

INTRODUCTION to the DISSERTATION on PAIN and ICES-PEMF by Dr. Stacey Ravid

Stacey Ravid Ph.D. RN, MSN, CNS, has an extraordinary nursing career spanning over twenty-four years. Research interests include comprehensive solutions for the opioid epidemic: Holistic modalities for pain relief. Dr. Ravid recently completed her PhD in Nursing. Her objective is to find solutions for the opioid epidemic and the related crisis of untreatable chronic pain. Dr. Ravid is the recipient of the Esther Saylor Rothenberger Award (2018) and the prestigious Presidential Fellowship Award recipient for 2016-2017. In 2011, she graduated with a Master's in nursing, Clinical Nurse Specialist in Acute Care as a student of High Distinction. Additional honors are as follows; High School Valedictorian, President of the Student Council, Dean's List, Northside Hospital Excellence Service Award. Dr. Ravid has spent many years studying pain relief solutions. The following document is her final Dissertation, based on a survey study of pain sufferers who used PEMF for pain relief.

Dissertations can be cumbersome academic documents with a lot of unnecessary content for the casual reader. This introductory summary and Quick Access page will allow you to quickly find topics of interest. You can also search this document for specific words of interest by pressing [CTRL]-f and typing in the word or phrase you want. The content of the following dissertation remains unchanged from the original, approved dissertation.

[DISSERTATION title page and front matter](#): Doctoral Committee signatures, Acknowledgements, [Abstract](#), Dedication, [Table of Contents \(original\)](#)

[INTRODUCTION](#): Discusses the background and significance of pain, the Caring Science approach, Purpose and Research Question for the dissertation, and theoretical perspective, chapter summary

[RELEVANT LITERATURE](#): Opioid Epidemic, Pathophysiology of Pain, Pain Management, Cost of Pain to the individual and society, History and Use of PEMF for pain, Gap in Knowledge, chapter summary

[RESEARCH METHODOLOGY](#): Research Design, Sampling, Recruitment, Setting, Data Generation and Analysis, etc., chapter summary. This is basically just a description of how the survey was carried out.

[FINDINGS](#): Based on answers to survey questions, the types of pain were varied, and 22 reported chronic pain, 6 reported acute, duration of pain ranged from 2 months to 44 years. Many reported [reduced use of medication](#), only one reported that the device did not reduce their pain ([CRPS](#))

[DISCUSSION](#): Various aspects of the FINDINGS, impact on nursing education, practice, and policy.

[SOME OF THE MOST INTERESTING MATERIAL IS IN THE APPENDICES. Follow the links to it directly](#)

[APPENDIX](#): including [IRB Approval letter](#), [SURVEY QUESTIONS](#), [PARTICIAN STATEMENTS](#),

[Demographics](#) There were 12 women and 16 men included in this study. Ages ranged from 33 to 65.

[Participant Themes and Descriptive Statements](#) Each individual participant was permitted to take as much or as little time as they wished, to discuss their experience with pain and non-drug pain relief using PEMF. Many of these statements and themes are of an intensely personal nature.

[Participant's Noteworthy Quotes](#): Many participants offered information that was very interesting or useful. Several of the most noteworthy quotes are presented here.

DESCRIPTIVE EXPLORATORY STUDY OF INDIVIDUALS' USE OF PULSED
ELECTROMAGNETIC FIELDS, THE MICRO-PULSE, FOR PAIN RELIEF by

Stacey Ravid

A Dissertation Submitted to the Faculty of
The Christine E. Lynn College of Nursing
In Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy

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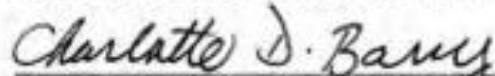
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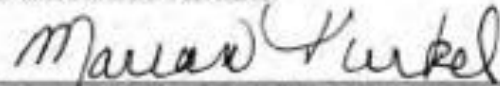
Stacey Ravid

This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Charlotte Barry, the Christine E. Lynn College of Nursing, and has been approved by all members of the supervisory committee. It was submitted to the faculty of the Christine E. Lynn College of Nursing and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

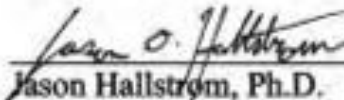
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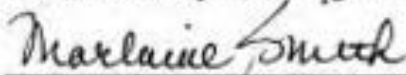
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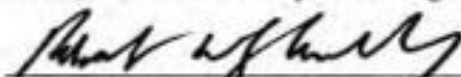


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ABSTRACT

Author: Stacey Ravid
Title: Descriptive Exploratory Study of Individuals' Use of Pulsed Electromagnetic Fields, The Micro-Pulse, For Pain Relief
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Pain has caused innumerable suffering to countless individuals and has impacted their lives in profound ways. There are many detrimental effects of pain including decreased ability to work, depression, isolation, increased pharmaceutical use, and addiction. Pain, on a worldwide scale, remains ineffectively treated and alternative solutions for managing pain are needed. Pain is conventionally treated with pharmaceuticals, primarily narcotics. Continuation of medications for these painful conditions often causes dependence and addiction. The pain and narcotics cycle contributes to the opioid epidemic. The cost in human lives is immense.

Pulsed Electromagnetic Field (PEMF) is a holistic modality used for various ailments. This exploratory descriptive research study focused on the experience of individuals using the Micro-Pulse, PEMF, for pain relief. The mind/body connection was a foundation of the holistic theoretical framework for this study. The theoretical grounding for this study was Watson's (2018) theory of human caring, which is based on a

foundation of holistic healing incorporating mind, emotional body, physical body, and spirit for treatment of pain. Understanding an individual's experience of pain relief will potentially raise awareness and promote the exploration of holistic therapeutic approaches for patients in pain.

DEDICATION

This manuscript is dedicated to all individuals who have suffered and continue to suffer in pain. Know that there are health care professionals who are dedicated to helping you as you seek to find pain relief and reclaim your life. May you find healing, respite, and peace.

DESCRIPTIVE EXPLORATORY STUDY OF INDIVIDUALS' USE OF
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CHAPTER 1. INTRODUCTION

Pain has caused innumerable suffering to countless individuals and has impacted their lives in profound ways. According to the American Academy of Pain Medicine Pain (AAPM, 2018), pain has more sufferers, over 100 million individuals per year, than other major diseases combined, including diabetes, heart disease, and cancer. The incidences of painful conditions are increasing, especially with an aging population and the rise in obesity. There are many detrimental effects of pain including decreased ability to work, depression, isolation, increased pharmaceutical use, and addiction. Worldwide, pain remains ineffectually treated and innovative solutions for managing pain are needed. Pain is conventionally treated with pharmaceuticals, primarily narcotics; continuation of these medications often leads to dependence and addiction. The cost in human lives cannot be estimated as this pain and narcotics cycle has contributed to the opioid epidemic.

The mind/body connection was a foundation of the holistic theoretical framework for this study. The theoretical grounding for this study was Watson's (2018) theory of human caring, which is based on a foundation of holistic healing incorporating mind, emotional body, physical body, and spirit for treatment of pain. Understanding an individual's experience of pain relief will potentially raise awareness and promote the exploration of holistic therapeutic approaches for patients in pain. PEMF is a holistic modality used for various ailments. This exploratory descriptive research study focused on the experience of individuals using PEMF, the Micro-Pulse, for pain relief.

Phenomenon of Interest

Pain and pain relief were the phenomena of interest and focus for this research. Pain is one of the most serious health care burdens and is one of the most challenging symptoms of modern medicine. “Pain is a disease is usually characterized by specific signs and symptoms, and it is a response to environmental factors, ineffective agents, defects of the organism, or a combination of these factors” (Raffaeli & Arnaudo, 2017, p. 2004). Pain is a concept and a symptom and types include chronic, subacute, and acute. Three primary facets of a disease are, “the presences of the impairment of normal functions, the presence of a specific symptomatology, and a distinct etiopathogenesis” (Raffaeli & Arnaudo, 2017, p. 2004). Pain is characterized as intermittent, intractable, lancinating, referred, burning, and dull pain. Anatomical terms include headache, back pain, neck pain, and all other types of bodily pain. In psychiatric/psychogenic terms, the description psychosomatic is frequently used.

Neuropathic and nociceptive pain are the mechanistic terms for various types of chronic pain. Chronic pain is one of the primary causes of disability worldwide can last for months, years, or even a lifetime. Chronic pain is categorized as pain that “lasts longer than the usual course of an acute injury or disease and continues for months or years” (AAPM, 2018). The mental, emotional, social, occupational, and economic consequences of pain are substantial.

Background and Significance

The opioid epidemic is a nationwide calamity, resulting in the death of many Americans. “Socioeconomic factors, including education, employment, and income are potential contributors to the growing opioid crisis in the United States” (Meit, Heffernan,

Tanenbaum, & Hoffmann, 2017, p. 1). “One causative factor is that the traditional treatment for pain is principally narcotics. In the United States, from 1999 to 2014, more than 165,000 persons died from overdoses correlated to opioid pain medication” (CDC, 2016). “Every year, an additional 1 in 10 people develops chronic pain” (Jackson et al., 2015, p. S10). “What starts as a valid reason to take these medications often leads to addiction, overdose, and death” (Meit et al., 2017, p. 18). The nurse researcher is located in the Appalachian Mountains of North Carolina where “69 % of the overdose deaths in Appalachia, or 3,859 deaths, were caused by opioids” (Meit et al., 2017, p. 18).

One of the most beneficial forms of electromagnetic therapy is PEMF (Markov, 2011). Over the past 70 years, PEMF exposure has been shown to reduce pain and inflammation in many conditions (Hubbard & Dennis, 2012). These electromagnetic modalities are often used in physiotherapy exercises to heal soft tissue injuries and alleviate pain. The recognition of the value of this modality to treat pain continues to increase in the medical community. This research study focused on PEMF, specifically the Micro-Pulse, for the treatment of pain.

Magnetic fields target pain in multiple ways. “One main hypothesis for application of EMF’s for the treatment of disorders is that in any disease; the electrical or magnetic features of the involved cells, tissues, organs, or systems are disrupted and applying exogenous EMF’s can balance them to a healthy state” (Yadollahpour & Rashidi, 2017, p. S76).

Link to Caring Science

The support of nurses is often a significant factor in pain management. Understanding patient’s perspective is one of the primary roles for nurses and sets

nursing knowledge and nursing practice apart from other disciplines. Caring about patients in pain, medicating them, and reassessing pain levels are some of the main responsibilities of nurses.

Integrative health treatments are fast approaching a broader acceptance as less harmful solutions for pain reduction are needed. Nurses need to have a basic understanding of these options. Several complementary and alternative therapies (CAM) modalities used for pain treatment include acupuncture, aromatherapy, energy medicine, herbal remedies, Reiki, meditation, light therapy, prolotherapy, osteopathic, and mind-body exercises, among others. “Treatments that combine conventional therapies with alternative therapies may positively improve outcomes” (Schulenburg, 2015, p. 319). Considering strategies for effective pain management and providing information about CAM are a part of the responsibilities of nurses.

Purpose Statement

The purpose of this study was to explore the experiences of individuals using the Micro-Pulse, for pain relief.

Research Question

The following research question guided this study: Tell me about your experience of using the Micro-Pulse for relief of your pain?

