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Chronic Pain, Malingering, and the Word Memory Test

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Abstract

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Dawn Emmett-Bishop

MA, University of Phoenix, 2000

BS, Black Hills State University, 1993

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

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Abstract

The importance of using scientifically grounded strategies to detect malingering has been established in the literature and past research. Many reliable tools have been established for the detection of malingered neurocognition; however, research on how pain may affect these tools is sparse. The purpose of this study was to investigate the effect of pain on cognitive symptom validity testing and to establish the validity of the Word Memory Test (WMT), a cognitive symptom validity test with good sensitivity and specificity, when the test taker is feigning pain (simulating) or remembering pain. The biopsychosocial model and the gate theory of pain were used as a background in this study. In this experimental design, 60 participants were randomly assigned to a group that remembered pain while taking the WMT honestly and a simulated pain group who were instructed to fake pain and cognitive symptoms related to pain. Mann-Whitney *U* tests were used to compare the mean WMT scores for both short-term and long-term memory subscales between the two groups. The simulated pain group had significantly lower scores than the remembered group on all the scales of the WMT. Based on these results, it was concluded that remembered pain did not significantly affect performance on the WMT, and that the WMT is a valid test when administered to a client in pain. Further study is recommended using pain induction instead of remembered pain. The findings of this study can encourage positive social change by validating the testing of individuals who are being assessed for malingering and thus validate their symptoms. Individuals and society will derive benefits from fair and comprehensive evaluations that include the WMT leading to positive social change.

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Dedication

I dedicate this work to those who suffer daily from pain.

Acknowledgments

I am extremely grateful for my husband, who hugged me when I cried. I am extremely grateful to my parents, Don and Sherry Emmett, who were with me through this process for 15 years. They have stood by my side, watching kids, doing errands, and cleaning my house. I am grateful to my three boys, who grew up with a mom getting a doctorate and didn't get into too much trouble, go to jail, or become menaces to society! I am grateful to Drs. Benjamin Bushman, Carlos Vega, Bradley Johnson, and Lisa Scharff, who stood by me, encouraging me and guiding me despite the amount of time it took to finish!

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Chapter 1: Introduction

Malingering is a broad term used to describe the behavior of someone with external incentives to feign or exaggerate an illness or condition (Hall et al., 2014; Heilbronner et al., 2009). Detection of malingered pain in patients is difficult and has historically been given little attention (Larrabee, 2003a; Meyers & Diep, 2000). This is because the symptom of pain and its associated functional outcomes are not easily or objectively described by each person (Bianchini et al., 2014). Research in malingering has mostly focused on malingered head injury (Meyers & Diep, 2000); however, in the last 15 years, the assessment of malingered chronic pain through measurement of its reported effects on cognition has received increased attention (e.g., Bianchini et al., 2005; Etherton, 2014; Etherton, 2015; Greve et al., 2013; Keogh et al., 2013).

The International Association for the Study of Pain defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (Merskey & Bogduk, 1994, as cited in Nicholson & Martelli, 2004, p. 2). Chronic pain is pain that persists longer than six months (Skuladottir & Halldorsdottir, 2008; Ugurlu et al., 2016) and has been called “a fate worse than death” (Patavas, 2014, p. 203) affecting many areas of an individual’s life (e.g., finances and relationships). It is estimated that a third of all individuals will experience spinal pain in their life, with half of those experiencing chronic pain (Greve et al., 2013). The disruptive effects of pain on cognitive performance and executive control can greatly affect quality of life: “Chronic interruption by pain can lead to chronic distress and disability” (Keogh et al., 2013, p. 1).

On a societal level, disability claims due to chronic pain total millions of dollars, and many plaintiffs may claim consequent or concurrent cognitive problems and/or psychological impact from pain (Nicholson & Martelli, 2004; Povedano et al., 2007). Chronic pain has been described as a major health issue and a worldwide social and economic burden (Gosselin et al., 2010). Chronic pain may also affect cognitive abilities, exacerbating an already under-served health care problem (Bianchini et al., 2005; Keogh, et al., 2013).

The purpose of this study was to explore the impact of malingered pain and RP on performance on a stand-alone cognitive symptom validity test (SVT), the Word Memory Test (WMT; Armistead-Jehle et al., 2015). The WMT was administered to two groups: one that took the test while remembering pain and one that took the test while feigning pain-related cognitive impairment. SVTs help psychologists in both clinical and forensic settings because they can be used to assess neurocognitive function. They are also standard in neuropsychological evaluations (Willis et al., 2011). This study may help clinicians be more confident in determining validity of performance when using the WMT to assess individuals with chronic pain and cognitive impairment related to that pain. In turn, the research may help individuals suffering from pain-related cognition problems, their families, and health care providers and may address societal issues related to individuals who feign pain-related cognitive problems by adding to the research regarding validity testing of an instrument used to assess malingering of cognitive impairment.

Background of the Study

Malingering can be described as an extreme form of negative response bias or an individual not responding to the best of their ability (Young et al., 2016). Other related terms used throughout the research by professional organizations and by experts include credibility, response bias, performance validity, and symptom validity (Martin et al., 2015). These terms will be discussed and defined later in Chapter 1 in the definitions section.

Malingering Prevalence

There is a high base rate, or prevalence, of malingering in forensic neuropsychological settings because of the motivation for compensation (Ross et al., 2003). According to Hampson et al. (2014), most of the research on base rates has been conducted using disability benefit evaluations in medico-legal settings, where there is a higher likelihood of patient malingering. Estimates of malingering prevalence vary depending on the diagnosis and referral source (Mittenberg et al., 2002). Prevalence may also vary from study to study due to the type of population, and thus the type of claim (including psychological and/or cognitive impairments/deficits) may affect the statistic reported (Armistead-Jehle & Green, 2016; Lande & Williams, 2013). For example, in a review of 11 published studies of compensation-seeking cases of mild head injury, it was estimated that 40% of the patients were malingering based on the testing results (Larrabee, 2003b). Mittenberg et al. (2002) surveyed 131 members of the American Board of Clinical Neuropsychology (ABCN) who were actively in practice. The practitioners estimated a mean prevalence rate of malingering of 8% in non-litigation referrals in both medical and psychiatric cases. The large difference between the prevalence rates identified in the Larrabee (2003b) and Mittenberg et al. (2002) studies seems to be most likely due to referral type and whether the population under study was likely to be involved in litigation.

Clinicians use prevalence rates when gathering information to determine the likelihood of an individual feigning symptoms; however, generalizations are neither ethical nor considered good practice (Greve et al., 2009). “A fundamental aspect of any health care evaluation is the presumption that the examinee is providing frank reports of symptoms and valid demonstration of signs so that the examining professional can render an accurate diagnosis” (Armistead-Jehle & Green, 2016, p. 449). There are a variety of reasons someone may perform below their abilities (Rogers, 1990). Incongruent test scores or effort might be due to anxiety, depression, tiredness (Young et al., 2016), pain (Bianchini et al., 2014), or pain-related fear (Linton et al., 2008).

Greve et al. (2009) discussed problems in some prevalence studies of malingering. For example, studies that fail to describe participants accurately or consider the incentive of the patients are poorly designed and can mislead and misinform. For example, Greve et al. (2009) cite an early study by Miller (1961) in which patients were misrepresented as having chronic pain when they in fact had head injuries. Miller (1961), an early researcher who first described what came to be called malingering, noticed people with “accident neurosis” (p. 992) or patients that exhibited emotional problems when financial gain was a factor. Patients with accident neurosis generally improved and responded to treatment after a claim was settled (Miller, 1961). In his lecture discussing what would later be termed malingering, Miller misrepresented head injury patients as chronic pain patients (Greve et al., 2009; Miller, 1961).

Cognitive malingering base rates are more reliable than pain malingering base rates because there are reliable and valid SVT measures for cognitive impairment but none for the assessment of pain. Prevalence rates of malingering in chronic pain populations are generally less accurate because the gold standard of pain measurement is self-report, which is completely subjective (Tu et al., 2016). Fishbain et al. (1999) conducted a review of chronic pain disability research and estimated the possibility of malingering in this population varies a great deal, with a range of 1.25% to 10.4%. The authors also reported poor quality and unreliable methods of determining malingering pain in existing research (Fishbain et al., 1999). Chapter 2 will include a review of base rates or prevalence of malingering in cognitive impairment and chronic pain in the medical-legal arena and in private practice in more detail.

Evaluation of Malingering

Malingering can present itself as (a) an exaggeration of a symptomatic complaint, (b) an intentionally poor performance on neuropsychological or psychological testing, or (c) both exaggeration of a complaint and intentionally poor performance (Greve et al., 2013; Heilbronner et al., 2009; Iverson & Binder, 2000; Larrabee, 2000, as cited in Larrabee, 2003). Detecting malingering requires a multimodal approach, including assessment of cognitive and emotional symptoms as well as physical capacities (Heilbronner et al., 2009; Martin et al., 2015).

Clinicians who are asked to conduct psychological evaluations when legal issues or compensation are involved are obligated to determine the degree of claimant effort and help clarify the clinical diagnosis of the claimant (Frederick & Bowden, 2009; Heilbronner et al., 2009; Martin et al., 2015). Malingering is not a carelessly used term in legal proceedings due to the strict standards of scientific reliability and validity set forth by the legal system, with the precedent of Daubert v. Merrell Dow Pharmaceuticals, Inc. (Peck & Williams, 1993; Lees-Haley et al., 2002). The court ruling from that case stated that testimony from an expert must be both reliable and relevant (Carroll, 2015). An expert witness in a legal proceeding who diagnoses a claimant with malingering will be asked to provide scientifically grounded evidence that is both reliable and relevant (Lees-Haley et al., 2002). Clinicians rarely use the term *malingerer*, as they fear mislabeling someone, being threatened, or being sued (Brennan, 2007).

Reliable and relevant measures can help clinicians meet the requirements of litigation and legal proceedings when determining effort (Paradas et al., 2013). The term *effort* is used to describe and measure a test taker's true attempt to do their best on the testing in order to measure their true capabilities (Heilbronner et al., 2009). Clinicians and researchers use terms such as *poor effort, response bias, malingering, secondary gain,* and *exaggeration* to describe a petitioner who is attempting to feign test results for the purpose of gaining external reward (Heilbronner et al., 2009).

Symptom Validity Testing

SVTs are forms of objective, standardized testing used to determine participant effort (Martin et al., 2015). When a person fails an effort test in a forensic or legal setting, it is often assumed that other tests taken during the evaluation will also be invalid (Green et al., 2001). Additionally, the use of multiple tests during an evaluation is recommended because effort can vary throughout an evaluation (Berthelson et al., 2013). In a study by Green et al. (2001), the authors concluded that effort test failure is a good indication that other neurological testing is invalid or that answers were exaggerated.

Most psychologists today use embedded tests (scales that are an integrated component of other tests), stand-alone tests (independent from other testing), or self-report SVTs to determine malingering or exaggeration of symptoms (Martin, et al., 2015). Along with SVTs, detection of malingering focuses on the identification of inconsistencies (Martin et al., 2015; Mossman & Hart, 1996). Some examples are discrepancies between history and test data, clear exaggeration of symptoms, or reports that are inconsistent with how many sufferers describe their illness (Mossman & Hart, 1996).

Martin et al. (2015) surveyed practicing psychologists and found that SVTs are the most common method to determine participant effort. Sensitivity, specificity, and predictive power are the relevant categories of classification of SVTs and are discussed in court (Greve & Bianchini, 2003). Psychologists must prove relevancy and reliability of the SVTs they are using in evaluations (Greve & Bianchini, 2003). Fabrication or exaggeration of symptoms can occur in the neuropsychological and medical setting but is more common in the forensic or legal setting (Bush et al., 2005; Greve, et.al., 2013). Malingering or symptom exaggeration needs to be considered when litigation or compensation is involved, whether the testing being conducted is forensic or neurological (Greve et al., 2013; McGuire et al., 2001).

The Effect of Pain on Cognition

Chronic pain is multifactorial, complex, and can affect many aspects of an individual's life (Furnes et al., 2014). It can limit a patient's ability to perform their usual activities, induce social isolation, and create problems in various life transitions (e.g., job change due to chronic pain from an injury; Furnes et.al., 2014). Chronic pain is a severe and common problem, and often includes grief and loss (e.g., loss of function and/or relationships; Dysvik et.al., 2013).

The pain-cognition interlay becomes more complicated when ligation or compensation is involved. The consensus seems to be that, although pain may slightly change an individual's preinjury cognitive baseline functioning, it usually does not cause permanent cognitive impairment or prohibit gainful employment (Buhl & Wager, 2010; Burgmer et al., 2009; Gosselin et al., 2010). Although this may be true for most chronic pain sufferers, there remain many individual cases where true impairment exists. For that reason, accurate testing and detection of cognitive impairment is necessary. It is imperative to accurately determine if chronic pain affects cognitive functioning at the level of significant impairment in each individual case (Rubenzer, 2006). Individuals who are truly suffering from both pain and cognitive impairment might be dismissed and continue to suffer without adequate financial support if they are not appropriately identified.

There is considerable evidence that chronic pain can influence cognitive functioning (Buhl & Wager, 2010; Burgmer et al., 2009; Gosselin et al., 2010), semantic memory, episodic memory, visuospatial abilities, working memory, and attention (Niemi et al., 2002). These impairments can impact an individual's life psychologically (e.g., relationships) and financially (e.g., ability to work; Barr, 2013). Bianchini et al. (2005) called for more research into the detection and diagnosis of malingered pain, especially in relation to cognitive impairment, in order to help both the suffering individual and society. They suggest using the four lessons learned from past malingering research:

> 1. Proper research on malingering requires a method for operationalizing malingering;
> 2. To be clinically useful, summaries of malingering research must report sensitivity, specificity, and predictive power.
> 3. Specificity is more important than sensitivity or overall classification rate in developing malingering detection techniques;
> 4. The validity of estimates of classification accuracy depends on the purity of the criterion (malingering and control) groups. (Bianchini et al., 2005, p. 406)

The Word Memory Test

Psychologists use a battery of tests to determine effort (Heilbronner et al., 2009). Some commonly used cognitive SVTs, such as the Test of Memory Malingering (stand-alone), the Reliable Digit Span (embedded), and the Processing Speed Index (embedded), have been found to be reliable even in the presence of pain (Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005). In their studies, Etherton, Bianchini, Ciota, et al. (2005) and Etherton, Bianchini, Heinly, et al., (2005) used the cold pressor method to induce pain, which involves placing a hand or a foot in ice water while administering questionnaires to assess if pain impacts performance (Etherton, 2014). Pain did not significantly affect the validity of any of the three tests in the Etherton and associated studies (Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005).

The WMT (Armistead-Jehle et al., 2015) is a commonly used cognitive SVT that has not been investigated for the impact on validity when pain is present. This is a problematic gap in the research that this study addressed. The WMT is a well-researched forced-choice SVT that requires immediate and delayed recognition of words and can be a reliable method for evaluating effort (Sherer et al., 2015; Tan et al., 2002). Forced-choice recognition test items are used at immediate and delayed intervals, and a delayed free recall task is used as well (Frederick & Bowden, 2009). The WMT has both a high sensitivity and specificity, with 99 to 100% accuracy when discriminating between full effort and simulated memory dysfunction (Donders & Strong, 2013; Green et.al., 2001; Sherer et al., 2015; Tan et al., 2002).

