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THE TRAUMATIC EVENTS INVENTORY: A PRELIMINARY INVESTIGATION  
OF A NEW PTSD QUESTIONNAIRE

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Bachelor of Arts in Psychology

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Cleveland State University

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OF A NEW PTSD QUESTIONNAIRE

KIRK R. BRYANT

**ABSTRACT**

The purpose of this study was to assess the preliminary psychometrics of the Traumatic Events Inventory (TEI), a new Post Traumatic Stress Disorder (PTSD) scale designed to identify individuals who are malingering. Participants were students and members of the community who were instructed to feign PTSD or to perform normally. The internal consistencies of the TEI full-scale as well as the subscales were high. Construct validity was examined by comparing scores on TEI to participants' performance on malingering indices of the TMT, the Digit Span, the Digit Symbol, and the RAVLT. The TEI full-scale, as well as many of the subscales, were significantly correlated with one of the most well validated malingering indices, the Reliable Digit Span (RDS), the Digit Symbol raw and scaled score, the TMT part A, and various RAVLT indices. The results of this study provide an indication of the TEI's potential ability to distinguish malingerers from those with genuine PTSD. The questionnaire may be used to help determine if an individual involved in a PTSD disability claim or lawsuit is accurately portraying their symptoms. The ability to determine which individuals have genuine PTSD will allow resources to be allocated to those who are in most need of assistance.

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## **CHAPTER I**

### **INTRODUCTION**

The purpose of the study is to investigate the potential efficacy of the Traumatic Events Inventory (TEI), a new scale designed to differentiate genuine and feigned PTSD. The TEI offers several potential advantages over the MMPI-2: it is much shorter, only taking 15 minutes to complete, and it measures symptom severity before and after the event. The before / after design of the TEI could prove to be a major strength of the scale. Even though the scale is only 60 items long, the design allows 3 different aspects of functioning and symptomology to be analyzed: functioning and symptomology before the traumatic event, after the event, and the change in functioning and symptomology precipitated by the event. It is possible that deceiving the test across 3 domains will be especially problematic for malingerers. As Hall and Hall (2006) noted, individuals who are feigning PTSD often report having fewer problems before the traumatic event relative to individuals with genuine PTSD, and exaggerate symptoms they believe would be caused by the event.

In this preliminary investigation, the TEI's construct validity will be assessed by comparing coached PTSD simulators' responses on the TEI to neuropsychological tests



with established malingering indices including, The Trail Making Test (TMT; Partington & Leiter, 1949), the Digit Span (Yerkes, 1921), the Digit Symbol (Yerkes, 1921), and the Rey Auditory Verbal Learning Test (RAVLT; Rey, 1964). Unlike this study, previous dissimulation studies involving feigned PTSD have not included measures which act as a “Gold Standard”. These studies included individuals diagnosed with PTSD that the authors believed did not have motives to malingering (e.g., Elhai, et al., 2002; Arbisi, et al., 2006). The authors would then observe if the measure being examined could differentiate between the groups in accordance with their assumptions of which individuals were and were not malingering. In this study, the neuropsychological tests will be administered in the standard way, but the responses will be simultaneously recorded in real time using a computer software program. The software will be run by the examiner who will be observing as each participant performs the tests. Each time a participant connects a dot (TMT), writes a symbol (Digit Span), recites a digit (Digit Span), or says a word (RAVLT), the examiner will click a corresponding button. The Impact of Events scale-Revised (IES-R; Weiss & Marmar, 1997), a measure of PTSD symptoms severity, will also be administered. The results of this investigation may help identify particularly effective / ineffective items or indices (i.e., before score, after score, change score, or a combination) included in the TEI, which will aid in subsequent revisions of the scale. In order to aid in future revisions, the Cronbach’s alpha of the TEI’s full-scale before, after and change scores will be assessed, as well as the Cronbach’s alpha for each of the subscales. In addition to serving as a preliminary investigation of the TEI, this study could lead to the development of a PTSD test battery that is designed to differentiate malingerers from individuals with genuine PTSD.

## **CHAPTER II**

### **LITERAURE REVIEW**

#### **2.1 PTSD and Malingering**

The *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV-TR*; American Psychiatric Association, 2000) defines malingering as “the intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives such as avoiding military duty, avoiding work, obtaining financial compensation, evading criminal prosecution, or obtaining drugs.” Malingering is especially salient when considering Post-Traumatic Stress Disorder (PTSD) for reasons including; diagnosis, ease of malingering, and the presence of strong external motives (i.e., financial compensation).

A diagnosis of PTSD cannot be given until malingering is ruled out (APA, 2000). Ruling out malingering can be difficult due to PTSD’s unique diagnostic criteria. PTSD is the only mental disorder in which the symptoms are linked to a traumatic event (Rosen & Taylor, 2007). Criterion A of the *DSM-IV-TR*, states that an individual must have experienced or witnessed an event that causes the individual to feel threatened and evokes a sense of horror or helplessness. The following criteria relate to symptoms that

are directly attributed to the traumatic event: Criterion B: experiencing the traumatic event through intrusive thoughts, nightmares, dissociative flashbacks, and environmental cues; Criterion C: persistent avoidance of stimuli associated with the trauma; and Criterion D: symptoms of arousal such as hypervigilance, difficulty concentrating/sleeping, increased irritability and startle response. Finally, the symptoms must be present for at least one month and cause significant impairment in functioning (APA, 2000).

PTSD can easily be feigned. Since the trauma experienced after an event is subjective, and may differ substantially across individuals, clinicians have relied on self-report methods to diagnose PTSD (Guriel & Fremouw, 2003). Even if self-report measures include validity scales, distinguishing individuals with genuine PTSD from malingers can be problematic because individuals diagnosed with PTSD often exhibit a wide-range of symptoms as well as symptom severity and often overreport symptoms. Hyer, et al. (1988) found that 171 of 439 (39%) veterans with PTSD who had experienced combat in Vietnam were classified as overreporters based on the criteria of elevated scores ( $> 160$ ) on the MMPI O-S scale. In a study conducted by Franklin, Repasky, Thompson, Shelton, and Uddo (2002), 77% of veterans diagnosed with PTSD ( $n = 127$ ) were not conscious that they were overreporting symptoms. Differentiating a malingerer from an individual with genuine PTSD is further confounded by PTSDs high rate of comorbidity with other psychological disorders, which ranges from 65-98% (Hall & Hall, 2007; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Exaggerated symptoms and a high rate of comorbidity contribute to an elevated symptom profile that is typical of individuals with PTSD (Hall & Hall, 2007).