Theoretical Perspective

A comprehensive approach to healthcare and the theoretical grounding underlying this dissertation is holistic healing and Watson’s (2018) theory of human caring. Holistic therapies that supplement traditional treatments are termed complementary and are often used

instead of conventional/allopathic therapies. Approaching the problem from several vantage points will increase the likelihood of therapeutic outcomes.

Nursing, a holistic caring art, is a unique way of viewing patient care, illness, and treatment. The origination of modern nursing began in 1860 with Florence Nightingale's holistic approach to patient care, which was revolutionary for the time. Throughout the years, nursing research has evolved to include other holistic nursing pioneers, including Dr. Jean Watson.

Watson's (2018) theory of human caring provided the theoretical framework to examine the experiences of pain and pain relief. The nursing profession connects patients, families, physicians, and all healthcare personnel for the benefit of the patient (Sitzman & Watson, 2018). Watson stated: "The present work helps anchor caring science, as a unitary transformative worldview. This in turn contributes to a maturing of the discipline of nursing" (preface). The theory is aligned with nursing's transformative and holistic healing paradigm. During this time when opioid addiction is so widespread, it is vital for today's healthcare professionals to uphold the ideals of human caring and integrate concepts of the theory of human caring into patient care.

Watson's (2018) theory advances a holistic approach to patient care. The unification of nurse and patient in a human-to-human encounter creates a caring moment (Sitzman & Watson, 2018). The theory includes 10 Caritas Processes™© that reflect caring in nursing practices when applied to patient care (Watson, 2018). Caring consists of 10 Caritas Processes™©:

1. Practicing loving-kindness and equanimity within the context of caring consciousness.

2. Being authentically present and enabling and sustaining the deep belief system and subjective life world of self and one-being cared for.
 3. Cultivating one's own spiritual practices and transpersonal self, going beyond ego self.
 4. Developing and sustaining a helping-trusting authentic caring relationship.
 5. Being present to, and supportive of the expression of positive and negative feelings.
 6. Creatively using self and all ways of knowing as part of the caring process; engaging in artistry of caring-healing practices.
 7. Engaging in genuine teaching-learning experience that attends to wholeness and meaning, attempting to stay within other's frame of reference.
 8. Creating a healing environment at all levels, whereby wholeness, beauty, comfort , dignity, and peace are potentiated.
 9. Assisting with basic needs, with an intentional caring consciousness administering 'human care essentials' that potentiate alignment of mind-body-spirit, wholeness in all aspects of care.
 10. Opening and attending to mysterious dimensions of one's life-death; soul care for self and the one-being-cared for; 'allowing and being open to miracles.'
- (Costello, 2018, p. 642)

The Caritas Processes TM© are unique to Watson's (2018) theory, guiding nurses and others who use these processes to follow a holistic, spiritual, and ethical path in caring for others.

A holistic, caring approach guided this study; in particular, three of the Caritas processes TM©: the second, “Being authentically present and permitting, and sustaining the deep belief system and subjective life world of self and one-being cared for;” the sixth, “Creatively using self and all ways of knowing as part of the caring process; engaging in artistry of caring-healing practices;” and the eighth: “Creating a healing environment at all levels, whereby wholeness, beauty, comfort , dignity, and peace are potentiated” (Costello, 2018, p. 642). All are congruent with this work of caring science.

Researcher’s Perspective

This nurse researcher has a firsthand knowledge of caring for patients in pain. As an emergency department nurse for over 17 years, I have observed many patients in pain. I worked as an ICU nurse and cared for a multitude of patients experiencing all types of pain. Many of these patients suffered debilitating injuries, leaving them paralyzed and permanently dependent on pain medications. The cycle was disheartening as I continued to work as a geriatric care manager and observed older adults struggle with painful conditions. Those who utilized holistic modalities often experienced lasting pain relief. A few years ago, I transferred to hospice nursing. The following personal story substantiates this nurse researcher’s passion for of conducting studies to explore holistic solutions for pain relief.

In a hospice unit, the round-the-clock potent narcotics administered to a patient with cancer did not ease his pain. Dilaudid, the primary medicine given, and morphine, Benadryl, Zofran, Ativan, and Restoril did not seem to touch his pain. The failure of all these medications to eradicate his pain continued to confuse and disturb the hospice doctor and nurses. A patient-controlled analgesia PCA pump, which would surely relieve

his pain, was ordered. However, the hospice facility was transitioning to a new company and there were no pumps available for over a week. This patient continued to experience unresolved pain. Ironically, one of the purposes of hospice is to relieve end-of-life pain. The medical system that was entrusted to care for this man was unable to address his fundamental need of effective pain control. One morning, as I gently administered a bed bath to him, he became quiet and still, and then passed away after much suffering. This experience inspired me to learn more about pain relief modalities and help individuals relieve their pain.

Chapter Summary

This chapter emphasized the multifaceted issues surrounding the pain experience; treatment of pain; and the need for holistic, integrative modalities for pain relief. There is a significant gap in nursing research studies completed on the experience of individual's using the Micro-Pulse for pain relief. Integrative choices for pain management, including PEMF, could have a positive impact on pain relief protocols and the opioid epidemic. Less dependency on narcotics and the medical paradigm could enable patients to be more autonomous in their pain relief efforts. Research studies are required to augment the body of knowledge revealing that integrative modalities, such as the Micro-Pulse, are of value and could be a leading-edge modality for pain reduction. This research study addressed the gaps of prior research related to the Micro-Pulse for pain relief. Understanding patients challenges of pain and their experiences with the Micro-Pulse provided a framework to help other individuals who are suffering in pain. Watson's (2018) theory of human caring was the theoretical framework for this qualitative exploratory descriptive study.

CHAPTER 2. RELEVANT LITERATURE

Introduction

This chapter provides a synthesis of relevant literature and the experience of pain, management, medications, opioid crisis, and holistic therapies for pain relief. The purpose of this chapter was to analyze and synthesize current research and highlight the need for a study on patient experience of pain relief with the Micro-Pulse. Due to the gap of qualitative studies on the Micro-Pulse, the literature search was widened to include other PEMF devices. Criteria for the studies included in this chapter are peer reviewed, conducted in the United States or internationally from 2008 to 2018, and conducted treatment on human subjects. The words Micro-Pulse or pulsed electromagnetic field therapy (or PEMF) and pain had to be included in the title. The visual analog scale (VAS) or numeric pain rating scale (NPRS) had to be included in the pain assessments outcome measures. An analysis and synthesis was conducted of 35 studies with over 200 participants using PEMF for various types of pain. Databases reviewed were Nursing and Allied Health, CINAHL Plus, Cochrane, and Embase. Results of these studies conducted on PEMF for pain relief are organized according to head-to-toe pain conditions with the most current literature included. An overview of relevant literature about pain and opioids is provided, as well.

Critical Synthesis of Literature

Addiction and Opioid Epidemic

Drug addiction is defined as a chronic, relapsing disorder characterized by compulsive drug seeking, continued use despite detrimental outcomes, and permanent alterations in the brain (AAPM, 2018). Individuals have valid motives for taking pharmaceuticals for pain, yet often cannot stop after they have begun. Often, addiction begins with the use of narcotics for pain reduction. A report from the CDC (2017) recounted more than 70,237 drug overdose deaths in 2017. Approximately, 67.8% of those deaths involved opioids (CDC, 2017). Overdose deaths from opioids, including prescription opioids, have increased by more than five times since 1999 (CDC, 2018). The overuse of opioids has created suffering, ill health, and harm to individuals of all ages, races, religions, and classes.

Pathophysiology of Pain

“Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage” (Loeser & Treede, 2008, p. 473). Rothemeyer and Enslin (2016) explained: “This system comprises the areas in the brain that are involved with the sensory experience of our surroundings; this information is transmitted to the thalamus and the rest of the central nervous system via the spinal column and brainstem” (p. 859). The peripheral nerves act as afferent pathways for neural messages from the nociceptive receptors to the spinal cord and as efferent pathways that relay the messages to react to the stimulus (Ingram, 2015). According to Rothemeyer and Enslin (2016), “Pain is caused by chemical, mechanical, or temperature stimuli that initiate a cascade of neurotransmitter substances” (p. 859). They continue:

“Pain is divided into visceral (dull and poorly localized owing to enteric sensory receptors) and somatosensory (more discreet and localized, often owing to nociceptors being stimulated) pain” (Rothemeyer & Enslin, 2016, p. 859).

The gate theory control theory of pain revolutionized the understanding of pain mechanisms and management. “Pain Mechanisms: A New Theory” by Ronald Melzack and Patrick D. Wall was introduced in November 1965 (Katz & Rosenbloom, 2015). “This theory proposes that the spinal transmission cells activate an action system in the brain comprising regions that trigger the experience and behaviors of pain” (Katz & Rosenbloom, 2015, p. 285). “The gating mechanism is affected by the relative activity in large-and-small-diameter fibers, with the former inhibiting transmission [closing the gate] and the latter facilitating transmission [opening the gate]” (Melzack & Wall, 1965, p. 971). Since its inception, this theory has changed pain assessments, treatment, and ongoing management by making pain real through the understanding of its pathophysiological mechanism.

Pain Management

Thorough pain assessments are essential to optimal pain management and can positively influence outcomes. After the assessment, quality pain management depends on recommendations of healthcare providers for the appropriate medications and treatments. In 1986, the World Health Organization (WHO, n.d.) published the ‘pain ladder’ approach for the management of pain. According to this approach, the following steps are taken, even in severe or complex pain management algorithms. “The first step includes the use of paracetamol or a nonsteroidal anti-inflammatory drug (NSAID), then if this does not relieve the pain, then adjunctive drugs including anticonvulsants

(gabapentin or pregabalin medications) or a tricyclic antidepressant (amitriptyline) are added” (WHO, n.d.). Finally, further severe pain requires the addition of an opiate (e.g., morphine) (WHO, n.d.). Patients with pain who do not respond to this ladder approach should be referred to a pain specialist.

The use of opioids for pain has substantially increased. “The American Pain Society (APS) and the AAPM commissioned a systematic review of the evidence on chronic opioid therapy for chronic noncancer pain and convened a multidisciplinary expert panel to review the evidence and formulate recommendations” (APS, 2017). According to the press release issued, “The expert panel concluded that chronic opioid therapy can be an effective therapy for carefully selected and monitored patients with chronic noncancer pain” (APS, 2017). It went on to say, “However, opioids are also associated with potentially serious harm including opioid-related adverse effects and outcomes related to the abuse potential of opioids” (APS, 2017).

Globally, pain is a significant problem and pain management is multifaceted. The fundamental problem is that pain has primarily been regarded as a medical problem and has not been addressed by the field of public health. Despite the ubiquity of pain, whether acute, chronic, or intermittent, public health scholars and practitioners have not addressed this issue as a public health problem (APS, 2017; Goldberg & McGee, 2011; Vargas et al., 2018).

According to Vargas et al. (2018),

Pain is usually considered a symptom secondary to another disease, which leads health professionals to be highly focused on the treatment of the primary etiology. However, in many cases, the unwanted consequences of pain, such as decreased

quality of life and disability, depend exclusively on the pain domain and, hence, require management that relies largely on pain-specific measures. (p. e656).

