EFFECTS OF HYPNOSIS ON PHANTOM LIMB PAIN

By

DAN ERIC NEIGHBORS

A dissertation submitted in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

WASHINGTON STATE UNIVERSITY
Department of Educational Leadership, Sport Studies and Education/Counseling Psychology

DECEMBER 2017

© Copyright by DAN ERIC NEIGHBORS, 2017
All Rights Reserved
To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation

of DAN ERIC NEIGHBORS find it satisfactory and recommend that it be accepted.

________________________
Marianne Barabasz, Ed.D., Chair

________________________
Arred Barabasz, Ed.D., Ph.D.

________________________
Olusola Adesope, Ph.D.
ACKNOWLEDGEMENT

It has been a true gift to be able to learn from the remarkably talented people on my committee throughout my time in graduate school. I particularly enjoy the clinical side of psychology and I am so grateful to have been able to learn from both Drs. Marianne and Arreed Barabasz as I developed my clinical abilities. Furthermore, I am extremely thankful to have been given the opportunity to develop a specialty background like treating pain and quality of life impacted by disability through my research experience. Without the mentorship of both Drs. Marianne and Arreed Barabasz, I recognize that I could not have grown into the clinician or researcher that I am today. I am also eager to recognize the outstanding contributions Dr. Olusola Adesope provided both to my dissertation quality and the larger development of my research competence. Dr. Marianne Barabasz, Dr. Arreed Barabasz, and Dr. Olusola Adesope, I cannot thank you enough for your tremendous support throughout this meaningful journey. I will forever remember what you have done for me.

I am also thankful for my parents who sacrificed a tremendous amount throughout their lives to provide me opportunities that they never had. Your foresight is admirable and your support is unmatched. Many times your encouragement has been the key to me persevering despite the challenges that I faced as a first-generation-college-student working on my PhD. As a parent of my own beautiful children, I plan to model my rearing style after the tremendous example each of you provided throughout my life. I will forever remember what you have done for me and what you continue to do and I hope to reciprocate that love.

Lastly, I would like to thank my family for being what I look forward to every day of my life. Boys, you and your mom are what give me energy every day; whether we are learning numbers and letters, playing games, or cuddling up to read a book or watch a movie together,
you make all that I do worthwhile. And, specifically to my beautiful wife, thank you for being the constant inspiration that you are. You are the most tenacious, determined, hardworking individual I have ever met. Your unrelenting energy is a constant motivator to me. You have given me the most amazing children I could have ever asked for, you have gone above and beyond to support my professional endeavors, and you continue to impress me with your intellect and creativity on a daily basis. You constantly push me to be more than I had ever dreamed of being. I cannot thank you enough for just being you.
Abstract

by Dan Eric Neighbors, Ph.D.
Washington State University
December 2017

Chair: Marianne Barabasz

This research examined the efficacy of hypnosis for relieving phantom limb pain (PLP) in a well-defined target population consisting of only people with non-chronic illness caused amputations; a group that is yet to be specifically targeted in hypnosis for PLP treatment studies. This study included both a between and within subjects design, with treatment as the between subjects variable (i.e., hypnosis versus relaxation) and time as the within group variable (i.e., pre-treatment versus two, four, and six weeks post-treatment). The treatment and control groups each received four one-hour sessions and used audio-tapes between sessions beginning from the second session on. Level of hypnotizability was measured using the Elkins Hypnotizability Scale. Dependent measures for both within and between group comparisons included the McGill Pain Questionnaire (MPQ), Daily Pain Rating Scale (DPRS), and Brief Pain Inventory Short-Form (BPI). The hypnosis treatment group also used the Present Pain Intensity Scale (PPIS) to measure pain before and after intervention each session. No significant differences were found between groups at pre-treatment (i.e., MPQ, PRI, DPRS, BPI, level of hypnotizability, age, PLP duration, pain severity, or quality of life). The Wilcoxon Signed Ranks Test and the Mann-Whitney U were used to analyze within and between group comparisons, respectively. Using a
significance level cut-off of .05, the hypnosis group showed significant improvements on the MPQ, DPRS, and BPI at all follow up time periods. Significant differences were also observed between treatment types. That is, hypnosis produced significantly lower scores than the control group for each dependent measure at certain comparison periods; on the MPQ at the six week follow-up period; on the DPRS at the two and six week follow-up periods; and on the BPI at the two week follow-up period. This study supports the use of hypnosis for treating PLP and improving quality of life for people with amputation due to non-chronic illness causes.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii-iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v-vi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>1</td>
</tr>
<tr>
<td>Rehabilitation Complications</td>
<td>2</td>
</tr>
<tr>
<td>Treatments</td>
<td>3</td>
</tr>
<tr>
<td>Hypotheses</td>
<td>6</td>
</tr>
<tr>
<td>Operational Definitions</td>
<td>8</td>
</tr>
<tr>
<td>2. LITERATURE REVIEW</td>
<td>10</td>
</tr>
<tr>
<td>Early Accounts of Amputation</td>
<td>10</td>
</tr>
<tr>
<td>Amputation’s Evolution</td>
<td>10</td>
</tr>
<tr>
<td>Amputation and the United States</td>
<td>11</td>
</tr>
<tr>
<td>An increase in amputation procedures and amputee survivors</td>
<td>12</td>
</tr>
<tr>
<td>Rehabilitation complications for amputees</td>
<td>13</td>
</tr>
<tr>
<td>Phantom Limb Sensations, Phantom Limb Pain, and Residual Stump Pain</td>
<td>14</td>
</tr>
<tr>
<td>Pain: Acute versus Chronic</td>
<td>17</td>
</tr>
<tr>
<td>Pain versus Suffering</td>
<td>19</td>
</tr>
<tr>
<td>Phantom Limb Pain Theories</td>
<td>20</td>
</tr>
<tr>
<td>Psychological theory</td>
<td>20</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Gate control theory</td>
<td>21</td>
</tr>
<tr>
<td>Hypnosis: State-Trait Theory</td>
<td>24</td>
</tr>
<tr>
<td>Factors that can impact hypnotic responsiveness</td>
<td>27</td>
</tr>
<tr>
<td>Hypnosis as an Intervention</td>
<td>28</td>
</tr>
<tr>
<td>Hypnosis and pain</td>
<td>29</td>
</tr>
<tr>
<td>Hypnosis and Chronic Pain</td>
<td>30</td>
</tr>
<tr>
<td>Headaches</td>
<td>31</td>
</tr>
<tr>
<td>Cancer</td>
<td>32</td>
</tr>
<tr>
<td>Disability related pain</td>
<td>32</td>
</tr>
<tr>
<td>Hypnosis for PLP</td>
<td>34</td>
</tr>
<tr>
<td>Case studies</td>
<td>34</td>
</tr>
<tr>
<td>Quasi-experimental design studies</td>
<td>39</td>
</tr>
<tr>
<td>Summary</td>
<td>43</td>
</tr>
<tr>
<td>3. METHODOLOGY</td>
<td>45</td>
</tr>
<tr>
<td>Design</td>
<td>45</td>
</tr>
<tr>
<td>Participants</td>
<td>45</td>
</tr>
<tr>
<td>Setting</td>
<td>48</td>
</tr>
<tr>
<td>Treatment</td>
<td>48</td>
</tr>
<tr>
<td>Hypnosis group</td>
<td>48</td>
</tr>
<tr>
<td>Relaxation group</td>
<td>49</td>
</tr>
<tr>
<td>Measures</td>
<td>50</td>
</tr>
<tr>
<td>Screening measures</td>
<td>50</td>
</tr>
<tr>
<td>Phantom experience</td>
<td>50</td>
</tr>
</tbody>
</table>
Hypnotizability ................................................................................................................................. 50
Pain Measures ................................................................................................................................. 52
McGill Pain Questionnaire .............................................................................................................. 52
Daily measures of pain..................................................................................................................... 56
Pre and post hypnotic pain measures .............................................................................................. 56
Quality of life measure .................................................................................................................... 57
Procedures .......................................................................................................................................... 58

4. RESULTS ........................................................................................................................................ 63
Design ................................................................................................................................................ 63
Analyses ............................................................................................................................................. 63
Participants ......................................................................................................................................... 64
Comparison of participant characteristics by group ......................................................................... 65
Hypotheses Testing ............................................................................................................................ 66
Between group analyses ................................................................................................................... 66
Hypothesis 1 ......................................................................................................................................... 66
Hypothesis 2 ......................................................................................................................................... 68
Hypothesis 3 ......................................................................................................................................... 69
Within group analyses ....................................................................................................................... 70
Hypothesis 4 ......................................................................................................................................... 70
Hypothesis 5 ......................................................................................................................................... 72
Hypothesis 6 ......................................................................................................................................... 73
Hypothesis 7 ......................................................................................................................................... 74

5. DISCUSSION .................................................................................................................................... 77
Summary and Interpretation .............................................................. 77
Strengths and Limitations ............................................................... 84
Future Directions ............................................................................. 87
REFERENCES .................................................................................... 90

APPENDIX

A: Phantom Pain Experience Questionnaire ..................................... 103
B: Demographic Information Form .................................................. 104
C: Recruitment Flyer ......................................................................... 105
D: Recruitment Letter ........................................................................ 106
E: Contact Script ................................................................................ 107
F: Ipsative Hypnotic Protocol .............................................................. 108
G: McGill Pain Questionnaire ............................................................ 113
H: Daily Pain Rating Scale (DPRS) – Numeric Rating Scale ............. 114
I: Present Pain Intensity Scale (PPIS) – Numeric Rating Scale ......... 115
J: Brief Pain Inventory Short-Form ..................................................... 116
K: Informed Consent Document ......................................................... 118
LIST OF FIGURES

1. Figure 1; MPQ PRI (R) Total Score: Between Group Means ..........................67
2. Figure 2; DPRS: Between Group Means ...........................................................68
3. Figure 3; BPI: Between Group Means ...............................................................70
4. Figure 4; MPQ PRI (R) Total Score: Within Group Means ............................71
5. Figure 5; DPRS: Within Group Means ..............................................................72
6. Figure 6; BPI: Within Group Means .................................................................74
7. Figure 7; PPIS: Within Group Means ...............................................................76
Dedication

This dissertation is dedicated to people with chronic pain and disability, as each of you deserve continued advancement of cost-affordable, non-invasive treatments that you can utilize to live an enjoyable and meaningful life.
CHAPTER ONE
INTRODUCTION

Statement of the Problem

Through the 19th century, there is evidence from wartime amputation death rates that many potential amputees risked death when having to undergo amputation surgery. Toward the end of the 19th century though, with increased knowledge of and access to antiseptics, amputee death rates post-operation rapidly declined (Helling & McNabney, 2000). Thus, throughout the 20th and 21st centuries, the United States has seen an increase in people living after amputation surgery. Amputation accordingly soon changed to be a trusted resource for saving a person’s life within civilian populations as well as military populations. Amputation is now most commonly used to help patients struggling with life threatening chronic health complications like: diabetes, vascular disorders, cancers, and other serious medical diagnoses (Lawrence, 2008). There has also been a resurgence in amputations caused by traumatic injury throughout the 20th and 21st centuries within military populations. Evidence can be found in the number of surviving amputees coming from military engagements throughout the 20th and 21st centuries (Department of Veteran Affairs, 2002; LaNoue, 1997; Peterson, 1970; Brackett, 1927). Furthermore, within the last couple of decades, as international tensions have risen again, the United States has placed troops in a number of major battle zones across the world (Weeks, Anderson-Barnes, & Tsao, 2010; Stansbury, Branstetter, & Lalliss, 2007) and there have been numerous accounts of traumatic amputation due to injuries soldiers have sustained in Iraq and Afghanistan (Weeks, Anderson-Barnes, & Tsao, 2010; Stansbury, Branstetter, & Lalliss, 2007). The international committee of the Red Cross estimates that there are 110 million landmines buried and or stockpiled throughout the world and that 70 people per day are either injured or killed by such landmines (Ferguson, Richie, & Gomez, 2004). Furthermore, the Department of Veteran Affairs
(2002) notes that even during peace times, there are an average of 20 traumatic injury caused amputations of military members each year. Considering the incredible growth of amputee survivors, specifically those who have received traumatic limb amputations, it is imperative to find accessible, viable treatments for post-amputation complications that can arise.

**Rehabilitation complications.**

Effects impairing the adjustment of amputees post-surgery are physical, psychological, and financial (Ferguson, Richie, & Gomez, 2004). Limb loss due to traumatic injury is often sudden and devastating, leaving a person to adjust to a society where physical ability is the norm (Ferguson, Richie, & Gomez, 2004). To further complicate the normal adjustment of losing one’s mobility and adjusting to a society where physical ability is the norm, many people with amputation experience post-amputation pains (PAP), specifically residual stump pain (RSP) and phantom limb pain (PLP). Quality of life can be significantly impaired by post-operative pain complications such as these (Fortington, Dijkstra, Bosmans, Post, & Geertzen, 2013; Sinha, & Van Den Heuvel, 2011; Zidarov, Swaine, Gauthier-Gagnon, 2009).

In the 16th century, military surgeon, Ambroise Paré introduced the concept of pain in an area of the body that had been removed by amputation (Weeks, Anderson-Barnes, & Tsao, 2010). He observed that his patients would continue to report pain in the removed limb months after the actual operation had been completed (Clarke, Lindsay, Pyati, & Buchheit, 2013). The term PLP was originally coined by Silas Mitchell toward the end of the 19th century (Ramachandran & Rogers-Ramachandran, 1996) to describe this life impacting chronic pain experience that onset post-surgery for many people with amputation. PLP is most commonly experienced in the distal portions of the phantom limbs (Hill, 1999). Hill (1999) cites the two most common descriptions of PLP as “burning” and “cramping” (p. 130) and lists other highly
cited descriptions as: stinging, throbbing, piercing, and tearing. It is not uncommon for a patient to experience many types of pain on a regular basis (Chan 2006; Kim & Kim 2012; Oakley & Halligan 2002; Oakley, Whitman, & Halligan, 2002).

**Treatments.**

Although a number of interventions such as pain medicine, mirror box therapy, and virtual reality therapy have been developed and researched for use in amputee populations, there are a number of issues with such interventions. Mirror therapy has received critique for counter indicated results. For example, Casale, Damiani, and Rosati (2009) found that 19 of their 33 participants reported confusion and dizziness, six reported irritation, and four refused to continue treatment, leaving only four participants out of 33 without complaints about the approach. Additionally, it has been observed that there are a number of participants who are unable to respond to and gain relief from mirror box or virtual visual feedback, leaving researchers to determine that some people are not susceptible to the treatment (Mercier & Sirigu, 2009).

Accordingly, Mercier and Sirigu (2009) found that only five of eight participants obtained a 30% decrease in pain as measured by the visual analog scale (VAS) and that only four participants out of eight maintained any benefits four weeks after their eight week of treatment. Moreover, mirror therapy has received critique for not being widely available to clinicians and clients alike. For example, Walsh and Bannister (2010) note that mirror box’s applicability as a reasonable treatment is limited by its size, suggesting that the devise becomes “prohibitively large”, especially when working with amputated legs (p. 971). The researchers add that since quality mirrors are made from glass, they can be both heavy and potentially dangerous.

Alternatives for replacing the mirror therapy approach have shifted into a focus on virtual reality therapy, noting its more reasonable size as a positive to its’ wide spread application.
Unfortunately, how many clinicians have a virtual reality therapy machine at their access, especially when considering that it needs to have a compatible program for treating PLP symptoms? This consideration is especially important to consider when working with people who have amputations, as it is not uncommon for this population to experience challenges related to financial status and mobility. For example, it seems likely that a person with an amputation could find virtual reality therapy difficult to access.

Pain medication has been used to treat PLP, as it has for other chronic pain disorders. Unfortunately though, the results are not promising and the complications of pain medication reliance are well known. Opioids, a highly addictive substance, are commonly used to reduce PLP although there are no substantial long-term benefits shown as of today (Quinlan-Colwell, 2014). Additionally, methadone in high doses was not shown to be effective in treating PLP (Quinlan-Colwell, 2014). Antiepileptic drugs, while they also have produced inconsistent results, remain the most commonly used pharmacological treatment for PLP (Quinlan-Colwell, 2014).

Thus, it is evident that there is a need to develop more available, empirically based treatment modalities for the chronic pain disorder of PLP for people who experienced amputation. Additionally, as Patterson (2010) states, it is important for chronic pain treatments to not just focus on pain improvement, but also quality of life improvement. Treatments like pain medication, mirror box therapy, and virtual reality therapy do not specifically target many of the commonly co-morbid concerns faced by people who have experienced amputation.

Hypnosis, “a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion” (Elkins, Barabasz, Council, & Spiegel, 2015, p. 6), has shown to be an effective clinical intervention for numerous medical and psychological disorders. In fact, there is a vast body of literature supporting the use
of hypnosis for treating both acute and chronic pain syndromes. Furthermore, there are case studies rooting back to 1979 that show promise for hypnosis being an effective tool for clients with PLP. There has also been a couple of quasi-experimental research studies that have focused on reducing PLP through use of hypnosis, although these studies were heavily characterized by participants with amputation due to chronic illness related medical complications. This article will later review the available hypnosis studies, both case studies and quasi-experimental design studies, to highlight the need for well-designed experimental research on hypnosis as a treatment for PLP and quality of life with a focus on a population of people with amputation not caused by chronic illness. It will be shown that, while hypnosis shows promise for chronic pain treatment and some evidence that hypnosis can be effective for people with PLP due to amputation, more research is needed to determine the efficacy of hypnosis as a treatment for people with amputation caused by traumatic injury or acute medical problems.
HYPOTHESES

1. The treatment group will show significantly reduced phantom limb pain (as measured by significantly lower pain scores on the McGill Pain Questionnaire when using the PRI (R) total score) at the two week, four week, and six week follow up assessment as compared to the active control group’s scores during those follow-up assessment periods.

2. The treatment group will show significantly reduced phantom limb pain (as measured by significantly lower average pain scores from the Daily Pain Rating Scale) at the two week, four week, and six week follow-up assessment as compared to the active control group’s scores during those follow-up assessment periods.

3. The treatment group will show significantly higher quality of life (as measured by displaying significantly lower scores on the Brief Pain Inventory short form) at two week, four week, and six week follow-up assessment periods as compared to the active control group’s scores during those follow-up assessment periods.

4. Participants within the hypnosis treatment group will show significantly reduced phantom limb pain from pre-treatment assessment to post-treatment follow-up assessments at two weeks, four weeks, and six weeks (as measured by significantly lower PRI (R) total scores from the McGill Pain Questionnaire).

5. Participants within the hypnosis treatment group will show significantly reduced phantom limb pain from pre-treatment to post-treatment follow-up assessments at two weeks, four
weeks, and six weeks (as measured by significantly lower weekly pain severity averages from the Daily Pain Rating Scale).

6. Participants within the hypnosis treatment group will show significant increases in quality of life when comparing pre-treatment scores to post-treatment scores at two weeks, four weeks, and six weeks (as measured by lower scores on the Brief Pain Inventory short form).

7. The hypnosis treatment group will show significant reductions in phantom limb pain from pre-hypnotic intervention to post-hypnotic intervention during each treatment session when pain is reported prior to intervention (as measured by the mean difference between scores on the Pre-hypnotic Pain Scale and the Post-hypnotic Pain Rating Scale).
OPERATIONAL DEFINITIONS

Amputation

A medical procedure referring to the removal of a portion of the body.

Traumatic Amputation

Amputation that occurs due to a severe injury sustained to a limb or limbs, as is seen in military deployments or severe civilian car accidents for example.

Acute Pain

Pain that is produced by damaged tissue or nociception and is resolved when the bodily damage has healed, generally lasting less than 3-6 months.

Chronic Pain

Chronic pain is pain that is experienced despite a wound already healing and it lasts longer than 3-6 months.

Post-operation pain

Pain syndromes that onset after undergoing surgery.

Residual Stump Pain

Post-surgery pains in the stump or residual limb of the amputated portion of the body.

Phantom Limb Pain

Pain sensations occurring in the portion of a limb or limbs that have been removed by amputation.

Phantom Limb Sensations

The presence of any sensation experienced in the amputated limb except pain.

Suffering
The affective component of the pain that is responsible for the human interpretation of pain (e.g., the difference between enjoyable pain in experienced in muscles after a good workout and that of an injury). Suffering leads to pain behaviors.

**Hypnosis**

A state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion.