Four continued areas of concern remain prominent in this research: attributions regarding failed SVT performance (Bigler, 2014), utilization and interpretation of multiple measures of validity (Berthelson et al., 2013; Bilder et al., 2014; Davis & Millis, 2014a, 2014b; Larrabee, 2014, as cited in Martin et al., 2015; Larrabee, 2014; Odland et al., 2015), appropriate descriptors for validity assessment measures (Larrabee, 2012), and relationships between cognitive performance, performance validity, and symptoms self-report (Van Dyke et al., 2013).

Problem Statement

It is important to assess the validity of patient performance in clinical settings in which there is an incentive to exaggerate disability (Etherton, Bianchini, Ciota et al., 2005). There are a vast number of strategies to detect malingering of neurocognitive symptoms (Etherton, Bianchini, Ciota, et al., 2005); however, strategies for detecting malingered pain, especially its effect on cognition, are sparse. Considering the cost of chronic pain to both the individual and society (Boersma & Linton, 2006) and that compensation for pain and suffering compromise a majority of worker's compensation and motor accident awards (McGuire & Shores, 2001), further research in detecting malingered symptoms associated with pain is worthwhile. This information can benefit individuals with claims who are suffering by validating their experiences as well as help identify individuals who are not honest in their symptom presentation, thus affecting societal costs.

Etherton, Bianchini, Ciota et al. (2005) and Etherton, Bianchini, Heinly, et al. (2005) have tested the effect of pain on one SVT (Test of Memory Malingering) and two internal validity indicators for the Wechsler Adult Intelligence Scale (the Processing Speed Index and the Reliable Digit Span) and reported that pain does not significantly affect the validity of these indices. The potential confounding factor of pain on the WMT has not been researched, and such an investigation could serve to strengthen the findings that SVTs are reliable and relevant, even in the presence of pain. This study deviated from the Etherton, Bianchini, Ciota, et al. (2005) and Etherton, Bianchini, Heinly, et al. (2005) studies in that a cold pressor test was not be used to induce pain. Rather, experimental group participants took the test while remembering the last time they felt pain. Some participants spontaneously stated that they were currently experiencing pain (e.g., they had chronic neck pain).

The developers of the WMT and their associates have conducted most of the validity research on this measure, and Bowden et al. (2006) have called for objective outside researchers to further study the usage of the test. Addressing the need for additional validity research (especially another SVT) and filling the gap regarding the effect of pain on the validity of the WMT were two problems that were addressed in this research. Identifying or discrediting pain attributions in failed cognitive validity tests can help both individual patients who truly suffer from pain and clinicians who are looking for additional utilization and interpretation of another SVT. The findings of this study may not only help the individual pain patient but may also be of potential benefit to the community as a whole by leading to work that could prevent costly treatments, work-related absences, and disability. In doing so, the research may help encourage positive social change.

Purpose of the Study

Research on validity testing, malingering, and participant effort in SVTs has increased in recent years (Martin et al., 2015). This research could help to ensure that people who are showing significant cognitive problems from pain are not misdiagnosed with malingering (Bar-On Kalfon et al., 2016). The research in this study may add scientific support for determining the efforts of test takers who experience pain and cognitive impairment, and it may also support the efforts of clinical psychologists and expert witnesses in their duty to uphold the Daubert standards. The findings will add to the evidence that may allow an expert witness to more confidently assert the impact of pain on the validity of the WMT.

The purpose of this true experimental quantitative research was two-fold. First it addressed the gap in the literature by contributing to research on the validity of the WMT when the test taker was remembering the experience of pain. Second, this research added to the detection, previously largely undetected, of malingered pain when cognitive impairment is an associated symptom.

Participants were from a convenience sample and consisted of volunteers who were randomly assigned to two conditions: feigned or simulated pain (SP) and remembered pain (RP). The individuals in the SP group were asked to take the WMT while feigning pain-related memory impairment, and the individuals in the RP group were asked to take the WMT to the best of their ability while remembering the last time they had pain (any type) and take the test as if they were still experiencing that pain. RP was used instead of cold pressor induction due to ethical concerns for participants, as medical oversight was not available at research locations.

Research Questions and Hypotheses

Research Question 1: Is there a significant difference in short-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

$H_0$1: There will be no difference between short-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).

H_a1: There will be a significant difference between short-term memory performance in individuals who are taking the test to the best of their ability while remembering pain (RP) and those who are feigning pain (SP group).

Research Question 2: Is there a significant difference in long-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

$H_0$2: There will be no difference between long-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).

H_a2: There will be a significant difference between long-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).

Research Question 3: Does the WMT serve as a valid test of effort when the test taker is suffering from RP?

$H_0$3: The WMT is not a valid test of effort when the test taker is suffering from RP. RP will impact the performance on the Word Memory Test, and there will not be a significant difference between the SP group and the RP group.

H_a3: The WMT will serve as a valid test of effort when the test taker is suffering from RP, and RP will not significantly impact performance. There will be a significant difference in the mean score between the SP group compared to the RP group, with the SP group scoring significantly lower than the RP group.

Theoretical Basis

In a historical review of pain theories, Estergard (2008) discusses the early philosopher Rene Descartes and ends with the most current theory, Engel's biopsychosocial model of pain (Engel, 1981). In the 17th century, Descartes described pain as traveling through the body through tiny threads to the brain and considered the mind, body, and soul as three different entities (Estergard, 2008). Descartes's theory, also referred to as specificity theory, was specific to what had been injured and was more concerned with precise tissue damage (the more tissue damage, the more pain the person experienced; Beecher, 1956; Melzack, 1999). Later, the Gate theory and the biopsychosocial theory of pain recognized that pain is much more complex and described pain as multifaceted and interactionary (Estergard, 2008).

Beecher (1956) noticed that there were two parts to pain: the initial sensation and then the reaction to the sensation. He explained that anxiety was most likely a factor in the amount of pain felt (Beecher, 1956). At the time, all wounded soldiers would automatically be given an analgesic; he suggested that people react differently to pain, and that each person should be asked about their own level of pain prior to dispensation of pain medication (Beecher, 1956).

The gate theory of pain evolved from discussions of the specificity theory between colleagues Ronald Melzack, Patrick Wall, and W. K. Livingston (Melzack, 1999). The discussions soon led them to the conclusion that there was a need for a new theory. The gate theory of pain introduced neural mechanisms to pain; it was conceived in 1962 and first published in 1965 (Melzack, 1999). Melzack believed the single most important contribution of the gate theory was the involvement of the central nervous system (CNS) as part of the physiology pain. The gate theory proposes that the brain has an active part in inhibition, excitation, and modulation of pain, whereas the specificity theory only focused on the peripheral factors of pain (Melzack, 1999).

The biopsychosocial model addresses both the trigger of pain and multiple reactions, such as psychological ones, to that trigger (Estergard, 2008). Engel (1981) developed the biopsychosocial theory in response to the biomedical model of pain. The biopsychosocial model is based on a systems approach and includes aspects (e.g., psychological and social) of the individual as important in the process. This is what Engel (1981) proposed was missing from the biomedical model. In the systems approach, each system is part of another system, making it both a whole and a part. Although the biomedical model only considered the disease or etiology that initially triggered pain, the biopsychosocial model also looks at the individual people with the pain, including their feelings and motivations in the continuation of pain (Engel, 1981).

In the past, pain was identified either as a psychological or a sensory phenomenon (Turk & Rudy, 1986). Considering all pain theories, it is apparent that pain has many etiologies as well as compounding and confounding factors (Barr, 2013). Although the exact variables and confounding factors of chronic pain are unclear, it is clear that pain can place physical and emotional demands and deplete cognitive resources (Attridge et al., 2017; Mathur et al., 2015). “Patients with chronic pain frequently complain of cognitive symptoms such as impaired memory or concentration with no history of head injury” (Etherton, 2014, p. 14). Chronic pain appears to alter the functional organization of neural brain networks (Farmer et al., 2012). However, Etherton and Tapscott (2015) point out, “The question of whether chronic pain consistently affects cognitive performance remains equivocal” (p. 243). The biopsychosocial model suggests that there are confounding factors in the pain-cognitive interaction, such as sleep deprivation, sedating narcotics, anxiety, and depression. It is important to control for the potential influence of pain on cognition as well as the “nonpain” confounds present in chronic pain patients by using laboratory-induced pain in nonclinical volunteers (Etherton & Tapscott, 2015). A more in-depth outline will be presented in Chapter 2.

Nature of the Study

This study is a quantitative experimental design comparing a control group of honest test takers who are remembering pain and a group faking cognitive impairment conditions. Each group took the WMT. The study was comparable in design to the Etherton, Bianchini, Ciota, et al. (2005) and Etherton, Bianchini, Heinly, et al., (2005) studies except for the cold pressor test. Instead, one of the groups took the WMT while remembering the last time they experienced pain; the other took the WMT while simulating pain. Prior to data collection, it was predicted that there would be significant differences in those who were remembering pain while taking the WMT honestly and those who were feigning pain-related cognitive impairment.

Definitions

Acute Pain: Acute pain is pain that has lasted less than 6 months (Skuladottir & Halldorsdottir, 2008).

Chronic Pain: Chronic pain is pain that has lasted 6 months or longer (Skuladottir & Halldorsdottir, 2008).

Embedded Measures: Validity indicators that are found in standard neuropsychological measures (Heilbronner et al., 2009, p. 1096).

Exaggeration: Exaggeration is a term used to describe when a person is embellishing symptoms for primary or secondary gain (Heilbronner et al., 2009).

Factitious Disorder: A diagnosis in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013) that is assigned when a person fakes symptoms of an illness in order to gain attention (Murdach, 2006).

Malingering: Malingering is a descriptive term for the actions of someone who intentionally exaggerates symptoms or intentionally diminishes capability in order to obtain an external award (Heilbronner et al., 2009).

Negative Response Bias (NRB): NRB is when true ability or abilities are misrepresented by the claimant in the presence of external gain; "when in the presence of the potential for external gain the valence of the response bias is negative" (Heilbronner et al., 2009, p. 1100).

Predictive Power: The amount of confidence one can have that a particular test is accurate (Greve & Bianchini, 2003).

Poor Effort: A term used to describe when a person is not using their full capabilities on a psychological test or other behaviors in a psychological evaluation (Heilbronner et al., 2009). Effort level is not black and white; it is usually measured on a continuum and can vary in incidence and prevalence (Heilbronner et al., 2009).

Primary Gain: Primary gain is a term used to describe internal incentives that satisfy internal incentives, such as attention from family, friends, or medical staff (Gatchel, 2004; Heilbronner et al., 2009).

Remembered Pain: This study asked participants to remember the last time they experienced real and honest pain with a wide variety of pain experiences (Adamczyk et al., 2019; Etherton, 2014; Etherton, 2015; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015).

Response Bias: Response bias is when true ability or abilities are misrepresented by the claimant (Heilbronner et al., 2009).

Secondary Gain: Secondary gain is a term used to describe when external incentives exist, such as financial reward, compensated time away from work, avoidance of military duty, relief from legal consequences, and obtaining medications/narcotics (DSM-IV-TR, APA, 2000). The American Academy of Clinical Neuropsychology (AACN) recommends that the term "secondary gain" be limited to the context of the evaluation taking place and not be used as a synonym of malingering (Heilbronner et al., 2009).

Sensitivity: “The true positive (Hit) rate for a test (number of persons with a condition who had a positive test result divided by all persons with the condition)” (Greve & Bianchini, 2003, p. 553). A test has good sensitivity when it correctly identifies the population it is said to identify (Greve & Bianchini, 2003).

Somatization: A long-term chronic condition that involves one or more body parts but for which a physical cause cannot be found (Noyes et al., 2006).

Specificity: “The true negative rate (number of persons without a condition who had a negative test result divided by all persons without the condition)” (Greve & Bianchini, 2003, p. 553).

Symptom Validity Tests: Symptom validity tests are psychological tests that are used to determine the effort of a test taker; “chance performance on an SVT requires active avoidance of correct response(s)” (Bianchini et al., 2001, p. 20).

Assumptions

The proposed study examined potential differences in short-term and long-term memory performance in individuals who are taking the WMT using their best ability while remembering pain and those who are feigning cognitive impairment while taking the WMT. I assumed that participants in the RP group performed honestly and to the best of their ability on the WMT. It was also assumed participants in the feigning group were exaggerating symptoms of cognitive impairment to the best of their ability. I assumed that participants were truthful when asked about their medications and illnesses in the pretest survey. Last, I assumed that participants were honest about being in good health while taking the WMT.

Scope and Delimitations

Only participants who were healthy without cognitive difficulties, according to self-report, and took the WMT using the best of their abilities were included in the study. A convenience sample was taken from healthy, English-speaking participants limited to the ages between 18 and 95. The study was limited to healthy individuals in order to limit potential risk to participants. The participant pool was mostly limited to a small geographic area in the Southwestern United States. The findings were limited to this population and are not generalizable beyond it.

Limitations

Although cold pressor is the standard laboratory method of inducing pain, this study did not use this method. It is impossible to address all pain and cognitive conditions in real-life settings (Etherton & Tapscott, 2014) when asking a group to remember pain. It is difficult to "isolate the effects of pain from effects of other variables that may affect cognition, such as sleep deprivation, emotional disturbance, or sedating pain medications" in real-life chronic pain patients (Etherton & Tapscott, 2014, p. 243). It was likely difficult for participants to continue to remember pain as they took the WMT, and this is a possible limitation compared to the Etherton studies. See a further review in Chapter 2. In addition, due to the small pool of study participants and limited geographic location, they may not represent a true representation of the general population, which is a limitation of this study. Additionally, the scope of this study was limited to the WMT, and the findings cannot be generalized to other SVTs.

Significance

It is expected that this study provided current information and knowledge when considering the effects of pain on cognition, identifying malingering, and utility of the WMT in the assessment of individuals with chronic pain. The variability of functioning in chronic pain patients is independent of the level of pain experienced, and this fact illustrates the importance of replication studies (Attridge et. al, 2017; Etherton &Tapscott, 2014). This study is a close replication of previous research, using a different SVT, and will advance practice and policy implications in both clinical and forensic settings.

Providing advanced and continued study on the pain-cognitive interaction may instigate social change for both individuals and clinicians. This research has the potential to help those who honestly suffer from pain and consequent cognitive impairment by aiding in validating a test of symptom validity. It is reasonable to expect chronic pain may "contribute to cognitive deficits in some patients" (Etherton, Bianchini, Ciota, et al., 2006, p. 70). The study of SVTs furthers the clinician's toolbox to find objective means to evaluate the pain-cognition indicators. The findings of this study offer evidence regarding the WMT as a viable SVT to use when evaluating pain-cognition interactions in both clinical and forensic settings. As such, individuals who suffer from cognitive impairment secondary to pain will be aided by evidence that the findings of testing are valid. This evidence may additionally help clinicians who are required to review that evidence as well as individuals who have the responsibility of evaluating disability claims. Any evidence that may help determine the validity of such claims may benefit society in general, given the large financial burden that disability claims place on the population.

Summary

Chronic pain can affect many areas of a person's life, and the purpose of this study was to clarify and extend research concerning the assessment of the pain-cognition interaction. In this chapter, the research regarding malingering prevalence was discussed, followed by evaluation of malingering and poor effort. The gap in the research that the proposed study filled was reviewed. The importance of SVTs as well as the importance of testing their validity in chronic pain populations was addressed. I introduced the research design as well as the research questions. The research may help determine if pain significantly affects cognition when using the WMT, a common SVT test used in clinical settings. This study also expanded research in the pain-cognition phenomenon.