They continue:

In addition, treating and managing the etiology of certain conditions does not necessarily result in a solution to the problem ... For example, although hip replacement is the best treatment for severe hip osteoarthritis (OA) and most patients recover mobility, some individuals continue to have chronic pain. (p. e656)

Cost of Pain

Pain is a major cause of work absenteeism and unemployment. “Pain is expensive and is the primary reason that Americans receive disability insurance, with societal costs estimated between \$560 billion and \$630 billion per year” (Reuben et al., 2015, p. 296). Individuals in pain have more disabilities than those with less severe pain and use more healthcare services (APS, 2017). The current economic climate and the restricted healthcare budgets have resulted in brief hospitalizations and a focus on maintaining costs (Ibrahim, Khan, Nizam, & Haddad, 2013). Patients are often sent home from the hospitals in pain and many need to pay out-of-pocket for pain medications and home healthcare services.

Work absenteeism has a huge impact on the costs of pain. Bevan (2015) stated, “Musculoskeletal disorders (MSDs) cause considerable economic cost to the healthcare system; notably, the reimbursement of treatments and compensation for lost income” (p. 357). Followed by “MSDs pose difficulties for companies as well, including loss of productivity, accumulated sick leave, and employee absenteeism” (p. 357).

Pharmaceuticals for pain relief are an inflated cost for these individuals and insurance companies. Many of these costs are due to the loss of productivity, absenteeism, and early retirement (Breivik, Eisenberg, & O'Brien, 2013). A comprehensive approach to pain management would include healing the causes of pain, as well as relief of pain (Breivik et al., 2013).

In the United States, chronic pain costs are higher than those for heart disease, diabetes, or cancer (APS, 2017). The overall economic impact of pain on developing countries, where the delivery of health services is more limited, remains uncertain (Breivik et al., 2013). Pain is a problem encompassing multiple problems and elevated costs, integrative modalities, including PEMF, should be considered as a first line treatment for pain.

Pulsed Electromagnetic Fields (PEMF)

The use of pulsed electromagnetism is part of the National Center for Complementary and Integrative Health (NCCIH, 2018) category of energy medicine. The PEMF device is considered an integrative modality within the category of integrative medicine (IM). Energy medicine roots are based in discoveries within chemistry, biology, endocrinology, immunology, psychology, and physics (NCCIH, 2018). Patients in pain have turned to integrative medicine for answers. Over the last several decades, an extensive number of clinical studies were completed testing PEMF for pain relief.

More recently, clinical studies focusing on pain and edema using various PEMF devices have produced positive results including decreased pain and pharmaceutical use. Some of these painful conditions include dental, postoperative, knee, osteoarthritis, neck

and back injuries, soft-tissue injuries, wound pain, and a variety of musculoskeletal injuries.

The randomized control design (RCT) has been the most utilized study design for research on PEMF for pain. The studies reviewed used a PEMF device that came in direct contact with the painful areas and used low dosage frequency PEMF devices with varying dosages ranging from 1-100 Hz. Frequencies are calculated using hundred quintillion Hz (a very large number). PEMF treatment is pulsed and brief, with many treatments lasting 10-20 minutes or longer. There were wide-ranging treatment protocols as treatment sessions varied within each study. Treatment groups consisted of evenly numbered patients as the placebo groups. Most treatment groups showed improvements in all assessment measures and decreased pharmaceutical use in relation to baseline values.

Pain Relief with the Micro-Pulse

Several magnetotherapeutic and electromagnetic PEMF medical devices have emerged for treating a broad spectrum of trauma, tumors, and infections with static, time-varying, or pulsed fields (Markov, 2011). Research is revealing that the human nervous system is powerfully affected by these therapeutic PEMFs (Pawluk, Dennis, & Tommerdahl, 2017). Two of these frequencies, the Schumann and Geomagnetic frequencies, have been hypothesized as being necessary for the human body's circadian rhythms, energy production, and pain relief (Markov, 2011). There are many claims that NASA and the Russian space program equip their space crafts with devices that reproduce these frequencies (Dennis, 2014).

The Micro-Pulse incorporates these two frequencies and several others. These putative vital frequencies have been used for bone repair, autoimmune diseases, viral diseases, and pain relief. However, pilot (unpublished) experiments have shown that other frequencies can be just as effective, and in no published case were putative vital frequencies tested against other non-vital frequencies.

The Micro-Pulse was initially developed under contract for NASA, then further developed with funding from the Defense Advanced Research Projects Agency (DARPA), and continues to be developed and refined with four recently issued patents (Dennis, 2014). The principle component that sets the Micro-Pulse apart from other PEMF devices is inductively coupled electrical stimulation (ICES) (Pawluk et al., 2017). Electrical signals penetrate the tissues deeply and are then transformed back into electrical fields by means of Faraday induction (Pawluk et al., 2017). Invented in 2012 by Dr. Robert Dennis from the University of North Carolina Chapel Hill, the Micro-Pulse is the product of two decades of intensive research and development. The main difference between the Micro-Pulse and other PEMF devices is that the Micro-Pulse, using Faraday conduction, can penetrate more deeply and uniformly into tissues, thus, allowing the use of much less power to achieve far superior results (Dennis, 2014).

A research study conducted by Hubbard and Dennis (2012) studied the effect of PEMF on a rat model, commonly used in the pharmaceutical industry to identify and assess potential anti-inflammatory agents. The rat model involved the widely used carrageenan-challenge model for acute inflammation. Dennis and Hubbard were able to show a rapid reduction of inflammatory response of greater than 60 % reduction when the Micro-Pulse was applied (Dennis, 2014). Performed by an independent testing

laboratory, these results confirmed the very important anti-inflammatory effects of Micro-Pulse ICES PEMF (Dennis, 2014). By decreasing inflammation, which has a direct impact on pain, this impacts pain processes in the body (Dennis, 2014).

Another research study using the Micro-Pulse, conducted by Dennis and Tommerdahl and funded by the Department of Defense (DOD), was for patients with a traumatic brain injury TBI (time of traumatic insult) ranging from several months to several years post-traumatic event (Pawluk et al., 2017). Eight military personnel who had suffered mild, moderate, and severe TBI were recruited into the study; all suffered from chronic symptoms of TBI (Pawluk et al., 2017). Results, measured with a device that measures brain wave patterns, the Brain Gauge, revealed that patients showed improvements in brain health and cognitive functioning over the course of the study (Pawluk et al., 2017). Substantial improvements were a decrease in pain and inflammation, increased central nervous system function, and overall brain health (Pawluk et al., 2017).

Further studies, both quantitative and qualitative, are needed to reveal the effectiveness of the Micro-Pulse for pain relief. Although studies have been conducted revealing the therapeutic effects of the Micro-Pulse for various diseases, there are no qualitative studies conducted on the patients experience of the Micro-Pulse for pain relief.

Pain Relief with PEMF

Several electrotherapeutic, magnetotherapeutic, and electromagnetic medical devices have been developed and are beneficial for treating a multitude of disorders including reduction of various types of pain.

PEMF works on pain in multiple ways; it stimulates adenosine triphosphate (ATP), mitochondrial enzyme synthesis, and anti-inflammatory processes, and increases the rate of turnover of dopamine and serotonin (Cvetkovic & Cosic, 2009; Habash, 2008; Sieron et al., 2004). The exposure of neural and vascular cells to PEMFs that resonate at 10 Hz can induce intracellular calcium oscillations and change the signaling cascades (Pilla et al., 2011; Yu-Hong, Yong, Tong-Jun, Ya-Fei, & Chang-Qing, 2009). Electromagnetic fields also enhance vascular tonicity and velocity (Habash, 2008; McKay, Prato, & Thomas, 2007). All of these have a direct effect on the pain pathways. Some human studies support neurochemical effects of weak electromagnetic fields that may act on neurotransmitters such as melatonin, cortisol, serotonergic, and dopaminergic systems implicated in the pathophysiology of migraine (Hatef et al., 2016; Lewczuk, Redlarski, & Ak Zi, 2014; Sieron et al., 2004; Silberstein et al., 2008). By decreasing inflammation, which has a direct impact on pain, these processes impact painful processes in the body.

History of PEMF

Bioelectromagnetics therapy has a long history and dates to 2000 BCE in China and 300 BCE in Western civilization (Markov, 2007). In the late 18th century, Galvani discovered that one of the primary methods of information transfer within nerve and muscle tissues occurs via electrical pathways (Hubbard & Dennis, 2012). After World War II, scientists in Japan began generating various electromagnetic wave shapes by altering electrical currents (Markov, 2011). In 1960, this modality spread to Romania and then to the former Soviet Union. By 1985, almost every European country designed and produced its own magnetic therapy systems (Markov, 2011). Todorov published the first

book on modern electromagnetic field therapy summarizing clinical observations using magnetic fields to treat 33 different pathologies on 2,700 patients (Markov, 2007). In 1979, the Food & Drug Administration (FDA) allowed electromagnetic fields to be used in the United States for treating non-union and delayed union fractures (Markov, 2007). Finally, 10 years later, the FDA allowed the use of PEMF for the treatment of pain and edema.

Technology of PEMF

PEMF is a delivery system for electrotherapy, creating both an electric field and a magnetic field. Alterations in membrane calcium ion flux are the basis for understanding the mechanism of PEMF for treating pain (Mumtaz, Ahmad, Waheed, & Shah, 2014). The reorientation of these molecules during PEMF exposure causes the deformation of embedded ion channels, thus altering their activation kinetics and resulting in “an increase in the threshold of pain sensitivity and activation of the anticoagulation system” (Mumtaz et al., 2014, p. 340). Mumtaz et al. (2014) continued: “Also, PEMF stimulates production of opioid peptides, activates mast cells, and increases electrical capacity of muscle fibers” (p. 340). “Evidence shows that EMF signals can be configured to increase the rate of CaM activation, which, in turn, can modulate the biochemical cascades of living cells and tissues, employing a response to external offences” (Pilla, 2006, p. 5). “An additional theory is that audible sonic waves interact with proteins, moving them to the lymphatic system, as in the bioresonance phenomenon” (Froes Meyer et al., 2007, p.2). Magnetic fields have the same result as acupuncture, leading to nerve regeneration (Miladinovic, Vavra-Hadziahmetovic, Kadic, & Vrabac, 2015; Mumtaz et al., 2014). The Micro-Pulse is an example of a PEMF device that uses Faraday induction (inductive

coupling) between paired Helmholtz coils to communicate with cells and tissues (Dennis, 2014).

PEMF Studies for Pain Relief - Head to Toe

The following two categories are examples of the studies that were reviewed for the literature review and then organized in a head to toe format. The selection of studies included in this literature review followed the guidelines as outlined in the introduction of Chapter 2.

Migraines. Several studies show the effects of PEMF on decreasing headache pain. According to Olesen (2009), “Disturbance of the para-sympathetic input to the cerebrovascular system (especially pial arteries) initiates migraines without an aura” (p. 680). This study showed that PEMF is effective in targeting this pathway and relieve migraine pain. According to Hatef et al. (2016), “PEMF has shown promising results in the treatment and prophylactic treatment of migraines” (p. 24). In this RCT, researchers investigated the effect of PEMF on refractory migraines for 39 patients diagnosed with migraines or medication overuse headaches for a year or more (Hatef et al., 2016). There was significant improvement for the active group compared to the placebo group (Hatef et al., 2016). Results showed that headache intensity and amount of medication used were reduced only in the control group using PEMF (Hatef et al., 2016).