Finally, individuals often have strong motivation to feign PTSD. Some reasons include, avoiding criminal responsibility (e.g., Slovenko, 2002), justifying poor performance (i.e., work, relationships) (Lacoursiere, 1993), gaining admission to a psychiatric hospital (e.g., Rosen & Taylor, 2007), increasing status among fellow veterans (e.g., Lacoursiere, 1993), and financial compensation (e.g., Resnick, 1997).

Financial compensation is the primary reason individuals feign PTSD (Resnick, 1997). Among a sample of 2100 veterans applying for disability from 1994 to 2004, The Office of the Inspector General (2005) reported that PTSD disability claims increased 75.5%, while claims for other forms of disability increased 12.2%. The report also states that PTSD disability payments increased 148.8%, while payments for other forms of disability increased 41.7%. The prevalence of malingering in the sample was not established, so the inflation of the figures could be attributed to various factors. Despite the unknown prevalence of malingering in the sample, due to the enormous increase in PTSD disability claims and payments, the report concluded that payments for PTSD disability might have been inappropriately awarded and diverted resources from other areas designed to benefit veterans.

Although more common, by no means are PTSD disability claims restricted to veterans, civilian cases involving trauma are just as susceptible to malingering, especially if self-report measures without validity scales are used and symptoms are not cross-validated with other measures (i.e., medical records, historical data, clinical interviews). Rosen and Taylor (2007) described two such civil cases. In the first, Daly and Johnston (2002) stated that 67% of individuals who survived a 3 hour hostage ordeal in a bar reported having PTSD. The second case involved a class action suit by 27 individuals

who had experienced a mudslide (Murphy & Keating 1995). Even though the *DSM-IV-TR* states that malingering must be ruled out before a diagnosis of PTSD can be made, neither case attempted to do so. Self-report assessment tools including the SCL-90-R (Derogatis, 1994) and the Impact of Event Scale (Horowitz, Winler, & Alvarez, 1979) were used in the second case. The self-report measures, lacking validity scales, largely determined the amount of compensation each plaintiff received. Although malingering was not ruled out of either case, several case reports have documented feigned PTSD (Rosen & Talyor, 2007).

## 2.2 Prevalence

Taylor, Frueh, and Asmundson (2007) noted that the discrepancy between the prevalence of traumatic events, 40-60%, and the lifetime prevalence of PTSD, 8%, is high, so questions as to the validity of the claims should be made when, as in the Daly and Johnston (2002), a majority of the individuals involved claim to have PTSD. Estimates for the prevalence of malingering psychological symptoms vary from 1% to over 50%, but may be as high as 64% in personal injury cases and 47% of worker's compensation cases (Resnick, 1997). Lees-Haley (1997) found that 20-30% of plaintiffs in traumatic injury cases may be malingering.

## 2.3 Current Assessment

### 2.3.1 Trauma Symptom Inventory

The Trauma Symptom Inventory (TSI; Briere, 1995) is a 100 item likert scale, self-report measure designed to assess trauma symptoms. Unlike many self-report

measures, the TSI includes validity scales. Edens, Otto, and Dwyer (1998) examined the effectiveness of the Atypical Responding (ATR) validity scale in a dissimulation study involving 155 college students. The students were instructed to answer honestly or to imagine that they were involved in a traumatic event and were seeking compensation. Using a cutoff score of  $\geq 61$ , statistics concerning the TSI's predictive power were obtained: overall hit rate = 85%, negative predictive power = 81%, positive predictive power = 91%, sensitivity = 78%, and specificity = 92%. After cross-validating the results, the cutoff score of  $\geq 61$  was applied to an outpatient sample. Only 16 of 97 (16.5%) obtained scores above the cutoff, further supporting the TSIs potential to detect malingering. However, 55.3% of individuals participating in a partial hospitalization program obtained scores  $\geq 61$  on the ATR without an overt reason to malingering. This suggests that the measure may not be effective for certain populations or individuals, especially those that may exaggerate symptoms. Since symptom exaggeration is common in individuals with PTSD, using the TSI to differentiate genuine PTSD from feigned PTSD could be problematic.

### 2.3.2 Personality Assessment Inventory

The Personality Assessment Inventory (PAI; Morey, 1991) is a self-report measure that has been examined in several studies with inconsistent results. One study examined 4 inmate samples: prisoners instructed to malingering, suspected malingerers, general population control inmates, and psychiatric patients (Edens, Poythress, & Watkins-Clay, 2007). Even though the PAI effectively identified malingers in a nonpsychiatric sample, it performed much worse in a sample of psychiatric patients and

suspected malingerers (Edens, et al., 2007). Liljequist et al. (1998) evaluated the PAI's efficacy in detecting PTSD malingerers and found that malingerers had similar profiles to people with genuine PTSD: the groups did not significantly differ on scores relating to anxiety, depression, and borderline personality. This may contribute to the fact that the measure often overestimates incidences of malingering (Calhoun, Earnst, Tucker, Kirby, & Beckham, 2000). A study by Calhoun et al. (2000) evaluated a PAI subscale's (NIM) ability to correctly classify PTSD malingerers and genuine PTSD. The results indicate that the commonly used cut off score ( $\geq 8$ ) correctly identified malingerers, but misclassified a substantial amount (65%) of individuals with genuine PTSD (Calhoun, et al., 2000).