Chapter 2: Literature Review

Chronic pain is subjective and multidimensional and can cause severe distress in individuals (Fishbain et al., 2015). Disability due to chronic pain has received increased attention in the literature in the last 14 to 15 years (Cook et al., 2015; Ferreira et al., 2016; Nicholson & Martelli, 2004; Povedano et al., 2007). This is largely because claims for disability from chronic pain total millions of dollars, and plaintiffs may claim consequent or concurrent cognitive and/or psychological problems (Cook et al., 2015; Ferreira et al., 2016; Nicholson & Martelli, 2004; Povedano et al., 2007). Chronic pain has been described as a major health issue and is a worldwide social and economic burden (Gosselin et al., 2010).

This chapter will attempt to provide an understanding of malingering by first defining the term and second by discussing current research regarding malingering behavior. The focus will then be narrowed to pain and malingering; more specifically, malingering in chronic pain will be discussed. The effects of pain on cognition will then be reviewed. Understanding the effect of pain on cognition is important in the assessment of suffering and the extent to which an individual is functional; thus, research in this area will also be discussed and reviewed. Standardized assessment measures that can objectively measure cognitive effort will also be reviewed, with a focus on the WMT and its reliability in measuring participant effort when pain is a confounding factor. Previous literature on the validation of SVTs will be reviewed, with a focus on the gap in the literature that the proposed research seeks to fill.

Search Strategy

A comprehensive literature search was conducted. Key words in the search included *malingering, chronic pain, pain and malingering, chronic pain and malingering, malingering prevalence, symptom validity testing, effort, Word Memory Test, Reliable Digits, Test of Memory Malingering, cognition and pain, cognitive impairment and pain, pain medication and cognitive impairment, pain induction laboratory,* and *cold-pressor*. The databases used in the literature search included CINAHL Plus, CINAHL Select, MEDLINE, ProQuest, PubMed, Science Direct, PsycARTICLES, PsycINFO, SocINDEX, Psychology: A SAGE Full Text Collection, and Nursing and Allied Health Sources. Dissertation and thesis databases were also searched through the Walden University library. Articles were also obtained by looking up references in relevant articles. Primary researchers involved with symptom validity testing and pain were also examined, including (in alphabetical order): Bianchini, Etherton, Fishbain, Green, Greve, and Larrabee. Drs. Benjamin Bushman and Lisa Scharff also provided articles.

Theoretical Foundation

The gate theory of pain and the biopsychosocial model best describe the multifactorial experience of pain, including psychological and physiological properties (Estergard, 2008). The gate theory first introduced the central nervous system as part of the physiology of pain (Melzack, 1999) and can explain the physiological aspects of pain (Katz & Rosenbloom, 2015). Physiologically, there is some indication that pain can disrupt attention (Attridge et al., 2017).

It is theorized that pain imposes “avoidance, escape, and analgesic behavior” (Attridge et.al, 2017, p. 8), indicating psychological reactions to pain. For example, pain may interfere with attention or performance on tests (Attridge et al., 2017). The biopsychosocial model addresses psychological reactions and pain triggers (Engel, 1981). Some researchers have opined that psychosocial factors are the most important predictors of the development of chronic pain and pain-related disability (Etherton et al., 2014). According to the biopsychosocial model, chronic pain has a negative impact on quality of life as well as other systems in that patient’s life (Etherton et al., 2014). The identification of malingered pain is difficult, especially when there may be some pain, but the patient exaggerates the severity and the extent of its impact on functioning (Bianchini et al., 2004; Lame et al., 2005). In a meta-analytic review, Rohling et al. (1995) found that chronic pain patients seeking compensation rated themselves higher on pain scales in comparison to noncompensation-seeking patients ($p < .0005$). After reviewing the findings and considering other factors (e.g., compensated patients have a higher level of pain or more physical impairment), Rohling et al. (1995) stated that the most likely explanation is that financial compensation can impact pain report.

The biopsychosocial model is a systems approach and recognizes that multiple factors, both psychological and environmental, are present and affect individuals (Engel, 1981; Moayedi, & Davis, 2013). Additionally, psychologists must feel confident in the SVTs they use, despite individual differences and factors (i.e., pain, cognitive dysfunction) in test takers (Turk & Rudy, 1986). The proposed study used the biopsychosocial model in its design to contribute information to the literature about the validity of the WMT to detect malingering in individuals who report cognitive impairment due to chronic pain. The study design controls for multiple factors, with the recognition that pain is a complex phenomenon.

Malingering

Malingering is most commonly identified in situations where an individual is likely to benefit financially from having physical symptoms, such as pain or neurological impairment (Heilbronner et al., 2009). During the American Academy of Clinical Neuropsychology (AACN) Consensus Conference meeting in 2008, a consensus statement was developed to help diagnose possible cases of malingering using empirical evidence from psychological and neuropsychological science (Heilbronner et al., 2009). The consensus statement offered definitions and recommendations for practitioners and evaluators in several different areas related to effort, response bias, and malingering (Heilbronner et al., 2009). Prior to this consensus statement release, Ardolf et al. (2007) opined that the definition of malingering was not clear, citing the fact that most clinicians who work with these patients used the criteria developed by Slick et al.(1999), who defined malingering as "the volitional exaggeration or fabrication of cognitive dysfunction for the purpose of obtaining substantial material gain, or avoiding or escaping formal duty or responsibility" (p. 552).

Conference participants were able to offer better definitions and protocol when considering effort, response bias, and malingering (Heilbronner et al., 2009). However, they acknowledge that these definitions and recommendations are not "static" and the “evolution of these topics is inevitable” (Heilbronner et al., 2009, p. 1121). Recent consensus positions are further explained throughout Chapter 2.

Malingering itself is not considered a form of mental illness and is not listed as a disorder in the DSM 5 (APA, 2013); however, it is a phenomenon that may occur along with a mental illness (Anderson, 2008). Although the term ‘diagnosis’ is used throughout the literature when identifying malingering, it is not a psychiatric illness, nor is a disease process implied (Heilbronner et. al., 2009). The AACN committee concluded that clinicians can diagnose malingering (whether an intentional or unintentional exaggeration) through the application of scientifically grounded psychological and neuropsychological science (Heilbronner et al., 2009).

Intentional exaggeration of symptoms can indicate the existence of malingering or factitious disorder (feigning illness for noncompensatory reasons), and unintentional exaggerations can indicate the presence of somatoform pain disorder or cogniform disorder (Heilbronner et al., 2009). Somatoform disorder with predominant pain (previously known as somatoform pain disorder) is when one or more somatic pain symptoms cause distress and result in significant disruption of daily life, as well as excessive thoughts, feelings, or behaviors related to somatic symptoms (APA, 2013). Cogniform disorder is not a diagnostic category in the DSM-5 (APA, 2013) but has been proposed as a diagnostic category to consider adding; Delis and Wetter (2007) describe it as excessive cognitive complaints.

As stated in the AACN conference statement, diagnostic classifications and definitions of malingering can help the clinician make scientifically and ethically sound clinical decisions (Heilbronner et al., 2009). This was part of the consensus. Additionally, it is important to base decisions on empirically based prevalence rates and scientifically grounded SVTs or forced-choice neuropsychological testing that has reliable sensitivity and specificity rates (Martin et al., 2015; Spadoni et al., 2015).

At the AACN conference in 2008, the consensus statement (Heilbronner et. al., 2009) invited clinicians to use a combination of classification systems developed by Slick et al. (1999) and Bianchini et al. (2005) to determine if a patient is malingering. Slick et al. (1999) suggested three categories of malingering; they include definite, possible, and probable.

To fit in one of these categories, one or a combination of four criteria must be met: (a) presence of a substantial external incentive, (b) evidence from neuropsychological testing, (c) evidence from self-report, and (d) behaviors from criteria b and c are not fully accounted for by psychiatric, neurological, or developmental factors (Slick et al., 1999). Definite malingering is said to occur when there is presence of a substantial external incentive, a definite negative response bias, and behaviors are not fully accounted for by psychiatric, neurological, or developmental factors (Slick et al., 1999). Probable malingering is indicated when there is a substantial external incentive, evidence from two or more types neurological testing or one piece of evidence from testing and one from self-report, and behaviors are not fully accounted for by psychiatric, neurological, or development factors (Slick et al., 1999). Possible malingering is identified when there is presence of a substantial external incentive, evidence from self-report, and behaviors are not indicated by psychiatric, neurological, or developmental factors.

In contrast, Bianchini et al. (2005) focus on an integrated and systematic analysis from multiple sources, detection indices that are both reliable and valid, the use of specificity and positive predictive value in SVT testing, and the use of SVT tests that have used at least two criterion groups (e.g., malingering and a non-malingering control) to determine sensitivity and specificity. Both systems consist of empirically based protocols (Heilbronner et. al., 2009). Heilbronner et. al. (2009) stated these criteria were far better than those listed in the DSM-4 (APA, 2000) because they are aligned with appropriate clinical and forensic guidelines set forth by the AACN and the Committee on Ethical Guidelines for Forensic Psychologists (1991). During the development of the DSM-5 (APA, 2013), the APA completely eliminated the malingering diagnosis. In a survey of 316 North American neuropsychologists, Martin et al. (2015) found most clinicians accept the consensual dual diagnostic criterion of Slick et al.(1999) and Bianchini et al. (2005) when assessing malingering.

In addition to diagnostic criteria for malingering, psychologists should understand the prevalence of malingering in the populations with which they are working. Base rate and posttest odds (or the prevalence of malingering) are important when establishing a strong scientific background for malingering (Greve et al., 2009). The prevalence of malingering varies by “diagnosis or referral circumstances” (Mittenberg et al., 2002, p. 1094).

Malingering should be suspected in the medico-legal context when there is a marked discrepancy between claimed stress or disability and objective findings, when there is lack of cooperation during diagnostic evaluations and/or treatment, or when the client also meets criteria for Antisocial Personality Disorder (Spadoni et al., 2015). The DSM-4-TR (APA, 2000) classified malingering as a V code. A V code is behavior that is worth clinical attention but does not qualify as a mental disorder (Slick et al., 1999). Malingering remains a V code in the DSM 5 (APA, 2013).

Malingering was first described as a means of avoiding military service; however, the definition has broadened to a general definition of falsifying and exaggerating symptoms in many different settings and includes external incentives, such as obtaining compensation, acquiring drugs, avoiding work, or evading criminal prosecution (Anderson, 2008). Some believe that the final determination of malingering is best left for a court to decide and not a report prepared for legal purposes (Anderson, 2008). Others believe malingering, or the intent of an individual claimant, can be detected in a clinical setting with statistical accuracy using psychological and neuropsychological science (Heilbronner et al., 2009).

Differential diagnosis between malingering, somatic disorders, and related diagnoses, such as conversion disorder and factitious disorder, can be a daunting task. The concept of somatization was first introduced over 100 years ago, when Freud coined the term conversion (Freud, 1959). He used the term conversion to describe patients who presented with neurological symptoms that did not have any demonstrable physical or medical basis. Freud posited that conversion disorders were a result of unconscious psychological conflicts (Freud, 1959). Other authors have suggested that malingering and factitious disorder are under volitional control, whereas conversion disorder is described as being due to unconscious motivations (Slick et al., 1999). Internal psychological incentives, such as attention seeking, are said to motivate conversion and factitious disorder, whereas external incentives, such as monetary awards, obtaining prescription medications, or legal consequences, motivate the malingerer (Slick et al., 1999).

Somatic disorders listed in the DSM-5 include somatic symptom disorder, illness anxiety disorder, conversion disorder (functional neurological symptom disorder), psychological factors affecting other medical conditions, factitious disorder, other specified somatic symptom and related disorder, and unspecified somatic symptom and related disorder (APA, 2013). The common thread in somatic symptom disorders in the DSM-IV-TR (APA, 2000) used to be “presence of physical symptoms that suggest a medical condition but are not fully explained by a general medical condition, direct effects of substance, or by another mental disorder” (p. 485). However, the DSM-5 (APA, 2013) acknowledges that somatic disorders can be comorbid with medical conditions (APA, 2013; see Table 1).

Table 1

Differences between Malingering, Factitious Disorder, and Somatic Symptom Disorders

Disorder/Condition	Drive	Incentive	Reward
Factitious Disorder	Conscious	Internal (primary gain)	Internal
Malingering	Conscious	External (secondary gain)	External
Somatic Symptom Disorder	Unconscious	Internal	External

The AACN established consensus on the assessment of participant effort, response bias, and malingering (Heilbronner et al., 2009). The researchers on the panel concurred that malingering is a descriptive term that can be adaptive, that intent should be considered (external or internal gain), and that the best way to assess intent is to rule out other possible circumstances, such as psychological, neurological, and developmental conditions. Malingering is not the same as secondary gain, although the terms tend to get confused with each other in the literature (Heilbronner et al., 2009). Secondary gain is the descriptive word regarding the context of a situation (Heilbronner et al., 2009). Secondary gain is the presence of an external incentive(s; e.g., monetary reward, or non-monetary incentives such as drugs, avoidance of responsibility, or escape from undesirable or intolerable conditions) that could be a reason for malingering (Heilbronner et al., 2009). An individual who is malingering may exaggerate or feign symptoms for secondary gain (Heilbronner et al., 2009).

Slick et al. (1999) opine that dichotomous diagnostic criteria, such as external versus internal psychological incentives or volitional versus unconscious control, make an easy definitional category in theory; however, in practice “black and white” decisions are more problematic. In some instances, internal and external incentives appear together (Slick et al., 1999). In a forensic setting, diagnostic criteria and models aid in the detection of malingering. The difficulty lies in differential diagnoses including neurological conditions, psychiatric conditions, and motivational factors (Bordini et al., 2002). Slick et al. (1999) noted the problems of previous models or diagnostic/assessment protocols, especially in the DSM-IV (APA, 1994).

When considering malingering in an evaluation, the clinician needs to determine intent. There are two ways to deceive or invalidate an evaluation: diminishment/reduction of capabilities or exaggeration of symptom complaints (Heilbronner et.al., 2009). The AACN Consensus Conference concluded that the best way to determine intent is to rule-out other possible contributions, such as psychological, neurological, and developmental conditions (Heilbronner et al., 2009). Generalizations and consequent inferences should have a strong scientific foundation (Heilbronner et al., 2009).

Prevalence and Impact

Base rate and posttest odds for the particular population, or the prevalence of pain-related malingering, are important to know when establishing a strong scientific background for malingering (Greve et al., 2009). Estimates of malingering prevalence can have implications for policy making and clinical practice (Greve et al., 2009). There is generally a high base rate of malingering in forensic neuropsychological settings because of the motivation for compensation (Ross et al., 2003). Understanding prevalence rates by type of claim alerts the clinician to the different categories of malingering.

Clinicians use prevalence rates while gathering information from the claimant to determine the likelihood of feigning. Clinicians are aware that subjective reporting of symptoms is not the only information to use when considering a claim for compensation. However, prevalence rates should not be used as an assumption of individual intent; generalizations for all plaintiff circumstances are not ethical or considered good practice (Greve et al., 2009). Estimation of malingering prevalence varies from study to study, and the claim type (including psychological and/or cognitive impairments/deficits) affects the statistic reported. Greve et al. (2009) discussed problems in some malingering prevalence studies. For example, several studies fail to consider the incentive for the patients or include subjects with a certain type of disability (head injury) and report information about another (chronic pain).

