break is scheduled during the assessments. However, the researcher will also allow breaks as necessary for your comfort. Although it is not expected to occur, should you feel uncomfortable answering any of the questions or performing any of the tasks, you are encouraged to discuss concerns with the researcher. Your participation is completely voluntary and you may refuse to answer questions or withdraw from the study at any time.

Contact Information: If you have questions about the study, or if you experience any harmful effects as a result of participation in this study, you are encouraged to contact Joshua Caron or Daniel Allen at 895-3305. For questions regarding the rights of research subjects, you may contact the UNLV Office for the Protection of Research Subjects at 895-2794.

Voluntary Participation: Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality: All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study.

Participant Consent: I have read or have had read to me all of the above information. I have had all of my questions answered and understand the purpose, procedures, risks and benefits of the study. I agree to participate in this study. I certify that I am at least 18 years of age. A copy of this form has been given to me.

Name Date

Witness Date

APPENDIX II

TBICVL INSTRUCTIONS

This experiment is trying to evaluate strategies people sometimes use to get larger settlements in civil litigation cases for injury. For this experiment, you are being asked to pretend that you have been involved in a car accident in which you were not at fault. While you did hit your head on the windshield during the accident, you do not experience any ill effects from the injury. During a discussion with your lawyer, she or he makes it clear that you will receive more money if postconcussive symptoms have occurred from the head injury. Therefore, you must successfully pretend to have suffered a mild traumatic brain injury with postconcussive symptoms to gain the most amount of money you can. During this evaluation, your task is to perform in a manner consistent with how a person with mild traumatic brain injury might perform. However, it is very important that you not overdo it. Psychologists are sometimes able to catch people who fake postconcussive symptoms if they exaggerate impairment too much. Persons who are more subtle at faking impairments are typically harder for psychologists to detect as faking their symptoms. Also, stay consistent; if two tests appear similar then you should perform the same way on both. Remember, you are to perform as if you have mild traumatic brain injury across the entire evaluation today. The participant who performs most like someone with mild traumatic brain injury will win a prize of $50.00.

APPENDIX III

TBICRM INSTRUCTIONS

This experiment is trying to evaluate strategies people sometimes use to get out of punishments and consequences. For this experiment, you are being asked to pretend that you are a criminal defendant undergoing a competency evaluation. You must successfully pretend to have mild traumatic brain injury in order to avoid the death penalty for your crime. Therefore, during this evaluation, your task is to perform in a manner consistent with how a person with mild traumatic brain injury might perform. However, it is very important that you not overdo it. People who exaggerate impairment too much are typically easier to identify as faking than persons who are more subtle at faking impairments. Stay consistent. If two tests appear similar, perform the same way on both. Remember, you are to perform as if you have mild traumatic brain injury across the entire evaluation. The participant who performs most like someone with mild traumatic brain injury will win a prize of $50.00.

APPENDIX IV

MRCRM INSTRUCTIONS

This experiment is trying to evaluate strategies people sometimes use to get out of punishments and consequences. For this experiment, you are being asked to pretend that you are a criminal defendant undergoing a competency evaluation. You must successfully pretend to have mild mental retardation in order to avoid the death penalty for your crime. Therefore, during this evaluation, your task is to perform in a manner consistent with how a person with mild mental retardation might perform. However, it is very important that you not overdo it. People who exaggerate impairment too much are typically easier to identify as faking than persons who are more subtle at faking impairments. Stay consistent, if two tests appear similar, perform the same way on both. Remember, you are to perform as if you have mild mental retardation across the entire evaluation. The participant who performs most like someone with mild mental retardation will win a prize of $50.00.

APPENDIX V

NC INSTRUCTIONS

This experiment is trying to evaluate strategies people sometimes use to get larger settlements in civil litigation. For this experiment, you have been randomly selected to take part as a comparison participant. This means you should perform to the best of your abilities on all the tests you are about to be administered. Your performance, along with other comparison group members, will be used to help us identify scoring patterns that can differentiate someone who is faking injury symptoms from those who are not. Remember, you are to perform to the best of your ability. The participant who obtains the highest scores across all the tests will win a prize of $50.00.

APPENDIX VI

TBICVL TEST

You are being asked to pretend that you have head trauma.

A. Yes B. No

The reason you are being asked to fake symptoms of head trauma is so that researchers can better understand the strategies people use to fake head trauma symptoms.

A. Yes B. No

You need to pretend as though you have head trauma throughout the evaluation.

A. Yes B. No

You should not exaggerate your head trauma symptoms too much or you will be easily detected as faking.

A. Yes B. No

There will be several tests given to you today. You should show the same type of symptoms on tests that appear similar.

A. Yes B. No

APPENDIX VII

TBICRM TEST

You are being asked to pretend that you have head trauma in order to avoid being sentenced to death.