**Quality of Life**

Maintaining one’s daily functioning in regards areas of well-being such as the following examples: general activity, mood, walking ability or the ability to move around, normal work within or outside of the house, relations with others, sleep, and enjoyment of life.
CHAPTER TWO
LITERATURE REVIEW

Early Accounts of Amputation

The removal of human limbs has been done for various reasons throughout history. The procedure has been used for an array of purposes, ranging from ritualistic exercises, punishment, traumatic injury after civilian or military accidents, and the most common reasons today within the United States: loss of blood flow due to chronic health issues like diabetes. Sellegren (1982) purports that hand drawings dating back to 5,000 B.C., which show missing fingers, may depict mankind’s earliest records of amputation. Sellegren believes that some practices were ritualistic, but also contends that other cases could have been due to traumatic injury, frostbite, and diseases that commonly plagued people during that time in France and Spain. Early history also documents the use of self-amputations to escape captors in wartimes. In 484 B.C. a Persian soldier held captive, Hegistratus, removed a portion of his own foot in order to escape to freedom (Sellegren, 1982). While he later died, his attempt to flee documents one of the earliest uses of prosthetics to enhance mobility (Sellegren, 1982). Though amputation can be traced back thousands of years, the procedure was not what it is today and was not perceived the same by society. Low success rates (Helling & McNabney, 2000), social perspectives (Sellegren, 1982), beliefs about the afterlife (Sellegren, 1982), and the ability to work and feed a family post-surgery (Sellegren, 1982) have been common arguments against limb removal throughout history.

Amputation’s Evolution

In the 16th century, Ambroise Paré provided the medical community what would later be concluded as two groundbreaking discoveries in the advancement of wound treatment (Sellegren,
His first contribution came in 1537 when he ran low on boiling oil, the time’s standard treatment for cauterizing open wounds (Sellegren, 1982). Paré quickly developed and applied a homemade formula to the wounds, which he and others learned left the wounded in better, more stable health the day after treatment (Sellegren, 1982). Possibly even more notably, especially in regards to amputation surgeries, Ambroise Paré popularized the use of ligatures for hemostasis in amputation (Sellegren, 1982). One problem that continued to stir debate amongst the medical communities though was the time in which it took a surgeon to complete the process of using ligatures. Wangensteen, Owen, and Wangensteen (1978) report that an 1890 German study of above the knee amputations required, on average, 53 ligatures when cauterization was not used. Thus, broader acceptance of Paré’s surgical procedures would rely on advancement in medical technology that would not arrive for centuries.

Amputation and the United States

Within the United States, the procedure of removing a limb for medical purposes was referred to as dismembering until the 17th century (Lawrence, 2008). In the 17th century, the English language adopted the word amputation from the French (Lawrence, 2008). Through the 19th century, there is still evidence from wartime amputation success rates that many potential amputees risked death when having to undergo amputation surgery. For example, The Civil War produced 29,426 amputations, 26% of which died during the amputation (Helling & McNabney, 2000). Additionally, of those injured soldiers who received lower limb amputations, 40% died following the amputation from shock or other post-amputation complications (Helling & McNabney, 2000). Toward the end of the 19th century though, with increased knowledge of and access to antiseptics, amputee death rates post-operation rapidly declined (Helling & McNabney, 2000). For example, mortality rates from amputation to the knee joint went from 54% during the
American Civil War to a mere 5% during the Spanish-American War later in the century (Helling & McNabney, 2000). As further advancements such as improved surgical technology, increased access to effective anesthetics, and research about optimal amputation procedures and recovery became more available, amputation success rates improved and the use of amputation within the United States changed, thus increasing the need for understanding rehabilitation concerns of our growing community of people with amputations.

**An increase in amputation procedures and amputee survivors.**

With increased success rates, the application of amputation procedures expanded beyond the historical uses of combating frostbite and helping those who incurred traumatic limb damage and circulatory compromise during battle. Amputation changed to be a trusted resource for saving a person’s life within the civilian populations as well as the military population. There were an estimated 1.6 million Americans suffering from limb loss in 2005 (Ziegler-Graham et. al, 2008). In other words, 1 person out of every 190 persons in the United States suffers from limb amputation (Ziegler-Graham et. al, 2008) and its common associated complications. It is projected that the number of amputees living within the United States will more than double by the year 2050 to approximately 3.6 million people (Ziegler-Graham et. al, 2008). Amputation is now most commonly used to help patients struggling with life threatening health complications like: diabetes, vascular disorder, cancers, and other serious medical diagnoses (Lawrence, 2008). While the most common cause of amputation in the United States is due to illness at this time, it should be understood that the relative number of surviving traumatic amputees has risen significantly throughout the 20th and 21st centuries. Evidence can be found in surviving amputees from engagements throughout the 20th and 21st centuries. World War I produced 2,300 traumatic amputees (Brackett, 1927), World War II produced 18,000 traumatic amputees (Peterson, 1970),
the Korean War produced approximately 1,500 traumatic amputees (Department of Veteran Affairs, 2002), and the Vietnam War produced an estimated 6,000 traumatic amputees (LaNoue, 1997). Within the last couple of decades, as international tensions have risen again, the United States has placed troops in a number of major battle zones across the world (Weeks, Anderson-Barnes, & Tsao, 2010; Stansbury, Branstetter, & Lalliss, 2007) and there have been numerous accounts of traumatic amputation due to injuries soldiers have sustained in Iraq and Afghanistan (Weeks, Anderson-Barnes, & Tsao, 2010; Stansbury, Branstetter, & Lalliss, 2007). For example, the Armed Forces Health Surveillance Center reported that there have been approximately 6,144 cases of traumatic amputations for military personnel from 2000 to 2011 (2012). Stansbury, Branstetter, & Lalliss attribute the observed rise in traumatic amputations throughout the Iraq and Afghanistan conflicts to their urban terrorism nature, suggesting that the common ground explosion creates increased amounts of soldiers who are able to survive traumatic amputations (2007). Additionally, the international committee of the Red Cross estimates that there are 110 million landmines buried and or stockpiled throughout the world and that 70 people per day are either injured or killed by such landmines (Ferguson, Richie, & Gomez, 2004). The Department of Veteran Affairs (2002) even notes that during peace times, there is an average of 20 traumatic amputations of military members each year. Considering the incredible growth of surviving traumatic amputees, it is imperative to continue addressing unanswered problems related to rehabilitation for this specific population.

Rehabilitation complications for amputees.

With a growing traumatic amputee population within the United States, it is necessary that rehabilitation continues to improve. There are a number of complications that arise post-amputation that people who have amputation must adjust to. Effects have been found to be
physical, psychological, and financial (Ferguson, Richie, & Gomez, 2004). Limb loss due to traumatic injury is often sudden and devastating, leaving a person to adjust to a society where physical ability is the norm (Ferguson, Richie, & Gomez, 2004). Adjusting to losing not just a limb and one’s former mobility, but also often social, occupational, familial, and community roles, as well as possible changes to economic status can be shocking for people who experience an amputation (Ferguson, Richie, & Gomez, 2004). Additionally, quality of life can be impaired by post-operative pain complications (Fortington, Dijkstra, Bosmans, Post, & Geertzen, 2013; Sinha, & Van Den Heuvel, 2011; Zidarov, Swaine, Gauthier-Gagnon, 2009).

Post amputation pain (PAP) can arise from a number of post-amputation diagnoses. Residual stump pain (RSP) and phantom limb pain (PLP) are two highly researched types of PAP. While RSP and PLP have been recognized since the 16th century, there is much disagreement related to diagnostics (Clarke, Lindsay, Pyati, & Buchheit, 2013), etiology (Hill, 1999) and treatment (Hill, 1999) of RSP and PLP. Hill (1999) even argues that the conceptual and methodological shortcomings of much of the research on PLP limits its application clinically.

**Phantom Limb Sensations, Phantom Limb Pain, and Residual Stump Pain**

Residual stump pain (RSP) is characterized by post-surgery pains in the stump or residual limb of the amputated portion of the body. Due to other post-amputation pain (PAP) problems relating closely to RSP (i.e., complex regional pain syndrome) some believe that RSP is inadequately defined in research and thus, causes various complications in studies’ diagnostics (Clarke, Lindsay, Pyati, & Buchheit, 2013). For example, Clarke, Lindsay, Pyati, and Buchheit (2013) note that observational studies of RSP have reported prevalence rates of RSP ranging from 21% to 74%. Therefore, although RSP and phantom limb pain (PLP) can be co-morbid
complications for amputees, the focus of the current discussion will be based solely on phantom limb sensations (PLS) and PLP. PLS and PLP are different from RSP in that the perceived sensation post-amputation is in the area of the body that was removed.

PLS and PLP are defined as distinct categories. PLS is the presence of any sensation in the absent limb except pain, while PLP classifies only pain sensations occurring in the portion of a limb or limbs that have been removed. PLS are most commonly characterized by a mild tingling or tightness (Hill, 1999). The full gamut of PLS qualities perceived by people include: touch, temperature, pressure, itch, position, length, and volume of the limb (Hill, 1999). Often the limb will telescope so that the distal portion of the limb is perceived to be connected to the residual limb or point of amputation (Hill, 1999). Some authors suggest that PLS are common for all amputees at some point post-operation and that it is often times not detrimental to post-operative wellbeing (Hill, 1999).

In the 16th century, military surgeon, Ambroise Paré introduced the concept of pain in an area of the body that had been removed by amputation (Weeks, Anderson-Barnes, & Tsao, 2010). He observed that his patients would continue to report pain in the removed limb months after the actual operation had been completed (Clarke, Lindsay, Pyati, & Buchheit, 2013). The phrase PLP was originally coined by Silas Mitchell toward the end of the 19th century (Ramachandran & Rogers-Ramachandran, 1996). PLP’s purported prevalence has varied across studies.

Desmond and Machlachlan (2010) found that 43.3 percent of upper limb amputees experienced PLP. Richardson, Glenn, Horgan, and Nurvikko (2006) cited the prevalence of PLP at 50-80%. One study sampling 1200 American military veteran amputees found 85% of
responders experienced significant PLP (Sherman & Sherman, 1983). Other studies suggest that 60-80% of amputees experience PLP (Buchannan & Mandel, 1986; Jensen, Krebs, Nielsen, & Rasmussen, 1983). At one clinic, the Walter Reed Army Medical Center in Washington D. C., at least 900 military veterans have been treated for PLP since the beginning of the Iraq and Afghanistan wars (Weeks, Anderson-Barnes, & Tsao, 2010). Additionally, in regards to PLP intensity, a study of 2694 amputees showed that 51% experienced PLP severe enough to hinder their lifestyle more than 6 times per month (Sherman, Sherman, & Parker, 1984). Sherman, Sherman, and Parker (1984) also reported that 48% of their respondents experienced significant PLP for 10-15 or more hours each day. Such high prevalence rates are surprising considering that studies have found that there is under reporting of PLP symptoms.

Sherman and colleagues found that 69% of their respondents reported that their physician stated that PLP is only in their head and those patients admitted to withholding information about their PLP symptoms out of fear of being viewed insane (Sherman, Sherman, & Parker, 1984). The duration of these PLP symptoms have been noted to be variable across patients. For example, Jensen, Krebs, Nielsen, and Rasmussen (1983) found that approximately 5% of patients in their study experienced a decrease in PLP prevalence at 6 months after surgery without intervention and 50% of patients experienced reduced pain severity. Other surveys though have reported that patients’ PLP does not diminish over time without being treated, even after 30 years (Hill, 1993; Sherman, Sherman, & Parker, 1984). The research on PLP suggests that while under-reporting may be an issue within this specific client population, prevalence rates remain high, suffering is present, and the duration of symptoms can last for significant amounts of time.

Like PLS, PLP is most commonly experienced in the distal portions of the phantom limbs (Hill, 1999). Hill (1999) cites the two most common descriptions of PLP as “burning” and
“cramping” (p. 130) and lists other highly cited descriptions as: stinging, throbbing, piercing, and tearing. It is not uncommon for a patient to experience many types of pain on a regular basis (Chan 2006; Kim & Kim 2012; Oakley & Halligan 2002; Oakley, Whitman, & Halligan, 2002). Oakley and Halligan (2002) provide an example of a case study, NB, who experienced cramping, hand clenching, burning sensations, throbbing, and small electrical shocks. Some patients experience a number of presenting PLP symptoms, but are able to differentiate certain types of pain as being more severe. Oakley, Whitman, and Halligan (2002) provide a case example, Mrs. D, who experiences pins and needles in her foot, the feeling of her toes being held tightly by a vice, slicing/cutting pain in the sole of her foot, and a chiseling pain in her ankle which she reports is the most severe of the pains. Across case study reports, patient attributions are found to vastly differ for various PLP experiences. In addition to the aforementioned attributions of pain (i.e., toes in vice, chiseling on ankle), some have identified their pain as feeling like: biting ants (Chaves, 1993), a saw cutting/drill pushing (Chan, 2006), and unnatural/impossible positioning of the phantom limb (e.g., feeling that the limb is twisted/contorted) (Kim & Kim, 2012; Rickard, 2004; Ramachandran, & Rodgers-Ramachandran, 1996). The classification of PLP is broad when reflecting on the vast differences in types of pain, severity of pain, duration of pain, and attributions of pain for each case example. To better understand pain and general information about pain, it is now necessary to review the topic of pain and then provide the reader with a review of theories of pain.

**Pain: Acute Versus Chronic**

When a patient is experiencing pain, it is necessary to classify the patient’s problem as either acute or chronic. Acute pain can be described as pain that is generated by tissue damage or active nociception (Patterson, 2010). Acute pain is expected to be relieved once a person has
healed from the damage they incurred. Acute pain can change to chronic pain if treatment of the injury is not effectively approached. For example, if acute pain provides a person with a cue that they have been injured, masking that pain through anesthetic may lead to acute pain patients further damaging their injured body part. It is just as important to accurately diagnose and treat chronic pain complications. Patterson (2010) suggests that treating it by acute means if the problem is in fact a chronic pain problem can worsen client symptoms, causing greater pain and disability in the chronic pain patient.

Chronic pain is pain that is experienced despite a wound already healing (Patterson, 2010). In the case of PLP, the pain is still experienced despite the portion of the limb that is perceived to be in pain being previously removed from the body. By definition, chronic pain persists longer than 3-6 months (Patterson, 2010). Chronic pain is a major public health issue in the United States (Patterson, 2010). Jacobson and Mariano (2001) cite chronic pain as the most common physical condition for Americans, with more than 70 million people suffering from one or more pain syndromes. Due to the high prevalence of chronic pain complications in the United States, and the more complex nature of chronic pain treatment, it is necessary to recognize PLP as a chronic pain syndrome before commencing treatment planning for patients.

Patterson (2010) suggests that any form of treatment plan, including hypnotic interventions, should target all of the modifiable factors that contribute to pain when working with chronic pain patients. Patterson emphasizes the importance of not simply focusing on the pain experience itself, as the pain experience may be just the end result of other factors such as maladaptive coping, inactivity, sleep dysfunction, depression, anxiety, social interactions, and many more factors that could psychologically impact suffering. Patterson highlights the importance of conducting a thorough evaluation prior to pain treatment in order to address all
modifiable factors throughout the hypnotic intervention. In fact, the outcome of success in chronic pain treatment may not even involve pain reductions; a patient may return to work, increase functional activities, and report a greater satisfaction with life even without reporting reductions in pain (Patterson, 2010). The two components being discussed relate to pain versus suffering, treating either can be considered effective treatment. The following section outlines the difference between pain and suffering.

**Pain versus Suffering**

An important distinction when discussing pain literature is the use of the term pain versus the term suffering. Barabasz and Watkins (2005) refer to the two distinctions as sensory pain and suffering. Sensory pain is described as necessary information that informs the person that something is wrong and that they need treatment (Barabasz & Watkins, 2005). Commonly, the perceived location of the sensory pain represents the location of disturbance (Barabasz & Watkins, 2005). Sensory pain provides the “key cues” in regards to the characteristics of the pain (e.g., burning, hot, cold, intermittent, etc.) (Barabasz & Watkins, 2005, pg. 220). Barabasz and Watkins (2005) describe suffering as the affective component of the pain, suggesting that suffering is the component that is responsible for the human interpretation of pain. Barabasz and Watkins (2005) refer to the pain following an intense muscle exercise as an example that people typically enjoy or look forward to, which depicts how human interpretation of pain changes the overall impact on the individual. Suffering acts to trigger pain behaviors (e.g., avoidance/withdrawal) (Patterson, 2010). Suffering and related pain behaviors are important to the process of treating chronic pain syndromes like PLP.
Phantom Limb Pain Theories

Psychological theory.

The psychological theory considers non-medical explanations as the cause of the suffering inherent in PLP. For example, Hill (1999) logically argues that there must be a psychological component involved to some degree in the cause of PLP due to the fact that damaged nerves have been removed from the body. Emotions such as anxiety and depression have been proposed by many to predispose people to or maintain people’s PLP symptoms (Sherman, 1994; Davis, 1993; Esquenazi, 1993; Ribbers, Mulder, & Rijken, 1989). Additionally, proposals rooted in the psychoanalytic perspective have posited that PLP is unconscious and is related to a person grieving their lost limb (Flor, 2002). Psychological theories as the cause of PLP have yielded inconsistent results (Richardson, Glenn, Horgan, & Nurmikko, 2006). For example, Fisher and Henspal (1998) found no relationship between emotional adjustment, anxiety, depression, and the grieving process when comparing amputees with and without PLP. Authors, while generally arguing against psychological factors as the cause of PLP, will acknowledge the moderating role cognitive and emotional factors play on PLP experience and management of suffering.

Psychological factors have gained recognition for impacting the severity of suffering, suffering chronicity, and one’s ability to cope with chronic suffering (Flor, 2002; Foell, Bekrater-Bodmann, Flor & Cole, 2011; Patterson, 2010; Turk, 1999). Whyte and Niven (2001) suggest that due to the low success rate of PLP treatments, patients must be self-reliant or else they will likely be discouraged to continue seeking treatment for their seemingly unsolvable pain problem. Patterson (2010) cites that there is evidence that cognitive distortions can impede one’s motivation to engage in therapeutic treatment and physical rehabilitation. Catastrophizing, taking
an extreme and often unrealistic negative perspective on future outcomes, can act to maintain chronic pain for PLP patients (Foell, Bekrater-Bodmann, Flor, & Cole, 2011). Accordingly, perceived helplessness and catastrophizing beliefs have been found to be of high occurrence in PLP populations (Hill, Niven, & Knussen, 1995). Also, catastrophizing has been shown to be significantly associated with elevated self-reported levels of pain intensity and disability (Severeijns, Vlaeyen, Van-Den-Haut, & Weber 2001). Patterson (2010) describes a pain conviction (a person’s belief about the cause of their pain which may be inaccurate and acting to impede their hopefulness for improvement) as a factor that increases patient suffering and decreases patient hope for improvement. Psychological factors should be recognized as important aspects of treatment when working with chronic pain patients.

**Gate control theory.**

The Gate Control Theory (GCT) of pain is recognized in current health care practice (Patterson, 2010). It is a bio-psycho-social model of pain and suffering that recognizes how extremely dynamic the human experience is. Melzack and Wall (1965) first proposed the gate control system and explained the mechanisms involved in the process of perceived pain from nociception, to pain experience, and then suffering. They proposed 3 underlying mechanisms that moderate pain experience.

The first mechanism is the cells of the substantia gelatinosa in the dorsal horn of the spine (Melzack & Wall, 1965). Melzack and Wall (1965) determined that the cells of the substantia gelatinosa modulate the afferent patterns (i.e., intensity, duration, and frequency by large and small cells) of stimulus inputs. Melzack and Wall (1965) describe two proposed causes of pain misinterpretation and relate the experiences to the human system’s lack of specificity in relation to stimuli origins and meanings. It has been identified that channels that remain open can permit
periphery stimuli to pass through to the dorsal horn and thus be interpreted in the pain system as pain stimuli (Melzack & Wall, 1965). That is, if a gate remains open, there is an opportunity for periphery experiences to increase perceived pain through summation (Melzack & Wall, 1965). Melzack and Wall describe how lesions that can sever the large fiber leave amputees more susceptible to surrounding stimuli passing through the open channel and increasing the patient’s perceived pain. Patterson (2010) describes the process of derailed, misinterpreted messages by providing an example of a person calling a friend from a specific location and telling that person they are in the same location as their friend, suggesting that while the phone call transmits via receivers in the friend’s location on its way to the friend’s ear the friend cannot differentiate the background noise on the other end of the call to verify the location of the caller. Thus, the process occurring in the central control trigger simply misinterprets the original location of the stimulation, which then impacts the following perception of pain, the location of the stimulation, and the pain response.