Dependable studies on malingering not only use the intended population but also look at a medico-legal cohort. Reliable base rate studies on malingering include Binder’s (1993) study, which suggested that malingering occurs in 18% to 33% of litigating mild head injury cases. Mittenberg et al. (2002) posit that this percentage is closer to 39%. Donders and Boonstra (2007) found a 24% rate of Negative Response Bias (NRB) in patients after a traumatic brain injury in at least one of four validity variables (SVTs). Larrabee (2003) identified NRB in 40% of civil forensic cases. Base rates for noncredible somatic disability and noncredible cognitive performance disability are in the range of 30% to 40% (Greve et al., 2009).

Gervais et al. (2001) reported that malingering rates in chronic pain patients may be as high as 40%. In a review of reliable studies conducted with chronic pain patients, Greve et al. (2009) suggested that there is a malingering base rate of 20% to 40% in chronic pain. Greve et al. (2005) examined data from 508 consecutive cases with plaintiffs who had filed chronic pain complaints and who also had financial incentives that were referred for psychological evaluation. Data included cases from 1995 to 2005 and encompassed patients who reported pain-related disability regardless of injury type, location, or etiology, with most complaining of back pain. Most patients were receiving treatment, including medication, injections, and physical therapy. Using two methods for diagnoses, the Bianchini et al. (2005) criteria for malingered pain-related disability (MPRD) and the Slick et al. (1999) criteria for malingered neurocognitive disability (MND), in addition to statistical data, they estimated a 20% to 50% malingering prevalence rate for their sample (Greve et al., 2005). Although prevalence rates are variable within studies, collectively they indicate that the incidence of malingering is relatively high in the medico-legal context, especially among plaintiffs who present with chronic pain symptoms or head injury when there is potential secondary gain.

Diagnostic Classification and Models of Malingering

Prevalence or establishment of a strong scientific foundation cannot be studied with any certainty without clear operationalized classification or models; this concept was established as good practice in the AACN consensus statement (Heilbronner 2009). Criteria for malingering can serve to classify and identify, and models can aid in prediction (Bordini et al., 2002). Classification ensures the science of detection and treatment by promoting commonalities in clinical and research populations. Professional communication, delivery of services, and defining populations for research are other benefits of classification and models (Slick et al., 1999). Operationalized classification and models of malingering can also facilitate communication between medical and psychological fields.

Mechanic and Volkart (1960), in a seminal article, discussed how people look at sickness in different ways. They observed that some patients adopt the sick role more readily than others. They also were the first medical researchers to reach out to the behavioral sciences to gain an understanding of patient reporting and possible bias, and they coined the term “selectively biased population” for people who present characteristics outside of the particular illness pattern of symptomology (Mechanic & Volkart, 1960, p. 86). Pilowsky (1969) labeled atypical reactions to illness as Abnormal Illness Behavior (AIB). He posited that some psychiatric syndromes, such as hypochondriasis, conversion reactions, hysteria, psychogenic pain, neurasthenia, and malingering, are all AIB. He further divided AIB groups into illness-affirming and illness-denying categories, with malingering placed in the illness-affirming category. Rogers (1990) later categorized theoretical models of malingering as pathogenic, puritanical, and adaptational. Pathogenic models view malingering as a mental disorder, and puritanical models explain malingering with a moralistic connotation (Rogers, 1990). Rogers stated that the DSM criteria for malingering stands in the puritanical model. The adaptational model depicts malingering as conscious engagement in a cost benefit analysis, with a decision to malinger based on perceptions of success (Rogers, 1990).

Later, Slick et al. (1999) developed four criteria for malingered neurocognitive dysfunction (MND) and set them in three possible categories: possible, probable, and definite malingering. Brennan (2007) proposed that Slick et al. (1999) is the most "thorough and systematic" (p. 7) way to assess and diagnose malingering, and it is currently the most commonly used classification model. Slick et al. (1999) used their model in patients with traumatic brain injuries, and the criteria is now applied to many different medical populations, as well as other types of malingering, such as chronic pain (Bianchini et al., 2005).

According to Slick et al. (1999), in order to be placed into one of the three categories, the patient should fit into one or a combination of the four criteria, which include:

> Criterion A: Presence of a substantial external incentive. At least one clearly identifiable and substantial external incentive for exaggeration or fabrication of symptoms (see definition) is present at the time of examination (e.g., personal injury settlement, disability pension, evasion of criminal prosecution, or release from military service).
>
> Criterion B: Evidence from neurological testing. Evidence of exaggeration or fabrication of cognitive dysfunction on neuropsychological tests, as demonstrated by at least one of the following:
>
> > 1. Definite negative response bias. Below chance performance (p <.05) on one or more forced-choice measures of cognitive function.

2. Probable response bias. Performance on one or more well-validated psychometric tests or indices designed to measure exaggeration or fabrication of cognitive deficits is consistent with feigning.

3. Discrepancy between test data and known patterns of brain functioning.

4. Discrepancy between test data and observed behavior.

5. Discrepancy between test data and reliable collateral reports.

6. Discrepancy between test data and documented background history.

Criterion C: Evidence from Self-Report. The following behaviors are indicators of possible malingering of cognitive deficits, but their presence is not sufficient for the diagnosis. However, presence of one or more of these criteria provides additional evidence in support of a diagnosis of malingering. These criteria involve significant inconsistencies or discrepancies in the patient's self-reported symptoms that suggest a deliberate attempt to exaggerate or fabricate cognitive deficits.

1. Self-reported history is discrepant with documented history.

2. Self-reported symptoms are discrepant with known patterns of brain functioning.

3. Self-reported symptoms are discrepant with behavioral observations.

4. Self-reported symptoms are discrepant with information obtained from collateral informants.

5. Evidence of exaggerated or fabricated psychological dysfunction.

> Criterion D: Behaviors meeting necessary criteria from groups B or C are not fully accounted for by Psychiatric, Neurological, or Development Factors. (Slick et al., 1999, pp. 552-555)

Another categorization system for malingering is pure, partial, simulation/dissimulation, and false imputation (Anderson, 2008). Pure malingering is when a claimant lies about all symptoms. An example of a pure malingerer would be someone who claims they are experiencing chronic pain after an injury while not feeling any pain. Partial malingering is when the patient has symptoms but may exaggerate the extent that the symptoms affect daily functioning. For example, someone who has depression, but is adequately treated to the point of being functional, states that they cannot function or perform any duties at work (Anderson, 2008).

Dissimulation occurs when the person denies problems that “would otherwise account for the symptoms” (Anderson, 2008, p. 1). This is commonly found in drug abuse, where someone attributes a symptom of drug abuse to another cause. An example of this is when someone claims that their inability to sleep is due to pain when it is an addiction to prescription pain medication that keeps them awake. Simulation is when someone imitates symptoms of a specific disability. An example of simulation would be an individual demonstrating symptoms of posttraumatic stress disorder (PTSD), such as hyper vigilance, when they do not have that symptom. Lastly, a person who misattributes real symptoms or illness to a different source would be labeled with false imputation. For example, a person who was injured at home and then claims that the injury occurred at work is an example of false imputation (Anderson, 2008).

Research Models of Malingering

Mechanic and Volkart (1960) discussed the importance of studying patients' subjective reports of disease and illness in the laboratory and in the context of function. Most research on the assessment of effort, response bias, suboptimal psychological effort, detection by means of objective indices, and malingering has occurred in the last 25 years (Binder, 1993; Bordini et.al., 2002; Heilbronner et al., 2009; Rogers, 1990). Subjective patient reports of many symptoms can now be objectively examined through effective methods and instruments, such as SVTs, performance curves, floor effects, and validity indices, all of which may detect symptom exaggeration (Heilbronner et al., 2009).

Research on Memory of Pain

For convenience, this study asked some of the participants to remember a time when they experienced pain while taking an SVT, the WMT. While research on the memory of pain is varied and complicated, some research illustrates that participants report pain accurately, some research indicates that participants overestimate their pain, and some research shows that participants underestimate on how pain is remembered (Adamczyk et al. 2019). There are many reasons why people may not perfectly remember their pain. Adamczyk et al. (2019) describe two important factors that affect the memory of pain: type of pain and recall delay. "Type of pain" can include "origin of pain and duration," such as chronic pain, naturally occurring acute pain, and experimentally induced pain. Recall delay is explained as the time in between the pain experience and the time the pain is recalled or remembered.

Research Pain Induction and Remembered Pain Methods

This study did not use pain induction strategies; however, it is important to review those strategies in the context of previous literature, especially when this study used some methods from research that used cold pressor induction. The validity and generalizability of research in the detection of malingering is subject to weighing strict experimental control against generalizations to real clinical situations (Etherton & Axelrod, 2013; McGuire et al., 2001). Unfortunately, clinical research about malingered pain and, especially, chronic pain is complicated and multifactorial in nature (Bianchini, et al., 2014; Svensson & Arendt-Nielsen, 1995). Most research in the detection of malingered pain uses simulated research models in healthy subjects out of convenience as well as the belief that simulated acute pain can be similar to real chronic pain (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017). Only acute pain induction is used in research settings, as chronic pain induction may have long-term effects (such as tissue damage) on the participant and would be unethical to use (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al, 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017).

In the laboratory setting, pain is most often induced in healthy participants through the cold-pressor procedure, a commonly used method of pain initiation that induces moderate to severe pain (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al.., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017). Other less used methods to induce pain are thermal, ischemic, exercise-induced, electrical, mechanical, and chemical (Buhl & Wager, 2010; Remy et al., 2003; Richardson et al., 2010; Svensson & Arendt-Nielsen, 1995; Terrighena et al., 2017). Most techniques used to induce pain focus on the activation of cutaneous nociceptors (Svensson & Arendt-Nielsen, 1995). Pain inducement using external stimuli employs exogenous pain models (i.e., electrical, mechanical, and chemical), and pain inducement using internal stimuli is based on endogenous pain models (i.e., ischemic and exercise-induced; Svensson & Arendt-Nielsen, 1995).

This research is modeled after the work of Etherton and colleagues, who have conducted studies to validate other assessment instruments that assess malingering and cognitive functioning, such as reasoning, processing speed, comprehension, and conceptualization. This research has focused on subtests of the WAIS-III and WAIS-IV as well as Wechsler Memory subtests, such as the Reliable Digit Span, Working Memory Index, Processing Speed Index, Visual Working Memory Index (VWM), and Auditory Memory Index (IAM) (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Ciota, et al., 2006; Etherton, Bianchini, Heinly, et al., 2006; Tapscott & Etherton, 2015). Stand-alone validity tests, such as the TOMM and the PASAT, have also been studied (Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015).

Some of the Etherton et al. studies (e.g., Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton, Bianchini, Ciota, et al., 2006; Etherton, Bianchini, Heinly, et al., 2006) administered the assessment instruments to participants randomized to three conditions: standard administration without cold pressor pain, standard administration with cold pressor pain, or administration with instructions to simulate cognitive impairment due to pain without cold pressor pain. Newer Etherton studies used randomization to only two conditions: standard administration with and without cold-pressor pain (Etherton, 2014; Etherton, 2015; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015). All participants placed their hand in water, with the pain group experiencing cold water emersion and the control group experiencing room temperature emersion.

This study utilized a two-group design. One group was like the Etherton studies and was given administrative instructions to simulate cognitive impairment due to pain without the cold pressor pain. The second group took the WMT while remembering true pain. Although there are no published studies asking participants to remember pain while replicating the Etherton model, there are other studies that asked participants to remember past real pain experiences (Adamczyk et al., 2019; Babel, 2017). For example, Adamczyk et.al (2019) are proposing a systematic review and meta-analysis of how adults remember pain because of the lack of studies on this subject. Research on the memory of pain or RP is varied and complicated and, although their meta-analysis will be focused on a medical setting, this research can be used in psychological settings when looking at memory of pain or RP (Adamczyk et al., 2019). An example used by Adamczyk et al. (2019) was how memory of past pain could affect behavior.

While some research illustrates that some participants report pain accurately, other research indicates that participants overestimate their pain, and some research shows that participants underestimate on how pain is remembered (Adamczyk et al. 2019). There are many reasons why people may not perfectly remember their pain. Adamczyk et al. (2019) and Babel (2017) describe several important factors that affect the memory of pain: type of pain, recall delay, and the peak and end of the pain. “Type of pain” can include “origin of pain and duration,” such as chronic pain, naturally occurring acute pain, and experimentally induced pain (Adamczyk et al., 2019, p. 201). Recall delay is explained as the time in between the pain experience and the time the pain is recalled or remembered. The peak and end of pain can include both acute and or chronic pain (Babel, 2017). Pain is difficult to study in a research setting, as described more in depth in the next section (Adamczyk et al., 2019, Babel, 2017). Asking participants to remember pain is a less preferred methodology to cold pressor induction; however, both methodologies have limitations (Adamczyk et al., 2019; Etherton, 2014; Etherton, 2015; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015).

Pain and Cognitive Research

Pain

Pain has a multidimensional etiology, with a complex interaction of biological and psychosocial factors that create a subjective experience that varies among individuals even when identical organic pain triggers are present (Skuladottir & Halldorsdottir, 2008). Pain is not considered a disease; it is a sensation, a symptom, and the second most common reason for seeking medical care (Fishbain et al., 2015; Skuladottir & Halldorsdottir, 2008). Pain is divided into three categories: acute (short-lived pain), chronic malignant (ongoing pain with a life-threatening cause), and chronic nonmalignant (ongoing pain with no life-threatening cause) (Skuladottir & Halldorsdottir, 2008). Some examples of chronic nonmalignant pain include headaches, rheumatoid arthritis, fibromyalgia, neck pain, causalgia, neuralgia, peripheral neuropathy, and myofascial pain. Chronic pain is distinguished from acute pain by duration (over three months in children and six months in adults) as well as the persistence of features such as hyperalgesia (an increased response to painful stimuli) and allodynia (a pain response to a stimulus that is not usually painful) (Gosselin et al., 2010).

The origin of pain can be difficult to determine due to the variety of etiologies, such as neuropathic (nervous system etiology), tumor progression (cancer pain), peripheral inflammatory pain, and unclear origins (such as fibromyalgia; Gosselin et al., 2010; Kumar, 2013). Other etiological sources of pain can include arthritis, rheumatism, infection, work-related and sports-related injuries, stress and tension, nerve pain, sciatica, osteoporosis, and cancer (Loustaunau, 2017). Back pain is one of the most common pain conditions reported in the general population, impacting 58% to 84% of adults in their lifetime (Skuladottir & Halldorsdottir, 2008). Subjective patient reports are considered the standard by which to assess pain and usually include ratings of a 0 to 10 on the Likert scale. Subjective reports of pain can be difficult to interpret, however, especially when severity scores do not match medical evidence, such as tissue damage (Binzer et al., 2003).

Pain and Malingering

Possible malingering for monetary gain should always be considered in neuropsychological examinations when compensation claims are considered, and claimants with pain are no different (Chafetz et al., 2015; McGuire et al., 2001). Pain is a major primary and secondary complaint in worker’s compensation claims (Etherton, Bianchini, Heinly, et al., 2006; Greve et al., 2013). It is mistakenly believed by some treating professionals that, in the context of pain, malingering is when a person complains of subjective pain in the absence of objective organic abnormalities (Anderson, 2008). It has been well established that chronic pain is multidimensional and complex and includes organic and functional components (Barr, 2013; Binzer et al., 2003). Given this, it is difficult to objectively judge individuals’ descriptions of their pain experiences. The absence of an identifiable organic cause for pain should not negate a report of pain; patient reports of pain should be taken seriously, even with a lack of an obvious physical cause (Anderson, 2008; Kucyi et al., 2015; Kumar, 2013).