### 2.3.3 Minnesota Multiphasic Personality Inventory-II

The F, Fb, Fp, and the Fptsd scales of the MMPI-II are scales that have been used to assess PTSD malingering. The scales are a combination of infrequently endorsed items. The Infrequency (F) scale includes items endorsed by less than 10% of the population, and Infrequency Back (FB) scale measures infrequently endorsed items on the second half of the MMPI- MMPI-II. After conducting a meta-analysis on the MMPI-2 validity scales, Rogers, Sewell, Martin, and Vitacco (2003), stated that Individuals with PTSD often have elevated F scales (i.e., F, Fb, Fp). Therefore, high F scales may be indicative of severe symptoms of genuine PTSD rather than an indication of malingering. Scores on the Infrequency Psychopathology scale (Fp; Arbisi & Ben-Porath, 1995), also elevated in individuals with PTSD, were more effective ("moderately effective") at detecting potential malingering in PTSD cases. Unlike the F or the Fb scales, which

include items infrequently endorsed by the general population, the Fp scale includes items infrequently endorsed by a sample of psychiatric patients at a Veterans Affairs Medical Center (VAMC). Therefore, the Fp scale is specifically designed to distinguish genuine pathology from malingering and it is less affected by severe pathology (Rogers et al., 2003). In fact, Elhai et al. (2004) notes that the Fp scale outperformed the F and Fb scales in a sample of combat veterans (e.g., Elhai, Ruggerio, & Frueh, 2002) and civilians (e.g., Elhai et al., 2004). The Fp scales also achieved the highest hit rate (76%) among the MMPI-2 scales in a study conducted by Elhai, & Frueh, (2001).

Similar to the Fp scale, the Fptsd scale is composed of infrequently endorsed items among veterans receiving treatment at a VAMC, but unlike the Fp scale, the normative sample was restricted to veterans with a PTSD diagnoses (Elhai, et al., 2002). During the initial investigation of the scale, Elhai, et al. (2002) found that it was a better predictor of malingering than the F, Fp, and Fb scales among a sample of combat veterans, while a later study (Elhai, et al., 2004) found that the Fp scale was a better predictor among civilians. In contrast to the Elhai, et al. (2002), Arbisi, Ben-Porath, and McNulty (2006) found that the Fp scale outperformed the Fptsd scale in a sample of combat veterans.

Other MMPI-2 validity scales that have been examined include the O-S and the F-K. After examining the MMPI-2 validity scales, Elhai, Gold, Frueh, and Gold (2000) observed that while the O-S scale was not a significant predictor by its self, it was part of group of MMPI-2 scales (F,  $|F - Fb|$ ,  $F - K$ , Ds2, O-S, and OT) with the greatest combined predictive power. The study also showed that F-K was the best individual



predictor. This is consistent with other studies (e.g., Rogers, et al., 2003; Elhai, Gold, et al., 2001) that have demonstrated the considerable predictive power of the F-K scale.

Although some MMPI-2 scales, especially the Fp, Fptsd, and F-K, can effectively (i.e., 70-80%) distinguish malingers from individuals with genuine PTSD, combinations of scales have also been investigated. For example, Elhai, Gold, et al., (2000) found that six scales (F – K, OT, F, |F – Fb|, Ds2, and O–S) exhibited the greatest predictive power (84%). In another study, a combination of the F-K, O-S, and Fp scales were able to correctly classify genuine PTSD and malingers 80% of the time (Elhai, Gold, et al., 2001).

The MMPI-2 has yielded several scales and combinations of scales with considerable predictive power. The scales that frequently exhibit the greatest individual efficacy in respect to correctly classifying malingers appear to be scales that are made of infrequently endorsed items, including those rarely endorsed by clinical populations, such as the Fp scale. The success of the F scale family is evidence that scales designed to detect malingers in PTSD populations, operating on the premise of infrequently endorsed items, can be highly effective. Despite the relatively high predictive ability of the MMPI-2 scales, the MMPI-2 has the disadvantage of taking several hours to administer. This can be expensive and may reduce the time that would be available to conduct additional tests or interviews. This can be problematic because several investigators (e.g., Taylor, et. al., 2007; Lyons & Wheeler-Cox, 1999) have stressed the importance of convergent evidence in cases of suspected malingering. Another disadvantage of the MMPI-2 scales, particularly the F scales is that they may be elevated by severe symptomology (Sewell, et al., 2003).

## **CHAPTER III**

### **METHOD**

#### **3.1 Measures and Hypotheses**

##### **3.1.1 Self-Report Questionnaires**

##### **3.1.1.1 Traumatic Events Inventory**

The scale is a 60 item questionnaire: 20 items concern ability to function (e.g., doing the dishes, preparing meals, and washing clothes), 20 relate to situations (e.g., meeting new people, riding in an elevator, and driving a car), and the final 20 items are symptom related (e.g., nightmares, sensitivity to light, and outbursts of anger).

Individuals must rate the severity of each item before and after the traumatic event based on a 4 point (0= None, 1= Mild, 2= Moderate, and 3= severe) likert scale. The design of the TEI allows for three scores (Before, After, and Change) to be derived from each subscale. These scores relate to functioning and symptomology before the traumatic event, after the event, and the change in functioning and symptomology precipitated by the event. Like the MMPI-2's F scales, the Symptoms scale includes physical symptoms that would be infrequently endorsed by individuals with PTSD (e.g., sensitivity to light). It also includes items that are not typical symptoms of PTSD and are more frequently

associated with social or general anxiety (e.g., riding in an elevator). Other items correspond to common symptoms of PTSD (e.g., nightmares).

*Predictions for the TEI (see Table 1.)*

The performance of an individual with PTSD would be comparable to individuals without PTSD on many items in the Ability to Function subscale (e.g., doing the dishes, preparing meals, and washing clothes). Malingerers will overestimate impairment in this domain and produce significantly higher scores than non-malingerers. The score on this subscale will be significantly correlated with indices of malingering on the neuropsychological measures, which are described below.

Many of these items on the Situations subscale relate to social anxiety (e.g., meeting new people, going to visit the doctor, and confronting a salesperson), and are not relevant when considering a PTSD diagnosis. This subscale will be sensitive to malingering because malingers will overestimate the degree of impairment in this domain, and produce higher scores than individuals who are not malingering. This subscale will be significantly correlated with indices of malingering found in the neuropsychological measures.

Items in the Symptoms subscale include genuine symptoms of PTSD (e.g., nightmares, outbursts of anger, and recurrent unwanted thoughts), and symptoms that are not typical of PTSD (e.g., burning of the skin, numbness in fingers and toes, and fainting spells). Of the three subscales, this scale will be the least sensitive to malingering, because it includes the largest number of items that would be endorsed by individuals

with genuine PTSD. This subscale will have the lowest correlations with the malingering indices of the neuropsychological measures.