Second, they assert that the dorsal column system is responsible for activation of specific brain processes that moderate the gate control system. Melzack and Wall refer to the dorsal column system as the “central control trigger” (p. 974). The dorsal column system is also the section of the pain/suffering process that moderates descending efferent inputs from the brain as a means of interpreting the ascending afferent fiber inputs from the stimulus location (Melzack & Wall, 1965). In other words, the dorsal column system makes sense of the stimulation that is reaching the dorsal horn and being transmitted to the brain, as well as information being sent back down from the brain. In PLP patients, this attribution process based on misinterpretation of incoming sensory material may explain not only the patients misunderstanding of sensory origin, but also may be the cause of patients experiencing pains that represent fire ants, drill punctures,
saws cutting, ankles being sculpted, or limbs being out of place/twisted and contorted as previously noted. In fact, Melzack and Wall believe that descending efferent outputs from specific brain processes involve incorporation of pain moderators such as a person’s mood, attention to the pain, and pain memories, as well as the situations at hand that influence every person’s interpretation of the ascending afferent stimuli. Thus, understanding of the stimulus experience varies across people because individuals have different biological and psychological backgrounds, thereby altering the suffering experience for each person (Melzack & Wall, 1965). Understanding of the balance between physiology and psychology involved in suffering increases the application of non-invasive psychological interventions for suffering and pain reduction.

The final process of the GCT simply explains the person’s reaction to the pain experience once the pain mechanisms have filtered and individualized the pain interpretation (Melzack & Wall, 1965). Melzack and Wall (1965) describe the final mechanism of the GCT as being activated by T-cells that reach critical firing levels upon summation and trigger a sequence of responses by the action system. The action system responses refer to the commonly observed pain behaviors, both acute reflexes and chronic pain behaviors such as avoidance (Melzack & Wall, 1965).

The Gate Control Theory not only acknowledges psychological moderators and verifies the importance of psychological theories, but also expands upon the proposed complexity of PLP causes by incorporating the biological and physiological mechanisms involved in the pain experience. The Gate Control Theory can increase treatment effectiveness through emphasis on: increasing understanding of varying pain reports, acknowledging moderator factors and their impacts on pain intensity and suffering, and normalizing the experience of PLP patients by
providing them a framework to understand their pain experience. It is believed that a bio-psycho-social theory of pain applies to non-invasive means of treating patients with PLP. In fact, imaging studies that will be reviewed later in this paper provide further evidence for non-invasive procedures relating well to the Gate Control Theory of pain and treatment of chronic pain presentations.

**Hypnosis: State-Trait Theory**

Hypnosis is defined as “a state of consciousness involving focused attention and reduced peripheral awareness characterized by an enhanced capacity for response to suggestion” (Elkins, Barabasz, Council, & Spiegel, 2015, p. 8). It entails an attentive perception that leads to controlled imagination (Spiegel, 1998). People can spontaneously enter into a state of hypnosis, but in health care facilities the mechanisms involved in hypnosis can be intentionally accessed through the use of either hypnotic interventions that are tailored to the participant/disorder or manualized for obtaining standardized effects (Barabasz, Olness, Boland, & Kahn, 2010). Patients have described the experience of hypnosis as “a state of deepened awareness” or as “a calm state of focused attention” (Barabasz, Olness, Boland, & Kahn, 2010, p. 1). The state entered into while in hypnosis has been compared to being deeply absorbed in a book, a movie, or watching cloud shapes pass by in the sky (Barabasz, Olness, Boland, & Kahn, 2010). Researchers have reported finding physiological changes in the human body that are characteristic of people when in hypnosis (Jensen, 1997; Brady & Levitt, 1966). Hilgard and Hilgard (1975) developed the neo-dissociation theory, which aims to explain how an altered state of awareness is brought on by hypnosis.

To research the cognitive process involved in hypnosis, Hilgard and Hilgard (1975) had participants report their experiences in hypnosis via two methods. While in hypnosis, participants
were asked to report their experience through automatic writing, writing that the person is not consciously aware of outside of hypnosis. They also asked participants for verbal responses of their experiences following hypnosis, which represented the experiences the participants were consciously aware of. The researchers reported that participants revealed through their automatic writing that their ailments were still present, but that they were consciously unaware of the physical experience occurring in their body. From these findings, Hilgard and Hilgard purported that multiple levels of cognitive awareness simultaneously exist when in hypnosis, those within the person’s awareness and those that are outside of the person’s conscious awareness.

Hilgard (1992) later developed the state-trait theory to further explain hypnosis mechanisms and effects. State, refers to the unique experience brought on by hypnotic inductions. Trait, refers to the cognitive ability of each person that impacts hypnotic performance. That is, the state/trait theory (Hilgard, 1992) acts to explain the effects of hypnosis by recognizing that hypnotizability, the ability to be hypnotized, is a trait that remains stable for individuals over time and one’s hypnosis ability is displayed when entered into a hypnotic state.

Support for the trait aspect of the state-trait theory comes from research on hypnotic susceptibility scales. Morgan, Johnson, and Hilgard (1974) did a longitudinal investigation of the stability of hypnotic susceptibility using the Hypnotic Susceptibility Scale: Form A (Weitzenhoffer & Hilgard, 1959) and found no changes in level of hypnotic susceptibility at 8-12 year retest. They noted that susceptibility remains stable under standardized conditions even with no intervening special conditions given (Morgan, Johnson, & Hilgard, 1974). Furthermore, Piccione, Hilgard, and Zimbardo (1989) reported from their longitudinal study that hypnotic susceptibility, as measured by the Hypnotic Susceptibility Scale: Form A, remained stable even
at a 25 year retest. The stability of individual’s hypnotic ability overtime supports the state/trait theory.

Despite the evidence commonly cited in support of the state/trait theory of hypnosis, there remains another camp that attributes observed hypnotic responses to socio-cognitive factors. More specifically, the socio-cognitive perspective has claimed that much if not all of the hypnotic responses observed are due to expectancy (Kirsch, 1990; Kirsch & Council, 1989). Kirsch and colleagues (1999) reported that the participants who received an enhanced-expectancy manipulation responded better to hypnosis than the control group. Benham and colleagues (2006) point out in critique of Kirsch’s findings that the study did not measure participant expectations. Benham and colleagues (1998) measured expectancy and implemented procedures to enhance expectancy. They found that expectancy was enhanced, but the increased expectancy did not lead to higher hypnotic responsiveness (Benham, Bowers, Nash, & Muenchen, 1998). Other studies have reported similar findings, indicating that expectancy is not solely responsible for hypnotic responsiveness.

Orne and Whitehouse (1999) reported that expectancy alone is insufficient to produce hypnotic effects when comparing high versus low hypnotizable groups. To increase low hypnotizable participants’ expectancy, Orne and Whitehouse provided what the client thought was glove anesthesia and then told participants that they were being administered electric shock to their hand, which was untrue. The low hypnotizable patients believed that they were now hypnotizable despite previous hypnosis efforts failing. Orne and Whitehouse thus, eliminated the difference in expectancy between low hypnotizable and high hypnotizable participants and controlled their variable of investigation to hypnotizability only before assessing response to ischemic muscle pain trials. They found that unhypnotizable participants received the same relief
from both the placebo trial and the hypnosis trial (very little), whereas the high hypnotizable
group received significantly more relief from the hypnosis trials.

Benham and colleagues (2006) examined the impact of the two opposing camps
(state/trait versus socio-cognitive) on hypnosis responsiveness. That is, Benham and colleagues
investigated the impact that aptitude has on hypnosis and the impact that attitude/expectancy has
on hypnosis. Using 90 participants, Benham and colleagues provided a standardized hypnotic
protocol to participants and then analyzed outcomes with a structural equation model that
incorporated assessments of underlying ability, expectancy, and hypnotic performance.
Expectancies were found to be a strong predictor of later expectancies, but were only a moderate
predictor of hypnotic performance (Benham, Woody, Wilson, & Nash, 2006). Benham and
colleagues reported that underlying ability was strongly correlated with hypnotic responsiveness.
The authors concluded that “there is an important unitary ability underlying hypnotic
performance” (p. 347). Thus, a large portion of hypnotic responsiveness can be determined
independent of ongoing expectancy (Benham, Woody, Wilson, & Nash, 2006). Due to the
evidence and rationale in support of hypnosis being a trait dependent measure and the hypnotic
experience being an identifiable state, the state/trait theory (Hilgard, 1992) will be used as the
framework for understanding the mechanisms behind hypnosis for the remainder of this
investigation. The state/trait theory of hypnosis guides future research by acknowledging the
importance of including measurements of hypnotizability and it provides a rationale that explains
client experience within hypnosis.

Factors that can impact hypnotic responsiveness.

Despite findings supporting the state/trait theory, it should be recognized that beyond
cognitive ability, hypnosis outcome can be influenced by some mediator and moderator
variables. One mediator factor that Hilgard (1992) coined is the “hidden observer.” Hilgard recognized that within hypnosis people retain the ability to refuse hypnotic suggestions based on environmental cues that may impact the person’s willingness to be hypnotized. While the person remains able to be hypnotized based on their hypnotic susceptibility, their personal choice can influence treatment. As one reflects on common factors research, it seems logical that environmental factors such as therapist characteristics (Messer & Wampold, 2002) and client-therapist therapeutic rapport (Lambert & Barrley, 2001) could impact a client’s willingness to engage in therapy.

Recent trauma can moderate hypnotic outcomes (Barabasz, Olness, Boland, & Kahn, 2010), as can be the case for people who experienced amputation due to some form of traumatic injury. PTSD patients, in general, are moderately high in hypnotizability (Barabasz, Olness, Boland, & Kahn, 2010). Nijenhuis, Spinhoven, Van Dyke, Vander Hart, and Vanderlindin (1998) reported that dissociation experiences can lead to intense absorption of the hypnotic experience. Accordingly, Barabasz & Watkins (2005) outline ways to increase dissociative experiences through intentional language used during induction. For example, they recommend stating “that hand” rather than your hand (Barabasz & Watkins, 2005, p. 122). Discussion of moderator variables will be limited to the effects of recent trauma and dissociation in order to provide relevant examples for working with patients who have experienced amputation due to some form of traumatic injury.

**Hypnosis as an Intervention**

Hypnosis research has provided clinicians with a rich background from which to pull when helping clients with a vast array of presenting concerns. Hypnosis has gained popularity for its application with a range of clinical presentations. For example, Barabasz and colleagues
(2010) report that hypnosis has effectively treated the following clinical presentations:
Posttraumatic stress disorder (PTSD), childhood and adolescent problems, childbirth pain and trauma, insomnia, depression, weight control/healthy eating/exercise, psychosomatic disorders, habit control, irritable bowel syndrome, headaches and migraines, cancer patient care, human papillomavirus (HPV), and both acute and chronic pain. Hypnosis’ effectiveness in targeting pain can be observed when further examining evidence of the role of the spinal cord and supraspinal areas involved in pain.

**Hypnosis and pain.**

Following the development of the gate control theory of pain, more attention was placed on the spinal and supraspinal sites within the CNS and hypnosis has recently been found to target those CNS regions that are common to pain sensation (Jensen, 1997). Imaging studies have helped to demonstrate hypnosis’ effect on pain regions of the spinal cord and supraspinal sites. Derbyshire, Whalley, and Oakley (2009) reported that hypnotic suggestions intended to reduce fibromyalgia pain could be observed in the CNS when using fMRI. As the researchers suggested that pain lessen, CNS activity in the aforementioned common pain sites decreased. Patients that received suggestions of higher pain displayed more activity in the CNS pain regions. Furthermore, Derbyshire, Whalley, Stenger, and Oakley (2004) reported that such changes in activity could not be replicated when hypnotic inductions were replaced by merely asking participants to imagine the pain. Additionally, research has found that specific hypnotic interventions can target specific CNS sites (Hofbauer, Rainville, Duncan, and Bushnell, 2001; Rainville, Duncan, Carrier, and Bushnell, 1997).
Hypnosis for Chronic Pain

Hypnosis has been widely cited as an effective analgesic for acute pain. Studies have displayed significant pain relief for issues such as: pain that occurs during invasive medical procedures, burn pain, labor pain, bone marrow aspiration pain, biopsies of the breast and other procedures for women’s health (Patterson, 2010). Chronic pain though, presents unique treatment challenges. When reviewing chronic pain research, it is important to remember that pain relief is not the only barometer of successful treatment (Patterson, 2010). Jensen (2009) asserts that hypnosis should not be expected to provide a “cure for chronic pain” (p.236), but instead hypnosis can markedly decrease pain intensity and other aspects of the pain experience. Additionally, hypnosis is not effective for everyone. Using measures of hypnotizability becomes important when treating chronic pain, as well as acute pain, because the hypnotizability scores obtained for each participant can act to guide treatment alterations, as well as help to explain treatment effectiveness in research. For example, the less hypnotizable a person is, the earlier self-hypnosis is recommended to be introduced into treatment (Jensen, 2009). That is, self-hypnosis has been found to help increase the efficacy of treatment in chronic pain populations (Jensen, 2009). Such considerations should be recognized when reviewing research on hypnosis as a treatment for chronic pain.

Early reviews of hypnosis’ effectiveness in treating chronic pain that were published by Turner and Chapman (1982) referred to the hypnosis results as “appallingly poor” (Patterson, 2010, p. 76). Early investigations of hypnosis effectiveness in treating chronic pain have been viewed as lacking in design rigor and early studies displayed minimal pain reduction (Patterson, 2010). For example, Malone and Strube (1988) reported that out of 14 hypnosis studies reviewed only one could be included into their meta-analysis due to limited information reported in the
remaining 13 hypnosis studies. Additionally, the authors cite that the remaining hypnosis study only reduced pain by 13%. Patterson (2010) suggests that over the past 20 years, hypnosis studies have improved. Patterson lists 12 hypnosis studies on chronic pain relief that have used randomized controlled designs since 1975, the majority of which come within the last 25 years. In fact, Patterson (2010) suggests that a body of research has grown in support of hypnosis as a treatment for chronic pain problems such as: headaches, cancer pain, multiple sclerosis, spinal cord injury, fibromyalgia, idiopathic orofacial pain, low back pain, arthritis, temporomandibular pain, sickle cell disease, mixed chronic pain, disability pain, and PLP. The reader will now be introduced to a brief review of research on hypnosis for chronic pain. The following review of chronic pain studies are intended to provide the reader with updated information about hypnosis’ effectiveness in treating chronic pain. Following some brief examples of hypnosis’ effectiveness in treating chronic pain, a more thorough review will be provided for hypnosis as a treatment for PLP and related suffering.

**Headaches.**

There are more hypnosis studies on headaches than any other chronic pain etiology (Patterson, 2010). Patterson (2010) provides a review of 9 investigations using hypnosis to treat headaches and 5 of those studies assess for hypnotizability with patients. Hypnosis’ effectiveness in treating headaches has been compared in investigative studies to biofeedback (Andreychuck & Skriver, 1975), medications (Anderson, Basker, & Dalton, 1975), autogenic training (Spinhoven, Linssen, Van Dyck, & Zitman, 1992), and waitlist control groups (Melis, Rooimans, Spierings, & Hoogduin, 1991) to name a few and each of the above studies have found hypnosis to be either as effective or more effective in reducing headache severity, frequency, and/or duration. Hammond (2007) concluded that the efficacy of hypnosis in the treatment of headaches is well
documented and the outcome from treatment is relatively free of side effects. Treatment of headaches using hypnosis is a highly documented example of hypnosis’ effectiveness in treating chronic pain problems.

**Cancer.**

Treatment of cancer pain is both an acute and a chronic issue. Outside of procedural pain that can occur from bone marrow transplants and other invasive medical procedures, cancer patients can also experience chronic pain due to what is referred to as disease pain. Hypnosis interventions have been used to address chronic pain in cancer patients. For example, Spiegel and Bloom (1983) investigated hypnosis as a treatment for 54 women with chronic pain from breast cancer. Hypnotizability was not assessed for in this investigation. The treatment was split into 3 groups: 1) treatment as usual, 2) Group therapy, and 3) Group therapy with 5-10 minutes of self-hypnosis at the end of sessions. Spiegel and Bloom found that while the support group participants reported improvement, participants who received hypnosis experienced greater improvements over participants who did not receive any hypnosis.

**Disability related pain.**

Chronic pain in patients with disabilities is said to be “notoriously difficult to treat” (Jensen, Barber, Hanley, Engel, Romano, & Cardenas 2005, p. 199). In fact, Engel, Kartin, and Jensen (2002) report survey data that suggests that chronic pain treatments have not been effective for patients with disabilities, despite that population actively seeking pain treatment for their chronic issues. Despite this trend, hypnosis has been applied to patients with disabilities to treat chronic pain and it has been found to be efficacious. Jensen et al. (2005) sampled 33 participants with disabilities and chronic pain. The disabilities varied: 13 spinal cord injury patients, 10 multiple sclerosis patients, 7 amputee patients, 1 cerebral palsy patient, 1 post-polio
syndrome patient, and 1 patient with Charcot-Marie-Tooth disease. Jensen and colleagues used a scripted hypnotic intervention with all 33 participants for 10 sessions each. The hypnotic intervention included focus on pain intensity and unpleasantness, hypnotic analgesia, depression, and perceived control over pain. The hypnotic treatment used suggestions for relaxation, imagined analgesia, reduced pain-unpleasantness, and replacement with non-painful sensations. Also, patients were given suggestions to practice self-hypnosis, while audio-tapes were not given to patients until the 3 month follow up. At post-treatment evaluation, Jensen and colleagues had 26 remaining participants due to participant drop-out. Jensen and colleagues found that the remaining participants reported significant pre to post-treatment improvements in average pain intensity, pain unpleasantness, and perceived control of pain at the 3 month follow-up assessment. Depressive symptoms were not found to be significantly reduced from the treatment.

Jensen, Barber, Hanley, Engel, Romano, Cardenas, Kraft, Hoffman, and Patterson (2008) extended the research of Jensen and colleagues (2005) by publishing assessments of treatment gain maintenance at 3, 6, 9, and 12 month post-treatment. Jensen and colleagues found that pain intensity improvements remained significant at 3 and 9 month assessments, but not at the 6 and 12 month assessments. Jensen and colleagues discovered that 23% of patients did experience meaningful decreases in pain intensity at the 12 month follow up. And, it was found by Jensen and colleagues that 81% of their sample continued to use self-hypnosis at the 12 month follow up assessment. The researchers note that despite the entire group not meeting significance for pain intensity reductions at the 12 month follow up, self-hypnosis reportedly continued to decrease the patients’ pain intensity to a 5 on a scale from 0-10 with 10 being the most severe pain. It was also found that the sub-significant gains obtained by participants from the use of self-hypnosis lasted for on average 2-4 hours after doing self-hypnosis. Jensen and
colleagues concluded that self-hypnosis continued to provide people with disability related pain the opportunity to engage in short-term pain intensity reductions.

The amputation population was a minority of the entire disability group in Jensen and colleagues (2005) study. The following review will provide more research specifically focused on hypnosis as a treatment for PLP. The following review is meant to provide the reader updated information about evidence for hypnosis as an effective treatment for PLP, as well as act to highlight some of the areas for future research.

**Hypnosis for PLP.**

Much of the research on hypnosis as a treatment for PLP has varied tremendously in sample size, PLP symptoms, use of hypnotizability measures, amputee populations investigated, and hypnotic interventions used. Such variation appears to root from the majority of studies on hypnosis as a treatment for PLP being individual case reports. Due to the paucity of larger sample studies, it is believed that it is important review these case studies along with the available quasi-experimental hypnosis studies for PLP. The following review will first present case studies and then transition into a more detailed review of the available quasi-experimental design investigations of hypnosis as a treatment for PLP.

**Case studies.**

Chan (2006) used hypnosis on one person with a lower leg amputation to treat symptoms of PLP. The treatment was comprised of 5 sessions. The client’s report of PLP experience varied from the feeling of pins and needles when the pain was less severe to feeling like a saw cutting when it became more severe. Chan began by using eye fixation and hand dropping for the induction. The researcher then used counting, visualization, and eye fraction for deepening.
Relaxation techniques were also included in the treatment, providing the client with progressive muscle relaxation and safe place visualizations. The client was also trained in self-hypnosis. Chan allowed the client to ultimately choose between a number of hypnosis interventions used throughout treatment for their self-hypnosis, which included: dissociation, displacement, sensory substitution, direct diminution of sensation, and direct anesthesia. Chan found that the client experienced decreased pain, decreased pain related distress, decreased sleep disturbance, increased hope, and increased self-efficacy for controlling pain through self-hypnosis at the end of treatment. Due to the case study nature of the treatment, outcomes were simply based on self-report from pre to post treatment.