Orthodontic. One of the most recent studies (Brignardello-Petersen, 2018) was a systematic review of RCTs: “Six studies were eligible on the qualitative analysis and five into the quantitative analysis included a total of 210 participants (90 men and 120 women) with an overall mean age of 43.3 years old” (p. e75). Various PEMF devices and treatment protocols and application ranged from five days to three weeks with PEMF of

four times a day to twice a week (Brignardello-Petersen, 2018). The VAS was used, and effect sizes indicated a clear tendency to reduction of the pain intensity for the PEMF groups (Brignardello-Petersen, 2018). Pulsed electromagnetic fields seems to decrease pain levels in females from 24 through 72 hours after initial archwire placement.

Numerous patients experience severe pain during initial orthodontic movement after fixed appliances placement, which negatively influences their oral health-related quality of life (Jung, Park, & Kim, 2017). According to Jung et al. (2017), “PEMF was effective for pain caused by placement of initial orthodontic wire in female orthodontic patients” (p. 582). They concluded, “PEMF was effective in reducing orthodontic pain caused by initial archwire placement” (Jung et al., 2017, p. 583).

Qualitative and quantitative studies were read and analyzed and included in this literature review and were organized into a literature matrix (Appendix A).

Gap in Knowledge Base

Two gaps in the literature have been identified: There are no qualitative exploratory descriptive studies for patients who have used the Micro-Pulse for pain relief and there are no qualitative exploratory descriptive studies for patients who have used PEMF for pain relief. This literature review substantiates the need for further investigation into patient experience of treatment with PEMF. Although the study on the Micro-Pulse showed a reduction of pain and narcotic use, and many studies show PEMF reduces pain and narcotic use, a gap exists in qualitative studies focused on patient experience of using these modalities for pain relief.

There are vast differences between the protocols, devices used, frequencies, and application and duration of treatments among the research studies conducted on PEMF.

With so many variations, comparing results and formulating evidence-based conclusions is challenging. Even in the studies analyzed, differences in outcomes were impacted by the type of PEMF device, dosages, treatment protocols, and participant compliance. In addition, “the difference in the subjective experience of pain may cause great variations in reported VAS and NPRS pain scores. In one study, patients reported VAS scores of 9 to 10 during the first postoperative day and yet other patients reported VAS scores of only 1” (Sværdborg, Momsen, & Damsgaard, 2016, p. NP200). Further studies using PEMF with more methodologically rigorous and consistent protocols are needed. Future studies should focus on the formulation of a standard protocol for this type of therapeutic modality.

There are several rationales for the lack of qualitative research studies for the Micro-Pulse and PEMF. Integrative Medicine (IM) is a relatively new model of care in the United States, approximately 50 years old. In this country, the use of all types of PEMF devices has been limited. Obstacles that compound the use of PEMF include the lack of understanding as to efficacy of PEMF treatments for pain, the nonlinear approach to PEMF treatment, and lack of research related to PEMF. PEMF has only been approved by the FDA in the last 20 years. The large variety of commercially obtainable PEMF devices makes it problematic to compare their physical and engineering characteristics, presenting a problem while trying to analyze the clinical effects obtained when so many different devices are used.

One of the reasons there is a lack of research studies related to the patient’s experience of pain relief with integrative modalities, especially PEMF, is the political interest of the pharmaceutical companies. Many researchers, funded by pharmaceutical

companies are reticent to invest research dollars in modalities that are not well funded. Many patients select traditional treatment options including pharmaceuticals, anesthetics, surgery, rehabilitative or physical therapy, and psychological therapies. The shift in philosophy from treatment of disease to the promotion of wellness is still controversial.

Even though Medicare has recognized PEMF as an effective therapeutic device, the number of practitioners using PEMF is noticeably low. Financial limitations include lack of Medicaid, Medicare, or other insurance reimbursement for CAM modalities.

Patients with a diagnosis of pain are not in a homogeneous population as the etiology of the pain syndromes has multiple origins. This population often experience failure of treatment at the primary care level and move on to treatment in a secondary pain center. More often than not, these patients want to continue taking pharmaceuticals.

There is a need for interdisciplinary approaches to pain relief and further research for sustainable solutions. Research challenges include the gap between knowledge and the application of this knowledge into effective pain treatment regimens. Another gap in studies is due to lack of public policies for problems of pain. Although this is changing due to the opioid epidemic, addressing pain as a global public health issue will impact the need for global policies.

The results from this literature review are inadequate in revealing the individuals experiences of pain relief. In general, most of these studies use limited subjective measures and tools to reveal outcome pain levels. Subjective perception of pain using VAS and pain drawings is 95% sensitive and 88% specific for current pain (Pawluk, 2003). Pain affects many areas of a patient's life that are not assessed with a VAS or a NPRS pain scale. Although these tests are valid, reliable, and appropriate for clinical use,

variations in use and different anchor descriptors are present, suggesting that comparisons between assessments may be undependable. There is the need for qualitative studies about an individual's pain experience. Pain relief is only one component to overarching approval of pain management. Quality of life is equivalent to the patient's experience of pain and this can only be expressed by the person experiencing the pain.

The lack of qualitative research studies with PEMF for pain relief coincides with the lack of nurse led research studies. This deficit of research studies conducted by nurses is a concept that was highlighted at the 2004 European IASP (2017), which sponsored Global Day Against Pain. The immediate need for nursing researchers to focus on pain was emphasized. This Global Day Against Pain summarized the detrimental physical, psychological, social consequences, and economic costs of untreated pain (IASP, 2017). Three areas of unrelieved pain, acute pain, chronic non-cancer pain, and cancer pain, were emphasized (IASP, 2017). The lack of patient-centered qualitative studies focusing on the patients' experience of dealing with pain is a gap in knowledge.

Future research should focus on PEMF devices for pain relief. Further studies conducted by doctorally prepared nurses and published in nursing journals are needed for care of patients in pain, while infusing a caring nursing perspective into a complicated and urgent healthcare issue. Qualitative and quantitative studies were read and analyzed and included in this literature review.

Link to Caring Science

A vital nursing role is nurse researchers who impact caring science by focusing on pain research. Nurses need to take more initiative in scientific research to help find solutions for patients experiencing pain. A deeper understanding of the patient experience

of pain can impact research and the allopathic medical paradigm. Person-centered care is essential when caring for patients with long-term pain issues. As the opioid epidemic intensifies, the need for solutions increases, including collaboration between allopathic doctors and naturopathic doctors as members of patients' healthcare team. Nurses are a part of this team and need to be a voice for patients.

A significant nursing role is fostering patient autonomy. Less dependency on the medical paradigm and pharmaceuticals could enable patients to be more autonomous in their pain relief efforts. One of the major advantages of the Micro-Pulse is the relinquishment of reliance on physicians and narcotics. The Micro-Pulse can be used outside of institutional settings, allowing patients to be treated in other locations. There are no known side effects with Micro-Pulse therapy as compared to pharmaceuticals. Safe and reliable therapeutic devices able to be used outside of institutional settings is congruent with holistic care. This is applicable in this era in which patients are increasingly discharged from hospitals earlier than ever before and are frequently treated in their homes. As revealed in some of the studies, this approach to pain treatment is well accepted by patients.

Understanding how the patient feels and their perception of the treatment experience are a fundamental part of pain research. Integration of both allopathic and alternative medicine, with a focus on the person as a holistic being, is necessary for transforming the way pain is understood, assessed, treated, and prevented. According to Turkel, Watson, and Giovannoni (2018), "Unitary caring science is consistent with the most evolved paradigm for nursing—the unitary transformative paradigm allowing integration of embedded philosophical and ethical unitary worldviews that connects all

while being open to the evolving consciousness of humanity” (p. 68). Nurses have a special role in supporting patient autonomy and facilitating healthcare transitions and holistic healthcare, while advancing caring science through the knowledge of holistic healing modalities.

Chapter Summary

In summary, this research focused on patients’ experience of treatment for pain with the Micro-Pulse. Clinical research has shown that PEMF can be used safely to reduce acute and chronic pain and decrease the need for pain medications. However, its acceptance in the medical community has been limited and it is one of the reasons there is a lack of quantitative and qualitative data related to the benefits of PEMF.

Interventions focusing solely on pharmacological approaches have often produced only short-term effects. “The Global Burden of Disease (GBD) study stated that musculoskeletal disorders were responsible for more than 120 million years lived with disability (YLDs) and account for more than 21% of the worldwide disability” (Vargas et al., 2018, p.e656). This necessitates the need for alternative solutions. Numerous physicians refer chronic pain sufferers to non-drug-based therapies and complementary and alternative medicine with a goal of reducing drug dependency and invasive procedures (Pawluk, 2003).

The findings from this dissertation study are a foundation for understanding the patient experience of treatment with the Micro-Pulse. The results from this study will add to current procedures and policies related to care and treatment of patients in pain. Eventually, this study could contribute to a practical method, supporting noninvasive, side effect free, non-addictive, affordable, pain relief options. To compensate for the

catastrophic opioid epidemic, alternative modalities must be considered for patients in pain. Frequently a traditional allopathic approach to pain relief issues does not solve the problem. A more holistic approach to pain relief is needed by all healthcare professionals. According to Becker (1990),

The new scientific revolution has shown that the whole of the body is more than the sum of its parts, that the ability of living things to heal themselves is far greater than the mechanists thought, and that electricity and magnetism are at the very basis of life. (p. 25)

Understanding and treating pain represents one of the most difficult challenges in the history of medicine. This research study addressed the gaps and weaknesses of prior research related to the patients' experience of pain treatment.

CHAPTER 3. RESEARCH METHODOLOGY

Introduction

This chapter provided a description of the research methodology, sampling, technique, research setting and data generation, analysis plan, ethical considerations, trustworthiness, rigor, and timeline for this study exploring the experiences of individuals seeking pain relief. In an effort to understand the perceptions and experiences of participants, the methodology of a qualitative descriptive exploratory design was implemented. The focus of this qualitative research study was to understand individuals' experience of pain relief with the Micro-Pulse.

A qualitative descriptive exploratory method was well suited for this study. This type of method is a practical mixture of sampling, data collection, and data analysis techniques. Exploratory research is defined as initial research where a researcher has observed something and seeks to comprehend more (Creswell & Clark, 2018). Facts only have meanings contextually contingent upon the researcher's account of the phenomenon (Sandelowski, 2000). The resource for this study to guide the methodology was a descriptive approach to qualitative research.

Research Design

In this qualitative descriptive exploratory design, the focus was on the participants' view of the world. Descriptive research describes characteristics of a group in a given situation (Creswell & Clark, 2018). The qualitative paradigm suggests that there are numerous realities and that we are researching constructs (Creswell & Clark,

2018). Qualitative research entails searching for participants, connecting with them, talking to them, and observing what they do as well as how they perceive and interpret their experiences (Tappen, 2014). The research questions are an important component to the design and impact the inquiry. The questions for this study revolved around the individuals comprehensive experience of using the Micro-Pulse and how it impacted their pain experience. According to Sandelowski (2000), to foster the researcher's insights on the "who, what, and where of events ... this is the method of choice when straight descriptions of phenomena are desired" (p. 339).

Sampling, Recruitment, Setting

Sampling

A maximum variation sampling of up to 40 volunteer adults (or until saturation occurs) who have used the Micro-Pulse for pain relief or for other reasons, and have experienced pain relief as a secondary outcome, were recruited. The nurse researcher conducted the interviews until data saturation was reached. Lincoln and Guba (1985) have proposed that 12 research participants may be sufficient where no new information will be elicited and 20 interviews "will surely reach well beyond the point of redundancy" (p. 235).