Table 1

*Predictions for TEI Full-Scale and Subscales*

TEI Scale	Malingers	Non-Malingers
Situations (before / after / change)	10 / 50 / 40	13 / < 15* / < 12*
Symptoms (before / after / change)	0 / 55 / 55	0 / < 30* / < 30*
Function (before / after / change)	5 / 50 / 45	7 / < 20* / < 13*
Full-Scale (before / after / change)	15 / 155 / 140	20 / < 65* / < 45*

Note. \*These figures are estimates. A genuine PTSD group would be needed to assess Non-Malingers *after* scores.

### 3.1.1.2 Impact of Events Scale-Revised

The IES-R is a 5 point likert-scale self-report measure based on *DSM-IV* criteria for PTSD that is designed to assess the subjective level of impairment in individuals following a traumatic event. The scale lacks validity scales and is based on face validity. The IES-R has 3 subscales: Avoidance (8 items), Intrusion (8 items), and Hyperarousal (6 items). Weiss and Marmar (1997) reported that the internal consistency of each subscale was high across 4 studies (i.e., Avoidance = .84-.86, Intrusion = .87-.92, and Hyperarousal = .79-.90). Test-retest reliability after a short interval is high (i.e., Avoidance = .89, Intrusion = .94, and Hyperarousal = .92), while the test-retest reliability after longer periods of time is considerably lower (i.e., Avoidance = .51, Intrusion = .57, and Hyperarousal = .59). Content and predictive validity are only available for the 2 subscales, Avoidance and Intrusion, on the original IES. The original scale demonstrated the ability to detect changes in clients over time, and had high (85%) endorsement of

items (Weiss & Marmar, 1997). In respect to construct validity, only 1 item has a higher correlation to a different subscale.

*Prediction-* The IES-R will not have significant correlations with neuropsychological measures of malingering.

### 3.1.2 Correlation with Neuropsychological Measures

Predicted mean test performances on neuropsychological measures are listed in Table 2.

#### 3.1.2.1 Trail Making Test

The TMT is a test of divided attention and executive functioning. Its current form, which consists of two parts, A and B, was first published as a part of the Army Individual Test Battery (1944). In Part A, individuals are required to connect 25 numbered circles in numerical order that are spread across a sheet of paper. Part B is similar, but the sheet contains circles with numbers and letters. In this part, individuals must alternate between numbers and letters (i.e., 1-A-2-B-3-C, etc.). The score is derived from the difference in completion time of each part.

The ratio score, the ratio of the completion times for Part A and B has been shown to detect malingering (e.g., Egeland & Langfjaeran, 2007; O'Bryant, Hilsabeck, Fisher, & McCaffrey, 2003) in several studies, while in other studies (Iverson, Lange, Green, & Franzen, 2002; Martin, Hoffman & Donders, 2003) the ratio score has shown less promise. Egeland and Langfjaeran reported that 28 of 41 (68%) malingerers had a ratio score of  $< 2.5$ , while 7 of 17 (41%) non-malingers had a ratio score  $< 2.5$ , even though the sample size was small and the difference was not significant, a larger portion of malingerers recorded scores below 2.5. In addition to the ratio score, Egeland and

Langfjaeran (2007) have found that participants who are malingering will perform significantly worse on Part A because performance on Part A is less affected by pathology than Part B, and malingers, not aware of typical performance will complete Part A much slower than an individual that was not feigning a disorder. The study found a significant difference in the completion time for Part A; malingers had a mean completion time of  $61 \pm 22$  seconds, while normal participants had a completion time of  $41 \pm 17$  seconds.

Finally, participants that are not malingering will connect the first 4 circles relatively quickly because the test administrator points to each of these circles during the instructions as the computer reads the name of each circle (e.g., connect 1 to 2, 2, to 3, 3 to 4, and so on until you have connected all the circle). Malingers will not take the practice-effect into account and will have significantly longer completion times.

*Prediction* - Performance on the TEI will be significantly correlated with the ratio score, the completion time for part A, and the completion time for the first 4 circles of each test.

#### 3.1.2.2 Digit Span

The Digit Span (Yerkes, 1921) is a test that requires individuals to repeat a series of numbers. It is composed of two parts: a forward and a backward portion. The forward portion requires individuals to repeat a series of numbers in the orders they were presented, while the backwards portion requires individuals to repeat the numbers in the reverse order they were presented. Greve, et al. (2007) noted that the reliable Digit Span (RDS; Greiffenstein, Baker, & Gola, 1994) is one of the most well-validated indicators of

malingering. The RDS is obtained by summing the longest forward and backward trials. RDS scores of 6 or less are associated with a false-positive rate of 10% or less in various clinical and general populations. Using a slightly higher RDS cutoff score ( $\leq 7$ ) and Digit Span score of 5 or below, Greve, et al. correctly identified 61% of malingerers in a toxic-exposure litigation with a false-positive rate of 8%. Similarly, Babikian, Boone, Lu, and Arnold (2006) found that a age corrected scaled score ( $ACSS \leq 5$ ) and a  $RDS \leq 6$  differentiated suspected malingerers from patients at a neuropsychological facility who were not seeking compensation 51% of the time with a false positive rate of 9%.

*Prediction* - If the results of our study are comparable to the Greve et al. (2007) study, participants in the normal condition will have RDS scores greater than 7, and malingers will have scores lower than 7. Depending on age, normal performance on the forward Digit Span ranges from 5-7, and backwards ranges from 3-5 (Schiffer, R. B., & Lajara-Nanson, 2003). Like Part A of the TMT, the forward Digit Span is less affected by pathology, and malingers will exaggerate impaired performance to the point where it will resemble an individual with severe brain damage instead of one with PTSD. Performance on the TEI will be significantly correlated with the reliable Digit Span, a well-validated index of malingering (RDS; Greiffenstein, Baker, & Gola, 1994), and the forward Digit Span.

### 3.1.2.3 Digit Symbol

The Digit Symbol test is a timed test that requires individuals to fill in blank boxes with symbols that correspond to a digit directly above the box. Throughout the

test, individuals must refer to a key at the top of the page that shows the digits and corresponding symbols.