Oakley and Halligan (2002) provided reports from using hypnosis for PLP with a patient who experienced a left brachial plexus, which is understood to be a disconnection of limb from body without amputation taking place. The client, NB, is reported to have no pain memory from the accident. NB was reported to be experiencing cramping, hand clenching, burning sensations, throbbing, and small electrical shocks. Oakley and Halligan used relaxation for induction and descent imagery of NB’s choosing for deepening techniques. NB had previously used a hypnotic mirror box, a box that provides images of the residual intact limb in a fashion that provides the illusion that the amputated limb is still present. This process is done through imaging with mirrors. The hypnosis procedure that NB was taken through was suggestions to replicate the mirror box that NB had previously experienced, except this time only hypnosis was used and the mirror box was not physically present. Oakley and Halligan reported that NB could visualize his arm being present as he had when using the mirror box. The researchers reported that NB also experienced a complete remission of pain while in hypnosis.
Oakley, Whitman, and Halligan (2002) conducted a study with a client named Mrs. D with whom they applied hypnosis as the clinical intervention for PLP symptom relief. Mrs. D was reported as having an above knee amputation due to vascular disease and she experienced an array of PLP symptoms with the most severe feeling as though someone was chiseling on her ankle and holding her toes in a vice. The researchers used a modified Spiegel eye roll as an induction and progressive muscle relaxation with visualizations of a special place as deepening techniques. The researchers used an ipsative hypnotic intervention, using the special place, Italy, to help create imaging to be used in the hypnotic protocol. To relieve the chiseling pain experienced by Mrs. D, Oakley and colleagues created a hypnosis protocol that referenced Michaleangelo sending the little chisler that had been working on her ankle away. The ankle chiseling hypnosis images were reported to be of focus for 2-3 sessions. The researchers noted also spending 2 sessions on using suggestions that waves were loosening the vice from her toes. In all, the treatment lasted a total of 8 sessions. Oakley and colleagues found that at 3 month follow up, Mrs. D experienced complete relief of chiseling pain. She was also reported to have experienced increased coping and decreased jumpiness.

Chaves (1986) reported having success using hypnosis on a client who experienced uncomfortable positioning, tension in hand, and frustrated movement in hand and fingers of the phantom limb. No hypnotizability measures were used pre or post treatment for the client. The therapy consisted of 3 sessions and included once per month use of a hypnosis audio recording at the client’s home. Hypnosis involved relaxation, as well as tension reduction suggestions and warmth imagery. Chaves found that the client was relieved of PLP symptoms completely at a 5 year follow-up.
Chaves (1993) provided hypnosis to a patient who experienced feelings of biting ants, tight bands, muscle tension, and uncomfortable leg positioning after a mid-thigh amputation of the right leg. No use of hypnotizability measures was mentioned in the research and the number of therapy sessions was not reported. The induction consisted of relaxation and the hypnotic imagery selected was related to the PLP symptoms experienced by the patient. The ipsative imagery chosen was decapitating the biting ants and cutting the tight bands. Chaves also had the client use recorded hypnosis audiotapes on a daily basis. Chaves reported that at the end of therapy the client’s pain severity was reduced to 30% of its original 100%. Also, while the exact frequency of residual painful sensations was not reported, the client was found to be completely pain free occasionally.

Sthaleker (1993) used hypnosis as a treatment for a single client experiencing constant tingling and intermittent localized stabbing and burning in their phantom limb after suffering an avulsion of the right brachial plexus. Sthaleker reported no hypnotizability pre-measures. Sthaleker treated the client for 21 sessions over an 8 week period. Hypnosis involved training in self-hypnosis using imagery of a beach, garden, and woods, suggestions for healing warmth throughout the arm, and positive future oriented suggestions. Sthaleker found that at the two week post-treatment follow up, the client reported their pain being under control, improved daily functioning, and the client returned to work. The client also reported increased optimism and hope.

Muraoka, Komiyama, Hosoi, Mine, and Kubo (1996) used hypnosis to treat PLP symptoms for above the knee amputation of the left leg. The client was reported to have experienced intermittent burning pain and a constant dull pain caused by uncomfortable positioning of the phantom limb. Hypnosis consisted of suggestions for movement of the
phantom limb, making the phantom limb a normal size, and telescoping of the phantom limb. Muraoka and colleagues found that following the hypnosis intervention the client’s pain severity went from an 8 to a 1 on a scale from 1-10, with 10 representing the most severe pain. This study mentioned no use of hypnotizability measures.

Rosen, Willoch, Bartenstein, Berner, and Rosjo (2000) treated two patients who experienced PLP due to amputation. Both of the clients were given a hypnotizability measure prior to treatment. The first client scored in the highly hypnotizable range and the second client scored in the moderate hypnotizable range. Both clients received 12 sessions over six months and treatment consisted of both hypnosis and CBT for each of the clients. Both patients imagined the amputated limb in a comfortable position and moving comfortably. The first client also imagined skiing, having both arms moving in a comfortable way. The second client also imagined the pain area shrinking. Rosen and colleagues found that after treatment, the first client experienced pain intensity reduced from 80-50, pain frequency reduced 55%, and the phantom limb shrunk in size. Rosen and colleagues reported that the second experienced a reduction in pain intensity from 40-20, pain frequency reduced 50%, and the gains were maintained upon 2.5 year follow up.

Many of the aforementioned case study investigations provide promising results for hypnosis being an effective intervention for PLP and suffering, thus making it appealing to further investigate as a chronic pain treatment for people with PLP after amputation. Strengths to be taken from the above studies can be seen in the positive outcomes obtained for the chronic pain patients involved in each of the studies. Various hypnotic interventions proved to help reduce pain intensity and suffering. For example, support was provided for the use of ipsative suggestions defined by the patient’s conceptualization of the pain. The glaring problem with the
above case studies though, is the limited sample size which limits the generalizability of the findings, as well as minimal, infrequent reporting of measurements used to obtain outcome information. Without examining the efficacy of hypnosis with larger, homogenous samples of people with amputations and PLP, one cannot be certain that such effects will be found with other clients. Additionally, a number of the studies did not use hypnotic susceptibility scales, which limits replicability for future researchers.

_Quasi-experimental Design Studies._

Bamford (2006) conducted a study with 25 amputees who experienced an array of PLP symptoms. No hypnotic susceptibility test was reported. The participants were made up of 18 people with lower limb and 7 people with upper limb amputations. There were 13 people who experienced amputation due to traumatic injury, 10 people who experienced amputation due to vascular problems, and 2 cancer caused amputations in the sample. The study design was quasi-experimental with no randomized sampling and no control groups. Pain assessments were conducted at pre-treatment, at treatment termination, and at 6 months post-treatment. Treatment consisted of 6 weekly sessions and the participants were asked to conduct self-hypnosis on their own 3 times per day. The first session was used to gather information of participants' pain reports (i.e., severity, duration, etc.). The hypnotic intervention was separated into 3 parts: hypnotic analgesia, exercise, and therapy. For the analgesia, the therapist took the pain out of each patient’s leg and placed the pain into an ice block. The therapist then melted the ice block and suggested that the pain melted away with the block of ice. For the exercise portion of hypnosis, the participants were asked to swim with all four limbs. The therapy section of hypnosis included post-hypnotic suggestions for pain dissociation, exercise, and ego strengthening to empower the participants. Bamford found significant pain reductions when
comparing pre-treatment pain reports and post-treatment pain reports. Bamford also found significant reductions in pain from baseline to the 6 month follow-up. Other significant findings from the investigation include: patients decreased the number of pain related appointments with their rehabilitation consultants, pain medications were able to be reduced for participants, there were reports of feeling more calm and relaxed, and there were increases in perceived control of the phantom limb and pain experiences.

Limitations to the investigation include rigor of the study’s design, outcome assessments used, and aspects related to the sample obtained. In regards to the rigor of the study’s design, introducing a control group or a treatment as usual group could have increased the clinical significance of the findings. It should be recognized that the study likely excluded the use of a control group due to expected problems with obtaining a sufficient sample size. Limitations related to outcome assessment can be seen in the study not utilizing a formal, valid and reliable measure of quality of life. Daily functioning is necessary to examine due to people with amputations characteristically experiencing restrictions in every day functioning. Future research could include measurements of functioning to observe differences in adjustment to life-style and changes in physical ability.

Lastly, traumatic amputee groups and illness related amputee groups may present with different characteristics. It appears that the study indiscriminately included both groups. Bamford (2006) appropriately acknowledged the differences between traumatic amputees and illness related amputees in the discussion section. Bamford reported that 52% of the study’s population was due to trauma when traumatic amputees make up only 8% of amputees. Bamford purported that traumatic amputees likely suffer from more anxiety and stress, which reciprocally increases their pain reports. Bamford also believed that people with traumatic amputation may be younger
in general, which he purported may lead to increased distress and adjustment when considering they are likely still needing to work, for example. Adjustment specific to differing age groups, health, and functional concerns may warrant future investigations to implement such concerns into recruiting, treatment planning, and assessment. That is, it is important for future research to restrict recruitment to the homogeneous group of non-chronic-illness related amputations.

Rickard (2004) used hypnosis with 20 participants experiencing PLP symptoms. Rickard’s population consisted of 14 people with amputation due to chronic illness and six people with amputation due to some form of traumatic injury. Hypnotizability was measured and each participant registered a score above 2 on a 5 point scale. The experimental design was quasi-experimental; there was no random sampling, but there was random assignment to either a treatment or a control group. The hypnotic intervention involved a multi-method approach that was unstructured and allowed for the researcher to decide on procedures at her own discretion for each client presentation. Participants in the treatment group met with the researcher for three treatment sessions and those in the control group met with her for no treatment sessions. Rickard found significant pain reductions in the treatment group compared to the control group at time two (the last recorded meeting). Rickard also discovered significant pain reductions when comparing the treatment group from pre (time one) to post-treatment (a 30 minute meeting following the last treatment session, presumably one week following their final treatment session).

Limitations to the investigation relate to treatment versus control group characteristics, differences between the number of sessions each group met with the researcher, replicability due to unstructured treatment, treatment of RSP versus PLP, not having a formal dependent measure for quality of life change, and not having more structured follow-up data collection periods.
planned. The control group was reported as having significantly older individuals than the treatment group. Also, Rickard reported that scheduling of sessions was impaired due to co-morbid client health complications. Future research may benefit from further clarity about group characteristics and it may be helpful to specifically research the effects of hypnosis on PLP for traumatic amputees only, as they generally have less co-morbid health complications than those also suffering from cancer, diabetes, or other illness related causes of amputation. Another problem with the treatment versus control group comparison is that the control group received no treatment. Furthermore, Rickard provided less sessions for the control group than the treatment group. Future research could offer an active-treatment-control group for more quality comparisons of the efficacy of hypnosis. Also, it would be important to at least hold the same number of meetings with participants to determine whether contact and involvement have some degree of impact on outcomes. More balance in regards to the two groups appears important in order to better determine the treatment outcomes are due to treatment rather than other factors. Other general critiques of the study are perceived as impairing the study quality, but issues with the treatment and control group are seen as most central to limiting interpretability of findings.

Reliability was limited by Rickard’s minimal description of treatment decisions. More clearly outlined procedures could help others replicate the significant pain reductions reported. Also, with poor descriptions of treatment, RSP and PLP interventions were confusing to the reader. Future research may want to focus on PLP symptoms and PLP outcome measures in order to more clearly assess the efficacy of hypnosis as a treatment of PLP. Additionally, the study did not include a formal measure of quality of life. It would be important to track changes in all modifiable factors of pain, as is recommended in treatment of chronic pain (Patterson, 2010). And, lastly, no hypotheses incorporated follow-up data collections beyond the last
recorded week. Although it sounds as though anecdotal reports were gathered at various times (weeks to months) post-treatment, it would be important for future research to formally assess whether treatment gains are maintained beyond treatment completion.

**Summary**

Hypnosis has been found to be an effective treatment for a number of chronic pain presentations. Initial investigations of hypnosis as a treatment for PLP have showed promising results, although a number of limitations to previous research still needed to be addressed. Lynn, Kirsch, and Koby (2000) assert that hypnosis investigations need to define a population, assess participant’s hypnotizability, and describe the treatment protocol in order for the approach to gain more recognition as an evidence based intervention. One population that was yet to be assessed is a sample made up of non-chronic-illness caused amputations and therefore, it was important for the current study to limit recruitment to only people with traumatic injury and acute medical causes for their amputation. Also, this study moves to improve the description of treatment protocol by providing a copy of the manualized protocol in the appendix section so that future researchers and even novice clinicians can replicate the findings of the current study. Both of these steps were taken to advance the fields of hypnosis, chronic pain, and disability research.

Next, past experiments have either used no comparison group or utilized a treatment versus no treatment model. It was important to improve upon past research design by comparing our hypnosis group to an active-treatment-control group like relaxation. Relaxation has been reported to be of equivalent efficacy to hypnosis for migraines (Patterson, 2010) and it has been reported to also reduce PLP (Sherman, Gall, & Gormly, 1979) and improve certain quality of life domains for PLP patients (Karbandi, et al., 2015; Manzoni, et al., 2009; Sherman, et al., 1979).
Next, the available experiments to date have not used a formal, valid and reliable measure of quality of life in order to show that hypnosis addresses all modifiable factors that would be necessary to address for a chronic pain presentation like PLP. This study incorporated a valid and reliable quality of life measure to address this void in past research.
CHAPTER THREE
METODOLOGY

Design

The current study utilized a between and within subjects design with treatment as the between subjects variable and time as the within group variable. The study investigated whether the independent variable of hypnosis had meaningful impacts on decreasing phantom limb pain (PLP) severity, as well as increasing quality of life for individuals with limb amputations due to non-chronic-illness related amputations. The study was quasi-experimental in nature. Participants were balanced by level of hypnotizability throughout the first year of data collection. After the first year of recruitment, participants scoring within the moderate range of hypnotizability on the Elkins Hypnotizability Scale were given preference for hypnosis treatment group assignment, although matching was applied when possible. Unfortunately, groups were not balanced based on hypnotizability throughout the entirety of the study, (EHS scores of 4-8 were intended to be matched with EHS scores of 4-8 and EHS scores of 9-12 were intended to be matched with other EHS scores of 9-12), post-study analyses of differences between groups are included in the results section, as have comparisons of other group characteristics (demographic information, chronicity of PLP, and baseline scores on all dependent measures).

Participants

The current study used the following inclusion criteria: each participant had one limb amputation due to a traumatic injury or other cause outside of chronic illness related amputation, onset of phantom limb pain occurred at least 3 months prior to the first treatment session for each participant, and all participants had English language fluency. In order to verify group qualification, participants provided self-report about the cause of their amputation and were
requested to provide self-reports about the following information: when their PLP onset, a
description of their pain, and how their pain has impaired their functioning and quality of life
(See Appendix A). Participants’ ability to understand and communicate effectively in the English
language was informally assessed during the screening session as a way of ensuring that the
directions and interventions delivered in English were able to be understood.

In addition to the definition of the target population above, the following exclusion
criteria were used as a means of limiting potential confounding variables: having the phantom
limb pain for less than 3 months, having chronic and life threatening medical complications such
as cancer or vascular disease for example, having prior diagnoses of psychosis, and meeting
diagnostic criteria for a severe substance use disorder as defined by the Diagnostic and Statistical
Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013) (i.e., presence
of 6 or more symptoms) at the time of the screening appointment. Exclusion criteria were
verified by participant self-report. Determining the severity of substance use relied on criteria for
substance use disorders outlined in the DSM-5. Participants were disqualified from the study if
they did not meet all inclusion criteria as well as if they met one or more of the exclusion criteria.

Additional information was obtained related to participant demographics (age, race,
gender, ability status, religious identity, and socio-economic status), their status as either military
or non-military, and the type of pre-amputation injury sustained. See appendix B for a copy of
the questionnaire. Relevant participant information obtained was used to better describe the
sample and to better interpret results obtained for each group.

The current study aimed to obtain enrollment of between 5-10 participants for each
group, making the total target sample equivalent to between 10-20 participants. The target
population is an under-represented group, causing prior PLP treatment studies to primarily consist of single case studies (Le Baron & Zeltzer, 1996; Rosen et al., 2000; Muraoka, 1996; Sthaleker, 1993; Chaves, 1993; Chaves, 1986; Oakley, et al., 2002; Chan, R., 2006; Kim & Kim, 2012). Multiple participant studies have been limited in number and have ranged anywhere from eight participants (Mercier & Sirigu, 2009), 10 participants (Ramachandran & Rodgers-Ramachandran, 1996), 20 participants (Rickard, 2004), and up to 25 participants (Bamford, 2006). When considering that participants were restricted to an even more narrow group than prior PLP studies, a single type of amputation and one that is a small percent of amputation causes in the U.S. (amputations due to traumatic injury), access to the population was limited and thus sample size suffered.

The participants for this study were recruited from Washington and Indiana, primarily through amputee support groups. Participants were informed of the study by both informational flyers delivered to the places of recruitment and by personal presentations to staff members and client groups at locations that permit such recruitment, as well as by word of mouth. For details on the wording of flyers and personal presentations delivered by the examiner, please see Appendix C and D respectively. In order to establish communication with the above listed places of recruitment, the examiner personally contacted the medical staff office of hospitals or the appropriate alternative contact at each prospective place of recruitment. For the general structure of contacts, please refer to Appendix E. Also, the number of potential participants who responded to recruitment efforts, the number retained, and the number of potential participants rejected from the study and the reasons for their rejections were recorded and are reported in the results section.
Setting

All clinical interventions within the current investigation were conducted within the states of Washington and Indiana. All screening sessions were completed within an office that was both large enough for at least two chairs for the researcher and participant to sit across from one another and provided visual and auditory privacy from other individuals as a means of assuring confidentiality throughout meetings.

Treatment

**Hypnosis group.**

Hypnosis was used as the independent variable for the study. The induction involved the arm-drop method with a modification for eye fixation (Barabasz & Watkins, 2005). Participants were exposed to an ipsative hypnotic suggestion protocol incorporating imagery that described their pain. It also involved viewing the pain in different ways, relief of pain, and the use of posthypnotic suggestions for future relief and quality of life. The posthypnotic suggestions included the following themes: lasting pain relief beyond the session, faster relief of pain in the future, decreased pain severity in the future, pain amnesia, ego strengthening, improving specific individualized areas of poor functioning, and age progression. The hypnosis protocol is listed in Appendix F. To develop the ipsative imagery based protocol, participants were first asked to develop and describe, in detail, a visual representation of their worst pain/s. They were then asked to develop a visual representation of imagery that they could create to relieve their pain visual. For example, if a person experienced pain described as lightning bolts, they were able to detach a metal rod connected to the limb or place on a rubber boot on the exterior of the limb to relieve pain and prevent future pain. The goal was to find the most harmonious treatment for each participant while also ensuring it was imagery that the person could quickly apply again in
the future. The structure and language of the protocol was developed by close review of the following authors previous work: Barabasz and Watkins (2005), Patterson (2010), and Weitzenhoffer and Hilgard (1962). Specifically, the following aspects of the hypnotic protocol originated from Barabasz and Watkins (2005): the hypnotic induction (p. 132-133), use of passive language when applying suggestions, use of dissociative language when referring to the area of the body in pain, changing the meaning of pain, and concepts and some specific language used in ego-strengthening suggestions. The following aspects were from recommendations within Patterson (2010): language used for introducing images of their pain experience, language used for dissociative suggestions, pain amnesia suggestion, hypnotic suggestions for lasting pain relief, a trigger to quickly re-induce relaxation and comfort, age progression, and the concept of their mind being a powerful ally. And, the method for bringing participants out of hypnosis was modified from the Stanford Hypnotic Susceptibility Scale: Form C (SHCS:C) (Weitzenhoffer & Hilgard, 1962).

To treat pain that is infrequent and unpredictable, Barabasz and Watkins (2005) suggested that there are two recommended approaches; using audio recordings and teaching self-hypnosis. The current study provided individualized audio recordings of the hypnosis protocol chosen for the treatment. The protocol they received on audio recording was the same as the protocol they received in session with the therapist/researcher. Use of audio recordings were assigned as homework between sessions.

Relaxation group.

The control group received relaxation for pain relief. They were taught a rhythmic breathing exercise, a deep diaphragmatic breathing exercise, and a progressive muscle relaxation technique in the four one-hour sessions they received. The participants were provided an audio
recording of the voice guided relaxation techniques practiced in session. Participants were asked to use the audio recording provided to them as homework between sessions.

**Measures**

*Screening measures.*

*Phantom experience.*

A more qualitative description of PLP experience was gathered using the Phantom Pain Experience (PPE). The Phantom Pain Experience (see Appendix A) is simply composed of questions regarding the onset, nature, duration, severity, and any changes experienced in PLP symptoms. Also, questions include those related to current medications taken for PLP and past treatments that have been received for PLP. No outcome measure was derived from the list of questions on the PPE.