Recruitment

Following approval by the university's IRB (Appendix B) and a letter of cooperation from Micro-Pulse LLC (Appendix C), potential participants who had purchased the Micro-Pulse (Appendix D) were initially contacted by the inventor via email (Appendix E) and given the researcher's contact information with a description of the study. Interested participants contacted the researcher via phone or email. These

participants were informed of the topic, research question, and purpose of the study prior to an interview. If they were interested in participating, informed consents (Appendix F) were obtained and any questions they had were answered. Consents outlined the participants willingness to be tape recorded and have researcher written field notes completed during the interview. The demographic data (gender, age and other relevant criteria) were collected with a separate survey prior to interview pain surveys. The researcher iterated that participation was voluntary. All interviews were recorded via phone. Participants were required to provide their names, contact information, diagnosis, details about their pain experience, and demographic data via an emailed form. Inclusion criteria were adults, aged 18 to 65 years of age, who have used the Micro-Pulse. Any non-English speaking individuals were excluded.

The recruitment process was initiated by the inventor and engineer of the Micro-Pulse, from the University of Chapel Hill, North Carolina. To assure the pool of potential participants were not hand-picked, an email via MailChimp was sent to each of the 4,972 persons who had bought the Micro-Pulse. A total of 84 responded and 42 participants completed an approved IRB survey and consent form in REDCap. Of these, 12 participants were not within the approved age range for this study, leaving 30 participants eligible for inclusion. Two participants completed the consent and demographics information but were unable to keep the interview appointment. This resulted in 28 participants who were interviewed and included in this research.

During phone interviews, participants were asked nine questions (Appendix G) about their experience of using the Micro-Pulse. Interviews were recorded on a tape-recorder using cassette tapes. Transcripts were read several times fully line by line, first

impression notes were recorded in the researcher's journal, and occurring statements by participants were highlighted. All transcriptions were completed by the researcher. Data were inserted in a grid with the participant's narrative matching each question (Appendix H). The researcher kept a daily detailed journal of the interview process including all the steps and correspondences.

Setting

The participants were located in many states and countries. Interviews, conducted over the phone, were recorded.

Data Generation

In one-on-one interviews with participants, the researcher asked the following questions:

1. Tell me about the pain you are experiencing including; cause for pain, location, type, frequency, and duration of pain?
2. What do you do to manage/relieve your pain? How well have those treatments worked for you?
3. Why and when did you begin using the Micro-Pulse? How is it used...where do you apply, for how long at each time, how frequently is it used? How many times each week?
4. How did you learn about the Micro-Pulse?
5. Does your physician (or other primary care provider) know about your use of the Micro-Pulse? If they know, are they supportive of you using it?
6. Regarding the effectiveness of the Micro-Pulse: Does the Micro-Pulse reduce your pain?

- a. Is there a reduction in pain, generally how much does your pain decrease, for how long (use the NRS, 1-10)?
 - b. How does the use of the Micro-Pulse compare to other pain management techniques that you have used?
 - c. Have you continued to use other methods or medications along with the Micro-Pulse?
 - d. Will you continue to use the Micro-Pulse? Why or why not?
7. How much has it cost you to use the Micro-Pulse?
 8. How has living with pain affected your life, work, and relationships?
 9. Is there anything else you would like to tell me about your experience of using the Micro-Pulse for pain relief?

Data Analysis

The analysis followed a descriptive exploratory approach. This approach was data driven. Qualitative content analysis codes were systematically applied and generated from the data during course of the study. Qualitative content analysis is interactive as new data is integrated within the results. The goal was to discover patterns and commonalities within the data.

After the recorded interviews, the nurse researcher journaled impressions, ideas, and feelings about the interview. Descriptive exploratory is the least interpretive of the qualitative analysis approaches. The study results contain a detailed description of the coding process. Data collection stopped when saturation occurred.

The researcher listened to audiotapes of the participants, gaining an insight into their experience. Occurring themes were identified and documented. At successive

stages, data emerged. A qualitative computer program, MAXQDA, managed the data; organizing it into practical units, synthesizing it, searching for patterns, and determining what was significant. Data analysis is an inductive, iterative process that yields verbal descriptions derived from interviews and researcher field notes. Eventually, these emerging themes became the major finding of this study. A detailed, comprehensive description was created.

Evaluation Criteria

One of the benefits of rigor is it upholds standards of scientific inquiry. Experienced qualitative researchers comprised of the dissertation committee assisted in this study. An audit trail can be used to accomplish dependability and confirmability simultaneously (Lincoln & Guba, 1985; Padgett, 1998).

Credibility

Credibility (truth value), applicability (fittingness), consistency (auditability), and neutrality (freedom from bias) are factors used to evaluate qualitative studies. Truth value is associated with the credibility of a study. In a qualitative study, this exists in the discovery of human phenomenon or experiences as they are lived by the participants (Sandelowski, 2000). Representing the descriptions of the participants experiences in a trustworthy way in which they can identify the descriptions as their own contributes to the credibility of a study. Important segments of the transcribed data were contained within the dissertation results allowing readers to understand in a more comprehensive way.

Applicability

Applicability for this study was achieved by including a sampling of participants from various nationalities, sexes, ages, religions, educational backgrounds, and economic classes.

Consistency

The researcher kept a detailed journal of the process allowing other researchers to reasonably follow the progression, procedures, and interpretations of the research. Since semi structured, audiotaped interviews were conducted and transcribed verbatim using voice recognition software, consistency of the interviews was maintained.

Transferability

Transferability means, that other researchers can apply the findings of the study to their own research. Denzin and Lincoln (1994) highlighted four factors be considered in establishing the trustworthiness of findings from qualitative research: credibility, transferability, dependability, and confirmability. Any researcher could follow the trail and discover the same, or similar results as this nurse researcher.

Ethical Considerations Including Protection of Human Subjects

Approval for this study was obtained from Florida Atlantic University (FAU) IRB, and participant informed consent was obtained prior to any data collection. The participants were given written and verbal information about the purpose of the study, voluntary nature of study, confidentiality, and the protection of their identities. They were provided information on risks and benefits of this study and their right to withdraw at any time. Interviews were assigned an identifier for purposes of confidentiality for recordings and transcripts to protect the participants' identities. Taped and transcribed interviews are

kept under lock and key in the researcher's home office in North Carolina. No incentives were offered for participation in the study. If at any time a participant wanted to withdraw from the study, they were free to do so.

The computer used for data storage and analysis was safely used by the researcher. All recordings, devices, transcripts, and any materials related to the research were protected. Data will be kept for at least four years and then deleted. Data security measures related to data storage for the computer were completed.

Risks

Risks to the participants included the potential to elicit emotions and feelings that might be difficult while answering and reflecting on the research questions. After the interview process, participants may have felt vulnerable and exposed. Provisions to diminish these risks were the researcher did not interrupt and allowed them to share as much of their stories as they wanted to share.

Strengths

The strengths of this study reveal a deep understanding of the phenomenon. Beneficially therapeutic for the participants was the retelling of their stories and their painful experiences. Participants felt that they were contributing to nursing research and the body of knowledge related to holistic pain treatment modalities by revealing their experiences.

Limitations

Survey questions were subjective and participants answers could have been influenced by the desire to be included in this study. Participants recruited as volunteers may have differed from those who would not volunteer for this study. A major threat to

trustworthiness was respondents' biases; participants may say what they think the researcher wants to hear. Since participants used a device for the modality, the research report included details about how the devices were used to reduce bias and the effects on the collection and analyzation of the evidence.

Timeline

A detailed timeline chart is provided in Appendix I.

Chapter Summary

In conclusion, the qualitative exploratory descriptive study was the method for understanding the pain relief experience of these individuals. Qualitative descriptive studies comprise a valuable methodologic approach. Findings from this study generated new knowledge beneficial for pain relief measures. There is a research gap of qualitative descriptive studies on the Micro-Pulse and PEMF for pain relief.

Nurses facilitating pain relief and promoting comfort is an integrative, holistic approach to nursing care. This descriptive exploratory study of individuals' use of the Micro-Pulse for pain relief contributed to the body of nursing knowledge for holistic modalities from a nursing perspective. Watson's (2018) theory of human caring was the theoretical framework for this qualitative exploratory descriptive study. The goal of this research was to highlight the patient perception and experience of seeking pain relief while contributing a deeper knowledge to solutions for the multifaceted opioid epidemic.

CHAPTER 4. FINDINGS

The findings presented in this chapter are the experiences of 28 individuals who used the Micro-Pulse for pain relief. An exploratory descriptive design methodology was used to understand the phenomenon of participants' experiences of pursuing pain relief. This chapter begins with results and a description of the research process including organization of participant statements, data analysis, themes derived from participant responses, analysis of the themes, excerpts from the nurse researcher's journal, participants' noteworthy comments, output from MAXQDA (Appendix J), demographics (Appendix K), and a summary.

Demographics

There were 12 women and 16 men included in this study. Ages ranged from 33 to 65. Twenty-one are college graduates, five attended college, and two are high school graduates. The longest duration of pain, 44 years, was a 52-year-old male who fell from a tree as a child. The shortest duration of pain experienced by a participant was two months. Of the painful conditions treated with the Micro-Pulse, 92% were chronic conditions lasting longer than 10 years. Eighteen participants had a primary care provider or physician managing their care and 10 participants had none.

MAXQDA

Transcribed interviews were read and re-read and entered into MAXQDA and analyzed using a three-step method. "This qualitative data analysis software

systematically organizes, evaluates, and interprets textual and multimedia data with numerous advanced features” (Creswell & Clark, 2018, p. 68). The three steps included:

- Occurring and common narrative were color coded in MAXQDA.
- Segment coding was categorized and color-coded. For example, pain relief was colored coded turquoise blue and all statements related to pain relief were coded in turquoise.
- The retrieved coded segments emerged into themes.

While analyzing the data in MAXQDA, the researcher discovered connections between the participant responses as themes emerged. One benefit of this type of design is while describing results, patterns and commonalities are discovered among the participants’ experiences. Descriptive research explores and explains a group situation (Creswell & Clark, 2018). Each narrative is followed by a table listing a summary of the descriptions and themes from participants’ interviews matching their descriptive statements (included in Chapter 4). Noteworthy quotes of the participants as selected by the researcher were separately highlighted. The participants’ identities were protected by assigning a number to each participant. To avoid researcher bias since the researcher could identify participants from the numbers, numerical codes were also color coded. Each participant was assigned their own color, totaling 28 colors.

The interview questions were designed to encourage the participants to share as much about their experience as they felt comfortable sharing. Questions one through three addressed the pain type, cause, location, duration treatment, and management. Questions three through seven focused on the use of the Micro-Pulse, including application, frequency, effectiveness, cost, numerical pain scale, comparison to other

modalities, and medication use. Question eight focused on the impact of pain on life, work, and relationships. Question nine encouraged participants to share other concerns about their experience that may have not been covered in the previous questions.