The Digit Symbol test can be used to detect malingering because malingerers often overestimate performance deficits and score much lower than most individuals with genuine impairments. For instance, Etherton, Bianchini, Heinly, and Greve (2006) found that more than 95% of clinical pain patients, even those with moderate to severe pain, did not demonstrate extreme impairment ( $\leq 70$ ) on the processing speed index (PSI) of the Wechsler Adult Intelligence Scale-3 (WAIS-III; Wechsler, 1997), which contains the Digit Symbol test and the symbol search test. The most extreme scores were obtained by participants instructed to malingering or clinical patients identified as malingerers. Furthermore, 80% of instructed malingers and 60% of malingering clinical patients scored below all but 5% of non-malingering clinical patients. The study also found that controls had a mean scaled score of 11.40 while malingers mean scale score was 2.80.

*Prediction* – Malingerers in this study will obtain lower raw and scaled scores than the group that is performing normally, and these scores will be significantly correlated with performance on the TEI.

#### 3.1.2.4 RAVLT

The RAVLT is a test of verbal memory. The version used in this study is comprised of 5 learning trials (i.e., participants are read the words and asked to repeat them), 1 interference trial, (list B) an immediate recall task (i.e., participants are asked to say the words from the first 5 trials), a 30 minute delayed recall task (i.e., same as immediate recall), a 30 minute forced choice recognition task (i.e., participants are read a



pair of words and are asked which word was from the list used in the learning trial), a 60 minute delayed recall task, and a 60 minute forced choice task.

King, et al., (1998), demonstrated the RAVLT's ability to correctly classify coached malingers (told to imagine they were in a car accident) and members of a non-clinical population 80-85% of the time. When comparing coached malingers to genuine motor vehicle accident head-injury victims, the predictive ability of the test was considerably lower (48%). Using various indices of the RAVLT and setting the false-positive rate at 10% or lower, Boone, Lu, and Wen (2005) successfully distinguished credible clinical patients from documented real-world malingerers 67% (standard recognition indices) to 76% (combination of indices) of the time.

*Predictions* – Individuals pretending to have PTSD will not exhibit a learning curve on the RAVLT. Results will be compared to Poreh's (2005) universal normative equation. Also, participants feigning PTSD will perform worse than individuals performing normally on each learning trial, especially trial 5, because the RAVLT has a ceiling effect and individuals typically remember most of the word list during the 5<sup>th</sup> trial. Boone, Lu, and Wen (2005) found that participants who had been suspected of malingering scored  $7.9 \pm 2.7$  on the trial 5, and controls who were instructed to perform normally scored  $12.1 \pm 2.4$ . Boone et al. also found that individuals who were suspected malingerers scored a combined  $31.9 \pm 10.3$  on the first 5 trials compared with controls that scored  $47.5 \pm 8.4$ . The performance of individuals in this study across the 5 learning trials will be comparable to the Boone et al. study. The TEI will be significantly correlated the presence of a learning curve, the number of words recalled on trial 5, the

total number of words recalled across the 5 learning trials, and the 30 Minute Forced Choice Task.

Table 2

*Predictions for Neuropsychological Measures Based on Previous Studies*

Neuropsychological Measures	Non-Malingers	Malingers
Trail Making Test		
Part A (mean, SD)	41 ± 17	61 ± 22
Ratio Score	> 2.5	< 2.5
Digit Span		
RDS	≥ 7	≤ 7
Total Forward (raw score)		
Longest Forward	≥ 5	≤ 5
RAVLT		
Learning curve present	Yes	No
Trial 5	> 12	< 8
Total 1-5	> 45	< 30
Digit Symbol		
Scaled Score	11.40	2.80
Total Raw	>60	<40

### 3.2 Participants

Participants included 58 college students and members of the general population (29 male, 29 female). The participants were predominantly (88%) right handed. The age range was 18 to 64 years old; with a mean of 27.33 (SD = 13.14), and the mean years of education was 14.31 (SD = 2.00). College students were given course-credit for participation. A questionnaire containing demographic information including age,

gender, hand preference, and trauma history was administered before testing. None of the potential participants had to be excluded due to past trauma.

### 3.3 Procedure

This study is modeled after published dissimulation studies (e.g., Elhai, Gold, et al., 2001; Liljequist, et al., 1998). Three groups were collected. Participants in the first group were asked to complete the RAVLT learning trials, the TMT, the Digit Span (4 trials forward and backwards, each consisting of 3 sets of numbers, will be completed regardless of performance), the Digit Symbol, and 30 minute delay portion of the RAVLT. A 90 item Digit Symbol form that corresponded with the data collection software was used for all groups instead of the 133 item form used with the WAIS-III. After completing the tests, the participants were asked to watch an informative video about PTSD. Following the video, the participants read a hypothetical situation asking them to imagine that they were in a car accident and must respond to items on the following tests as if they had PTSD in order to receive financial compensation. The scenario included a cautionary statement concerning the tests ability to detect responses that are not consistent with a PTSD profile. *DSM-V-TR* criteria were listed on the second half of the page. While feigning PTSD, participants were asked to complete the RAVLT. After completing the RAVLT, participants completed the TEI and the IES-R, a scale that measures the severity of PTSD symptoms. Following completion of the TEI and the IES-R, participants completed the 30 minute delay portion of the RAVLT. Then, the participants completed the TMT, the Digit Span, and the Digit Symbol for a second time, and finally, the participants completed the 60 minute delay portion of the RAVLT. When

testing the second group of participants, the non-feign, feign order was reversed. First, the group watched the video and completed the tests and questionnaires while feigning PTSD, and then they took the tests normally. The third group took the tests in a normal way, and after completing the tests and questionnaires, the group was asked to complete the tests and questionnaires a second time but to “try harder” and to “really give it your all and try to do better than the first time”. The third group served as a control group and provided an indication of practice-effects, and the effects of coaching.