*Hypnotizability.*

Hypnotizability was measured during the screening session for all participants by using the 12-item research version of the Elkins Hypnotizability Scale (EHS) (Elkins, 2014). The EHS took approximately 25 minutes to administer. The EHS is composed of twelve items that are clustered within six different constructs from the domain of hypnotizability: 1) arm heaviness, 2) arm lightness, 3) mental imagery/dissociation, 4) rose-scent olfactory hallucination, 5) positive hallucination, and 6) post-hypnotic amnesia. All of the constructs except for post-hypnotic amnesia have at least two indicators assess the strength of response. Arm heaviness is separated into two challenges; arm heaviness and lifting the arm. Arm heaviness is scored based on behavioral observation (i.e., do they lift the arm?) and the participants’ report of how heavy their arm felt. Arm lightness/arm levitation includes the following suggestions: 1) the participant’s arm feels light, 2) the arm feels weightless, and 3) the arm lifts by itself without any conscious or
willful effort by the participant. Mental imagery/dissociation includes the following types of suggestions: 1) dissociate from the present time and place, and 2) experience imagery associated with walking through a garden. The mental imagery and dissociation suggestions are scored separately so that the EHS is able to determine those who can completely dissociate and those who can only experience mental imagery. Elkins (2014) states that his clinical experience suggests that the mental imagery/dissociation item identifies people who are in the moderate range of hypnotizability. The rose-smell/olfactory hallucination includes suggestions for smelling a rose as the participant walks through a garden in their mind’s eye. The scoring of the rose-smell/olfactory section differentiates between those who were able to only faintly smell a rose and those who distinctly experience the smell of a rose, helping to indicate the degree to which they are able to experience a sensory change. The positive hallucination items are the most difficult and are separated into vague visual hallucinations and distinct visual hallucinations. The participants are asked to respond to suggestions to “see” a box that does not exist in reality and scoring of the two indicators is based on the how distinct or vague the participant’s description of the block is. This construct is helpful in distinguishing those individuals in the high hypnotizability range. Lastly, the post-hypnotic amnesia construct involves the therapist/examiner suggesting an inability to recall the items given until a “cue” is given. For a more thorough review of the EHS protocol, refer to *Hypnotic Relaxation Therapy*, chapter 10 (Elkins, 2014).

The EHS scoring summary includes a list of all 12 items and the examiner marks either yes (giving a participant a score of 1 for that item) or no (giving the participant a score of 0 for that item) based on a detailed list of questions to be asked after hypnosis. Scoring is based both on the participant’s experience and the examiner’s behavioral observations. A total score can be
obtained by adding the yes marks above for each of the 12 items. Interpretation of levels of hypnotizability involve the following: a score of 0-1 = Very Low; a score of 2-3 = Low; a score of 4-8 = Middle; a score of 9-10 = High; and a score of 11-12 = Very High. Please review the results section for a detailed description of level of hypnotizability by group.

The items of the EHS were developed based on clinical experience and from past client feedback. In order to establish content validity, the items of the EHS were submitted for review to a panel of experts in clinical and experimental hypnosis. Face validity was established by agreement that the items appeared to represent those that would indicate differences between various levels of hypnotizability. Elkins established convergent validity by recruiting a sample of 252 adults (129 men and 123 women) and administering the EHS and SHSS:C to the participants in a balanced order during individual sessions. Correlational analyses of the EHS and SHSS:C revealed strong convergent validity, displaying a strong relationship (r = .821, p < .001). The EHS was also found to be highly reliable (Cronbach’s alpha = .849).

Pain measures.

Pain intensity/quality was measured by the McGill Pain Questionnaire (MPQ) (Melzack, 1975), as well as the Daily Pain Rating Scale (DPRS) the screening session, and again at two weeks, four weeks, and six weeks post treatment completion. Pain immediately before and after hypnosis treatment was measured by the Present Pain Intensity Scale (PPIS) each hypnosis session.

McGill Pain Questionnaire.

Ronald Melzack (1975) developed the MPQ (See Appendix G) after neuropsychological evaluations of pain led him to understand the importance of bio-psycho-social influences on human interpretation of pain intensity. He believed that the MPQ could assess the client’s
experience of pain more thoroughly than could be done through solely using pain intensity ratings. The MPQ was developed for use with adult populations who are experiencing various types of pain (Burckhardt & Jones, 2003) and was originally validated in a sample of 297 participants presenting with various pain presentations. The MPQ took approximately 10 minutes to administer and it took less time after multiple administrations (Melzack, 1975). It has been studied for over 30 years and has been translated into 26 different languages (Burckhardt & Jones, 2003). The MPQ was first administered during the screening session, and again at the two week, four week, and six week post-treatment data collection periods.

The MPQ is comprised of three sections. One section organizes 78 pain descriptor words into 20 items that investigate the following four categories: sensory, affective, evaluative, and miscellaneous. Melzack had doctors, patients, and students review and rank order a list of 102 words that were later reduced down to the 78 currently used in an attempt for the content to be parsimonious. Melzack (1975) originally developed three domains (sensory, affective, and evaluative) that were measured with 16 items, but found that four additional items were needed to better assess the complete, although less commonly experienced pain qualities of participants. It is important to note that the content validity of this first section of the MPQ has been deemed satisfactory in research (Burckhardt & Jones, 2003). The 20 items that measure the four domains are each comprised of 2-6 pain descriptor words that are rank ordered based on the common severity associated with the pain descriptor. The following is an example of one of the 20 items presented on the MPQ: “Sharp, Cutting, Lacerating.” Participants are instructed to circle the most representative word/s from the list of pain descriptor items. They are to be reminded not to select a word from an item list if none of the words apply to their current pain experience.

Complications related to the first section of 20 items, as well as another section related to present
pain intensity (PPI), caused Melzack to specifically recommend that examiners verbally administer the MPQ to their participants rather than allowing the participants to complete it themselves (Melzack, 1975). The current study followed Melzack’s recommended procedures and the MPQ was verbally administered to all participants at all data collection periods. Additionally, administration of this questionnaire requires that the interviewer defines any words not understood by the participant; a procedure also followed in this study. The Pain Rating Index Rank method, the PRI (R) was used in this study. Melzack (1975) reported an alpha coefficient of 0.95 for the PRI (p < .05).

Scoring the PRI (R) involves using the rank orders of each of the words presented in the item lists. Endorsement of the first word in an item always receives a score of 1, endorsement of the second word always receives a score of 2, and so on. For example, item four (i.e., sensory domain) that was presented earlier lists the following words, “Sharp, Cutting, Lacerating.” The word “Lacerating” from item number four on the MPQ would be scored a 3 due to its’ listing being in the third position, representing a more severe form of the same type of pain. An examiner can choose to assess changes in the PRI by dimension and/or assess changes to the total PRI score for all dimensions. The current study compared the total score changes.

The PRI (R) was chosen as the scoring method used to measure pain rather than the number of words chosen score (NWC) because the NWC has been found to be less reflective of changes in pain intensity, as participants who experience significant, but incomplete removal of all pain typically replace their previously chosen word that represented a more excruciating type of pain with another word that is considered to be representative of less severe pain, leaving the number of words chosen relatively or exactly the same. When looking at the proposed
expectations for treating clients with chronic pain, it is unrealistic to make the goal permanent and complete removal of all pain (Patterson, 2010).

Another section of the MPQ helps the examiner to better understand how the participant’s pain experience changes over time. The first question asks participants to select a word or words that best describe their pattern of pain. The participants are offered nine different word options to best describe their pain pattern (e.g., continuous, intermittent, brief, steady). The participant can also be asked about what has helped to relieve their pain in the past and what kinds of things have increased their pain in the past. This section of the questionnaire does not provide any interpretative results for pre to post treatment comparison and was not used.

The last section of the MPQ assesses the present pain intensity (PPI). Participants are provided with six options: 0 = no pain, 1 = mild, 2 = discomfoting, 3 = distressing, 4 = horrible, and 5 = excruciating. Participants are to write the most appropriate pain intensity word in response to five questions. An example of a few of the questions include: What word best describes your pain right now? What word best describes you pain at its worst? And what word describes your pain when it is at its least? Scores from PPI changes from pre to post treatment can be obtained to show changes in pain intensity. Melzack (1975) noted though that PRI (R) was a more valid measure of changes in pain intensity than the PPI. In fact, Melzack stated that “some patients still reported that their pain was at the same PPI level, but had changed in a way that was difficult to describe; [Their pain was reported to be] less sharp, less gnawing, not as exhausting and [not as] miserable as before (1975, p. 16).” Changes in meaningful client interpretation of their pain are thus better reflected by the PRI (R) total score, which is why the PRI (R) total score was the sole focus of this dependent measure.
Daily measures of pain.

The Daily Pain Rating Scale (DRPS) was developed by Rickard (2004). It is a simple numeric rating scale self-report measure that participants were asked to complete daily in the evenings (See Appendix H). They were provided with one week’s worth of DPRS during the screening session so that they could begin to track their daily pain scores beginning during the week prior to treatment beginning. They were provided an additional one week of DPRS at the beginning of each treatment session and were reminded to continue using the forms each week throughout the four week treatment period. The DRPS requires participants to rate their pain on a scale of 0 to 100 everyday from the day of the screening appointment to the six-week follow-up assessment period. The DPRS assesses variations in participants’ pain levels throughout the days between visits (Rickard, 2004). Zero represents no pain and 100 represents the worst pain a person could imagine. Participants were asked to document the numerical number that best represents their average pain experienced throughout the day. The DPRS also allows the client to track changes to the location of their phantom pain and whether their pain experience has changed.

Pre and post hypnotic pain measure.

A pre and post-hypnotic pain measure was administered to the hypnosis group to determine pain relief provided by the hypnotic intervention. See Appendix I for review of the Present Pain Intensity Scale (PPIS) that was given immediately before and after the hypnotic intervention each treatment session. The PPIS was adapted from the Pre-hypnotic Pain Scale (PPS) and the Post-hypnotic Pain Rating Scale (PPRS) first used by Rickard (2004). It is simply a numeric rating scale ranging from 0 to 100, where zero represents no pain and 100 represents the most pain imaginable to the participant.
Quality of life measure.

Quality of life was measured by the Brief Pain Inventory (BPI) Short-Form (Cleeland, 2009) during the screening session and again at three post-treatment data collection periods (two week, four week, and six week follow-up). See appendix J for a copy of the BPI. The purpose of the BPI is to assess the severity of pain and the impact of pain on daily functioning. The BPI is intended to be used with patients experiencing various forms of chronic diseases that produce pain. The BPI can be administered by paper and pencil either by interview or self-report. The BPI took approximately five minutes to administer. The short form version used in this study includes the exact same items for the pain interference dimension that the long form does, which is why, as it is our quality of life measure, we chose this form.

The BPI is comprised of two dimensions: pain severity and pain interference. The pain interference section is comprised of two dimensions of its own: activity and affect. That is, using a Likert scale scoring format, the BPI pain interference dimension assesses the degree to which the participant’s pain interferes with seven domains related to daily functioning, including: General activity, mood, walking ability, normal work inside and outside of the house, relations with other people, sleep, and enjoyment of life. The BPI pain interference score for measuring treatment outcomes can be obtained by adding all of the pain interference items and dividing by seven to obtain the mean, although this study simply used the raw total pain interference score for data analysis.

The factor structure of the BPI has been well validated. Comparisons of language versions of the BPI with similar pain populations produced eigenvalues greater than 1 when factor analysis was applied to the matrix of intercorrelations of the scores of each sample, supporting that the first factor is pain interference and the second factor is pain severity
(Cleeland, 2009). Also, a large national study consisting of 1261 people with metastatic cancer pain provided the same results, supporting that there is a two factor structure: interference and severity (Cleeland, 2009). Internal stability was also shown to be good (pain severity = .80-.87; pain interference = .89-.92) (Cleeland, 2009). Additionally, research into alternative language formats (Saxena, Mendoza, & Cleeland, 1999; Klepstad et al., 2002) has supported the authors’ hypotheses that interference is composed of an affective cluster made up of the following items: enjoyment of life, mood, and relations, as well as an activity cluster made up of the following items: walking, general activity, work, and sleep.

Test-retest reliability has been well established for the BPI. Initial reliability ratings for retest 1 day to 1 week after the first administration provided high reliability coefficients for worst pain (r = .93) and usual or average pain (r = .78) measures (Cleeland, 2009). Also, a German pain clinic sampled 109 outpatients, retesting 30-60 minutes after the initial administration and found test-retest reliability to be high (pain severity = .98; pain interference = .97) (Radbruch et al., 1999). Another study found high test-retest reliability (pain severity = .83-.88; pain interference = .83-.93) after daily administrations for one week (Mendoza et al., 2006). Alternate forms administrations have also produced high test-retest reliability (pain interference = .88; pain severity = .95) (Saxena et al., 1999). This study used only used the pain interference section to measure quality of life. The pain severity factor was not of focus for the current study.

**Procedures**

After receiving IRB approval, the examiner personally contacted medical staff, support group volunteers, and other professionals connected to the amputee population in Washington and Indiana. Recruitment flyers were provided to interested groups and places, presentations were given, and recruitment took place when people or groups had interest in the study.
Throughout the duration of data collection, the screenings completed versus the number of retained participants retained was tracked and is reported in the results section of this paper.

Once a participant contacted the examiner with interest in participating in the study, the examiner scheduled them for a screening session after briefly inquiring over the phone whether the participant experienced PLP, how long they had experienced PLP, and the cause and date of their amputation. The screening session included: education about the inclusion and exclusion criteria, client self-reporting of their qualification for the current study, gathering of demographic information (Appendix B) and Phantom Pain Experience (PPE) information (Appendix A), completion of screening measures such as the Elkins Hypnotic Scale (EHS), and completion of outcome measures such as the McGill Pain Questionnaire (MPQ), the Brief Pain Inventory (BPI) short form, and the Daily Pain Rating Scale (DPRS). In the screening session, this researcher also collaboratively reviewed responses about pain descriptors from the PPE information with participants to get them thinking about ipsative imagery should they have been assigned to the hypnosis treatment group later. In all, with the BPI short form taking approximately 5 minutes to administer, the MPQ taking around 10 minutes to administer, and the DPRS taking approximately 5 minutes to explain, the outcome measures provided during the screening session took approximately 20 minutes in total to administer. Additionally, with the EHS taking approximately 25 minutes to administer, total assessment administration ranged from 45-50 minutes typically, providing the examiner plenty of time to complete all screening session tasks in the 90 minute screening appointment. Potential participants were given information in the screening appointment about their EHS scores, although group assignment was not always given at the time of the screening appointment. Decisions regarding group enrollment and procedures
for dismissing ineligible participants were made in the way that has been described throughout this chapter.

Once pre-treatment measures were completed and participants were assigned to groups, sessions began within one week for all members retained in the study. In the first therapy session for the treatment group, the session began by informing the participants that they have been chosen to be a part of a four week treatment intended to reduce their PLP and improve their quality of life by decreasing the degree pain interferes with desired activity and positive affect. Next, the participants were provided with information about hypnosis and myths were debunked as needed; some participants had less desire for this supplemental information. Next, the participant and the examiner collaboratively reviewed and discussed their DPRS results and any challenges they had in completing the DPRS. Next, each participant was asked to develop their ipsative imagery with the researcher so that the protocol could be personalized to their experiences and images. Once the participant had determined their ipsative imagery, the examiner administered the Present Pain Intensity Scale (PPIS). Once a baseline pain severity was established from the PPIS for each session, the examiner guided the participant through the ipsative hypnotic treatment protocol described in Appendix F. Following completion of hypnosis, the PPIS was given again to assess changes in pain experience from pre to post hypnotic intervention. Time was saved at the end of the first session and every following session for the participants to ask questions, share their experiences of the treatment, and address any concerns about treatment if any arose. Participants were provided with audio copies of the hypnotic induction to use from the second session on between sessions and after treatment had terminated. If a participant wanted to change their ipsative imagery for protocol F, they were able to for future sessions and they were provided an updated audio tape to match their new
protocol. All following sessions for the treatment group followed the exact outline noted above (i.e., check-in, measures administered and reviewed, hypnotic protocol used, and end of session check-in), except following sessions did not further discuss the experimental treatment outline or de-bunk hypnosis myths.

In the control group, participants practiced applying one relaxation technique each session. The control group’s first session provided them with information about how many sessions they would receive, their mode of experimental treatment, and a detailed description regarding the mind-body connection in relation to the effects that relaxation can have on stress and the way that stress can impact pain experience. Also, the examiner reviewed the DPRS results from the week prior to treatment and explored any challenges to completing the DPRS. In regards to interventions throughout the four weeks, the typical order consisted of the following: the first session provided practice with a rhythmic breathing technique, the second session provided training and practice applying a deep diaphragmatic breathing exercise, the third session provided training and practice using progressive muscle relaxation, and the fourth session provided the opportunity for each participant to identify their preferred technique and to receive additional time for training and practice with the preferred technique. Access to audio files were provided after the second session just like they were for the hypnosis treatment group. Each participant was provided time at the end of each session to ask questions that arose, explain the effects of the treatment that day, and to express any concerns they may have had about the treatment plan. The outcome measures were administered in the same time-frame that are explained above for the treatment group, except the PPIS was note given to this group.

In the last session for both groups, participants were reminded that the MPQ, DPRS, and BPI were going to be administered two weeks, four weeks, and six weeks following treatment
completion. All participants were contacted by the examiner himself. At the end of each follow-up period the examiner reminded the participant to continue tracking their pain and quality of life experiences for the next follow-up and asked if the participant could foresee any problems in doing so.

Following completion of data analyses, all participants were provided with debriefing paperwork, explaining the purpose of the study, their role in the investigation, and the value of the study for their community. Also, they were informed of how to gain access to research results once the research has been completed.
CHAPTER FOUR

RESULTS

Design

Between (experimental vs control) and within group (Pretreatment, 2, 4 & 6 weeks post treatment) contrasts were tested. The following dependent variables: The Daily Pain Rating Scale (DPRS), McGill Pain Questionnaire (MPQ), and the Brief Pain Inventory (BPI) were analyzed to determine between group differences at two weeks, four weeks, and six weeks following treatment completion. The same dependent variables were used for within group analyses and compared treatment group scores from pre to post treatment at three different follow-up periods (Time 1 = pre-intervention versus two weeks post-intervention; Time 2 = pre-intervention versus four weeks post-intervention; and Time 3 = pre-intervention versus six weeks post intervention). For the hypnosis group, analyses also included a comparison of Present Pain Intensity Scale (PPIS) scores from pre to post hypnosis intervention each treatment session to determine if there were significant differences between subjective pain ratings before and after the hypnosis intervention.

Analyses

The data failed to meet the assumptions required for parametric analyses. Therefore, non-parametric statistics were used. Wilcoxon Signed-Ranks Tests (Wilcoxon, 1945) were computed to analyze within group differences on the DPRS, MPQ, and BPI from pre-treatment to 2, 4, and 6 weeks post-treatment, as well as the pre-treatment PPIS versus post-treatment PPIS scores from each session for the hypnosis group. The Mann Whitney U test (Mann & Whitney, 1947) was calculated to analyze DPRS, MPQ, and BPI differences between groups at each follow-up period. All statistical analyses were calculated manually. Alpha was set at the behavioral
sciences standard of $p < .05$ level of significance for this study. The results from the analyses are
reported below. Due to the small sample size, the rank order nature of the Mann Whitney U was
vulnerable to displaying insignificant results for between group analyses when even one control
group member received the highest rank possible. Thus, it was opined that the results are more
accurately represented in graphic presentations. (See below).

**Participants**

Out of everyone who completed a screening appointment ($N = 16$), only three people
were excluded based on exclusion criteria (i.e., one due to substance use reports, another due to
memory impairment that made the person unable to respond to the scales, and another due to
their level of hypnotizability being too low) and another person opted out of the study before
group assignment. It is important to note that, due to the narrowly defined target population for
this study and related recruitment difficulties, the minimum threshold for level of hypnotizability
required to participate was decreased to zero.

Every participant who was enrolled in the study and received group assignment (i.e., -hypnosis or control) completed the study ($N = 12$). Of the 12 participants, 11 people identified as
White (92%) and one as Hispanic (8%); four members identified as women (33%) and eight as
men (67%); and age of participants ranged from 29-74 years old at the time of screening ($M =
56.08, SD = 15.84$). No participants in this study experienced amputation due to chronic illness;
10 participants’ amputations were caused by injury (83%) and two participants’ amputations
were caused by acute medical/health (17%) related concerns.