Findings

Descriptive research guided the development of the findings. Some participants had a chronic pain experience ($n= 22$), while some ($n=6$) experienced acute pain. There were numerous types of pain (and complaints) treated, including all types of back pain, migraines, dental pain, A-fibb, Alzheimer's, carpal tunnel, hip, and coccyx pain. In addition, other types included sleep disturbances, degenerative disc disease, failed back surgery, sciatica, tail bone, sacral, post-surgery, plantar fasciitis, arthritis, foot and ankle, shoulder, bursitis tendonitis, multiple sclerosis, and complex regional pain syndrome (CRPS). Musculoskeletal pain was the most common type of unrelieved pain. The protocols and methods of application and duration of the Micro-Pulse varied among all participants. Each participant determined a schedule that worked for them, as they experimented with placement, rotation of coils, frequency, and treatment times.

One participant's unique use of the Micro-Pulse was the application of the device to the jawline for tooth and jaw pain. After successfully using it for this type of pain, the participant applied it to the left eye with a goal of testing the Micro-Pulse for pain relief and improved vision. First the participant went to an ophthalmologist and had both eyes tested prior to Micro-Pulse treatment. Then, the Micro-Pulse was applied to the left eye for a month but omitted it from the right eye. Post treatment tests revealed that the left eye reverted to 20/20 vision and the right eye remained the same. A benefit of the Micro-Pulse's healing capabilities for this participant was improved vision.

Themes

Five themes emerged from participant statements and are the major finding of this study. These themes were related to seeking and finding pain relief: feeling hopeless, engaging in self-care, finding pain relief, sharing the experience of pain relief, and modifying the use of pharmaceuticals. These themes and corresponding participant statements are detailed (Appendix L). They are also included in participants' noteworthy statements (Appendix M).

Feeling Hopeless

Feeling hopeless, the first theme, emerged from participants' feelings of despair and sadness as their lack of pain relief caused hopelessness. Most had tried many modalities or medications with no lasting pain relief. The time, money, and energy invested in pain relief pursuits, with little success, left them feeling desperate and hopeless.

This theme is expressed in the following descriptive statements from participants. Participant #1 "We were at a point with my mom where we were ready to try anything. She was at the late stages of Alzheimer's."

Participant #11, "I could never get ahead. No matter what I did. It was an energy deficit."

Participant #15, "And after all the time of rest, rest, rest, you think it is going to get better, and it never gets better."

Participant #16, "So, I was desperate when I found the technology."

Participant #17, “If you talk to my daughter, her pain went on for 20 years. It was becoming debilitating and she was becoming desperate. My daughter had tried everything, I mean everything for her back pain.”

Participant #19, “I said I’m all for anything at this point in time because the pain wasn’t going away ... One time I sat on my couch just crying in tears because the pain didn’t go away.”

Other participants, especially those who experienced chronic pain, voiced hopelessness and desperation.

Engaging in Self-Care

This theme is expressed in the following descriptive statements from participants. Engaging in self-care is a strong theme derived as participants self-administered the Micro-Pulse, allowing them to be autonomous from the medical system. Devising their own treatment regimens that worked for them fostered empowerment and self-reliance and increased self-esteem. They were able to enjoy their lives again and bond with their loved ones. The ability to do things they could not previously do, like walking, climbing stairs, sports activities, and holding a child in their arms, was empowering for these participants.

Participant #2, “Within a week, she was able to start reading a newspaper again which she always liked to do. It helped her in the later part of her life, not be as confused. I know it worked.”

Participant #3, “But ever since then, I’ve never had a migraine come to fruition because I’ve always been able to abort it with the device. I carry one for that. I sleep on it now.”

Participant #4, “I don’t know if it’s just that, but I depend on those machines. Now, I feel like I’m normal for me and I didn’t have that in a long time. If it comes back, I go to the machine; I’m more free and I can drive a car.”

Participant #11, “I didn’t find any help from Western medicine ... I let it go for about four hours and then I would amp it up to the medium setting and it was even more healing.”

Participant #13, “I continued to wear it in the back area for a couple of months. I would wear it while I slept, too. So, I took it upon myself to do something for my pain.”

Participant #17, “So now, if I twinge my back, I will use it prophylactically. I will use the Micro-Pulse on it, and it won’t develop, it won’t get bad.”

Participant #19, “I could do things I couldn’t do before.”

Finding Pain Relief

Finding pain relief was a common experience for all the participants except one. All participants were amazed, comforted, and relieved when they finally experienced a reduction or complete loss of pain. This theme is expressed in the following descriptive statements from participants.

Participant #11, “I could feel something flowing in my body again in that area and it didn’t hurt anymore.”

Participant #13, “It was miraculous. In about a week, everything, calmed down and the nerves calmed down. I owned my life again. It was so exciting. It was like, ‘Oh my God.’”

Participant #15, “With his coils, I came back around five months. It blew my mind. Another week of this, I’m guessing that it will be resolved. Pretty amazing.”

Participant #17, “For my ankle, I tucked it in my sock for one whole day, while I worked. I bought an M-1 and it was wonderfully wearable and being able to work with it on was a major benefit. I remember waking up and noticing that there was no pain and I rotated my foot and there was greater range of motion and less swelling. I remember wondering if there would be pain when my foot hit the floor, but there wasn't. Not long after that, I walked on snow and I had walked up and down stairs normally. The pain never returned and, recently, I was babysitting my brothers 8-year-old granddaughter and she wants me to play tag or race her on foot with her on a bike and she also wants a head start, but what I noticed is that I found myself speed-walking and almost jogging, which I never did, even when I was younger.”

Participant #18, “I cannot remember the last time I was in pain. I can't remember the last time I hesitated walking up or down stairs. And I am going to tell you, it never went back. I could not sit through church service and I could not sit in dining room chairs because of my back. That has not happened since I used this machine.”

Sharing the Experience

Many participants shared the experience of pain relief with others and encouraged a friend, family, or co-worker to use the Micro-Pulse. They cared about their loved ones and were generously lending the Micro-Pulse or buying one for friends or family. One participant created an app on his iPhone to educate other individuals in pain about the benefits of the Micro-Pulse. This theme is expressed in the following descriptive statements from participants.

Participant #1, “I have given them as gifts several times.”

Participant #5, “I have such an epic for this. I’ll tell friends who are having pain.”

Participant #7, “I put the ICES on the lady this weekend while she was working, and put a rubber band around her wrist, and put the two electrodes on her wrist, and after two – or three hours, she said it was like 80% gone. She was feeling so much better.”

Participant #9, “Then my wife broke her wrist. When she broke it, I immediately, knowing the pain relief I got, I used the one I had on her and I ordered another one from Bob. I’ve also referred two or three of my friends who had pain, and basically, they had the same experience.”

Participant #11, “My wife used it on her eyes to help her vision.”

Participant # 13, “His wife, had been in a car accident, broke her knee really bad. They had been using the machine for a year or so. So, he told me about it. I have told like seven or eight people about it who have all bought the device itself and it has been phenomenal.”

Participant #14, “When I moved here, to Santé Fe, my land lady broke her knee and I gave it to her, and she wore it for a few days, and she had less pain. Just word of mouth from Australia.”

Participant # 16, “This is what I tell people who don’t really know about PEMF. In fact, my therapist he’s been very fascinated by it. My mom has used it and she has seen benefits too. I gave her my old device and I bought the new one. She uses it on her knee.”

Participant #18, “My sister, I was thinking for other people. I believe in it and want to give back.”

Modifying the Use of Pharmaceuticals

The theme of abandoning or reducing the use of pharmaceuticals was reflected in participants statements about their decreased dependency on drugs, including narcotics, after using the Micro-Pulse. After experiencing pain relief, many participants stopped taking all types of drugs, including alcohol. This theme is expressed in the following descriptive statements from participants.

Participant #3, “I don’t think I’ve taken any Tylenol or any of that since I got it. It totally replaces any other pain meds for me.”

Participant #4, “They prescribed hydrocodone and a muscle relaxer, which I kind of depended on. Then in research in trying to figure out how to get off these pills, I came across PEMF.”

Participant #5, “He gave me a steroid shot that wore off, another steroid shot, that wore off, they said the next thing you are going to have to have is an epidural. I didn’t want to do that. Then I remembered the Micro-Pulse, so I put that on my hip, and that’s gone.”

Participant #10, “They gave me OxyContin and OxyContin MR. One for them is a 24-hour pain reliever. Three hours post op, I put on a Micro-Pulse over the incision.”

Participant #13, “I avoid drugs even over the counter as much as I possibly can since having it and being able to use it.”

Participant #16, “I have used off and on hydrocodone. I’ve done things like that. I try to really stay away from any oral medication or pharmaceuticals because this has really been the most effective thing I could do.”

Participant #21, “I had been pounding the Tylenol and ibuprofen pretty heavily when I got that. I have been able to back off to just once in a while.”

Participant #16, “All the pain I’ve been drinking about every night - gin, rum, was trying dope, too, so I wouldn’t have to feel the pain so bad. But all the pain after I got up off the end of that bed was gone. I went and didn’t drink that night. But I no longer take anything for pain whatsoever.”

This is a profound finding since long term use of narcotics often leads to addiction. One participant experienced pain continuously for over 20 years before she found the Micro-Pulse and stopped taking all pain medications. Another participant stopped drinking alcohol and consuming narcotics, breaking a long-term addiction habit.

The only participant who did not experience pain relief, was suffering with CRPS. He called the inventor of the Micro-Pulse to discuss placement and frequency of the device. After implementing the recommended adjustments, he still had no relief and selected another holistic modality to use. He stated, “It did not work for my pain. It didn’t holdup.”

“How has dealing with pain affected your life, work, and relationships?” was the final question and one of the most revealing. It allowed the participants to express their feelings about their journey from pain to reprieve. This theme is expressed in the following descriptive statements from participants.

Participant # 6 “It made me mean and very short tempered.”

Participant #12 “But if I didn’t do this... a lot of people depend on me. Again, I am so glad I have this.”

Participant #19 “I would take pain medication. That’s no good. The pain goes away for a little while, but you feel awful.”

Participant # 27 “Oh gosh. It has definitely affected every part of my life. It has made work a struggle. You can’t explain it to somebody if they haven’t been through a chronic pain state. I use a little device on my neck in the mornings and at night. It is a challenge. It is an absolute challenge. I am divorced. I think that is a big part of my divorce.”

“I haven’t had to think about pain. I have friends who are still in pain. You don’t want to go out socially. You are kind of this outsider doing a different experience. It affects every part of your life and it is truly hard to explain that to someone.”

Technology Findings Among Participants

Several findings revealed by the participants related to the technology of the Micro-Pulse are significant. In approximately 12 of the participant cases, prolonged use of low power PEMF eliminated orthopedic pain (indicates tissue recovery and not pain blocking). Eight of the participants relieved their pain with lower intensity pulses and shorter duration of application. If the effects of the Micro-Pulse were an opioid-like effect, the dosage needed would increase with time, not decrease. If the Micro-Pulse helped participants significantly reduce orthopedic injury pain, and if they use it for at least two or three more weeks beyond the reduction of pain, then often their pain did not resume. This indicates that the Micro-Pulse initiates a regenerative cycle in injured tissues. This theme is expressed in the following descriptive statements from participants.

Participant #8, “The use of low power PEMF eliminated orthopedic pain. This indicates tissue recovery and not pain blocking.”

Participant #24, “I realized that lower intensity pulses and shorter duration of application worked the best.”