Pain can be acute or chronic, and there is an unfortunate tendency in medical settings to also classify chronic pain as either “organic” or “functional” (Binzer et al., 2003; Kumar, 2013). Assumptions have been made that “organic” pain is real and that “functional” pain is unreal and therefore must be emotionally based (Binzer et al., 2003; Kumar, 2013; Twigg & Byrne, 2014). This dichotomous classification does not reflect the complicated nature of pain or consider the psychosocial factors that are most important in the transition between acute and chronic pain, including psychiatric issues, age, and socioeconomic indicators (Greve & Bianchini, 2004b; Povedano et al., 2007; Twigg & Byrne, 2014). Pain-related disorders are an interaction of medical, psychological, and social factors, with additional complications when compensation is involved (Gatchel, 2004; Twigg & Byrne, 2014).

Evaluation of pain includes subjective and objective measures. Gatchel (2004) discusses the importance of a multidimensional approach and the avoidance of "assumption traps" in the evaluation of pain that include:

1. One cannot assume high correlations among different assessment measures.
2. One cannot automatically assume, on an a priori basis, that one outcome measure will necessarily be more valid or reliable than another. Generally, the more objectively quantified the measure is, the more likely it can be empirically established as a valid and reliable referent or marker.
3. One cannot assume that a physical measure will always be more objective than self-report/psychosocial measures. No matter what the level of accuracy or sophistication of a mechanical device/physical assessment method used in collecting physiological measures, it is always the case that human interpretation ultimately must be used in the understanding of the resulting findings. Moreover, it must be remembered that a patient's performance during a physical assessment protocol can be greatly influenced by fear of pain or injury, motivation, instructional set, etc.

4. One cannot assume that there is a consistent "pain prone" personality type that will negatively affect reliable and valid measurement. Research has consistently demonstrated no conclusive evidence for such a pain-prone personality type.
5. One should not assume that we are able to predict function with 100% accuracy. There are a great many individual differences (such as the psychosocial issues of motivation, fear of reinjury, etc.) that can significantly affect performance on a functional task. (Gatchel, 2004, p. 198)

Fordyce (1976) described chronic pain sufferers as having the illusion of homogeneity; in other words, the illusion is that all appear to be similar. In reality, chronic pain symptoms are experienced in an individualized manner. This can complicate matters when considering pain and malingering. When evaluating pain patients, it is important to determine if there are predictive factors for malingering, including different subgroups (i.e., chronic or acute pain), psychosocial variables (e.g., depression and anxiety), and behavioral factors (e.g., substance abuse and functional impact; Crighton et al., 2014).

Although most pain episodes resolve without incident, chronic pain is a highly prevalent condition (Caberera-Leon et al., 2017; Tunks et al., 2008). Estimates of the prevalence of chronic pain vary from study to study because of variations in "definitions, study population, sample size and/or data-gathering procedure" (Caberera-Leon et al., 2017, p. 1). Worldwide estimates of the prevalence of chronic pain range from 12% to 42%, and this statistic has remained stable for the last eight to nine years (Caberera-Leon et al., 2017). In a National Population Health Survey (1994-1995) cited by Tunks et al.

(2008), it was estimated that 20% of Canadian women and 15% of Canadian men experience chronic pain. They also reported that the occurrence of chronic pain increased with age and concurrent illness. In those with arthritis or rheumatism at the age of 64 and older, 49% reported chronic pain. Pain caused by migraines decreased with age. Low back pain and rheumatism were the most common diagnoses associated with chronic pain (Tunks et al., 2008).

Recent studies about pain in other countries show prevalence percentages of chronic pain slightly lower than the Tunks et al. study (Caberera-Leon et al., 2017; Nakamura et al., 2014). In Japan, an epidemiological survey reported a chronic pain prevalence of 11.1% (Nakamura et al., 2014), and, in Southern Spain, a chronic pain prevalence of 10.78% was found (Caberera-Leon et al., 2017).

Cognitive Impairment

Cognitive impairments are deficits in the processes by which an individual person perceives, encodes, stores, retrieves, and uses information (Buffum et al., 2007). Neurocognitive impairment can be the result of many different etiologies, such as trauma to the head or traumatic brain injury (TBI), whiplash-associated disorders, psychological illnesses/disorders, and neurodegenerative, vascular, toxic, anoxic, and infectious processes (Buffum et al., 2007). Clinical presentations may also include a combination of the above-mentioned etiologies. Some examples of combined presentations in the clinical setting may include someone presenting mild TBI and ensuing cognitive damage (Sherer et al., 2015), migraine headaches (Mathur et al., 2015), or psychological/psychiatric claims with resultant cognitive impairment (Viglione et al., 2017). Pain and its effect on neurocognitive function will be more intensely studied later in the chapter.

Knowing the common cognitive complaints or presentations of mild TBI or coexisting psychological/psychiatric illness can aid the clinician in identifying malingered cognitive impairment (Heilbronner et al., 2009; Viglione et al., 2017). Patients who present with neurocognitive impairment may report problems with memory, concentration, and recall. Concurrent cognitive and psychological/psychiatric disorders include cognitive impairments such as attention, processing speed, memory, and executive functions (Heilbronner et.al, 2009).

Psychologists use various tests and other methods, such as collaborative reports and clinical interviews, to determine malingering in cognitive impairment, otherwise known as “testing effort” (Iverson et al., 2007, p. 533; Viglione et al., 2017). Some of these methods include subtests from standard neuropsychological tests with internal or embedded internal validity indicators, tests that are specifically designed to determine exaggeration of cognitive impairment (such as SVTs), or stand-alone cognitive effort tests (Heilbronner et al., 2009). Many clinicians like to use tests with internal validity indicators because they increase the validity of the malingering battery without increasing the time required for the assessment; they can determine performance validity on specific tests, and a claimant is less likely to benefit from coaching (Heinly et al., 2009; Martin et al., 2015; Martin et al., 2017).

Pain and Cognition

The relationship between pain and cognition is complex; this has been the topic of a great deal of research. Some researchers have associated pain with poor neurocognitive performance, while others show no such relation (for a review, see Iezzi et al., 2004). Other complications in the research of pain and its effects on cognition include the many confounding factors that affect cognitive functions, such as depression, anxiety, fatigue, age, and somatization (Lee et al., 2010).

One basic premise in pain/cognitive research is that pain distracts cortical resources involved in allocating attention or that ongoing pain "limits the resources available for task performance" (Seminowicz & Davis, 2007, p. 9). Pain is believed to be a prominent cortical disruption that distracts attention from cognitive tasks (Seminowicz & Davis, 2007; Terrighena et al., 2017). This is called divided attention or limited capacity, and it is hypothesized that pain can affect cognitive functioning, especially attentional tasks, because of its effect on the brain's ability to focus on multiple stimuli simultaneously (Seminowicz, & Davis, 2007; Terrighena et al., 2017).

Pain can affect cognitive functions such as long-term memory. Landro et al. (1997) conducted a study with 25 individuals with primary fibromyalgia (FM), 22 of them with comorbid major depression, and 18 healthy controls. Using a variety of memory tests, such as the Digit Span subtest of the WAIS and the Randt Memory Test, it was found that individuals with FM and major depressive disorder were significantly impaired on long-term memory tasks requiring effortful processing compared to healthy controls ($p < .05$). The authors further reported that the FM patients without a long history of major depression did not show significant long-term memory impairment. These findings may indicate that depression was the primary factor affecting long- term memory, rather than pain (Landro et al., 1997).

Lee et al. (2010) attempted to find an association between chronic wide-spread pain (CWP) and impaired cognition in a community setting. The authors used the data from 3,369 men, ages 40 to 79 years, who were enrolled in the European Male Aging Study (Lee et al., 2010). CWP was diagnosed using the American College of Rheumatology (ACR) criteria for fibromyalgia, which requires that pain is present for at least three months, above and below the waist, on the right and left sides of the body, and on the axial skeleton. There were 266 participants who reported having CWP and 1,273 participants who indicated that they had not experienced any pain in the last month (Lee et al., 2010). Cognitive functioning in these individuals was assessed using a battery of neuropsychological tests. The authors found that the CWP group had significantly slower psychomotor processing compared to those without CWP ($\beta = -2.4$, $p = \leq .0001$). There were no significant group differences in visuospatial, visual memory, or visual memory retrieval tasks. This research was a significant contribution to the pain/cognition literature due to the multivariable regression delineating important factors. Multivariable aggression was used to adjust for common comorbid factors associated with pain and cognition, such as depression, age, substance use, and health factors.

In a study by Keogh et al. (2013) looking at the disruptive effects of pain on complex cognitive performance and executive control, 62 adult participants (40 female) were recruited from the staff and student population of the University of Bath. A thermal stimulator was used to induce pain in the SP group, and the participants completed two tasks on a computer: modelled breakfast making (cooking and setting the table) and a word generation puzzle. The purpose of the simulated tasks was to measure executive functioning, including aspects of working memory (Keogh et al., 2013). In the breakfast task, pain was found to significantly disrupt multi-tasking performance (setting the table while cooking) but not the central task (cooking; $p < .05$). Participants in the pain conditions set the table significantly fewer times (Keogh et al., 2013). In the word generation task, pain did not affect performance but was found to significantly affect the perceived allocation of time to the task (less time on an easy task) and switching perceptions (Keogh et al., 2013). Those in the pain group recalled spending less time on the easy task than those in the control group ($p < .05$). Those in the pain group recalled more task switches than did members of the control group ($p < .05$). The authors concluded that pain can “affect subtle or indirect changes in cognition” (Keogh et al., 2013, p. 1).

Pain can disrupt an individual’s ability to perform various attention tasks (Attridge et al., 2017). The effect pain has on attention has been tested with a range of methods, including induced pain and naturally occurring pain, such as headache and menstrual pain (Attridge et al., 2017). Attridge et al. (2017) recruited 103 participants from two universities in Bath who had frequent headaches. Participants were asked to perform five complex attention tasks and a choice reaction time task with and without naturally occurring headaches. Reaction times were slower in four out of five of the complex tasks during a headache, suggesting that headache pain can affect attention (Attridge et al., 2017).

Another issue that introduces noteworthy complexity in the relation between pain and cognition is the difference between acute and chronic pain. Chronic pain is often associated with high levels of anxiety, depression, and social/occupational dysfunction (Lame et al., 2005; Lee et al., 2010). Intensity and duration of pain may have different effects on cognitive tasks (Seminowicz & Davis, 2007).

Antepohl et al. (2003) compared the performance of 30 patients with chronic whiplash-associated disorder (WAD) to 30 healthy controls in four cognitive tests, including reaction time, working memory, verbal processing, and spatial processing. Before and after every test, participants rated their pain level (Antepohl et al., 2003). The researchers reported that the more pain participants experienced, the longer the reaction time in completing required tasks (Antepohl et al., 2003). They also found that WAD patients reported significantly increased pain levels during testing and worse performance on all cognitive tasks when compared to controls. The working memory cognitive testing generated the largest differences compared to the other cognitive tests (Antepohl et al., 2003).

Additional pain factors that may influence cognitive variables include individual tolerance of pain or an individual’s perception of pain, such as pain catastrophizing or fear of pain (Seminowicz & Davis, 2007). Someone who catastrophizes or fears pain may have heightened vigilance or awareness of pain and may be more likely to have difficulty with attention-demanding tasks (Seminowicz & Davis, 2007). It has been theorized that patients with fibromyalgia, for example, are more prone to a cognitive style of catastrophizing than healthy controls and therefore more likely to focus on pain (Burgmer et al., 2009).

It is generally accepted that chronic pain has a negative effect on quality of life (Lame et al., 2005). It is also expected that there is at least some mild cognitive impairment with chronic pain (Povedano et al., 2007). In identifying malingered cognitive impairment in those who report chronic pain, it is important to distinguish exaggerated cognitive impairment from legitimate cognitive impairment, both for the claimant as well as the defense (Etherton, Bianchini, Heinly, & Greve, 2006). Legitimate claims can help the defendant and their family obtain the help or compensation needed to improve their quality of life (Povedano et al., 2007). Alternately, accurate detection of exaggerated cognitive impairment, especially in the forensic arena, can save millions of dollars in false compensation claims (Povedano et al., 2007).

Remy et al. (2003) conducted a study that paired pain with semantic cognitive tasks, such as word repetition or word generation, in 12 healthy subjects. Using thermal stimulation to induce pain, they asked the participants to conduct cognitive tasks. Through neuroimaging, they found that cerebral activity patterns changed during semantic cognitive tasks when pain was introduced (Remy et al., 2003). Specifically, more activity (positive modulation) was found in the midcingulate, Broca’s area, left insula, occipital cortex, right thalamus, and left premotor area when pain was present during semantic tasks (Remy et al., 2003).

Povedano et al. (2007) reported that participants with neuropathic pain (NeP) were more likely to experience mild cognitive function impairment in comparison to the general Spanish population. In their large participation pool of 1,519 adult patients (58.8% women) with neuropathic (NeP) or mixed NeP and nociceptive (MP) pain, pain was measured by using the visual analog scale of the short form of the McGill Pain Questionnaire (Povedano et al., 2007). Cognitive impairment was measured using the Spanish version of the Mini Mental Status Exam. A score of ≤ 24 was considered cognitive impairment (Povedano et al., 2007). After adjusting for confounding factors, such as depression, anxiety, age, and obesity, the authors found that patients with NeP pain were more likely to experience mild cognitive impairment than those in the general Spanish population (Povedano et al., 2007).

The above review of studies examining the relation between pain and cognition reveals that there is not a simple answer to the question of how and when pain affects cognitive variables. The general consensus seems to be that pain does affect cognition, with at least some mild cognitive impairment (Povedano et al., 2007; Remy et al., 2003). However, it is more likely that pain affects cognition when other factors, such as depressive symptoms, are present (Landro et al., 1997; Lee et al., 2010).

Pain medication may also play a role in cognitive impairment (Lee et al., 2010; Sjogren et al., 2000; Sjogren et al., 2005). It is not certain whether pain (only), pain medication (only), or a combination of pain and pain medication are contributing factors to cognitive impairment (Sjogren et al., 2005). Sjogren et al. (2005) reported that some studies determined beneficial effects of pain medication on cognition, and other studies established either no effect or negative effects on cognition (Sjogren et al., 2000).

In a study investigating neuropsychological performance in 40 patients with chronic nonmalignant pain who had taken daily opioids for more than 14 days compared to 40 healthy controls, Sjogren et al. (2000) found that vigilance/attention, psychomotor speed, and working memory were significantly worse in the opioid group. The authors utilized the continuous reaction time test, finger-tapping test, and paced auditory serial addition task as part of their test battery in determining cognitive function. These findings suggest that long-term opioid therapy may independently or through an interaction with chronic pain cause cognitive impairment, further complicating the relationship between pain and cognition (Sjogren et al., 2000). Other ways pain can impact cognition can include duration of pain (acute or chronic), pain intensity, pain tolerance, and perception of pain (Antepohl et al., 2003; Etherton, Bianchini, Heinly, & Greve, 2006; Seminowicz & Davis, 2007).

Effort and Intent in SVTs

Greve and Bianchini (2004a) stress the importance of addressing psychological and motivational factors of pain in a controlled fashion to understand how pain affects individual sufferers. They recommend that practitioners look at the motivations behind participant effort before making assumptions. The terminology used to describe participant effort and intent on objective psychological testing includes insufficient, inadequate, and poor effort (Heilbronner et al., 2009). Effort is not easily or reliably assessed by clinical judgment alone (Bianchini et al., 2001).