All participants included in the study experienced phantom limb pain (PLP) for at least 6
months prior to beginning the study. The range of PLP chronicity prior to enrollment in the study
was 2.5-52 years ($M = 17.98, SD = 16.84$).
Every participant except for one endorsed more than one ipsative description of PLP. That is, 92% of participants endorsed between two and six pain descriptions without prompting or word lists to choose descriptions from during the screening appointment.

All participants were screened using the Elkins Hypnotizability Scale (EHS) to determine their hypnotizability. Due to the restricted availability of and access to eligible participants, the intended minimum hypnotizability criteria for inclusion (i.e., hypnotizability score of between 4 and 12) was dropped and participants were not matched for group assignment after the first four participants were assigned to treatment and control groups. Hypnotizability scores for participants in the hypnosis group ranged from 6 to 12 with a mean of 9 and standard deviation of 2.68. Hypnotizability scores for the relaxation/control group ranged from 0-12 with a mean of 4.3 and standard deviation of 4.32.

**Comparison of participant characteristics by group.**

No significant differences were found between the two groups that could confound treatment versus control group outcomes, although these conclusions appear to be influenced by the small sample size of the study, as can be seen by the larger t-scores reported below for some variables. Examples of variables between groups at pre-treatment that displayed large, but non-statistically significant differences include the following: The level of hypnotizability for the treatment group ($M = 9$) and the control group ($M = 4.33$) ($SE = 2.08$, $t (10) = 2.24$, $p > .05$), the MPQ PRI (R) total score for the hypnosis group ($M = 122.5$) and the control group ($M = 59.67$) ($SE = 30.05$, $t (10) = 2.09$, $p > .05$), and the quality of life for the treatment ($M = 30$) and control ($M = 15.58$) groups as measured by the BPI ($SE = 7.15$, $t (10) = 2.01$, $p > .05$). The DPRS scores, another measure of pain intensity, were found to not be significantly different between treatment ($M = 47.98$) and control ($M = 52.02$) groups at pre-treatment ($SE = 13.19$, $t (10) = .31$, $p > .05$).
Lastly, age of the participant and duration of phantom limb pain (PLP) were each examined to determine if there were characteristic differences for the two groups. It was found that there were no significant differences for age between the treatment (56.5) and control (55.67) groups ($SE = 9.59$, $t (10) = .10$, $p > .05$) or duration of PLP prior to research enrollment for the treatment ($M = 18.38$) and control ($M = 17.58$) groups ($SE = 10.19$, $t (10) = .10$, $p > .05$) between the two groups at pre-treatment.

**Hypotheses Testing**

**Between group analyses.**

**Hypothesis 1.**

To test the hypothesis that the treatment group would show significantly reduced phantom limb pain (as measured by significantly lower pain scores on the McGill Pain Questionnaire when using the PRI (R) total score) at the two-week, four-week, and six-week follow up assessment periods as compared to the active control group’s scores, the Mann-Whitney U (a rank test for two independent samples) was used. The Mann-Whitney U failed to reveal significant differences between the hypnosis treatment ($M = 49.33$; $SD = 64.30$) and relaxation active control ($M = 46.2$; $SD = 31.03$) intervention scores at two weeks post-treatment ($n [6, 5]$, $U [12, 18]$, $p < .197$; $d = -.062$), or at four weeks post treatment (hypnosis $M = 35.83$; $SD = 56.34$) and (control $M = 48.17$; $SD = 35.61$) ($n [6, 6]$, $U [13, 23]$, $p < .242$; $d = .26$).

However, at the six-week post-treatment follow-up period, the Mann-Whitney U calculation revealed a significant difference between the hypnosis ($M = 17$; $SD = 16.89$) and relaxation ($M = 50.66$; $SD = 28.59$) groups on the MPQ PRI (R) total score measure ($n [6, 6]$, $U [4, 32]$, $p < .013$; $d = 1.43$) (see Figure 1.). A small effect size was found at the four-week post-treatment
A comparison and a large effect size was found when comparing groups at the six-week follow-up comparison. 

Although the group means at the two-week follow-up show only a 3.13 mean difference between the groups, the two-week post-treatment score represents a 60% decrease in overall pain from pre-treatment ($M = 122.5$) to post-treatment ($M = 49.33$) for the treatment group whereas the control group only showed an 11% decrease in pain from pre-treatment ($M = 59.67$) to two weeks post-treatment ($M = 46.2$). The hypnosis group showed a 70% decrease in pain from pre ($M = 122.5$) to four weeks post-treatment ($M = 35.83$) compared to the relaxation group’s 19% decrease in pain scores from pre-treatment ($M = 59.67$) to four weeks post-treatment ($M = 48.17$). The hypnosis group showed an 86% decrease in pain from pre-treatment ($M = 122.5$) to six weeks post-treatment ($M = 17$), whereas the six week control group mean score of 50.67 compared to the pre-treatment mean score of 59.67 represents only a 15% decrease in pain.
Hypothesis 2.

The treatment group was expected to show significantly lower phantom limb pain (as measured by significantly lower average pain scores from the Daily Pain Rating Scale) at the two-week, four-week, and six-week follow-up assessment. The Mann-Whitney U revealed a significant difference between the hypnosis treatment ($M = 13.33; SD = 13.84$) and relaxation active control ($M = 42.14; SD = 68.72$) interventions at two weeks post-treatment ($n = 6$, $U = 23, 7$, $p < .047; d = .58$). The Mann-Whitney U test did not reveal significant differences between the hypnosis ($M = 12.14; SD = 10.53$) and relaxation ($M = 47.86; SD = 36.09$) groups at the four-week follow-up period ($n = 6$, $U = 10.5, 25.5$, $p < .120; d = 1.34$). The Mann-Whitney U did reveal a significant difference at the six-week follow-up period for the hypnosis ($M = 7.62; SD = 8.70$) and relaxation ($M = 50.77; SD = 32.82$) groups ($n = 6$, $U = 4,32$, $p < .013; d = 1.80$) (see Figure 2.). At two weeks post-treatment a medium effect size was found, and at four and six weeks post-treatment large effect sizes were found for treatment differences.

![DPRS Mean scores for Treatment and Control Groups](image-url)
At two weeks post-treatment the hypnosis group \( (M = 13.33) \) reported 72% less pain than at pre-treatment \( (M = 47.98) \) while the relaxation group at two weeks post treatment \( (M = 42.14) \) reported 19% less pain than at pretreatment \( (M = 52.02) \). At four weeks post treatment, the hypnosis group \( (M = 12.14) \) reported 75% less pain severity than at pre-treatment \( (M = 47.98) \) while the relaxation control group \( (M = 47.86) \) reported 8% less pain than at pre-treatment \( (M = 52.02) \). At six weeks after treatment the hypnosis group \( (M = 7.62) \) reported 84% less pain than at pre-treatment \( (M = 47.98) \) while the relaxation control group \( (M = 50.77) \) reported 2% less pain than at pre-treatment \( (M = 52.02) \).

**Hypothesis 3.**

It was predicted that the treatment would show higher quality of life as measured by lower scores on the BPI short form than the control at each follow-up period (i.e., two-week, four-week, and six weeks after treatment). The Mann-Whitney U was used to compute group differences. The hypnosis group \( (M = 3.33; SD = 8.16) \) and the relaxation control group \( (M = 11.20; SD = 7.69) \) showed significant differences in quality of life as measured by BPI short-form scores at two weeks post-treatment \( (n [6, 5], U [4, 26], p < .013; d = .99) \). The Mann-Whitney U tests did not reveal significant differences between the hypnosis \( (M = 0.50; SD = .55) \) and relaxation \( (M = 6; SD = 7.38) \) groups at four weeks post treatment \( (n [6, 6], U [13.5, 22.5], p < .242; d = 1.05) \) or at six weeks post treatment for the hypnosis \( (M = 2.50; SD = 3.89) \) and relaxation \( (M = 6.17; SD = 6.11) \) groups \( (n [6, 6], U [9.5, 26.5], p < .090; d = .72) \) (see Figure 3.). Two and four-week follow-up assessments produced large effect sizes when comparing treatment and control group outcomes post-treatment. The six week follow-up comparison produced a medium effect size.
Note. Lower BPI scores indicate higher quality of life.

At two weeks post-treatment the hypnosis group ($M = 3.33$) reported 89% higher quality of life than at pre-treatment ($M = 30$) while the relaxation group at two weeks post treatment ($M = 11.20$) reported 28% higher quality of life than pretreatment ($M = 15.58$). At four weeks post treatment, the hypnosis group ($M = .50$) reported 98% higher quality of life than at pre-treatment ($M = 30$) while the relaxation control group ($M = 6$) reported 61% higher quality of life than at pre-treatment ($M = 15.58$). At six weeks after treatment the hypnosis group ($M = 2.50$) reported 92% higher quality of life than at pre-treatment ($M = 30$) while the relaxation control group ($M = 6.17$) reported 60% higher quality of life than at pre-treatment ($M = 15.58$).

Within group analyses.

Hypothesis 4.

The Wilcoxon Signed-Ranks Test was computed to examine the hypothesis that participants within the hypnosis treatment group would show significantly reduced phantom limb pain from pre-treatment to post-treatment follow-up assessments at two weeks, four weeks, and
six weeks (as measured by significantly lower PRI (R) total scores from the McGill Pain Questionnaire). The Wilcoxon Signed-Ranks Test displayed significant pre-treatment \((M = 122.5, SD = 67.84)\) to post-treatment \((M = 49.33, SD = 64.30)\) differences at two weeks (Ns-R (6), T (0), \(p < .05; d = 1.11\)). Statistical significance was also found in comparison of the hypnosis group’s MPQ PRI (R) total scores from pre-treatment \((M = 122.5, SD = 67.84)\) to four weeks after treatment completion \((M = 35.83, SD = 56.34)\) (Ns-R (6), T (0), \(p < .05; d = 1.39\)). Lastly, the pre-treatment \((M = 122.5, SD = 67.84)\) and six-week post treatment MPQ PRI (R) total scores \((M = 17, SD = 16.89)\) showed significant differences (Ns-R (6), T (0), \(p < .05; d = 2.13\)) (see Figure 4.). All pre to post treatment comparisons produced large effect sizes using Cohen’s d.

![Figure 4. Hypnosis Group Pre - Post MPQ PRI (R) Mean Total Scores](image)

The hypnosis group demonstrated a decrease in pain intensity of 60% on the MPQ PRI (R) from pre-treatment \((M = 122.5)\) to two weeks-post-treatment \((M = 49.33)\), 70% at four weeks post-treatment \((M = 35.83)\), and 86% at six weeks post-treatment \((M = 17)\).
**Hypothesis 5.**

The Wilcoxon Signed-Ranks Test was used to test the hypothesis that participants within the hypnosis treatment group would show significantly reduced phantom limb pain from pre-treatment to post-treatment follow-up assessments at two weeks, four weeks, and six weeks (as measured by significantly lower weekly pain severity averages from the Daily Pain Rating Scale). The hypnosis group’s DPRS two-week follow-up scores ($M = 13.33$, $SD = 13.84$) proved to be significantly reduced compared to the DPRS pre-treatment baseline scores ($M = 47.98$, $SD = 13.09$, Ns-R (6), T (0), $p < .05$; $d = 2.57$). The comparison of pre-treatment DPRS scores ($M = 47.98$, $SD = 13.09$) and those reported at four weeks after treatment completion ($M = 12.14$, $SD = 10.53$) displayed significant reductions in average pain intensity (Ns-R (6), T (0), $p < .05$; $d = 3.02$). Lastly, the treatment group displayed significant differences between pre ($M = 47.98$, $SD = 13.09$) and post-treatment pain intensity at the six-week post-treatment data collection period ($M = 7.62$, $SD = 8.70$) as measured by the DPRS (Ns-R (6), T (0), $p < .05$; $d = 3.63$) (see Figure 5.). All follow-up comparisons produced large effect sizes using Cohen’s d.

![Figure 5. Hypnosis Group Pre - Post DPRS Mean Scores](image-url)
The hypnosis group demonstrated a decrease in pain intensity of 72% on the DPRS from pre-treatment \((M = 47.98)\) to two weeks-post-treatment \((M = 13.33)\), 75% at four weeks post-treatment \((M = 12.14)\), and 84% at six weeks post-treatment \((M = 7.62)\).

**Hypothesis 6.**

It was expected that participants within the hypnosis treatment group would show significant increases in quality of life when comparing pre-treatment scores to scores at two weeks, four weeks, and six weeks post-treatment (as measured by lower scores on the Brief Pain Inventory short form) and this hypothesis was analyzed using the Wilcoxon Signed-Rank Test. The analysis revealed that the two-week follow-up scores \((M = 3.33, SD = 8.16)\) on the BPI were significantly lower than the pre-treatment reports \((M = 30, SD = 13.40)\) (Ns-R (6), T (0), \(p < .05; d = 2.40\)). A significant difference was also observed between pre-treatment \((M = 30, SD = 13.40)\) quality of life scores as measured by the BPI short-form and scores taken at the four-week follow-up \((M = .50, SD = .55)\) (Ns-R (6), T (0), \(p < .05; d = 3.11\)). Lastly, the six-week follow-up \((M = 2.50, SD = 3.89)\) scores were found to significantly differ from those obtained at the pre-treatment screening \((M = 30, SD = 13.40)\) for the BPI short-form (Ns-R (6), T (0), \(p < .05; d = 2.79\)) (see Figure 6). All follow-up comparisons produced large effect sizes using Cohen’s d.
The hypnosis group demonstrated an increase in quality of life (as measured by lower scores on the BPI) of 89% from pre-treatment ($M = 30$) to two weeks-post-treatment ($M = 3.33$), 98% at four weeks post-treatment ($M = 0.5$), and 91% at six weeks post-treatment ($M = 2.50$).

**Hypothesis 7.**

It was hypothesized that the hypnosis treatment group would show significant reductions in phantom limb pain from pre-hypnotic intervention to post-hypnotic intervention during treatment sessions (as measured by the mean difference between scores on the Present Pain Intensity Scale administered immediately before and after the hypnosis intervention in each session). At least one group member reported no pain prior to hypnosis intervention in three out of the four treatment sessions. Since the minimum number of observations required to run the Wilcoxon Signed-Ranks Test is six (pre to post), this study’s sample size was insufficient to analyze when every member did not report pre to post treatment differences. The first treatment session was the only session all members reported pain prior to the hypnosis intervention and, therefore, the first treatment session is the only period the Wilcoxon Signed-Ranks Test could be
applied. Raw scores as well as means and standard deviations have been reported for both the before and after hypnosis administrations of the Present Pain Intensity Scale (PPIS) for the second, third, and fourth treatment sessions.

The Wilcoxon Signed-Ranks Test revealed that participant pain experience as measured by the pre PPIS ($M = 40, SD = 17.89$) and post PPIS ($M = 5, SD = 8.36$) significantly reduced following the hypnosis intervention during the first treatment session ($Ns-R (6), T (0), p < .05; d = 2.51$) (see Figure 7.). The individual scores from the second treatment session for the pre PPIS ($M = 22, SD = 18.97$) and post PPIS ($M = 0, SD = 0$) are as follows: 10, 0, 30, 40, 30 and 0, 0, 0, 0, 0 respectively ($d = 1.64$). The individual scores from the third treatment session for the pre PPIS ($M = 10.83, SD = 10.21$) and post PPIS ($M = 0, SD = 0$) are as follows: 0, 25, 20, 10, 10, 0 and 0, 0, 0, 0, 0, 0 respectively ($d = 1.50$). The individual scores from the fourth treatment session for the pre PPIS ($M = 5, SD = 8.37$) and post PPIS ($M = 1.67, SD = 4.08$) are as follows: 0, 20, 0, 10, 0 and 0, 10, 0, 0, 0, 0 respectively ($d = .51$). The first three treatment sessions produced large effect sizes from pre-hypnosis intervention to post-hypnosis intervention using Cohen’s $d$. The final treatment session produced a medium effect size.
Figure 7. Pre - Post PPIS from Each Session: Hypnosis Group Means
CHAPTER FIVE

DISCUSSION

The findings support the hypothesis that hypnosis can be an effective treatment for reducing phantom limb pain (PLP) and improving quality of life for people who experienced amputations caused by traumatic injury or acute illness, a population that has been under-represented in prior research. Furthermore, this study extends the research supporting hypnosis as effective in treating chronic pain by showing pain reduction plus quality of life improvement. Hypnosis significantly improved quality of life which has not been measured in prior phantom limb pain research. Patterson (2010) states that quality of life is an important modifiable factor to address when treating chronic pain.

Summary and Interpretation

Hypotheses one through three predicted significant differences between the treatment and active-control groups at two, four, and six-week follow-up assessments. Hypothesis one predicted that the treatment group would significantly reduce pain severity compared to the relaxation intervention as measured by the McGill Pain Questionnaire (MPQ) PRI (R) total score. This hypothesis was supported at the six-week follow-up period but not the two or four-week follow-up periods. A small effect size was found at the four-week post-treatment comparison and a large effect size was found when comparing groups at the six-week follow-up comparison. It is remarkable that the six-week effect size between the two groups was nearly one and a half standard deviations greater for hypnosis than relaxation, especially considering pre-treatment differences that are not taken into account in this calculation. It is important to note that at pre-treatment the hypnosis group ($M = 122.5$) reported 51% more pain than the control group ($M = 59.67$), which means that a 62.83 reduction in pain would only make the hypnosis group scores equal to those of the control group at pre-treatment. Considering the differences at
pre-treatment, reviewing changes over time appears to best depict differences between the effects of the two interventions. See Figure 1. The hypnosis treatment reduced pain reports from pre-treatment \( (M = 122.5) \) by 60% at the two \( (M = 49.33) \) and 70% at the four-week \( (M = 35.83) \) follow-up periods respectively while the control intervention reduced pain reports from pre-treatment \( (M = 59.67) \) by 23% at the two-week \( (M = 46.2) \) and 19% at the four-week \( (M = 48.17) \) follow-ups. The hypnosis group reduced pain by 86% from pre-treatment \( (M = 122.5) \) to six weeks post-treatment \( (M = 17) \), whereas the relaxation group reduced pain by 15% from pre-treatment \( (M = 59.67) \) to six weeks post-treatment \( (M = 50.67) \).

The active control group was exposed to relaxation treatment and provided with relaxation tapes to practice at home. Sherman, Gall, & Gormly (1979) found that relaxation was effective for PLP. This may account for the reduction in MPQ PRI (R) scores. The control group reduced their pain scores by 23%, 19% and 15% respectively from pre-treatment at the two-week, four-week and six-week follow-ups. In contrast, participants in the hypnosis group reported greater pain reduction: 60%, 70% and 86%. The hypnosis group continued to show more pain reduction over time whereas the control group’s pain reductions continued to regress back toward the pre-treatment mean over time.

Hypothesis two predicted that the hypnosis treatment would significantly reduce pain severity compared to the relaxation intervention as measured by group scores on the Daily Pain Rating Scale (DPRS) at two, four, and six week follow-ups. The Mann-Whitney U revealed a significant difference between the hypnosis treatment and relaxation active control at two and six weeks post-treatment but not at four weeks post treatment. (see Figure 2). At two weeks post-treatment a medium effect size was found, and at four and six weeks post-treatment large effect sizes were found between treatments. Considering the small sample size, measurement of effect
size may produce more useful examination of the treatment differences. As can be seen at week four, statistical significance was not found although the hypnosis treatment reduced pain experience 1.34 standard deviations greater than did the relaxation intervention.

Further examination revealed that the hypnosis treatment group reduced pain reports from pre-treatment ($M = 47.98$) by 72% at the two-week follow-up ($M = 13.33$), 75% at the four-week follow-up ($M = 12.14$), and 84% at the six-week follow-up ($M = 7.62$). The control group reduced pain reports from pre-treatment ($M = 52.02$) by 19% at the two-week ($M = 42.14$), 8% at the four-week ($M = 47.86$), and 2% at the six-week ($M = 50.77$) week follow-ups. These outcomes are similar to the (MPQ) PRI (R) findings that showed pain continued to reduce over time for participants in the hypnosis group while the control group’s pain reductions decreased over time.