### 3.4 Data Analysis

Cronbach’s alpha, which measures the relationship among the items in each scale, was used to measure the internal consistency of the full-scale TEI and the subscales of the TEI. An ANOVA was conducted to examine the differences in performance between individuals feigning PTSD and individuals performing normally on the neuropsychological indices of malingering being examined in this study. A Bonferroni correction was utilized to account for Type-I error inflation. Since the purpose of the TEI is to differentiate genuine and feigned PTSD, ROC curves of the various indices of the TMT, Digit Span, Digit Symbol, and RAVLT were analyzed to identify the indices with the best sensitivity and specificity. Special consideration was given to indices that have been shown in the literature to be less affected by pathology (i.e., RDS and RAVLT forced choice). Pearson’s R was used to assess the association between participants’ TEI full-scale and subscale scores and indices of malingering on the TMT, the Digit Span, the Digit Symbol, and the RAVLT that were significantly different between groups and exhibit relatively high sensitivity and specificity. Only the group that was instructed to

feign PTSD was included in the Pearson's R analysis, because the TEI can only be given to people who have a trauma to reference. Since only the feigning group's performance could be examined, the analysis had a restricted range, which resulted in lower correlations. A step-wise regression analysis was used to determine which scale or subscale of the TEI was the best predictor of RDS score or performance on the RAVLT 30 Minute Delay Forced-Choice task. Other stepwise multiple regression analyses were run with the neuropsychological indices set as dependent variables and a TEI scale as the independent variable. A separate analysis was run for each TEI scale. These analyses were employed to mineralize the risk of Type-I error.

## **CHAPTER IV**

### **RESULTS**

A series of t -Tests showed no significant differences between mean test results in the feign first group and the normal first group. Also, no significant differences were found on any testing variable between participants taking the tests in the normal condition for the second time and participants taking the tests in the normal condition for the first time.

The TEI full-scale internal consistencies for Total before ( $\alpha = .94$ ), Total after ( $\alpha = .92$ ), and Total change ( $\alpha = .97$ ) were high, so were the internal consistencies of the TEI subscales (See Table 3.). These results indicate that the TEI has high internal consistency and does not need revisions designed to increase reliability.

Table 3

*Mean, Standard Deviation, and Reliability of TEI Subscales*

TEI Scales	Mean	SD	Cronbach's Alpha
Situation			
Before	9.53	5.913	.778
After	37.91	11.143	.922
Change	28.283	12.779	.898
Symptoms			
Before	6.58	5.372	.839
After	37.17	10.818	.909
Change	30.7736	11.57026	.913
Functions			
Before	4.73	7.369	.922
After	33.77	13.470	.929
Change	29.461	13.9599	.934
Full			
Before	20.70	15.948	.936
After	108.27	33.000	.964
Change	88.096	35.9369	.967

Note. n = 53

An ANOVA revealed a significant difference between malingerers and non-malingerers performance on all the analyzed neuropsychological indices except the TMT Ratio Score. The RAVLTX was not included in the analysis because the 60 minute delay of the RAVLT was not administered to participants in the normal condition. Also, since data from the Digit Symbol test were obtained using a form with 90 items, a simple algebraic equation was used to estimate performance on a 133 items form for the purpose of comparing the results to those in previous studies. Table 4 shows the results of the ANOVA with a Bonferroni correction made for multiple comparisons. With the Bonferroni correction, alpha will be set at .003 to reduce type 1 error. A Cohen's d statistic reveals that the effect size is large ( $\geq 0.800$ ) for almost of the indices .

Table 4

*Means, Standard Deviations, and F Ratios for Indices of Malingering by Group*

	Normal (groups 1 & 3)		Feign (group 2)			
Index	M	SD	M	SD	F	Cohen's <i>d</i>
Trail Making Test						
Part A	22.63	8.538	69.00	82.942	22.547**	0.786
Part A 21-25	4.37	2.294	13.23	11.785	39.002**	1.043
Ratio	2.25	0.926	1.78	0.912	7.145	0.511
Part A 1-5	3.51	2.199	11.70	14.620	22.194**	0.783
Part B 1-5	6.86	4.685	18.00	16.355	29.858**	0.926
Digit Span						
RDS	11.04	1.829	6.67	1.459	178.077**	2.641
Longest Forward	7.07	1.071	4.49	0.883	177.953**	2.629
Total Forward	16.25	3.570	7.26	3.533	172.958**	2.531
Reversal Back	1.79	1.013	3.91	1.477	83.156**	1.674
RAVLT						
Dual Choice 30 Tot	14.51	1.042	7.88	3.041	289.974**	2.917
Post Interference	11.04	2.951	3.81	2.528	179.953**	2.631
Trial 4	12.03	2.160	4.95	2.410	266.219**	3.094
Trial 5	12.47	2.076	5.21	2.669	266.606**	3.036
Total 1-5	52.36	9.624	24.00	8.583	254.075**	3.110
Learning Curve	0.802	0.155	0.40	0.330	77.619**	1.559
Digit Symbol						
Total	99.35	17.830	60.31	25.612	91.526**	1.769
Scaled Score	13.78	2.790	7.43	4.037	94.168**	1.829

Normal n = 73, Feign n = 43

\*p &lt; .003 (alpha level needed for significance with Bonferroni Correction)

\*\*p &lt; .001

ROC curves of the various indices of the TMT, Digit Span, Digit Symbol, and RAVLT were analyzed to identify the indices with the best sensitivity and specificity.

The results are listed in Table 5.



Table 5

*Sensitivity and Specificity Results of Indices in Neuropsychological Measures*

Indices	Cutoff	Sensitivity	Specificity
Trail Making Test			
Part A (sec)	29.50	.860	.836
Part A 21-25 (sec)	5.50	.907	.822
Digit Span			
RDS	7.50	.945	.884
Longest Forward	5.50	.904	.884
Total Forward	10.50	.918	.860
Reversal Back	2.50	.860	.740
RAVLT			
Dual Choice 30 Total	11.50	.973	.860
Post Interference	6.50	.945	.884
Trial 3	6.50	.973	.860
Trial 4	7.50	.959	.860
Delay	6.50	.945	.907
Forced Choice 30 Middle	4.50	.904	.884

Note. Figures represent the highest combination of Sensitivity and Specificity

Pearson's correlations between the TEI and malingering indices of the TMT, the Digit Span, the Digit Symbol, and the RAVLT are listed in Table 6. Only indices that had significant correlations with at least one TEI scale are listed. Significant correlations were found between the TEI Situation after score and performance on Part A of the TMT ( $r = .405$ ,  $p < .01$ ), the RDS ( $r = -.344$ ,  $p < .05$ ), the longest forward Digit Span ( $r = -.317$ ,  $p < .05$ ), and the total forward Digit Span ( $r = -.348$ ,  $p < .05$ ). Significant correlations were also found between these indices, excluding longest forward Digit Span, and the TEI Symptom After subscale. The most clinically relevant subscales may prove to be those involving the change score. Significant correlations were found between the RDS and the Situation, Symptom, and Full-Scale change score ( $r > -.300$ ,  $p < .05$ ). Only one

significant correlation was found between the malingering indices and the TEI Function subscale, and none were found between the RAVLTX, and any subscale of the TEI. Significant correlations were also not found between the TEI and the TMT Ratio score, the RAVLT learning curve across the first 5 trials, or the RAVLT 30 minute delay dual choice task. It should be noted that the IES-R was only significantly correlated with TMT A and TMT A 21-25.