Hartman (2002) reviewed the strategies available to investigate participant effort, including the use of performance patterns within test batteries, correlation of real-world activities with test performance, patterns that indicate malingering within clinically sensitive tests, and stand-alone tests of malingering. Stand-alone tests are SVTs whose primary purpose is the testing of effort (Hartman, 2002).

It has been long accepted that subjective reports of physical (i.e., pain) and cognitive (i.e., memory) symptoms are unreliable and prone to error; yet, the use of subjective pain assessment measures has been standard practice in the forensic and legal setting (Green et al., 2001). Objective measures in the psychological forensic and legal setting include various testing and validity indices. When conducting assessments, it is imperative to look at the possible motivations behind inadequate, insufficient, and poor effort when completing objective measures (Heilbronner et al., 2009). First, the clinician must rule out factors that may seem like poor effort, such as impaired arousal or vigilance, distraction due to extreme fatigue or pain, and developmental or acquired disorders of coding (Sullivan et al., 2007). Cultural issues, such as language, culture, education, and ethnic background, must also be considered before an assumption of poor effort is made (Heilbronner et al., 2009).

Rohling et al. (1995) conducted a meta-analytic review of 157 studies to examine disability compensation in pain complaints. Excluding non-quantifiable studies and using 136 related comparisons, they found that compensation is related to increased reports of pain and decreased treatment efficacy with an overall effect size of .50 to .60 (Rohling et al., 1995). Although this review was conducted over 20 years ago, it demonstrates that possible financial compensation for pain has a clear overall effect on the results of effort testing.

There are high rates of exaggeration and poor effort in certain populations, such as those with mild head injuries and chronic pain patients who are seeking compensation (Green et al., 2001). For example, Green et al. (2000), in their sample of 904 consecutive patients who were seen for neuropsychological assessment for a Canadian Worker's Compensation Board claim, a medical disability claim, or personal injury, reported that effort had a .73 correlation rate with their Overall Test Battery Mean (or neurological tests converted to normative Z-scores and averaged). Interestingly, individuals with mild head injuries, major depression, orthopedic injuries, chronic fatigue syndrome, and chronic pain had a higher rate of failure on effort tests than those with moderate to severe brain injuries (Green et al., 2000).

Williams (1998) outlined several techniques that individuals use to feign memory impairment, including incorrect response, appearing distracted, or slow or haphazard responses. In a study by Iverson (1995), healthy participants were asked to fake memory impairment, and they used techniques that were similar to those described by Williams. The most common strategies used in the Iverson study were poor cooperation, signs of aggravation and frustration, slow response times, frequent hesitations, total amnesia, and general confusion during the test taking process (Iverson, 1995).

Pankratz (1983, as cited in Bianchini et al., 2001) developed an SVT with a forced-choice design that had a 50% probability of guessing correctly by chance alone. Scoring at significantly below the 50% rate indicated that the test taker was purposefully answering items in error. SVTs were improved by Hiscock and Hiscock (1989) with the Digit Memory Test, which was portrayed as a memory test; when an SVT has the appearance of a memory task/test, this is called transparency, otherwise known as face validity (Bianchini et al., 2001).

Compensation seeking often has a considerable influence on SVT performance. Grote et al. (2000) found that those who were not seeking compensation performed better than those seeking compensation on an SVT as well as on other measures of memory, response latency, and consistency of effort. The participants in the Grote et al. study consisted of 30 consecutively referred patients with intractable epilepsy who were not compensation seeking and 53 consecutively referred patients for neuropsychological evaluation, primarily with mild traumatic brain injury, who were seeking compensation. Despite this evidence, Grote et al. (2000) emphasize the importance of clinician objectivity and advise examiners not to assume that all compensation-seeking clients are exaggerating on tests.

Moore and Donders (2004) examined the records of 132 individuals from inpatient and outpatient referrals in a Midwestern rehabilitation facility and found that persons who were seeking financial compensation who had a psychiatric history were more likely to produce an invalid test result on two SVTs by a factor of four. They opined that premorbid or comorbid factors may have more of an effect on effort than subjective complaints (Moore & Donders, 2004). Although they cautioned against overgeneralization, the authors reported that those with long-standing emotional difficulties might be more prone to exaggeration of symptoms (Moore & Donders, 2004).

Testing of Poor Effort and SVTs

Structural assessment of brain injury involves the use of electroencephalography, computer tomography, and nuclear magnetic imaging (Bianchini et al., 2001; Tu et al., 2016; Wong et al., 2016). Although structural assessment has improved over the last ten or so years, the extent of functional impairment or neurocognitive deficits cannot be determined by looking at the structure of the brain (Bianchini et al., 2001; Caeyenberghs et al., 2016; Wong et al., 2016). Moreover, traditional neurological testing and other neuropsychological procedures do not account for participant effort or potential malingering of neurocognitive deficits (Caeyenberghs et al., 2016; Wong et al., 2016). Although the APA's ethical principles (2002) do not address effort testing, they do state that, "Psychologists' work is based upon established scientific and professional knowledge of the discipline" (para. 2.04) and that, "Psychologists administer, adapt, score, interpret, or use assessment techniques, interviews, tests, or instruments in a manner and for purposes that are appropriate in light of research on or evidence of the usefulness and proper application of the techniques" (para. 9.02).

There is a need for more research in the testing of effort to ensure useful and proper application (Berthelson et al., 2013). As Bowden et al. (2006), Larrabee (2014), and Medici (2013) have stated, there are gaps in the research about the validity of effort testing, namely methodological impediments to the study of symptom validity. Specific tests that can determine cognitive malingering and have transparency or face validity include: the Digit Memory Test (Hiscock & Hiscock, 1989), the Portland Digit Recognition Test (Binder, 1993), the Test of Memory Malingering (Tombaugh, 1997), the Victoria Symptom Validity Test (Slick et al., 1997), and the WMT (Green et al., 1996). Subtests of the WAIS-III (Wechsler, 1997), such as the Digit Span and the Processing Speed Index, have also been used to test effort.

Berthelson et al. (2013), Bowden et al. (2006), and Davis and Millis (2014) criticized the assumptions made regarding the validity of SVTs (in particular, the WMT), calling for more independent studies on reliability, sensitivity, specificity, and confounding factors. A confounding factor in the testing of effort could be pain. The effect of pain on the validity of some cognitive SVTs has been studied; however, the effect of pain on the validity of other SVTs, such as the WMT (Green, 2003) and the Victoria Symptom Validity Test (Slick et al., 1997), has not been examined for specific pain-related validity, although these tests are often used in clinical practice (Greve et al., 2013).

Other common SVTs that are used in clinical practice to detect malingered pain-related cognitive response bias include, but are not limited to, the Test of Memory Malingering (TOMM; Tombaugh, 1997) and certain subtests and index scores of the Wechsler Adult Intelligence Scale (WAIS-IV; i.e., the Reliable Digit Span [RDS], the Processing Speed Index [PSI], the WMT, and the Portland Digit Recognition Test [PDRT]; Greve et al., 2013).

SVTs Validation Using Pain Induction

As discussed in Chapter 1, clinicians use both embedded and stand-alone instruments to evaluate participant effort (Heilbronner et al., 2009). Although this study did not use cold pressor induction, it is important to discuss previous studies that used cold pressor pain when testing the validity of an SVT. In recent studies, pain was not found to significantly affect cognition in healthy participants in several embedded measures (Etherton, 2014; Etherton & Tapscott, 2015). For example, Etherton (2014) found that cold pressor-induced pain did not have a significant effect on performance on the WAIS-IV subtests: PSI and Working Memory Index (WMI) scores. In a similar study, Etherton and Tapscott (2015) found no significant effect on performance on the fourth edition of the Wechsler Memory Scale (WMS-IV) visual working memory index (VWM) or WMI when pain was induced in nonclinical volunteers.

Tapscott and Etherton (2015) found significant interaction between cold pressor-induced pain and controls while administering the Paced Auditory Serial Addition Test (PASAT). Seventy-two healthy volunteers were randomly assigned to a pain group or a control group. Each participant was administered the PASAT in the same way, except the control group placed their hand in non-painful, room temperature water, instead of cold water, which induces pain (Tapscott & Etherton, 2015). The control group increased performance by roughly six items going from Trial 1 to Trial 2, while the pain group showed no improvement. This suggests that pain affects performance, with practice effects on the control group showing improvement and pain inhibiting improvement in the pain group. The authors concluded that other possible unforeseen psychosocial factors, such as lack of motivation, misrepresentation of abilities, or other pathology, might truly cause individual differences in pain and cognition interactions.

Using the WMT When Pain is Present

Some prior research has suggested that chronic pain has been associated with impaired cognition (e.g., Tapscott & Etherton, 2015), while other studies indicate no significant association between chronic pain and impaired cognition (e.g., Etherton, 2014). More research is needed and will possibly expand our understanding of these inconsistent results when studying the effect of pain on cognition (Etherton, 2014; Etherton, 2015; Etherton & Tapscott, 2015).

The WMT is used to determine inconsistent or submaximal cognitive effort in suspected malingering and is a common SVT used in neurological testing batteries (Sherer et al., 2015). It measures verbal learning and memory by measuring the test taker's ability to learn a list of 20 word pairs (e.g., "pig-bacon, fish-fin, dog-cat"; Green et al., 2002, p. 99). The initial trial is called the immediate recognition recall (IR) and asks the test taker to pick a word from the original list in each of 40 new word pairs (e.g., "dog" would be recognized from "dog-cat" in a new pairing such as "dog-rabbit"; Green et al., 2002, p. 99). The delayed recognition recall (DR) is then given after a half-hour delay. The DR is similar to the IR but includes words that were not seen in the original list of 20 word pairs. Response consistency is measured between the 40 paired IR and DR responses (Green et al., 2002).

After the response trials, four separate measures of memory are given: the Multiple Choice subtest (MC), in which the person is asked to pick the first word from each pair from eight options; the Paired Associates (PA), in which the person is given the first word from each pair by the tester and is then asked to give the second word; the Delayed Free Recall (DFR), in which the person is asked to recall as many words as possible from the list in any order; and the Long Delayed Free Recall subtest (LDFR), which can be given with even a further 20-minute delay (Green et al., 2002).

Consistency scores on the WMT are calculated from the IR to the DR (Green, 2005). A passing score is when IR, DR, or consistency scores are above 90% correct (Green, 2005). A clear “fail” is when any of the IR, DR, or consistency scores are at or below 82.5% correct (Green, 2005). Scores between 83% and 90% indicate “caution” or close to failing (Green, 2005).

Green et al. (2002) have investigated the validity of the WMT and believe that it meets Daubert challenges with proper interpretation. Green et al. (2002) report that the WMT has close to 100% reliability, is completely “sensitive to all but the most extreme forms of cognitive impairment, and is unique in that the test has been validated with participants in a clinical forensic setting rather than simulators” (p. 97). Green et al. administered the WMT along with other testing batteries to over 1,000 consecutive compensation or disability claimant adults, and much of the WMT research is based on this population (Green et al., 2002).

Green and Flaro (2003) tested the WMT with children. In this study, 135 children with various diagnoses, including Schizophrenia, Bipolar Mood Disorder, various neurological diseases, Attention Deficit Disorder, Conduct Disorder, Oppositional-Defiant Disorder, and learning disabilities, were given the WMT. It was concluded that, apart from children with lower than a third-grade reading level, the WMT is valid for use in children (Green & Flaro, 2003).

In a study comparing the utility of the Test of Memory Malingering, the Victoria Symptom Validity Test, and the WMT, Tan et al. (2002) found that the WMT was the single most effective measure of determining effort or identifying malingering. Their sample consisted of 52 university students ranging in age from 17 to 40. The group was divided and randomly assigned to two groups. Both groups were given a scenario in which they were to pretend that they had been involved in a car accident and had briefly lost consciousness. One group was told to do their best on the tests and the other was told to perform the tests (in a realistic manner) that would indicate cognitive impairment associated with a head injury. The last group was labeled as the malingering group (Tan et al., 2002).

All the persons in the malingering group were accurately identified by the WMT, whereas only 12% and 20% were identified by the Victoria Symptom Validity Test and the Test of Memory Malingering. In addition, the participants were asked to rate the ease of faking a mild TBI on the three tests. When asked which of the SVTs was easiest to fake cognitive impairment, participants rated the Victoria Symptom Validity Testing as the easiest to fake, followed by the Test of Memory Malingering. Participants rated the WMT as the hardest to fake (Tan et al., 2002). They were also asked if they felt that the tests assessed ability. Only 8.7% felt the Test of Memory Malingering was a measure of ability, 23.1% believed the Victoria Symptom Validity Test to be a measure of ability, and 30.8% believed the WMT to be a measure of ability. The answers to these two questions have clinical utility, in that perceptions in a real evaluation can affect measurement of effort. For example, testing subjects may be less likely to feel that they can feign cognitive impairment on the WMT than the other tests, and they may be more likely to view the WMT as a measure of ability rather than of participant effort.

Most studies of the WMT demonstrate good validity and reliability; however, Bowden et al. (2006) complained that studies on the validity of the WMT were conducted by Green and his associates (the developers of the measure). They suggest that more outside research is needed to support the validity research on the WMT. Although the WMT's dichotomist use of "pass" or "fail" ratings is a straightforward way to test effort, according to these researchers and others, it should not be the sole measure or factor to be considered when determining a malingering diagnosis (Frederick & Bowden, 2009).

The effect of pain on the validity of the WMT has not been examined, and research investigating this may expand clinicians' abilities to identify exaggerated cognitive symptoms because of pain. Such a study on the WMT may also expand the data regarding its validity, sensitivity, and specificity in answer to Bowden et al. (2006), who called for research outside of the studies conducted by Green and his colleagues. Studying the effect of RP on another SVT may also further research on the relation between pain and cognition.

Summary

This review discussed the broad topic of malingering, including diagnostic classification and models (Mechanic & Volkart, 1960; Pilowsky, 1969; Rogers, 1990) as well as more current definitions and classifications (Anderson, 2008; Slick et al., 1999). Next, specific research topics in the area of malingered pain and cognition were explored, such as working definitions for pain and cognitive impairment and the effects of pain on cognition. The need for more research on the relation between pain and cognition was emphasized, as there are many factors that influence pain and functioning according to the biopsychosocial model, such as depression, substance use, pain medication, duration, perception, and age (Iezzi et al., 2004; Lee et al., 2010; Seminowicz & Davis, 2007).

The topic of participant effort was discussed in this chapter, as well as the psychologist's role in identifying malingered pain and cognitive impairment. The most used SVTs were described and explained as an objective way to address malingered pain and cognition (Bianchini et al., 2001; Green et al., 2002; Tan et al., 2002). I also reviewed previous research investigating the validity of several SVTs in individuals experiencing pain. Lastly, the WMT was described as a worthwhile SVT to research and use in the clinical setting (Green et al., 2002). The need for more outside research on the WMT was emphasized, as most research on this test has been conducted by its developers (Bowden et al., 2006).

Chapter 3: Research Methodology

This chapter will include a description and justification of the research design and approach. The setting and sample will be outlined. Instruments and materials used during the study will be described. An explanation of data collection and analysis will be provided. In addition, ethical considerations and precautions taken to protect the participants' rights will be summarized. The focus of this study was to determine whether someone feigning pain-related cognition problems would be significantly different from someone remembering acute pain. Another focus of this study was to collect validation information on the WMT. This research also determined how feigned pain-related cognition might affect the specificity of the WMT, a cognitive SVT that specifically determines the effort of a test taker. This study also addressed some aspects of the relation between pain and cognition as well as the specificity of the WMT when pain may be a confounding factor.