The two measures of pain provided qualitatively different information. The McGill Pain Questionnaire (MPQ) provided a more thorough exploration of pain quality and severity. It consists of 78 pain descriptor words that are rank ordered from representing least to worst pain severity which are organized across 20 items investigating four different dimensions of pain quality. Thus, participants are allowed to think more dynamically about pain severity and dimensions. The rank ordered word lists of pain descriptors allows participants to choose from them to define their pain experience. For example, sensory, affective, evaluative, and miscellaneous domains are considered by each participant each time they take the MPQ and they are allowed to endorse words from a rank ordered list (e.g., sharp, cutting, lacerating) to help them more intentionally define pain experience. Accordingly, Melzack (1975) believed that the MPQ could assess the client’s experience of pain more thoroughly than could be done solely using linear pain intensity ratings (e.g., the DPRS) that rely on application of an arbitrary
subjective numbering system. The DPRS on the other hand, simply asked participants to rate their pain on a scale of 0 to 100 everyday; a standard method that health care professionals use in assessing patient pain and one that is able to be completed more quickly than is thorough pain questionnaires like the MPQ. The DPRS, as noted by Rickard (2004), provides valuable data for this population because of the unpredictability of pain severity and the importance of having a method of pain assessment that can be applied each night with minimal effort and time. At pre-test, the MPQ PRI (R) mean for the hypnosis group ($M = 122.5$) was much higher (62.83; 51%) than the control group ($M = 59.67$). The DPRS means for the two groups at pre-treatment were similar (hypnosis = 47.98, control = 52.02). The differences in pain reports at pre-test suggests that the two measure are tapping different aspects of pain, which may support Melzack’s theoretical foundation for the development of the MPQ. Together, it appears the two different pain measures complimented each other in providing both depth and efficiency of pain assessment.

Hypothesis three stated that the hypnosis treatment group in comparison to the relaxation active control group would show significantly greater quality of life as measured by lower scores on the Brief Pain Inventory Short-Form (BPI) at two, four, and six week follow-up data collection periods. Evaluating quality of life changes between groups by using the Mann-Whitney U test displayed a significant difference between the hypnosis group and the relaxation control group at two weeks post-treatment but not between the hypnosis and relaxation groups at four or six weeks post treatment (see Figure 3). Two and four-week follow-up assessments produced large effect sizes when comparing treatment and control group outcomes post-treatment. The six week follow-up comparison produced a medium effect size. Again, effect size evaluations indicate clinically meaningful differences.
The difference between pre-treatment scores for the hypnosis group ($M = 30$) and the control group ($M = 15.58$) appear to have confounded post-treatment group comparisons. When treatment differences were examined more closely, the hypnosis group improved by 89% from pre-treatment ($M = 30$) to two weeks post-treatment ($M = 3.33$), 98% at four weeks ($M = .50$), and 91% at six weeks ($M = 2.50$). In contrast, the control group improved by 28% from pre-treatment ($M = 15.58$) to two weeks post-treatment ($M = 11.2$), 61% at four weeks ($M = 6$) and 60% at six weeks ($M = 6.17$).

It is also notable that the active control intervention encompassed techniques that have been shown to improve specific domains of the BPI, such as sleep (Karbandi, Hosseini, Masoudi, Hosseini, Sadeghi, & Moghaddam, 2015; Sherman, Gall, & Gormly, 1979), and mood (Manzoni, Pagnini, Castelnuovo, & Molinari, 2009; Sherman et al., 1979). Findings that relaxation helped improve quality of life domains was supported in this research as well. Although no within group comparisons were significant for the relaxation group, more thorough examination of pre-to-post-treatment change shows that relaxation produced 28%, 61%, and 60% improvements in quality of life from pre ($M = 15.58$) to post-treatment at two ($M = 11.20$), four ($M = 6$), and six ($M = 6.17$) week follow-up periods respectively.

Hypotheses four through six focused on time as a variable and predicted that the hypnosis group would have a significant impact on pain and quality of life from pre to post treatment at the two, four, and six week follow-up periods. It was found that hypnosis significantly reduced pain from pre to post-treatment at all follow-up periods for both the MPQ PRI (R) total score measure and the DPRS measure; supporting hypotheses four and five respectively. It was also found that hypnosis significantly improved quality of life by improving quality of life scores (i.e., lower scores on the BPI) at all follow-up comparison periods; supporting hypothesis 6.
Furthermore, using Cohen’s d, large effect sizes were found from pre to post treatment for the hypnosis group at all follow-up periods for the MPQ, DPRS, and BPI. The effect sizes observed suggest that hypnosis had clinically meaningful impacts on both pain and quality of life and again show that treatment gains were maintained over time.

Closer examination of pre to post-treatment change on the MPQ showed that the hypnosis group reduced their pain intensity by 60% on the (MPQ) PRI (R) total score from pre-treatment ($M = 122.5$) to two weeks post-treatment ($M = 49.33$). At four weeks post-treatment ($M = 35.83$), the hypnosis group showed a decrease in overall pain of 70% from pre-treatment scores. And, at six weeks post-treatment ($M = 17$), the hypnosis treatment group showed a considerable decrease in pain of 86% from pre-treatment scores. These findings, in combination with the statistical significance from pre to post-treatment analyses at each follow-up period clearly support hypnosis as an effective treatment for reducing client’s perceived pain intensity.

The hypnosis group showed a 72% decrease in pain from pre-treatment ($M = 47.98$) to two weeks post-treatment ($M = 13.33$) on the DPRS; a 75% decrease in pain at four weeks post-treatment ($M = 12.14$); and an 84% decrease at six weeks post treatment ($M = 7.62$). Thus, it appears that the brief four-week hypnosis intervention provided participants with effective resources to increase their treatment gains six weeks following treatment completion (i.e., an 86% decrease in pain on the MPQ at six weeks and an 84% decrease in pain on the DPRS at six weeks).

Hypothesis six predicted that the participants in the hypnosis treatment group would show significant improvements in quality of life as measured by lower scores on the BPI at two, four, and six weeks post-treatment, which was confirmed for all follow-up periods. Improvements in quality of life were exceptional when looking at degree of change for the group
as well as for each individual in the group. For example, when comparing the pre-treatment BPI score for the hypnosis group ($M = 30$) to the post-treatment BPI score obtained at the two-week ($M = 3.33$), four-week ($M = .50$), and six-week ($M = 2.50$) follow-up periods, representing 89%, 98%, and 91% improvements in quality of life respectively.

Finally, hypothesis seven predicted that the PPIS administered before and after the hypnosis intervention would show significantly lower pain scores after treatment than those collected before treatment each session. The hypothesis was supported, as all hypnosis group participants’ pain reduced from pre to post treatment each session. Furthermore, large effect sizes were found in pre to post hypnosis comparisons for sessions one through three and a medium effect size was found in week four. That is, PPIS differences from pre to post treatment each session were vast: The week one post-treatment mean of 5 compared to the pre-treatment mean of 40 indicated that pain reduced by 88% after the hypnosis treatment; the week two post-treatment mean of 0 compared to the pre-treatment mean of 22 indicated a 100% pain reduction after hypnosis treatment; the week three post-treatment mean of 0 compared to the pre-treatment mean of 10.83 indicated a 100% decrease in pain after hypnosis treatment; and the week four post-treatment mean of 1.67 compared to the pre-treatment mean of 5 indicated a 67% reduction in pain after the hypnosis treatment. These results indicate the participants in the hypnosis group were effectively able to use hypnosis to reduce pain.

Considering the significant impact the hypnosis treatment had on pain and related quality of life, it is important to reflect on past research that our findings may support. The Gate Control Theory developed by Melzack and Wall (1965) suggests that pain stimuli ascend up the spinal cord and into the dorsal horn (gate control system) where descending messages from the brain combine to influence the following suffering experience and response. Melzack and Wall (1965)
believed that descending outputs from specific brain processes such as mood, attention to the pain, and pain memories, as well as the situations at hand can moderate pain. Hilgard and Hilgard (1975) discovered that in hypnosis we can shift attentional processes, or dissociate, in order to become less consciously aware of pain stimuli. Thus, Arreed Barabasz from Barabasz and Watkins (2005) speculated that “removing pain with hypnosis is normally a process of gating the pain perception” (p. 227). As Barabasz and Watkins (2005) summarize Hilgard’s (1977) neo-dissociation theory, they note that hypnosis allows a person to partially release reality in order to experience and benefit from fantasy. In this study, participants allowed themselves to enter a relaxed, comfortable hypnotic state where they were given the tools to alleviate their own pain experience through dissociative imaginative processes they co-created. It is possible that this dissociative attention system first identified by Hilgard and Hilgard (1975) actually helped to change the pain experience at the gate or dorsal horn level defined by Melzack and Wall (1965).

**Strengths and Limitations**

This study addressed weaknesses of past literature on hypnosis for PLP. First, Bamford (2006), one of the two available experimental treatment studies on hypnosis as a treatment for PLP did not measure hypnotizability. Little can be said about the specificity of hypnosis to account for findings without determining the hypnotizability of participants. This study measured hypnotizability to assure that people in the hypnosis group were hypnotizable.

Next, Bamford (2006), one of the two available experimental treatment studies to date, did not use a control group to compare treatment outcomes. Rickard (2004), employed a waiting list control group. The group did not receive any form of treatment; the participants assigned to the control group completed a screening appointment and were told to track their pain while they waited for the hypnosis treatment to begin. This study is the first comparing hypnosis treatment
to an actual active control group. Moreover, this study utilized relaxation training as an active control group, an intervention that has been quoted by some to reduce PLP (Sherman, Gall, & Gormly, 1979) and to improve targetable aspects of quality of life (Karbandi, et al., 2015; Manzoni, et al., 2009; Sherman, et al., 1979). This study’s procedures incorporated equal intervention time for the hypnosis and active control group. Both groups were provided materials to be used for practice. Thus, everything was kept as equivalent as possible for the treatment and control groups.

Another strength of this study is that it used a quality of life measure. For example, while Bamford (2006) mentions that some patients reported decreases in post-amputation pain clinic visits, or improvements in sleep, no quantifiable information was reported. As noted previously, Patterson (2010) has stated the importance of addressing all adjustable factors when treating chronic pain. Well recognized researchers like Jensen and colleagues (2005) for example used a revised version of the BPI to measure quality of life in a study looking at the efficacy of hypnosis for treating chronic pain related to disability. This study is the first to use a measure like the BPI to assess pre to post-treatment quality of life differences from hypnosis within a group of people who experienced amputation and have PLP. This study shows hypnosis is effective in treating modifiable factors of both pain and quality of life for people from our target population.

Additionally, this study provides a replicable treatment that can be used by researchers and clinicians in the future. As noted in the procedures section, the treatment protocol permitted the researcher to collaborate with participants in a way that personalized pain experiences could be included while also maintaining the manualized structure and repeatability of the tool. See Appendix H for the hypnotic induction employed.
Lastly, Lynn, Kirsch, and Koby (2000) recommend that hypnosis studies more clearly define a population as one of a few ways to help the approach gain more recognition as an evidence based intervention. To this point, there is no evidence that people with chronic illness related versus non-chronic illness related amputations are of the same population. Frequently, people with chronic illness likely have other health related complications that could impact chronic pain treatment. For example, Rickard (2004) specifically states that scheduling was difficult with her sample of people who primarily experienced chronic illness caused amputations due to other factors related to the illness. Furthermore, there may be an age difference between groups that could impact rehabilitation and chronic pain treatment considerations; Ziegler-Graham and colleagues (2008) report that 66% of people with traumatic limb amputation are under the age of 45 while 64% of people with dysvascular disease related amputation are 65 or older. Considering the sample characteristics of this study, it is believed that the results more easily generalize to both military and civilian populations who sustain traumatic injury related amputations than would the less defined populations of past hypnosis treatment studies for PLP.

Limitations of this study are the impact of the inclusion and exclusion criteria on recruitment. While a strength of the study is the specifically defined target population, that aspect proved to limit the number of eligible participants this researcher could locate. Amputation caused by traumatic injury is a small subset of the overall causes of amputation. Specifically, traumatic injury related amputations only make up 16% of the nation’s amputations (Ziegler-Graham, et al., 2008). Additionally, each member needed to experience PLP to be included in the study. This additional mediator of enrollment is problematic because not every person with an amputation experiences PLP; approximately 50-80% of people with an amputation experience
some degree of PLP (Buchanan & Mandel, 1986; Richardson, et al., 2006). Thus, between limited numbers of people with non-chronic illness related causes, people not experiencing PLP, and needing to experience PLP for 6 months or more, the population from which this researcher could draw from became limited and difficult to access.

Furthermore, exclusion criteria limited the number of participants that could be retained. For example, one person’s traumatic injury impaired storage and retrieval of new information (i.e., short-term memory) after the accident that caused their amputation and, therefore, could not be obtained for the study. Another example can be seen in the participant that was excluded from the study due to substance use disorder symptom endorsement. And, lastly, due to this researcher wanting to balance group assignment by hypnotizability, one participant was excluded due to not meeting the initially established minimum level of hypnotizability required for enrollment. Recruitment challenges eventually led this researcher to forego previously determined assignment procedures to obtain sufficient participant enrollment.

Next, level of hypnotizability was not able to be balanced between groups, as was initially intended. It could be argued that level of hypnotizability differences between groups could have influenced treatment outcomes.

Of course, larger sample size in a future replication is needed to help confirm the findings. Larger sample size would likely allow for parametric analyses to be utilized and could have reduced type two error possibly impacting many of the between group comparisons.

**Future Directions**

Since this is the first study to include only people with non-chronic illness related amputations, it is recommended that the ipsative hypnotic protocol outlined in this study be used to replicate these research findings with a larger sample of the same target population. One way
that future researchers could address problems with recruitment and enrollment when working with people who experienced traumatic injury related amputation is to recruit from military rehabilitation centers. Considering that the Walter Reed Army Medical Center in Washington D. C. has treated at least 900 veterans for PLP since the beginning of the Iraq and Afghanistan wars (Weeks, Anderson-Barnes, & Tsao, 2010), it seems possible to replicate these findings with the same population and gain a larger sample size. This researcher was not connected to any military organizations and despite his initial plans to have this research contribute to military populations, he was unable to gain access to recruitment from local military organizations.

It will also be important for studies comparing the efficacy of hypnosis versus another active-treatment-control group to balance group assignment based on level of hypnotizability more than this study was able to do. Although Santarcangelo, Paoletti, Balocchi, Carli, Morizzo, Palombo & Varanini (2012) found that people with high and low hypnotizability in their investigation reported similar subjective levels of relaxation when exposed to relaxation exercise, researchers will be unable to determine whether quality of life or pain improvements between groups are solely due to treatment differences until hypnotizability is better balanced.

It will also be important to include a measure of quality of life to evaluate whether the intervention effectively addresses additional targetable impairments related to this chronic pain presentation. This study found the Brief Pain Inventory Short-Form (BPI) to be invaluable in assessing quality of life interference due to pain and disability. It assesses a range of quality of life experiences that can be impacted by post-amputation and disability pain presentations, such as the following: enjoyment of life, mood, relations with other people, walking, general activity, work, and sleep. It is highly validated and reliable, as was reported in the methodology section of
This study also found that linear means of pain assessment like the Daily Pain Rating Scale (DPRS) produce different pain outcome scores than more thorough qualitative pain measures like the McGill Pain Questionnaire (MPQ). It is recommended that future research include both, as they appeared to nicely complement each other with the MPQ providing depth and the DPRS providing sufficient brief linear pain reports on a daily basis from pre-treatment screening through the sixth week of data collection for this pain experience that can be highly variable in its’ frequency, duration, and intensity.
References


http://www.publichealth.va.gov/vethealthinitiative/traumatic_amputation.asp


Veterans Health Initiative (2002). Traumatic amputation and prosthetics: Independent
Study Guide. Employee Education System, ONLINE PUBLICATION ACCESSED
FROM: http://www.publichealth.va.gov/vethealthinitiative/traumatic_amputation.asp

Quinlan-Colwell, A., D. (2014). Dealing with the specter of phantom limb pain. Nursing, 44(11),
63-66.

Cleeland, C. S. (1999). Validation of the German version of the Brief Pain Inventory.

encoded in human anterior cingulate but not somatosensory cortex. Science, 277, 968–
971.

Ramachandran & Rogers-Ramachandran, (1996). Synaesthesia in phantom limbs induced with
morrors. Biological Sciences, 263(1369), 377-386.

International Journal of Rehabilitation Research, 12, 175-186.

phenomena including phantom limb pain 6 months after major lower limb amputation in


APPENDICES
Appendix A

Phantom Pain Experience Questionnaire

Name: __________________________

1) How long ago in months and years did your phantom limb pain begin?

2) How would you best describe what the pain feels like? Use your imagination to best describe an example of the pain (e.g., fire ants biting, fire burning, vice gripping, etc.). List all types experienced using your own imagery and/or the examples provided above. Please rank type of pain by which most severe (1) to least severe (2,3,4,5, etc.).

3) How has your pain decreased your functioning/happiness in regards to relationships, employment, activity/exercise, mood/anxiety, involvement in enjoyable activities, or any other way that you can think of? Please list all and rank importance to you.

4) How frequently do you experience pain (number of times per day, week, month)?

5) How long does the pain last on average each time? What is the longest it has lasted?

6) Describe the pain severity you experience on a 1-10 scale (with 1 representing pain that is barely noticeable and with 10 being the most excruciating pain imaginable).

7) Has the type of pain, frequency, duration, or severity changed overtime? If yes, how so?

8) Please list all pain medications, the dose (mg), and number taken per day/week.

9) List of prior interventions/treatments you participated in to reduce/control your phantom limb pain. What were the outcomes?
Appendix B

Demographic Information Form

Age: __________________________________________

Race: __________________________________________

Ability status:

List developmental disabilities: __________________________________________

List acquired disabilities: __________________________________________

Religious importance: _______________  Name of Religion: _______________

Primary source of income in the past year: __________________________________

Have you served in the military?  Yes  or  No

If yes, what branch? __________________________________________

If yes, Have you been on active duty?  Yes  or  No

Please describe how you incurred your physical injury that led to amputation:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Appendix C

Recruitment Flyer

Suffering from Phantom Limb Pain?

- Free experimental treatment study through Washington State University.

- Treatment goals:
  - Reduce pain located in the missing portion of participants’ amputated limb (Phantom Limb Pain).
  - Improve quality of life for people who have had an amputation due to injury.

- Eligibility:
  - Amputation must have been caused by some form of injury.
  - Must experience Phantom Limb Pain.
  - Must be available to meet 1 time per week for 4 consecutive weeks.

- Please call Dan Neighbors, M.A. at ***-***-**** or email at **********@***.*** to receive more information about the study.
Appendix D

Recruitment Letter

Hi, I am Dan Neighbors. I have a master’s degree in community counseling from Washington State University and I am currently a pre-doctoral candidate in the counseling psychology program there. I am personally interested in improving the treatment options available to people suffering from post-amputation pain, specifically in the form of phantom limb pain. I am here today to speak with you about the opportunity to participate in a free treatment program I am investigating for my dissertation. The study will involve the use of hypnosis interventions for treating PLP and related suffering components impacting quality of life.

[Give definition of hypnosis here]. [Give background about hypnosis and its’ applications, as well as its specific acute and chronic pain background]

The treatment would last 4 weeks, with 1 hour meetings in addition to a 1.5 hour screening appointment.

The treatment goals, in line with recommended practice for treating chronic pain, are to reduce pain and decrease suffering to improve functioning and quality of life. Also, I want to provide each participant with tools they can leave therapy with to help each person remain resilient for years beyond treatment.

I want to thank you for your time today and I especially want to thank you for allowing me to present this important information to you. I will leave you my contact information so that any of your or other people you know can contact me about participating. I hope you give me the opportunity to be with you on this journey to a more enjoyable life.
Appendix E

Contact Script

Dear Medical Staff Officer,

My name is Dan Neighbors and I am currently working on my dissertation from Washington State University for my counseling psychology PhD. My dissertation focuses on using hypnosis therapy to reduce phantom limb pain and increase life satisfaction for patients who have had an amputee due to a traumatic accident.

I am currently looking for patients to meet with for four consecutive weeks. I was hoping I could write an email to your providers that you could forward onto them. Or, if you could insert it into your monthly newsletter that would be greatly appreciated. Additionally, I have flyers I would like to distribute to your clinic and to any specific support groups that include people with an amputation due to traumatic injury. The letter would make them aware of this study, so that if they find this applicable, they could mention this study to their patient as an opportunity to decrease pain. This would in turn help them increase their patient outcomes by giving another tool for their patient to manage pain. I can provide you with a copy of both the letter and flyer for your review. Thank you for your time!
Appendix F

Some protocol materials are reprinted from:

Barabasz and Watkins, 2005, reprinted with phone and email permission from Arreed Barabasz.

Patterson, Clinical Hypnosis for Pain Control, American Psychological Association, Washington, DC, 2010, reprinted with permission under the fair use policy #3 as informed by kthomas@apa.org due to extracts being under 800 total words. Dr. David Patterson, via email, provided permission to re-use materials for dissertation defense presentation as well.