Table 6

*Pearson's Correlations between TEI Scales and Neuropsychological Indices*

TEI	Trail Making Test			Digit Span				RAVLT				Digit Symbol	
	Part A	A21-25	B 1-5	RDS	TF	LF	RevB	Pst.Int	Trial 4	Trial 5	Tot1-5	Raw	SS
Situation													
B	.195	.256	.240	.055	-.063	.005	.067	.068	-.029	-.012	.000	.016	.016
A	.405**	.530**	.453**	-.344*	-.348*	-.317*	.374*	-.332*	-.314*	-.279	-.243	-.384*	-.341*
C	.258	.337*	.278	-.322*	-.271	-.276	.291	-.318*	-.256	-.235	-.209	-.338*	-.301
Symptoms													
B	.285	.391**	.165	.016	-.003	-.035	-.104	.011	-.042	-.037	-.080	.042	.011
A	.384*	.558**	.364*	-.346*	-.336*	-.298	.333*	-.354*	-.344*	-.337*	-.313*	-.360*	-.352*
C	.236	.354*	.274	-.343*	-.324*	-.272	.372*	-.348*	-.313*	-.309*	-.265	-.366*	-.344*
Functions													
B	.056	.201	.129	.170	.082	.100	-.199	.159	-.015	.097	-.002	.135	.073
A	-.164	.199	.310*	-.149	-.162	-.109	.179	-.159	-.212	-.108	-.110	-.200	-.227
C	-.186	.108	.248	-.220	-.195	-.151	.263	-.226	-.201	-.148	-.108	-.258	-.257
Full													
B	.209	.335*	.215	.100	.007	.031	-.093	.099	-.034	.022	-.030	.078	.041
A	.204	.466**	.420**	-.305*	-.309*	-.262	.325*	-.308*	-.321*	-.261	-.241	-.347*	-.341*
C	.101	.289	.305*	-.331*	-.295	-.263	.340*	-.331*	-.291	-.257	-.219	-.356*	-.337*

Note. All values are raw data except the RAVLTX and the Digit Symbol Scaled Score

B = Before, A = After, C = Change, TF = Total Forward, LF = Longest Forward, Rev B = Reverse Back, Post Int = Post Interference Trial, Tot1-5 = Total across 5 leaning trials Raw = Digit Symbol Raw Score, SS = Digit Symbol Scaled Score

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

A stepwise regression analysis revealed that after scores on the Symptom subscale were the best predictor of RDS scores ( $F = 5.569$ ,  $p = .023$ ) in this sample, but none of the scales were significant predictors of RAVLT 30 Minute Forced Choice task. The results of the other stepwise multiple regression analyses run with the neuropsychological indices set as dependent variables and a TEI scale as the independent variable are presented in Table 7. Compared to the other neuropsychological indices, TMT A 21-25 had twice as many appearances in the predictive models. Only 4 out of the 13 indices included in the Pearson's R analysis were included in the models that best predicted TEI scale scores. These indices were the TMT A 21-25, TMT A, Digit Symbol Raw, and Digit Span Backwards Reversals.

Table 7

*Stepwise Multiple Regression Analysis: Malingering Indices that Best Predict TEI Scale**Scores*

TEI scale	Index	Model Data			Variable Data		
		R2	F	Sig	Beta	t	Sig
Sit A		.281	15.652	.000			
	TMT A 21-25				.530	3.956	.000
Sit C		.114	5.161	.029			
	Digit Symbol Raw				-.338	-2.272	.029
Sym B		.270	7.208	.002			
	TMT A 21-25				.586	3.720	.001
	Digit Span Back Reversals				-.394	-2.500	.017
Sym A		.311	18.050	.000			
	TMT A 21-25				4.248	.558	.000
Sym C		.139	6.432	.015			
	Digit Span Back Reversals				.372	2.536	.015
Func A		.410	13.997	.000			
	TMT A				-1.141	-5.034	.000
	TMT A 21-25				1.160	5.118	.000
Total B		.201	4.900	.013			
	TMT A 21 - 25				.504	3.062	.004
	Digit Span Back Reversals				-.343	-2.083	.044
Total A		.339	10.000	.000			
	TMT A 21 - 25				1.012	4.190	.000
	TMT A				-.649	-2.686	.011
Total C		.127	5.822	.020			
	Digit Symbol Raw				-.356	-2.413	.020

Note. Only scales with a significant predictive model ( $p < .05$ ) were included.

Sit A = Situations After, Sit C = Situations Change, Sym B = Symptoms Before, Sym A = Symptoms After, Sym C = Symptoms Change, Func A = Functions After, Total A = Total After, Total C = Total Change

## **CHAPTER V**

### **DISCUSSION**

The neuropsychological measures predictions, based on literature, for participants performing normally and those who were pretending to have PTSD were comparable to the results obtained in this study. These results indicate that, as in previous studies, malingerers and those performing normally have significantly different scores. However, some predictions differed from the results. In this study, those performing normally had a TMT A completion time that was 20 seconds lower than normal performing participants in Egeland and Langfjaeran's (2007) study, but the results for the feign group was similar. The lower completion time for those in the normal condition may be due to the lower mean age of participants in this study. Another finding that differed from the predictions was the TMT Ratio score. Previous studies have found that malingers have a TMT Ratio score below 2.5, while participants performing normally have a TMT Ratio score above 2.5. In this study, both groups had scores below 2.5. Even though participants performing normally had a higher ratio score than malingerers, the results were not significant. Participants' performance on the Digit Symbol task was significantly different for the normal and feign groups, but the raw and scaled scores

were higher than expected, especially for those in the feign group. This may be due to the fact that most of the participants had some level of college education. These results could also be due to the fact that examiners used Digit Symbol forms with 90 items, as opposed to the 133 item test form used for the WAIS-III. Due to this discrepancy, total raw and scaled scores had to be transformed in order to compare the results to previous studies that had used the Digit Symbol task including in the WAIS-III. It is possible that this may have inflated the scores, because participant's performance may slow down over the course of the test and the estimation did not take this into account.