Research Design and Rationale

This quantitative true experimental study provided information to fill in a gap left by previous literature studying the potential impact of pain on SVTs. Specifically, it assessed the strength of the WMT when determining possible malingering and assessing pain-related cognitive impairment in claimants whose primary complaint is pain (Etherton, Bianchini, Ciota, & Greve, 2005).

The study focused on another SVT, the WMT. The research design and methodological approach were similar to earlier studies conducted by Etherton et al. (Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005;

Etherton, Bianchini, Ciota, et al., 2006; Etherton, Bianchini, Heinly, et al., 2006), which studied the effect of pain on the Test of Memory Malingering, Reliable Digit Span, and Processing Speed Index. However, this study did not use cold pressor induction because there was no oversight at the research location. An experimental design using two groups, including a feigned pain group and a group that honestly takes the WMT while remembering pain, was used to determine the effect of pain on the WMT. The simulator group took the WMT while simulating pain-related cognitive impairment, and the honest pain group took the WMT while remembering the last time they experienced pain.

Methodology

Population

The participants for this study were a convenience sample of individuals aged at least 18 years, and were of any ethnicity or sex. They were all English speaking, as the WMT is only published in English. Potential participants were recruited from various community settings, mostly in Arizona through word of mouth. Although a flyer was ready and approved by the Walden Institutional Review Board, it was not used. The only educational criterion was a third-grade reading level, as described in the WMT manual (Green, 2005). Data was collected over approximately a seven-month time period.

Sampling Procedures

Potential participants were all recruited by word of mouth, as I let friends and family know about the research before flyers were posted. Enough participants were interested in the research using this method that I was able to recruit for the study without the need of posting a flyer. I screened them for the inclusion/exclusion criterion prior to the consent process and scheduled a meeting to begin the consent process and the study procedures. As a part of the consent process, participants were informed that they would be randomly assigned to one of two conditions: simulator or remembering. The procedures were explained to them, and they were offered an opportunity to ask questions.

After signing the informed consent, participants were placed in groups by picking a sealed envelope with the condition assignment instructions in the envelope. The remembering pain group consisted of a group that took the WMT under standard conditions to the best of their ability while remembering the last time they experienced pain. Those assigned to the simulator condition were asked to simulate pain-related memory impairment during the testing. The participants in the simulator group were given written instructions that are the same as those given by Etherton et al (2005).:

> Imagine that you have been in an accident and suffered an injury to your neck and shoulder. Initially, you experienced pain in that arm and hand, but now you are completely healed and are experiencing no problem. Nevertheless, you have filed a lawsuit and you stand to gain a very large settlement if you are disabled. In your lawsuit, you are claiming that your pain has affected your ability to think, especially your memory. Because of the memory problems you have developed, you cannot do college-level schoolwork, and now your future employment opportunities are limited. You have been sent to a psychologist to evaluate your claim of memory problems and are now about to take a memory test for that purpose. Your task is to perform on that test as if your memory were impaired

> because of severe, persistent, chronic pain. However, you must fake your memory impairment in a way that is believable, because if you are caught, your lawsuit will be thrown out of court and you will get nothing. (Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly et al., 2005; Etherton et al., 2006b, p. 1221)

The group taking the WMT while remembering pain were given the following instructions:

> Please take the Word Memory Test and its subtests as if you are having chronic neck and shoulder pain. If you have never had neck or shoulder pain, please remember the last time you had any type of pain. For example, the last time you were sore from working out at the gym, or the last time you had a toothache might be some examples of pain you have experienced. Any type of pain you can remember will be fine. If you are having trouble remembering pain or have any questions, please ask the researcher. Keeping that pain in mind, please take the test as if you still had the pain, but honestly take the test to the best of your ability while in that pain.

There are six subtests of the WMT as described in Chapter 2, including Immediate Recognition, Delayed Recognition, Multiple Choice, Paired Associates, Delayed Free Recall, and Long Delayed Free Recall. Each subtest took approximately 10 minutes.

Instrumentation and Materials

The Word Memory Test

The WMT is a computerized dichotomous symptom validity test that determines cognitive effort (Frederick & Bowden, 2009). The examiner gives the test taker a list of words for memorization, which is followed by a "forced choice recognition at immediate and delayed intervals, as well as delayed free recall" (Frederick & Bowden, 2009, p. 111). Each person was tested on the same computer and, when I had multiple participants, each person was staggered during delayed intervals.

Demographics

A demographic questionnaire was used to collect information regarding age, sex, education level, and ethnicity after signing the consent and before the administration of the WMT. Names or other identifying information was not collected.

Analysis

This study was designed to address the following research questions:

Research Question 1: Is there a significant difference in short-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

> $H_0$1: There will be no difference between short-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).
>
> H_a1: There will be a significant difference between short-term memory performance in individuals who are taking the test to the best of their ability while remembering pain (RP) and those who are feigning pain (SP group).

Research Question 2: Is there a significant difference in long-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

> $H_0$2: There will be no difference between long-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).
>
> H_a2: There will be a significant difference between long-term memory performance in individuals who are taking the test to the best of their ability while RP and those who are feigning pain (SP group).

Research Question 3: Does the WMT serve as a valid test of effort when the test taker is suffering from RP?

> $H_0$3: The WMT is not a valid test of effort when the test taker is suffering from RP. RP will impact the performance on the Word Memory Test, and there will not be a significant difference between the SP group and the RP group.
>
> H_a3: The WMT will serve as a valid test of effort when the test taker is suffering from RP, and RP will not significantly impact performance. There will be a significant difference in the mean score between the SP group compared to the RP group, with the SP group scoring significantly lower than the RP group.

This study used a between-groups design with one between-group factor (group assignment) with two levels. Descriptive statistics were calculated to provide a description of the sample characteristics and pain ratings. Independent groups *t*-tests and chi-square analyses were used to compare the groups on demographic variables, and to determine if there were significant group differences between variables and would be considered for use as covariates when testing the hypotheses. Bonferroni corrected *t*-tests were also used to test the hypotheses.

An estimated sample size of 54 was calculated by conducting a power analysis based on the findings of similar studies conducted by Etherton and his colleagues, who reported medium effect sizes (Etherton, Bianchini, Ciota, & Greve, 2005; Etherton, Bianchini, Heinly, & Greve, 2005). G*power was used to calculate the needed sample size, using a medium effect size. Alpha (α) was set at 0.05 and power (1 – β) at 0.80. Fifty-four participants were needed to achieve adequate power, and 60 were recruited and tested to account for potential dropouts.

Ethical Considerations

Careful consideration was given to ensure the safety of the participants. Informed consent was a process, and information regarding the study and the rights of the participants was provided when individuals inquired about the study and as they were signing up for the study. In addition, a consent form was given to each participant that included full disclosure of the study, the procedures of the study, confidentiality, the voluntary nature of the study, the risks and benefits of participating, my contact information, my chairperson's contact information, and information regarding how to contact the Walden Institutional Review Board. The consent process included the consent form but was also ongoing throughout involvement in the study. Participants were informed that they could quit at any time.

All records were kept confidential, and only I have access to those records. Participants were notified that they were free to withdraw at any time during the process, and they were not obligated to complete any part of the study in which they felt uncomfortable. Physical records are kept in a locked cabinet, and electronic files are kept in a password-protected computer and iPad that only I have access to. All data will be destroyed five years after publication.

Summary

Chapter 3 focused on the research methodology and study design in looking at the relationship between pain and cognition using a cognitive symptom validity test, the WMT. Two groups were compared and included a simulator (feigning pain) and a group that took the WMT while remembering a time when they felt pain. Descriptive statistics, *t*-tests, and chi-square analysis were used to compare and analyze mean scores of the WMT and determine the relationship between pain and simulation in the scores.

Chapter 4: Results and Findings

The purpose of this study was to investigate the effect of RP on the validity of the WMT. Individuals were randomized into RP and SP groups, and the WMT was administered to all participants. In this chapter, I will discuss the data collection process. I will also review the analyses in regard to how the hypotheses were tested. The first two research questions regarded both short-term and long-term memory performance. The mean scores of the WMT subtests were compared between the RP and SP groups. The third research question sought to identify the possible impact of RP on the performance of the WMT by using the consistency subscale on the WMT. I will describe and report the data collection process and present the results of the descriptive and hypothesis testing analysis findings below.

Data Collection

Data collection started on July 14, 2019, soon after approval from Walden's Institutional Review Board (IRB) (approval number 07-08-19-0105191) and was completed on February 17, 2020. Most of the testing was conducted in private homes in Arizona on one laptop with a passcode. Recruitment was generally by word of mouth, recruiting friends and family. I did not keep track of individuals who declined participation, but there were approximately four people who were contacted about the study who did not want to enroll in the research. Everyone who agreed to participate completed the entire testing process, and no one dropped out during testing. Most of the testing sessions took approximately an hour and a half per person. Some testing sessions included more than one person and were staggered during the required 30-minute and 20-

minute breaks for the Free Recall (FR) and Long Delayed Free Recall (LDFR) subtests of the WMT.

Most participants in this study were Arizona residents. When comparing this sample to population estimates from the 2010 Arizona Census (U.S. Census Bureau, Arizona, 2019), the sample was similar in ethnicity, with some degree of underrepresentation of Hispanic Americans. The majority of the study participants identified as White, not Hispanic (70% in the study, compared to 86.6% in the state of Arizona), followed by those identifying as White, Hispanic (11.7% in the study, compared to 31.7% in the state of Arizona), and those who identified as Black (8.3% in the study, compared to 5.2% in the state of Arizona). There was also representation of American Indians (3.3% of the study sample, compared to 5.3% of the state population) and Asian Americans (1.7% of the study sample, compared to 3.7% of the state population; U.S. Census Bureau, Arizona, 2019). The gender distribution of the sample was 57% women, compared to 50.3% of the state population (U.S. Census Bureau, Arizona, 2019).

There were a total of 60 participants, consisting of 34 (57%) women and 26 (43%) men. The difference in sex distribution between the groups was not statistically significant (χ^2 [1, N = 60] =.56, p =.46). Twenty-nine participants (48%) were randomized into the RP group, and 31 (52%) were randomized into the SP group. Participants ranged in age from 18 to 89 years, with a mean age of 45.06 (SD = 17.05). There was no significant group difference in age (t [59] = 20.36, p = .001). Chi-square tests demonstrated no significant differences in the distribution of ethnicity (χ^2 [5, N =

60] = 2.76, p = .74) or education (χ^2 [11, N = 60] = 14.15, p = .23). There were no significant differences in sex distribution between the groups (χ2 [1, N = 60] = 56, p = .46). The demographics are presented in Table 2.

Table 2

Demographic Variables

Variable	Simulator	Remembering	Total (%) or Mean (SD)
Age Mean (SD)	43.34 (17.35)	48.58 (17.58)	46.05 (17.05)
Ethnicity			
Asian	0	1	1 (1.7%)
Black	3	2	5 (8.3%)
White	21	21	42 (70%)
Hispanic	5	7	12 (16.7%)
Native American	1	1	3 (3.3%)
Gender			
Female	15	19	34 (56.7%)
Male	14	12	26 (43.3%)
Education			
Some High School	2	0	2 (3.4%)
High School/GED	5	1	6 (10%)
Some College	12	15	27 (45%)
Four Year Degree	8	11	19 (31.6%)
Postgraduate	2	4	36 (10%)

Results

Statistical Assumptions

The analysis plan for hypothesis testing included using a series of independent sample t-tests. The statistical assumptions of a t-test include dependent variables that are measured on an ordinal or ratio scale (this assumption was met by the measure), normal distribution of the dependent variables, random sampling, and an adequate sample size. The sampling was not random, and it was relatively representative of the area (see above). The sample size exceeded the power analysis estimate but is a relatively small sample for an experimental study. The normality assumption was violated for all of the subtests of the WMT, as every subtest distribution was significantly skewed. Given this, the plan to use *t*-tests was changed to a more conservative approach. Mann-Whitney *U* nonparametric tests were used instead of *t*-tests.

The assumptions of nonparametric chi-square analyses are that the data needs to be presented in frequencies or counts, the categories need to be mutually exclusive, each participant may only contribute to one cell, the groups are independent of each other, the data is either categorical or ordinal, and the value of each cell's expected count should be five or more in at least 80% of the cells. All assumptions for the chi-square were met.

Research Question 1

Research Question 1: Is there a significant difference in short-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

The short-term memory tests of the WMT include Immediate Recall (IR), Delayed Recognition (DR), and multiple choice (MC). The lower the scores, the lower the effort of the test taker. Cut-off scores above 90% on the IR, DR, and MC are considered "passing," and scores lower than 82.5% are considered "failing" and suggest malingering (Green, 2005).

All of the participants fell into either the "passing" or "failing" categories (no participants scored between 82.5% and 90%). A chi-square analysis was used to compare the remembering and simulator groups on how many in each group were in the "passing" and "failing" categories. There were significant differences between the two groups on all three short-term memory tests: (IR, χ^2[23, *N* = 60], = .93, *p* = .001; DR, χ^2[24, *N* = 60], =. 96, *p* = .001; MC, χ^2[17, *N* = 60], = .88, *p* = .001). Participants in the simulator group met the "failing" thresholds most of the time, with 26 participants (89.7%) "failing" on the IR and all of the simulator participants "failing" on the DR and the MC. In comparison, in the remembering group, four participants (12.9%) "failed" the IR and two participants (6.5%) "failed" the DR. Eleven of the remembering group participants (34.5%) "failed" the MC.

Mann-Whitney *U* tests were used to compare mean rank values on the IR, DR, and MC subscales between the two groups. Differences between the SP and RP groups on all three variables were statistically significant (all *p* values < .001) when comparing median values. The IR subtest (*U* = 876.05) rank values were higher in the RP group (mean rank = 44.27) than the SP group (mean rank = 15.78). DR (*U* = 877.50), and MC (*U* = 822.00) subtest rank values were also higher in the RP group (DR mean rank = 44.31; MC mean rank = 42.52) when compared to the SP group (DR mean rank = 15.74, MC mean rank = 17.66). Given this finding, the null hypothesis for the first research question was rejected (see Table 3 for all testing data).

Table 3

Group Comparisons on Subscales of the WMT

	Group Type	*N*	Mean (SD)	Mean Rank
Immediate Recall (IR) *	Simulator	29	.55 (.17)	15.78
	Remembering	31	.94 (.07)	44.27
Delayed Recall (DR) *	Simulator	29	.53 (.17)	15.74
	Remembering	31	.94 (.10)	44.31
Consistency (C) *	Simulator	29	.53 (.11)	16.79
	Remembering	31	.91 (.12)	43.32
Multiple Choice (MC) *	Simulator	29	.34 (.16)	17.65
	Remembering	31	.83 (.20)	42.52
Paired Associates Recall (PAR) *	Simulator	29	.36 (.13)	17.29
	Remembering	31	.84 (.19)	42.85
Free Recall (FR) *	Simulator	29	.25 (.13)	17.16
	Remembering	31	.60 (.18)	42.98
Long Delayed Recall (LDR) *	Simulator	29	.26 (.11)	17.78
	Remembering	31	.61 (.18)	42.40

Research Question 2:

Research Question 2: Is there a significant difference in long-term memory performance in individuals who are feigning pain-related memory impairment (SP group) and individuals who are taking the test to their best ability while remembering acute pain (RP group)?