Excerpts from Researcher’s Journal

- As I begin this research process, it is important as a nurse researcher to follow everything as outlined in the IRB proposal and data management plan. Both documents are pinned to a bulletin board above my desk and provide a visual reference which I have reviewed numerous times. In addition, a step by step itinerary guiding this research study is posted. After researching various methods of recording, I have selected an old tape recorder with cassette tapes. Following each interview, I immediately write in this journal any thoughts, feelings, or findings that arise. Participants were eager and willing to be interviewed for this study. Most participants are reliable and keep their original phone appointments.
- I am spending every day during a two-week period conducting the interviews. It is taking much longer than I anticipated. This transcription phase is very important, and I have decided to complete all the transcriptions myself.
- The transcriptions are taking twice as long as the interview phase, maybe I should have used a transcription service. However, I am thrilled I am completing all the transcriptions since it adds another layer of understanding as I listen to their stories.
- I am aware of some researcher bias as the data is entered into MAXQDA. I changed the numerical identifiers to color coding for myself, so I will not

know which interview belongs to which participant. Many insights are revealed within the data.

- I am stunned by the degrees of pain that they have been living with day after day. Statements that impacted me are: ‘Hopefully, insurance will pay. Maybe you can do that, get insurance to pay for it. Because it will save a lot of money in the long run.’ ‘I have friends that are on opioids. I do not want to be on pain meds - ever. I think as you get older that becomes a bigger fear. Pain becomes a bigger fear as you start to head toward being elderly. Pain is one of the biggest fears.’ One simple quote that impacted me immensely was stated by a man who suffered gravely in pain for years, ‘That being said, I can’t remember the last time I had back pain. Not even a twinge. Okay, that is all.’

Summary of Findings

Overall, most participants could not function well in their daily lives and spent a great deal of time taking medications, trying various modalities, keeping doctor’s appointments, and searching for solutions for their pain. Most participants learned about the Micro-Pulse by word of mouth, while others learned about it from their chiropractor, searching the Internet, or watching YouTube videos. Participants were amazed when they experienced pain relief and felt they were compelled to share their experience with others. Many bought the Micro-Pulse for family and friends or gave their device away to loved ones while upgrading their Micro-Pulse purchase. Autonomy and disconnection from the healthcare system were very important to these individuals. The majority discontinued medications and reformed unhealthy lifestyle habits. One participant experienced pain continuously for over 20 years before she used the Micro-Pulse and

then discontinued all medications. A man who had become, in his own words, “A drug addict and an alcoholic,” stopped drinking and taking drugs, breaking a long-term addiction, once he was pain free.

Chapter Summary

This chapter described the experiences of 28 participants’ experiences of pain and use of the Micro-Pulse for pain relief. This exploratory descriptive design provided them an opportunity to reveal their experiences in detail. Using descriptive research enabled the exploration of participant experiences while providing additional information about the topic. Further statements were detailed in the color-coded grid and the color-coded output in MAXQDA. From these descriptions, five themes were derived. The themes, shared experiences of the participants, are some of the most emotionally impactful and profound findings of the study. They are at the core of what is most important to these individuals.

The differences among the participants included various treatment regimens; timeframes in which they experienced pain relief; their confidence in using holistic modalities and stepping outside the allopathic medical system; understanding their bodies capacity to recover; and multi-tasking families, work, and relationships, all while trying to reduce their pain.

Most participants voiced gratitude for the Micro-Pulse and the chance to experience a reduction of pain. These expressions and feelings shifted them from emotional states of desperation and hopelessness to reprieve and peace. As one participant stated, “Any persons lived experience is worth something, but I do think that research can provide much more in the way of evidence for it.” Another participant

stated, “I had the drug in the drawer; did not take it. I would take it out and look at it sometimes, but I never needed to take it. It is still there.” They are all advancing on a healing journey, enabling them to experience relief from pain and feel at peace again. The next chapter highlights nursing’s role and the impact of this research on caring science.

CHAPTER V. DISCUSSION

Introduction

This exploratory descriptive research study focused on the experiences of 28 individuals who were seeking pain relief. Participants used PEMF, the Micro-Pulse, for their painful conditions. This chapter is organized as follows: introduction; discussion of the findings; advancement of caring science; implications for nursing practice, nursing education, nursing policy, research; and conclusion.

Using the exploratory descriptive research method as a research tool enabled participants to freely express what was important to them, supported by the length of the interviews and the rich data generated from the process. Results from this Micro-Pulse study show that, except for one participant, all of the participants experienced pain relief.

Discussion of the Findings

The main results of this study emerged from the participants' experiences. Findings indicate that the Micro-Pulse reduced pain for 27 out of 28 participants. Five emerging themes were feeling hopeless, engaging in self-care, finding pain relief, sharing the experience of pain relief, and modifying the use of pharmaceuticals. Participants had tried other complementary and alternative medicine (CAM) modalities and medications, with little to no avail. The participants could not function normally in their daily lives and spent a great deal of time taking medications, trying various modalities, seeing doctors, and searching for solutions to their pain. The lack of pain relief resulted in feelings of sadness, hopelessness, and despair as participants continued to live in pain. Although not

all participants responded to the treatments in the same timeframes and treatment protocols varied, 99% of the participants experienced some pain relief or therapeutic outcome. As participants experienced pain relief, they felt empowered and compelled to share their experience with others. Many of the participants reduced or discontinued their use of pharmaceuticals.

Among the research studies conducted on PEMF and included in Chapter 2 in the literature review, vast differences between the protocols, devices used, frequencies, applications, and durations of treatments are evident. With so many variations, comparing results and formulating evidence-based conclusions was challenging. Even in the studies analyzed, differences in outcomes were impacted by the type of PEMF device, dosages, treatment protocols, and participants' compliance.

For this Micro-Pulse study, the diverse ways the participants applied the Micro-Pulse had no impact on the efficacy of the treatments. Some conditions treated with the Micro-Pulse included arthritis, carpal tunnel, degenerative disc disease, dental issues, elbow pain, foot pain, and generalized muscle and musculoskeletal pain. Often the healing cycle was replicated when they used the Micro-Pulse for other complaints: Alzheimer's, constipation, digestive problems, Huntington's disease, hypermobility syndrome, incontinence, and sleep disturbances. One participant used the Micro-Pulse for his dental appointments to avoid Novocain injections.

The participant findings also related to the technology of the Micro-Pulse. Six participants expressed how the Micro-Pulse settings and duration of application impacted effectiveness. As one participant explained,

High power PEMF may mostly work by pain signal blocking. Yet, low power daily PEMF did not for several reasons: It can take a while to get a pain relief effect. An opioid-like effect would be almost immediate, not requiring days or weeks and the effect tends to go on with improvements in function, such as joint mobility, range of motion, and muscle strength. These indicate tissue recovery; not pain blocking.

For approximately 12 of the participants, prolonged use of low power PEMF eliminated orthopedic pain, indicating tissue recovery rather than pain blocking. The use of low power PEMF took longer to have noticeable effects, but decreased the pain for days, weeks, months, or even years. Eight participants relieved their pain with lower intensity pulses and a shorter duration of applications. As one participant noted,

An interesting finding is if the effects of the Micro-Pulse were an opioid-like affect, the dosage needed would increase with time, not decrease.” “If the Micro-Pulse helps to significantly reduce orthopedic pain, and if I use it for at least two or three more weeks beyond the reduction of pain, then approximately 80% of my pain does not resume.

This indicates that the Micro-Pulse begins the regenerative cycle in injured tissues.

This is an important finding in that the continued use of the Micro-Pulse needs to be long enough for the healing process to complete. Some other commonalities among 92% of the participants were:

- Participants were anxious for pain relief when they tried the Micro-Pulse.
- Participants had previously used many other modalities but were still in pain.

- After participants used the Micro-Pulse for one specific painful condition and experienced pain relief, they used the Micro-Pulse for other ailments, and these were not always related to pain.
- Most participants did not believe in, nor did they want to use, medications.
- All participants, except one, stated they had some kind of pain relief using the Micro-Pulse.
- All participants, except one, stated they will continue to use the Micro-Pulse.

Watson's Theory of Human Caring

Watson's (2018) theory of human caring was the nursing theoretical framework for this nursing research study. Watson's (1979) original work on the theory, *Nursing the Philosophy and Science of Caring* was grounded in the 10 Carative Factors, the core for professional nursing practice. Watson's (1988) second book *Nursing: Human Science and Human Care* advanced caring as the essence of nursing and the unifying focus for the discipline and profession. In the revised edition of *Nursing the Philosophy and Science of Caring* there was an evolution from the Carative Factors to the 10 Caritas Processes™©. The shift from the Carative Factors to the Caritas Processes™© made explicit the connections between caring and healing. Two of the Caritas Processes™© that guided this dissertation included *Creating a healing environment at all levels* through the use of the Micro Pulse as a healing modality for pain relief and *Being authentically present while honoring the faith and hope* of the research participants as they moved forward in their journey to finding pain relief.

Advancement of Caring Science

The implications to caring science is that by further understanding the human experience of pain, improved patient outcomes are attainable. In strengthening our understanding of the transpersonal roots of caring science, nurses can strive to focus on the aspects of human caring within nursing work. A major component of compassion is personal connection. The nurse researcher integrated caring moments into the research process, demonstrating an important component of nursing as a healing art. The essence of care begins with empathy. Empathy begins with listening. Caring about patients in pain, medicating them, and reassessing pain levels are some of the main responsibilities of nurses. An integrative medicine and health approach is a patient-centered approach combining the best of conventional and complementary approaches. The ANA (2018) position statement provided ethical guidance and support to nurses as they provide care to persons experiencing pain: “Nurses must advocate for policies to assure all effective modalities” (p. 2). Nurses practicing in a wide variety of settings are in key positions to help patients and families make well-informed decisions about their treatments. These practices will undoubtedly advance caring science for individuals experiencing pain.

Implications for Nursing Practice

Through this insight of understanding the participants’ experience of using the Micro-Pulse to relieve pain, modifications for pain treatment could be implemented. Nurses are at the forefront of caring for individuals facing illnesses, surgeries, accidents, and all types of pain. According to Donovan et al. (2017), “Over one hundred million American adults suffer from chronic pain and an estimated 20% of patients who present to physician offices with pain syndromes diagnoses receive an opioid prescription, the

most common treatment for pain” (p. 1805). Fentanyl, hydrocodone, and Percocet are just some of the medications that lead to long-term addiction. Primary nursing practice responsibilities are prevention and education in identifying individuals taking these drugs and at risk for addiction.

An important educational topic underutilized in healthcare settings is the use of CAM. This diverse group of therapies and supplements are more naturally based. Over the past few years, the implementation of more holistic based solutions has increased. The ANA (2018) endorses these practices and supports the removal of barriers to effective treatment with the inclusion of CAM as a treatment option.

Another issue to be addressed in nursing practice is ineffective pain assessments. Primary care providers prescribe narcotics based on a 1 to 10 pain scale, a non-comprehensive approach to pain assessments. Inadequate pain assessment and management outcomes negatively affect the psychosocial, emotional, and physical well-being of patients. Effective pain assessment and treatment is a key component for optimum pain management, and momentum is shifting to more holistic-based solutions. The gaps in knowledge base are on the part of both practitioners and patients about the value of CAM modalities.

Recommendations for nursing practice include:

- Nurses to provide compassionate caring to patients in pain and suffering from addiction.
- Nurses to provide a non-judgmental healing environment for patients in pain and suffering from addiction.
- Nursing practice to be guided by theory.