Significant differences in test performance between the normal and feign groups supports the use of these measures to establish the construct validity of the TEI. The high sensitivity and specificity of the malingering indices provide further support for their ability to differentiate between the normal and feign groups and serve as the "Gold Standard" for this study. Beyond the malingering indices supported in past literature, ROC curves revealed several indices that also exhibited high sensitivity and specificity. These include the TMT A 21-25, the Digit Span Reversals Backwards, and several indices of the RAVLT including, Post Interference Trial, Trial 3, Trial 4, Delay Trial, and 30 minute Forced Choice Middle. The RAVLT indices, excluding the Forced Choice Middle, may not be clinically relevant because scores on these indices are likely to be correlated with the level of pathology, especially if brain injury occurred during the trauma. Contrary to the RAVLT indices, the TMT A 21-25 may be promising, because TMT A has been shown to differentiate those performing normally and malingerers (Egeland & Langfjaeran, 2007), and performance on TMT A is less affected by brain injury. Even though, as predicted, significant differences were found between the normal

and feign groups on both the TMT A 1-5 and TMT B 1-5, the ROC curve analyses revealed that TMT A 21-25 was a better predictor of group membership.

Participants' scores on the TMT A 21-25, along with the other malingering indices supported in literature, including one of the most well established indices of malingering, the RDS, were significantly correlated with the TEI full-scale and the Situations and Symptom subscales, particularly the after and change scores of these scales. The before scores of the TEI had only two significant correlations with the neuropsychological indices, both involving the TMT A 21-25. This is compared to 32 significant correlations for the after score and 19 significant correlations for the change score. The TEI Function subscale was only significantly correlated with one neuropsychological measure, despite the fact that the TEI Function subscale has similar before, after, and change score means as the Situation and Symptom subscales. It is somewhat surprising that the Symptoms subscale had a greater number of significant correlations with neuropsychological measures than the Function subscale. This may be because the Symptom subscale includes items (i.e., Forgetfulness, Poor Concentration, Unable to learn new things, and Unable to remember things that just happened) that are not typical of PTSD, some of which would negatively impact performance on neuropsychological measures, so if participants endorse these items, poor performance on neuropsychological measures would be consistent with their symptom profile. It should also be noted that IES-R scores were not significantly correlated with most of the neuropsychological indices of malingering despite the fact that participants endorsed a high level of pathology. This indicates that the significant correlations between the TEI

and the neuropsychological measures were likely caused by the types of items that were included on the TEI.

In general, these results support the efficacy of the TEI full-scale after and change scores, as well as the after and changes scores of the Situations and Symptoms subscales as possible malingering detection indices. Conversely, the before score of the TEI full-scale and subscales, as well as all scores of the Function subscale were not supported as malingering indices in this study.

Even though the before score was not highly correlated with the neuropsychological indices of malingering, it remains a very important component of the TEI, because without it, the change score would not be available. The after scores had the largest amount of significant correlations with the neuropsychological measures, but the change score may prove to be the most clinically relevant because it measures the changes in an individual's life that arose following a trauma. In other words, the change score is a direct reflection of perceived impairment related to the trauma, not preexisting conditions. In this way, the change score helps to control for pathology that was not caused by the trauma. The TSI, PAI, and various MMPI-II subscales do not have features that control for preexisting pathology, so it is hard to determine if items endorsed on these scales are directly related to a traumatic event. Since impairment must be attributed to a traumatic event in order for a diagnosis of PTSD to be given, it is important, especially in litigation, to determine if an individual's claimed level of impairment can be directly attributed to a traumatic event (Rosen & Taylor, 2007). Considering the change scores possible clinical utility, it is encouraging that the full-scale



TEI, as well as the Situation and Symptom subscale change scores were significantly correlated with one of the most well-validated indices of malingering, the RDS.

A stepwise regression analysis revealed that after scores on the Symptom subscale were the best predictor of RDS scores in this sample. Other stepwise multiple regression analyses further established the relationship between the TEI and the neuropsychological malingering indices, in particular, TMT A 21-25, Digit Symbol Raw Score, TMT A, and Digit Span Backwards Reversals.

Unfortunately, the TEI was not significantly correlated with another well established index of malingering, the 30 Minute Delay Forced Choice task of the RAVLT, but correlations between the Situations change score ( $r = -.256$ ) and the Symptoms after score ( $r = -.293$ ) were close to the level needed for significance, and these correlations may have been significant if there was a larger sample. Also, a stepwise regression analysis did not reveal any TEI scale scores that were significant predictors of the RAVLT 30 Minute Forced Choice task.

A limitation of the study was not administering the 60 minute delay portion of the RAVLT to participants who were instructed to perform normally. This made it impossible to compare scores of participants in the normal and feign conditions on the 60 minute delay index and the RAVLTX. The largest limitation in this study was the lack of a clinical PTSD sample without obvious incentives to malingering to serve as a comparison group. Unlike the neuropsychological measures, the TEI is useless when administered to individuals who do not have a traumatic event to reference. This is the reason that the TEI could not be given to participants in the normal condition of this study. Since we

could only give the TEI to participants who were instructed to feign PTSD, the correlations between the neuropsychological indices and the TEI had a restricted range. A restricted range will result in lower correlations. Considering the impact of the restricted range on the correlations analyzed in this study, the results should be viewed as more promising than if the same figures were obtained without a restricted range. It is likely that if a genuine PTSD group was included in the study, the correlations between the TEI and neuropsychological malingering indices may have been higher.

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