Ipsative Hypnotic Protocol

Introduction

Raise your hand slightly above your head with your arm straight and at an upward angle so that you can still see your fingers. “Stare at one of the fingers, either the index finger or the middle finger. You may continue to look at it, or, if you wish, close your eyes and visualize it in your mind’s eye. As you fixate your gaze on it you will [begin] to notice that the other fingers tend to fade out of focus and that your entire arm begins to feel heavier and heavier” (Barabasz & Watkins, 2005, p. 132). Notice the look of your finger, the wrinkles and hair on the finger, the room’s light bouncing off of your finger nail. As you begin to focus more and more, more and more on my voice and the finger, “you will notice the other fingers fade out so that your eye (if open)/mind’s eye (if closed) only focuses on the finger you are so intently looking at” (Barabasz & Watkins, 2005, p. 132). You will notice that your arm begins to feel heavier and heavier, heavier and heavier. The longer you concentrate on that finger, the heavier your arm becomes. Keep concentrating on that finger while the arm gets heavier and heavier, heavier and heavier. [keep repeating above instructions until the arm begins to lower], [once the arm begins to lower] Notice that as the arm is getting heavier it is slowly coming down, down, down. Your arm is feeling heavier and needs no assistance to lower, just let the arm lower without trying to keep it from happening. You are feeling more and more relaxed as your arm moves down, down, down. You may find that you can hear my voice more and more clearly, and everything else fades into the back of your mind. You are feeling more and more relaxed, more and more comfortable as your arm goes down, down, down. But you will not relax into a deep and profound state of relaxation until the arm is all the way down and touching. Going down, down, down, deeper, deeper, deeper, deeper. [The hypnotic instructions are paced with the actual movement of the arm]. [when the arm reaches the bottom] You are now feeling completely and utterly relaxed. Your mind is a powerful tool that can be a great friend to you. And as you are relaxed and comfortable, hearing my voice clearly, you will use your mind to follow my suggestions that you find helpful. Having your mind produce vivid images that are profoundly useful to you. Relaxed, comfortable, and attentive.
Introducing the pain

“And, one thing I would like you to notice now is that you can actually notice, in a comfortable way, strangely enough, what it is like to have the [(type of pain) (e.g., stabbing pain) _________]” (Patterson, 2010, p. 220). Please visualize the (pain imagery) (e.g., butcher knife) _________ that (causing type of pain) is/are (e.g., piercing) _________ the (location of the pain) (e.g., right thigh) _________; you see (visually describing the pain imagery in great detail) the (e.g., black, dull handle with the 8” long shiny silver blade with the point at the end) _________.

You can feel the (type of pain sensation) (e.g., stabbing) ___________________ sensation (cause) (sharp knife) ______________ cause. Can you feel the (the pain imagery hurting) (e.g., knife stabbing) ______________?

Relieving the pain

Now please visualize a (imaged materials that treat the imagined cause of pain) (e.g., large, wooden cutting board that is approximately 1-2” thick) ________________ that you can use to (how you use them to relieve pain) (e.g., block the knife from stabbing) __________________ the (location) (e.g., thigh). Let me know once you can see the (imagined materials for treatment) ____________. Good, please (access the materials and touch them) place your fingers onto the ______________________________. Can you describe the feel, the weight, the color of the (treatment materials)? Please use the (material for treatment) __________ to (how they will use the materials) (e.g., block the knife). As you continue to (how they will use the materials) (e.g., hold the cutting board to the thigh) ______________________________, you will notice the (pain sensation) (e.g., stabbing) ___________ slowly fade away. The more you (action of treatment) __________, you feel more and more comfortable and pain free, but you will not experience complete relief until you have completely (e.g., blocked the knife) ______________ from your (location of pain). You will nod your head when you are pain free and feeling entirely relaxed. [after nod] You can see the (location of pain) free of the (type of pain sensation).

Lasting Relief

“You may be pleased to notice that your comfort lasts far beyond today’s session. In fact, it may be for a matter of minutes, hours, [days,] weeks, or even years” (Patterson, 2010, p. 168).

Preventing pain from returning

“Your mind is a powerful tool and you are recognizing your ability to control your experience through your mind. I don’t know how you will do it, but your mind may find a way to prevent the [(pain sensation) __________] from returning in the future” (Patterson, 2010, p. ). You may find yourself using the (imagined materials used to prevent return of pain imagery)
to keep the (pain location) _______ free from the (pain imagery) ________________ in the future.

**Triggers to re-induce relaxation and comfort**

“Your mind may serve you now by noticing in the future, that when you notice signs of [(type of pain/no imagery) _______________________] pain, that that will become a signal from your mind. Recognizing the signal as a helpful tool from your mind that you will soon become completely, comfortably, deeply relaxed, more relaxed than you are now. You’ll still be able to function, to move around, to talk to people, to do what you are doing. But you will have an immediate rush of well-being and comfort as you begin to notice the early signs of [(type of pain/no imagery) ______________________ in the (location of pain) _______]” (Patterson, 2010, p. 220. For some reason if the (imagery used to prevent return) ________________________ wear off, just (imagery for treatment and prevention) ________________________ again for quick, long lasting relief. “You will likely find though that you have become so relaxed at the first sign of the [(type of pain/no imagery) _________________________] that the full pain experience may never appear at all. Finding the pain disappear from the [(location of pain) _______] far faster than you would have imagined.” (Patterson, 2010, p. 220).

**Post-hypnotic pain amnesia**

“Perhaps you will not even remember whether or not you had ever been in any type of discomfort” (Patterson, 2010, p. 221).

**Increasing coping mechanisms through age progression and immediate hypnotic induction**

“And now some images start coming to mind, and those are pleasant images in the future when you don’t have any pain at all. Just noticing what you are doing, who you are with, what it looks like to be absolutely, profoundly comfortable” (Patterson, 2010, p. 221) “Your mind is a very powerful ally, and it can do many things to make you more comfortable. It may be that in the future closing your eyes and [viewing through your mind’s eye the vision of your hand becoming heavier and heavier until it touches down] will allow you to reach a more profound state of relaxation” (Patterson, 2010, p. 221).

**Distorting their experience of how long they are in pain**

“It may be that periods of discomfort seem to go into fast motion, and what might have seemed like 10 minutes, or a half an hour, or two hours, all of the sudden seem like 6 minutes, or 3 minutes, or maybe even one and a half minutes. And perhaps you will be suddenly looking back and being surprised by all of the comfort that you have been remembering” (Patterson, 2010, p. 221).

**Ego and efficacy strengthening**
Noticing yourself feeling more alert, more energetic, and physically stronger each day, noticing that you are full of endurance and resilience. You will begin to notice yourself becoming “deeply interested in whatever [they] are doing, that the mind has become calmer, and that [they] think more clearly” (Barabasz & Watkins, 2005, p. 238). Your strong mind and strong body will feel full of energy and vitality, you will be “more relaxed, and imbued with greater confidence... Each day feeling more and more optimistic” (Barabasz & Watkins, 2005, p. 238). Stronger, more and more relaxed, more and more confident, and more and more optimistic. “Every day and in every way you are getting better and better” (Barabasz & Watkins, 2005, p. 238). More and more able to adjust to changes in your life. Living with intention as you lead a meaningful life.

**Ego and efficacy strengthening: Improving specific aspects of their life they wished to improve**

You will find yourself motivated to (behavior change goals covering domains of quality of life and daily functioning) _____________. As you contemplate improving your life by (behavior change goals) ______ you feel confident in your ability and your pursuit of your goals makes you feel happy and accomplished. You recognize the importance of (behavior change goals) ____________ and you feel free to move in that valued direction, no pressure and nothing to stop you. Each day moving closer and closer. You may find yourself making plans for improving your resources to be successful, like (planning that could facilitate their change). You will begin to recognize the strength and control you have within you to live life the way that you want. Using the strength of your mind to plan for and navigate your way around the walls that have been standing in your way. You may become more and more dedicated to breaking down those barriers like a wrecking ball removing old, unneeded buildings in a city that you are dedicated to rebuilding more beautifully than anyone could have ever imagined. [If negative self-talk and catastrophizing are an issue]: You will find that the negative comments from yourself and others that had stopped you in the past, will no longer be true at some point in the future and that your mind’s planning will give you all of the power you need to break through the walls to a better, more satisfying life. You will (area of functioning to improve) (e.g., sleep more soundly, be more social, mow the yard again, etc.).

Your mind is a very powerful resource and it will continue to serve you. And, as you sit here, know that you will remember everything important to you and that you will forget anything that was not particularly useful.

**Coming out of hypnosis** (section adapted from Weitzenhoffer & Hilgard, 1962)

Now I want you to listen to what I say next. I will soon count backward from 20 to 1. You will progressively become come out of this hypnotic state, although you will continue to be hypnotized for most of the counting. You will open your eyes when I reach the number 5. When I get to 1 you will be entirely awake and in your normal level of alertness. I will begin counting
now and you will open your eyes at 5 but will not be fully awake until I say 1. At 1 you will be alert. 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, almost there 6, 5, 4, 3, 2, 1. Wide awake. How do you feel?
Appendix G

McGill Pain Questionnaire
(Use Agreement #3498)
Approved on 4/4/15 by Mapi Research Trust, Lyon, France for use in this study and with permissions to include a protected version with the indication “sample copy, do not use without permission”.

MPQ © Ronald Melzack, 1975. All Rights Reserved
Appendix H

(Concept and table adapted from Rickard, 2004)

**Daily Pain Rating Scale (DPRS) – Numerical Rating Scale**

Instructions: Please complete this form every evening, filling in the average pain intensity experienced throughout the day in the appropriate box. You will rate the average pain intensity from 0-100 with 0 equaling no pain at all and 100 equaling the worst pain imaginable. Please also complete the two additional boxes each day.

Name: _________________________________    Date: ________________

**DPRS**

Week # ____

<table>
<thead>
<tr>
<th></th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Pain Intensity (0-100)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pain Location</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pain changes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix I

Present Pain Intensity Scale (PPIS) – Numeric Rating Scale

Name: ____________________________ Date: ________________

PPIS

Instructions: Please circle only one number that best represents the *current* intensity of your phantom limb pain. The number 0 represents no pain at all and the number 100 refers to the worst pain imaginable; higher numbers represent more pain.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Pain</td>
<td></td>
<td>Mild Pain</td>
<td>30</td>
<td>40</td>
<td>Moderate Pain</td>
<td>60</td>
<td>70</td>
<td>Severe Pain</td>
<td>80</td>
<td>90</td>
<td>Worst Pain Imagineable</td>
</tr>
</tbody>
</table>
Appendix J

Brief Pain Inventory Short-Form

Approved for use on Wednesday, 4/22/15 by symptomresearch@manderson.org after submission of order form for use in this research only.
7. What treatments or medications are you receiving for your pain?

8. In the last 24 hours, how much relief have pain treatments or medications provided? Please circle the one percentage that most shows how much relief you have received.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>No Relief</td>
</tr>
<tr>
<td>10%</td>
<td>Complete Relief</td>
</tr>
<tr>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

9. Circle the one number that describes how, during the past 24 hours, pain has interfered with your:

### A. General Activity
- 0: Does not Interfere
- 10: Completely Interferes

### B. Mood
- 0: Does not Interfere
- 10: Completely Interferes

### C. Walking Ability
- 0: Does not Interfere
- 10: Completely Interferes

### D. Normal Work (includes both work outside the home and housework)
- 0: Does not Interfere
- 10: Completely Interferes

### E. Relations with other people
- 0: Does not Interfere
- 10: Completely Interferes

### F. Sleep
- 0: Does not Interfere
- 10: Completely Interferes

### G. Enjoyment of life
- 0: Does not Interfere
- 10: Completely Interferes
Appendix K

Informed Consent Document

WASHINGTON STATE UNIVERSITY
Educational / Counseling Psychology

Research Study Consent Form
(WSU IRB# 14705-001)
(WSU IRB# 14705-005)
(WSU IRB# 14705-007)

Study Title: The Efficacy of Hypnosis: Reducing Phantom Limb Pain and Improving Quality of Life for People with Limb Amputation Due to Traumatic Injury

Researchers:

Principle Investigator: Marianne Barabasz, EdD, Licensed Psychologist, Director of Clinical Training, Educational and Psychological Leadership department. Phone number: 509-335-****.

Co-Investigator: Dan Neighbors, M.A., Counseling Assistant at Washington State University; Counseling and Psychological Services. Phone number: ***-***-****.

You are being asked to take part in a research study carried out by Marianne Barabasz, EdD, and Dan Neighbors, M.A. This form explains the research study and your part in it if you decide to join the study. Please read the form carefully, taking as much time as you need. Ask the researcher to explain anything you don’t understand. You can decide not to join the study. If you join the study, you can change your mind later or quit at any time. There will be no penalty or loss of services or benefits if you decide to not take part in the study or quit later. This study has been approved for human subject participation by the Washington State University Institutional Review Board.

What is this study about?

This study aims to identify an evidence based intervention for people with limb amputation due to a traumatic injury. This study will provide two forms of psychological interventions to compare their efficacy for reducing phantom limb pain (i.e., pain experienced in the missing portion of an amputated limb), improving life satisfaction, and daily functioning for people with amputation due to traumatic injury.

You are being asked to take part because to date no research has specifically focused on reducing phantom limb pain and improving quality of life for a sample group completely made up of people with amputations caused by traumatic injury. Your voluntary participation can help to determine whether the
interventions used in the current research could be effective for other people with traumatic limb amputations who also experience phantom limb pain.

Taking part in the study will require participants to attend a 90 minute screening session, four consecutive weeks of treatment, and to complete follow-up questions on relief of your pain, and degree of life satisfaction and daily functioning at three follow up points; two weeks, four weeks, and three months after treatment completion. The first treatment session will last 90 minutes and sessions 2-4 will last approximately 50-60 minutes. In total, participation may involve about 6 hours of your time, plus completion of follow-up questions that can be provided to the examiner via phone.

You cannot take part in this study if any of the following apply to you: 1) answer yes to six or more questions you are asked about substance use; 2) previously received a diagnosis of a psychotic disorder or currently experience delusions (e.g., strongly believing that you are being watched when others verify that the belief is unrealistic) ;3) after being given a scale that measures how hypnotizable you are (Elkins Hypnotizability Scale) your score is not above the average level of ability to be hypnotized; or 4) you are not able to speak and understand the English language.

What will I be asked to do if I am in this study?

If you take part in the study, you will be asked to take part in the following:

1) A screening session which will involve:
   a. A conversation about the minimum requirements necessary to take part in the research
   b. Completion of a test of hypnotizability and a substance use screening questionnaire
   c. Completion of pre-treatment (baseline) questionnaires which will be later used to compare scores prior to treatment to scores after treatment completion.

2) Next, you will be assigned to one of two groups of treatment: the relaxation treatment group or the hypnosis treatment group. The two treatments are non-invasive and both are intended to reduce your pain and improve quality of life. You should know that the treatment groups are considered to be experimental, as your participation will be used to compare the efficacy of the treatments. Both groups will be asked to complete four weeks of treatment (first session: 90 minutes; sessions 2-4: 50-60 minutes). Both groups will be asked to also practice therapeutic materials provided (i.e., two times per day between sessions starting after session 2).
   a. Hypnosis group: You will be provided with the opportunity to enter into a hypnotic state and to receive hypnotic suggestions for changing your pain experience and improving your confidence, daily functioning, and life satisfaction. You will receive a hypnotic intervention as described above one time each session, you will also be provided with an opportunity to update the examiner about any challenges or improvements at the beginning and end of therapy sessions. You will be asked about your pain throughout the past week by reviewing a rating scale that is to be completed each evening. Additionally, questionnaires about pain experience will be completed before and after hypnosis during each session.
b. Targeted relaxation group: You will be provided with the opportunity to enter into a state of relaxation and to practice relaxation techniques each session. You will be asked to practice two different relaxation techniques throughout treatment. Also, you will be provided with the opportunity to provide updates and ask questions about your treatment at the beginning and end of sessions. Additionally, you will be asked about your pain throughout the past week by reviewing a rating scale that is to be completed each evening.

3) You will be asked to complete questionnaires after treatment has ended. Follow up questionnaires will be sent to you to complete at two weeks, four weeks, and three months after treatment has ended. You will be asked to complete the questionnaires and to provide questionnaire results to the examiner over a phone conversation. Questionnaires provided before and after treatment are focused on pain description and severity, average daily pain ratings, and daily functioning and life satisfaction.

Are there any benefits to me if I am in this study?

The potential benefits to you for taking part in this study are: relief of pain intensity, reduced number of painful sensations, reduced time pain lasts, increased control of maintaining and regaining comfort, improved confidence and decreased feelings of being helpless in your chronic pain, increased involvement in meaningful activities, increased life satisfaction, and new therapeutic tools that you can use in the future.

If you take part in this study, you may help other people with limb amputation due to traumatic injury to receive similar benefits from the psychological interventions being explored by the current study.

Are there any risks to me if I am in this study?

The potential risks from taking part in this study are: discomfort as you describe your pain experience.

Risks related to your confidentiality, your information storage, and your psychological and physical welfare are being minimized by the nature of the research design as well as the design of treatment sessions and plans for confidential material storage. The researchers will not provide your name or results attached to your name to anyone. Storage of questionnaire materials will be dealt with by changing your name to a unidentifiable code. The master code list and the questionnaires will then be stored in two separate locations, within locked file cabinets in locked offices. Built into the treatment design is minimal risk. Also, participant screening is intended to protect you and other potential participants be excluding individuals who are likely to not benefit or to experience adverse effects by their participation. Lastly, your welfare is and will continue to be protected throughout treatment by building into the beginning and end of sessions checkins to assess your satisfaction with treatment, changes that occur throughout treatment, and questions/issues that arise throughout treatment. Also,
as previously noted, you can end your volunteer participation in the current study at any time without consequence. Those ineligible to take part in the current study, those requesting alternative referrals, and those who want to end treatment to pursue alternative treatment will be provided with some provider referral options for within their community.

Will my information be kept private?

The data for this study will be kept confidential to the extent allowed by federal and state law.

No published results will identify you, and your name will not be associated with the findings.

Under certain circumstances, information that identifies you may be released for internal and external reviews of this project. All questionnaires will be coded and the master list will be maintained in a separate location. Additionally, the researchers will not share identifiable information with other participants or in reports related to publication. Exceptions to confidentiality include: if a child or elderly person is at risk of abuse or neglect, or you or another person are in imminent danger (you are planning to commit suicide or homicide); the researchers in these cases are required to report such issues immediately for the protection of you and other people. Dr. Marianne Barabasz and Dan Neighbors will have access to the research, as will the Institutional Review Board (IRB).

Additionally, the results of this study may be published or presented at professional meetings, but the identities of all research participants will remain confidential.

The data for this study will be kept for 7 years in accordance with the American Psychological Associations guidelines, but as noted above your name will not be associated with any specific data.

Are there any costs or payments for being in this study?

There are no costs to you for taking part in this study. You will not receive money or any other form of compensation for taking part in this study.

Who can I talk to if I have questions?

If you have questions about this study or the information in this form, please contact the researchers, Dan Neighbors and/or Marianne Barabasz. You can report questions directly to Dan Neighbors during counseling sessions or you can contact him by calling ***-***-****, emailing him at ********@***.***, or mailing him at 225 NW Thomas St., Pullman, WA 99163. Marianne Barabasz can be contacted by calling her at 509-335-****, emailing her at ********@***.***, or mailing her at Cleveland bldg., Rm # 363; PO box 642136.
If you have questions about your rights as a research participant, or would like to report a concern or complaint about this study, please contact the Washington State University Institutional Review Board at (509) 335-3668, or e-mail irb@wsu.edu, or regular mail at: Albrook 205, PO Box 643005, Pullman, WA 99164-3005.

What are my rights as a research study volunteer?

Your participation in this research study is completely voluntary. You may choose not to be a part of this study. There will be no penalty to you if you choose not to take part. You may choose not to answer specific questions or to stop participating at any time.

What does my signature on this consent form mean?

Your signature on this form means that:

- You understand the information given to you in this form
- You have been able to ask the researcher questions and state any concerns
- The researcher has responded to your questions and concerns
- You believe you understand the research study and the potential benefits and risks that are involved.

Statement of Consent

I give my voluntary consent to take part in this study. I will be given a copy of this consent document for my records.

__________________________________  ____________________ Signature of
Participant                          Date

__________________________________ Printed
Name of Participant

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect.
I certify that when this person signs this form, to the best of my knowledge, he or she understands the purpose, procedures, potential benefits, and potential risks of participation.

I also certify that he or she:

- Speaks the language used to explain this research
- Reads well enough to understand this form or, if not, this person is able to hear and understand when the form is read to him or her
- Does not have any problems that could make it hard to understand what it means to take part in this research.

____________________________________  ___________________________ Signature of Person Obtaining Consent  Date

____________________________________  ___________________________ Printed Name of Person Obtaining Consent  Role in the Research Study