A. Yes B. No

You are being asked to fake symptoms of head trauma is so that researchers can better understand the strategies people use to fake head trauma symptoms.

A. Yes B. No

You need to pretend as though you have head trauma throughout the evaluation.

A. Yes B. No

You should not exaggerate your head trauma symptoms too much or you will be easily detected as faking.

A. Yes B. No

There will be several tests given to you today. You should show the same type of symptoms on tests that appear similar.

A. Yes B. No

APPENDIX VIII

MRCRM TEST

You are being asked to pretend that you have mild mental retardation in order to avoid the death penalty.

A. Yes B. No

You are being asked to fake mild mental retardation so that researchers can better understand the strategies people use to fake symptoms of this disorder.

A. Yes B. No

You should pretend to have mental retardation throughout the evaluation.

A. Yes B. No

You should not exaggerate mental retardation too much or you will be identified.

A. Yes B. No

There will be several tests given to you today. You should show the same type of symptoms on tests that appear similar.

A. Yes B. No

APPENDIX IX

NC TEST

You have been randomly selected for the control group in this experiment.

A. Yes B. No

You are being asked to perform to the best of your abilities on the following examination.

A. Yes B. No

You should perform the best you can throughout the entire examination.

A. Yes B. No

Your performance will be used to help us identify scoring patterns that can differentiate someone who is faking injury symptoms from those who are not.

A. Yes B. No

The single participant who obtains the highest score across all the tests will win a prize of $50.00.

A. Yes B. No.

APPENDIX X

POST EXAMINATION INTERVIEW

What did your instructions at the beginning of the experiment ask you to do?

1. Act as if you have head trauma in order to gain financial compensation
2. Act as if you have head trauma in order to avoid the death penalty
3. Act as if you have mental retardation in order to avoid the death penalty
4. Perform to the best of your abilities (If selected, do not ask questions 3-7)

Did you have trouble following the instructions?

No Yes If yes, why?

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What symptoms or behaviors did you use to show you had impairment and why?

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____

____

Do you remember the test where you repeated a string of numbers forward, and then you had to say them backward? What type of ability do you think that test measured?

____

Did you try to fake symptoms and behaviors on all tests, or were you selective about which tests you choose?

____

If selective, why?

____

____

Which tests were easiest to fake symptoms on, or which test did you feel that you were most convincing? Why?

____

____

Which tests were hardest to fake symptoms on, or which tests did you feel you were least convincing? Why?

____

____

APPENDIX XI

DEBRIEFING FORM

Title: Detection of Malingering Using the WAIS-III

Researcher: Josh Caron, M.A.

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702-895-3305

Our Study:

The purpose of this study is to develop and investigate new methods for identifying individuals who feign brain damage or mental retardation in order to avoid prosecution or for financial gain. The term malingering is used to describe a patient=s behavior when trying to increase secondary gains (financial incentive or avoidance of prosecution) by faking symptoms on tests to imply impairment. Malingering can be conceptualized as a deception intended to create an impression of illness (Lees-Haley, 1986). The Diagnostic and Statistical Manual for Mental Disorders- Fourth Edition (DSM-IV; American Psychiatric Association, 1994) defines malingering as Athe intentional production of false or grossly exaggerated physical or psychological symptoms motivated by external incentives@ (p. 296-297). The prevalence of malingering cognitive deficits may be as high as 66% percent among individuals involved in compensable personal injury litigation (Bollich, McClain, Doss, & Black, 2002; Greiffenstein, Baker, & Gola, 1994; Heaton, Smith, Lehman, & Voit, 1978; Johnson & Lesniak-Karpiak, 1997; Rogers, 1997). Thus, it is important to develop powerful methods for detecting people who malinger. In addition, most malingering detection instruments are designed for TBI and not MR. This is problematic because it places defendants with MR at risk for being identified as malingering. Until appropriate malingering instruments and methods are developed for use with defendants being evaluated for mental retardation, this risk for misclassification will persist. Thus, it is very important to begin researching and develop malingering detection instruments specifically for identifying people faking mental retardation. To learn more about this study, or to voice questions/concerns regarding this study, please contact Josh Caron at 895-3305.

Talking with someone:

For some people, this study may have raised questions regarding one=s current emotional state. If you want to talk to someone about these issues, you may contact the UNLV Student Counseling & Psychological Services at 895-3627.

The reward:

You will be contacted by phone or e-mail if your results were selected for the $50 award for best performance. The winner cannot be determined until all participants have been run. All participants are expected to complete testing by the end of the Spring 2005 semester. Therefore, the end of that semester is the estimated time frame for when the winner will be notified. If you have any questions regarding the award process, please call 895-3305 and leave a message for Josh Caron regarding your questions and/or concerns.

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