Subtests of the WMT that test long-term memory include Paired Associates Recall (PAR), Free Recall (FR), and Long Delay Recall (LDR). Mann-Whitney *U* tests indicated significant differences between SP and RP groups when looking at the long-term memory subtests (all p values were $< .001$). Mean rank scores were all significantly higher for the RP group compared to the SP group for all three variables (PAR *U* = 832.5, FR *U* = 836.5, and LDR *U* = 818.5). This was reflected in higher mean rank scores in the RP group (PAR = 42.85, FR =42.98, LDR = 42.40) compared to the SP group (PAR = 17.29, FR = 17.16, LDR = 17.78). Those who took the WMT while remembering pain scored higher than those in the simulator group. The null hypothesis for research question #2, which suggested that there were no significant differences between the SP and RP group, was rejected.

Research Question 3

Research Question 3: Does the WMT serve as a valid test of effort when the test taker is suffering from RP?

The Consistency (C) subscale determines the validity of the WMT. The simulator group had significantly lower mean rank scores on the C scale (*U* = 847, p < .001). The RP mean rank score on the C subscale was 43.42, which was higher than the SP mean rank score of 16.79. Lower scores indicate lower effort, so the results indicate that the simulator group exhibited significantly less effort than the remembering group. The null hypothesis, which stated that the WMT is not a valid test of effort when the test taker is suffering from pain, was rejected. (See Table 3 below.)

Summary

The WMT was administered to individuals who were randomly assigned to either the SP or RP group. Non-parametric Mann-Whitney tests were conducted, as the normality assumption was violated for all of the scales. Median values indicated significant differences between SP and RP groups, with the RP group scoring consistently higher than the SP group. The findings imply that there are significant differences in WMT performance depending on whether one is remembering pain versus simulating pain. Subtests measuring short-term memory found a significant difference between those who were feigning and those who took the test honestly while remembering pain. Long-term subtests of the WMT also found significant differences between the two groups. The findings also imply that the WMT is a valid test for those experiencing pain (remembered). The consistency scale of the WMT showed a significance between SP and the RP groups, with those in the SP group showing lower effort. All three null hypotheses were rejected, with significant differences found between both groups. Chapter 5 will discuss the significance and implications of the findings.

Chapter 5: Application to Professional Practice and Implications for Social Change

This true experimental quantitative study used the WMT, a symptom validity test that had not been tested by other researchers to determine the effects of pain on cognition. The purpose of this study was to determine if there were significant differences between two groups: those that took the WMT (Green, 2005) while feigning pain and those that took the WMT while remembering pain. This study also looked at the effect of RP on the consistency of the WMT. This research was modeled after studies conducted by Etherton and colleagues (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al.2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015) where participants took various symptom validity tests either when feigning (simulated or malingered) pain or honestly while using cold pressor induction. The studies conducted by Etherton and colleagues also included a group in which participants took symptom validity tests honestly without malingering or induced pain. Although the SP group I used for this research was similar to the Etherton studies, I asked participants to remember pain while taking the WMT instead of inducing pain via cold pressor, and I did not use a third group without remembered or SP. The current study was conducted to expand the literature regarding the validity of testing cognition and memory in individuals suffering from chronic pain and to enhance the detection of malingered pain when cognitive impairment is an associated symptom.

My findings indicated poor effort in the SP group compared to the RP group, as demonstrated by significantly lower scores. The SP group also scored significantly lower on the consistency subtest of the WMT compared with the RP group, indicating the WMT test is valid when the individual is experiencing RP.

Interpretation of the Findings

The findings in this study align, support, and extend findings from other research where pain (or in this particular study, RP) does not impact memory or resemble cognitive impairment (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017). Differences in this study included the use of a remembering pain group (instead of a cold pressor group), which was used to compare to a SP group, and the WMT was used as the SVT.

This study replicated most of the Etherton studies where similar theory (gate theory of pain and biopsychosocial theories) and methodology (honest test takers vs. simulators) were used (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017). These theories provide a physiological and psychological background for studying pain and cognition, as outlined in Chapter 2. Both short-term and long-term memory were not significantly affected by pain (remembered) when the participant was asked to take the WMT honestly. When participants were asked to simulate (or pretend to have) pain, they presented with a clearly diminished level of effort. The gate theory of pain indicates a physiological cognitive distraction when pain is present; however, my findings indicated that memory was not impaired when individuals were remembering pain. Individuals who were feigning pain and asked to feign memory impairment did so in a way that could be easily detectible. Although the biopsychosocial model of pain is well-supported, I did not find a connection between memory and pain in the RP group, and the participants in the feigning pain group clearly exaggerated the connection between pain and memory in a manner that the WMT was sensitive enough to detect. These findings were consistent with the findings of Etherton and colleagues in their research focused on other SVTs.

Other SVT tests, as described in Chapter 2 (subtests of the WAIS-III, WAIS-IV, and Wechsler Memory subtests, such as the Reliable Digit Span, Working Memory Index, Processing Speed Index, Visual Working Memory Index [VWM], and the Auditory Memory Index), were found reliable when pain was present in the Etherton et al. studies (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al,, 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015). The WMT was similarly found reliable in this study. This study used the Consistency Scale (C), a subtest of the WMT, to determine reliability. Participants in the SP group scored significantly lower compared to the RP group on the C scale, which can be interpreted to mean that the SP group showed lower effort. Etherton and colleagues' findings were similar to this study in that participants in their simulator groups demonstrated significantly lower effort on various SVT tests (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Svensson & Arendt-Nielsen, 1995; Tapscott & Etherton, 2015; Terrighena et al., 2017). This is consistent with an exaggeration of the relation between cognitive functioning and pain in the minds of the participants in comparison to the lack of such an association in the group that was experiencing cold pressor pain.

Mean scores in the SP group, where participants were asked to feign pain-related cognition problems, were all lower than the RP group, where participants were asked to remember past pain, indicting poor effort in the SP group. Although a normative group was not used in this study, cut-off scores established by the developers of the WMT were used to compare the pass/fail rates of each group (Green, 2005). Most (93%) of the participants in the SP group failed all subtests of the WMT, indicating poor effort. Most (87%) of the participants in the RP group passed the WMT cut-off scores, indicating good effort despite RP. These findings indicate that the WMT is a valid assessment of memory when pain (or at least RP) is present.

Given the results from this study, psychologists can use the WMT with confidence to determine effort when the individual is experiencing pain, because pain (or at least RP) did not appear to impact effort. Future research may be able to support the findings of this study with a pain-induction procedure; however, given that these findings are consistent with the Etherton and colleagues studies, which employed pain induction procedures with multiple SVTs, the findings are likely resilient. The results of this study indicated that pain (remembered) does not have significant physiological effect on short-term or long-term memory.

Limitations of the Study

A limitation of this study was that the convenience sample I recruited was small and may not be a true representation of the population in the United States. Thus, the findings cannot be generalized to that population. The sample of participants used for the study may be biased in both sampling and selection. The sample size was small for an experimental study, and a larger sample may have yielded different findings. The time requirement in administering the WMT was a consideration when approaching participants; therefore, most participants were family and friends. Researchers who may be able to compensate participants for their time may be able to recruit a larger, more diverse sample to replicate the findings. Unfortunately, I did not keep track of study decliners, which consisted of four individuals. There may have been something about those four people that was different from the study completers that could have also influenced performance; however, I could not examine if this was the case.

The use of a remembered pain group was a limitation in this study when compared to other studies that used cold-pain induction (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015). Asking people to remember pain means that there will be a wide variability of individual RP experiences compared to a controlled induction of a specific pain experience, creating a wide variety of bias within the small sample.

Many confounding variables may be present in this study. For example, pain is a common experience, and some participants spontaneously admitted that they were experiencing some pain (e.g., neck or back pain) while taking the WMT. Additionally, it would be difficult to determine the extent to which experiencing real-life pain interfered with the findings, if at all, when it is such a universal and commonplace experience. The presence of pain in some of the participants in both groups nonetheless may limit the interpretation of the data. Other confounding factors may include age of the participant (e.g., pain intensity), self-report bias (e.g., individual pain tolerance), pain felt or not felt that day (e.g., the participant was having no pain and had a hard time recalling last pain felt), and researcher bias (e.g., selection bias out of convenience). Given that I developed, conducted, and analyzed the data for this research and was involved in all stages of its planning and implementation, the potential for researcher bias to influence the findings is an issue despite all attempts to remain objective.

Recommendations

The field of research in malingering would benefit from a true cold pressor study using the WMT to supplement the current findings. As discussed in Chapters 1 and 2, cold pressor is a research modality where a participant places a foot or a hand in ice water to induce real pain. This allows pain induction to be consistent for every participant, although it might still be perceived differently by the individuals in the study. Remembering pain is obviously not as reliable or consistent as genuine pain while any measure of cognition is being administered to assess the impact of pain on performance. This greatly limits this study when compared to other studies in which cold pressor was used to induce real time pain.

Another option would include testing people who have known pain issues, such as those diagnosed with arthritis or fibromyalgia, while taking the WMT. The problem with this research idea is that, even among those who have the same diagnosis, everyone has various pain levels. Expanded research could replicate previously tested SVTs and include other SVTs that haven't been researched, such as the Rey 15-Item Test, the Recognition Memory Test (RMT), the Validity Indicator Profile (VIP), and the Computerized Assessment of Response Bias (Slick et.al., 1999). All research would benefit from comparing the simulator and cold pressor pain groups with a normative group.

Research in malingering pain and cognition would also benefit from comparing other common factors or stressors that often are associated with pain and cognition, such as depression, anxiety, and opioid use. An interesting study would be to compare those diagnosed with chronic pain issues and a simulated malingering group. Participants could identify listed common comorbid factors usually associated with pain for comparison and analysis. Finally, a qualitative or mixed-method research design would add to this topic, as comorbid factors could be identified and delineated. Adding a qualitative component would allow for a description of the lived experiences of the participants, including the strategies used to remember or simulate pain. This field of research would also profit from a larger sample from a targeted population.

Implications

This study used the gate theory of pain and biopsychosocial theories when approaching explanations of the pain/cognition phenomenon (Estergard, 2008). These theories explain the multidimensional experience of pain, both physiologically (gate theory) and psychologically (biopsychosocial). These theories were also utilized in the

Etherton et al. studies (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al.,, 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015). The gate theory of pain and the biopsychosocial model of pain view the experience of pain as both a physiological (e.g., perceptive) and psychological (e.g., suffering) experience. The gate theory implies that pain may affect cognition in some circumstances (Estergard, 2008). The findings of this study implied that RP did not significantly affect short- or long-term memory; however, those who were asked to malinger pain faked significant memory problems. This phenomenon points to the biopsychosocial theory, which indicates external factors may play a big part in the pain experience of a person.

This research study adds to other research on malingering, pain, and cognition by demonstrating that the WMT is likely not impacted by the presence of pain and is sensitive to malingering. This research addresses a gap by both continuing research and using a different SVT, the WMT. The findings of this study can help both individuals and their families suffering from pain by providing evidence that supports valid pain responses. This research will also have organizational and societal implications when considering effort testing and the detection of malingering. For example, insurance companies processing worker's compensation claims can rely and trust psychological findings testing for effort, saving millions of dollars on claims (Bianchini et al., 2005; Heilbronner et.al., 2009). The findings of the current study added to the previous research by supporting the methods used in the Etherton et al. research, as I am not affiliated with that set of researchers. The findings also supported the use of the biopsychosocial model of pain, as discussed above, in the field of pain research.

Progress in the field of research on the effect of pain on cognition and memory is slow and gradual. The current findings support previous research (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015) that indicated RP likely does not significantly impact cognitive function. Such research can result in positive social change for individuals who suffer from pain. For example, they may benefit from knowing that their pain may not be significantly reducing their ability to remember, or that their memory is most likely not affected, giving them more confidence. This can also help individual family members who may question the pain/cognition dynamic in their loved one. Knowing that your memory and other functions are not affected by your pain can be empowering, possibly improving self-esteem and self-efficacy. Individuals with chronic pain may be able to use the results of this study to support the validity of their testing results and support their diagnosis. Health care professionals may also benefit from this research by having data that can be used to give clear diagnoses.

Positive social change in society may be inspired from this research when agencies, institutions, and psychologists can rely on results of this study and other studies showing pain is not generally a significant factor in memory or cognitive function (Landro et al., 1997; Lee et al., 2010). Society benefits when we are able to detect malingering and validate the experience of chronic pain. Individuals who suffer from chronic pain may benefit from this research by the addition of a validated measure of malingering. Chronic pain is an invisible disability, and any development in the field that contributes to the validation of people's suffering also contributes to social change. The recognition that chronic pain can be validated with measures that distinguish it from malingering benefits individuals with pain, their families, and the health care providers that diagnose and treat them. Given the expense that chronic pain represents in terms of disability payments and lost productivity, research that contributes to the validation of chronic pain and distinguishes it from malingering also benefits society in general.

Most researchers studying the pain/cognition connection have concluded that other factors or stressors affect cognition more than pain (Landro et al., 1997; Lee et al., 2010). The current findings support that conclusion. Professionals who use effort testing can rely on the WMT as a reliable and valid tool in a comprehensive evaluation when someone is experiencing pain, saving society millions of dollars by detecting malingering and helping pain sufferers (Meyers & Diep, 2000).

Conclusion

SVTs are important tools to determine effort. Psychologists can use SVTs during an evaluation to determine effort when someone is experiencing pain as part of a comprehensive evaluation. This research used the WMT, an SVT used to determine effort. The purpose of this study was to see if the WMT might be a valid and reliable SVT when someone is experiencing pain (remembered). The findings indicated that the WMT is indeed valid and reliable in this regard.

This research adds to the current body of literature on this topic and may be used to move the field forward in regard to expanding our knowledge in malingering detection and validating cognitive testing in individuals with chronic pain. My findings supported past research (i.e., Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al.; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015) in the field of detecting malingering using SVTs when pain is present. This research showed that RP was not a significant factor in cognition or memory. In fact, participants in this study who SP showed poor effort when compared to a RP group. In the Etherton et al. studies, pain was also not found to be a significant factor in memory or cognition (Etherton, 2014; Etherton, 2015; Etherton, Bianchini, Ciota, et al., 2005; Etherton, Bianchini, Heinly, et al., 2005; Etherton & Tapscott, 2015; Tapscott & Etherton, 2015). These findings can be applied to benefit individuals with chronic pain, their families, health care providers who rely on testing, and society in general by creating social change through validating the experience of chronic pain.

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Appendix A: WMT Subtests and Test Administration

"The WMT measures the ability to learn a list of 20 word pairs (e.g., pen-pencil, pig-bacon). After being shown 20 word pairs on the computer screen at a rate of one word pair per six seconds, the person sees the same list a second time and is then given the Immediate Recognition trail (IR)" (Green, 2005).

<u>The six WMT subtests:</u>

IR Immediate Recognition- During this trial, the person is required to pick the original word from a list in each of 40 new word pairs (eg. "pen" from "pen – pencil")

DR Delayed Recognition

MC Multiple Choice

PA Paired Associates

FR Free Recall

LDFR Long Delayed Free Recall

Appendix B: Demographic Information and History of Participant

Please use the back of this paper if additional room is needed for answers.

Gender: ________Male_______Female________Other

Age:_____________________

What race and ethnicity do you identify as?

_______ Black or African American

________Native Hawaiian and other Pacific Islander

_______ Native American or Alaskan Native

______Asian or Asian American

_________Caucasian

Are you:

_________Hispanic or Latino

_________Not Hispanic or Latino

What is the highest educational level you have completed?_______________________