- Watson's (2018) theory to be implemented to guide holistic nursing practice.
- Restructuring of pain assessments based on the 1 to 10 pain scale to include more comprehensive pain assessments.
- Multi-disciplinary team-based approach for pain assessments and follow up care.

Implications for Nursing Education

Nurses' knowledge base regarding CAM is paramount to incorporating holistic healing solutions for patients in pain. CAM should be included in nursing continuing educational requirements. Nursing institutions and hospitals have a skills day with an array of equipment and devices for demonstration and testing purposes; including CAM in these educational requirements is a viable option.

In addition, a knowledge base about pain management and the formation of a standardized curriculum in pain management is essential for nurses. Clinicians would benefit from education related to evidence-based guidelines in pain prevention, treatment, and CAM services. Pain management is the responsibility of primary care physicians. Nurse practitioners are increasingly filling these roles in primary care, another rationale for nurses to be well-educated in pain management. Nurses are in a unique position to help patients with non-opioid options including CAM and the Micro-Pulse.

The education and implementation of these modalities could begin with college students. Often injuring themselves in sports and having access to opioids, educating students about holistic modalities for pain relief could benefit them in multiple ways. Some students' misuse of prescription analgesics for sports injuries and painful disorders leads to addiction. College years are a unique and transformative period in an individual's

life. Yet drugs continue to infiltrate the school system, disturbing students' ability to have a normal college experience. A possible solution to the influx of drugs onto college campuses is to identify and support students at risk with early detection, education, interventions, and continued care. College can be an opportune time for intervention with students who are at risk of this escalating drug use and can provide substantial interventions in their first year of college and beyond (Morioka, Howard, Caldeira, Wang, & Arria, 2018). The problem of continued drug use in U.S. schools is due to lack of early recognition, reliable support systems, easy accessibility to drugs, peer pressure, stressful college environments, intense workloads, and lack of coping mechanisms by many students.

The decline of academic progress for students engaging in nonmedical use of substances is often a domino effect: nonmedical use of prescription stimulants for studying, cannabis, alcohol use, drugs to counterbalance the stimulants, and then opioids. The stakeholders are many: university students, parents, families, friends, teachers, and medical professionals. Since the ages between 18 and 25 are the most common time for young people to use illicit substances, high school and college nurses are in a prime position to identify and support students.

One solution could be mandated by schools and conducted by school nurses: All incoming freshmen would be required to attend a three-hour workshop on substance abuse. This mandatory course would include personal testimonies of students who previously experienced substance abuse problems, videos of the effects of drugs on the brain and body, CAM modalities for pain relief, a dialogue exchange between students, and follow up by nurses with these students; this could have an impact on college student

drug use. Further education is needed for these students, individually and in groups, related to the impact of nonmedical use of prescription and non-prescription drugs. Then, an ongoing identification, educational, and support programs could greatly benefit college students across the country.

Another gap in education is the stigma associated with patients in pain and dependent on medications. Continuing education courses for nurses about addiction as an illness is required. A primary barrier to individuals reporting pain, especially if they do not respond to treatment, includes the conscious or unconscious attitudes of medical professionals towards these patients. Nurses must be leaders in changes for pain management approaches. The strategies should include prevention, early recognition, intervention of pain issues, and a caring and supportive approach to pain management.

Education recommendations include:

- An educational course on complementary and alternative medicine (CAM), including the Micro-Pulse, should be included in the mandatory continuing educational requirements for nurses.
- On-line courses about CAM and the Micro-Pulse for nurses.
- Education related to evidence-based guidelines in pain assessment, treatment, and prevention.
- Establishment of a partnership with specialists in CAM to collaborate in these multi-disciplinary educational opportunities for nurses.
- A presentation about CAM for hospital administrators, nurses, physicians, and other team members.

- A substance use prevention and education seminar for high school and college students, presented by school nurses.

Implications for Nursing Policy

The ANA (2019), tracking trends and issues in nursing-related legislation, introduced more than 1,000 nursing and healthcare bills to impact nursing practice. These included nursing scope of practice, workplace issues, safe staffing, overtime, and workplace violence (ANA, 2019). Further nursing policies related to holistic pain management, including comprehensive pain assessments that accurately assess all aspects of pain, are necessary. One of the reasons there is a gaping hole in pain assessments is the use of the 1 to 10 pain scale, with physicians prescribing opioids based on this scale. Although there are a multitude of tools used in various healthcare settings, none exists that holistically and comprehensively assess all components of pain. “As a nation, we are not approaching assessment and management of chronic pain in the best possible manner that maximizes effectiveness and minimizes harm” (Reuben et al., 2015, p. 296).

This nurse researcher invented a state-of-the-art medical device that obtains comprehensive data about an individual’s psychological, emotional, and physical pain. Plans are to apply for funding to build this comprehensive pain assessment device (CPAD). This pain assessment tool will make it easier for health care professionals to accurately assess, diagnose, and treat patients in pain. The CPAD can be used in a variety of settings: for patients living at home; for those in a hospital, skilled nursing facility, hospice unit, or assisted living facility; and for those in other locations.

Funding is often directed to the gaps in knowledge and treatment. Overall, the global market for pain management is expected to grow from nearly \$36.1 billion in 2017

to \$52.0 billion by 2022, at a compound annual growth rate of 7.6% (Transparency Market Research, [TMR], 2016). The device segment is expected to increase from \$3.7 billion in 2017 to nearly \$4.4 billion by 2022 (TMR, 2016). “Holistic pain assessment tools can be beneficial in identifying how biomedical, psychosocial, and behavioral factors interact to influence the nature, severity, persistence of pain and disability, and response to treatment” (Deshaies, Akhtar-Danesh, & Kaasalainen, 2015, p. 37). Policies to improve a more holistic approach to pain are a key component to the solutions.

On the legislative front, on October 21, 2015, in West Virginia, President Obama issued a memorandum to federal departments federal, state, local, and private-sector efforts aimed at addressing the prescription drug abuse and heroine epidemic (ANA, 2018). In conjunction with the work of the White House, the U.S. Department of Health and Human Services prioritized activities to address the opioid epidemic (ANA, 2018). The opioid epidemic continues into the Trump administration, resulting in the declaration of a public health emergency in October 2017 (ANA, 2018).

Nursing organizations lobbied Congress and were a part of the movement. In June 2018, a package of dozens of bills geared toward fighting the opioid epidemic were passed by the U.S. House of Representatives, the Support for Patients and Communities Act (H.R.6) (ANA, 2018). Congressional action prompted the advancement of bills to enhance opioid deterrence education and reduce of the prevalence of unused pain pills, among others bills (ANA, 2018). In March 2018, Congress passed a federal spending bill that includes a \$3.3 billion increase in funding to support prevention, treatment, and law enforcement activities across entities that assist state and local governments (Quinn,

2018). Although additional finances were not allocated, federal services have assigned resources to mitigate the opioid epidemic (Quinn, 2018).

However, the opioid crisis has been aided, in large part, by the actions of Congress, lobbyists, and the drug distribution industry. Whether it is the tobacco industry or the pharmaceutical industry, when the government is corrupted by big business, societal safeguards are compromised, and individuals suffer. As the government benefits from drug sales taxes, and mass quantities of opioids are flooding the market, people are suffering. Public policy must protect the people against harm from larger institutions as they work to seek to enrich companies at the expense of human lives. Nurses have a voice in Washington; impacting policies and improving these outcomes.

One more policy nurses can impact is recognition, support, and service to the underserved (a substantial population dealing with pain issues). “Both allopathic and CAM providers have noted a lack of support for these chronic pain patients, especially those on Medicaid” (Saper, 2016, p. 6). Collaborating to address the needs of these underserved, the Annual Integrative Medicine for the Underserved (IM4US), a multidisciplinary group of professionals committed to affordable, accessible integrative health for all individuals, is addressing these concerns (Saper, 2016). According to this consortium, “The importance of the relationship between practitioner and patient, focuses on the whole person, is informed by evidence, and makes use of all appropriate therapeutic and lifestyle approaches, health-care professional and disciplines to achieve optimal health and healing” (Saper, 2016, p. 5). Currently in Rhode Island, Medicaid offers a Chronic Pain Program, an integrated treatment approach that consists of free complementary therapies (massage, chiropractic, acupuncture) (Donovan et al., 2017).

An increased awareness for holistic based care is emerging worldwide. In Dubai, the World Congress on Complementary and Alternative Medicine: Pathways to an Integrative Approach and Natural Healing Conference is being held in December 2019. This initiative unites research and business communities focusing on CAM therapies to share valuable information, disseminate the knowledge, and promote the use of these holistic modalities (Quinn, 2018). Although there is a united front from the nursing profession, nursing policies to emphasize a more holistic way of practicing are needed. Influencing government policymakers to make laws related to these interventions will be the next step of this health policy recommendation. Policies to support these gaps are essential.

Policy recommendations include:

- Nursing policies to address improved comprehensive pain assessments.
- Healthcare policies to protect and support the underserved dealing with pain.
- Advocating for necessary policies to monitor in the distribution of pharmaceutical and non-pharmaceutical drugs.
- Policies to enable school drug use screenings to deter future drug abuse among high school and college students.
- A comprehensive substance use prevention and education seminar for high school and college students.

Implications for Research

Nurse-led research with the intent of improving patient outcomes is imperative for the evolution and progression of the nursing profession. Additional qualitative and quantitative research studies conducted to reveal the efficacy of CAM modalities are needed. Research showing the value of identifying, educating, supporting, and following

up with college students who have a propensity for substance use disorders is necessary. These studies might reveal the potential benefits of using CAM modalities for pain relief outweigh the risks.

Once research is conducted, a major challenge in providing patients with the most effective pain treatments is application of solutions into definable actions. Examples of barriers include lack of knowledge related to benefits of CAM modalities, availability in hospital and primary care locations, affordability, and misconceptions about the risks involved in using CAM modalities. Increased awareness among the public and health sectors will increase the demand. If nursing leads the way, other disciplines will follow. Incorporating not only holistic clinical interventions but public health and policy reforms to include CAM are critically needed.

Research recommendations include:

- Clinical and population studies of the use of PEMF for pain.
- Effectiveness studies prioritized over efficacy trials.
- Replication of important results on the use of PEMF.
- Investigation on the underlying biophysical mechanisms of PEMF.
- Definitions of classes of PEMF, with standardization of parameters, to allow sensible comparison of scientific results.
- Studies to determine the precise pathophysiologic mechanism of action on how the Micro-Pulse and PEMF affect pain and inflammation.
- Peer reviewed published studies on the Micro-Pulse.
- Micro-Pulse protocols tested for various illnesses.
- Qualitative studies about the experiences of patients and PEMF.

- CAM modalities verse medications as first line treatments for pain.
- Studies on the usefulness of the newly developed CPAD.

This nurse researcher plans qualitative and quantitative research on the Micro-Pulse and other CAM modalities for holistic pain treatment as well as research geared toward comprehensive pain assessments. These are all definitive gaps in nursing research.

Conclusion

In summary, although relatively few studies have examined the efficacy of the Micro-Pulse, this research proposed this device may be highly effective for patients with all types of pain. The use of the exploratory descriptive design provided a framework to explore participant experiences. The current opioid epidemic is fueled, in part, by ineffective efforts to manage pain. Individuals' lives are impacted in unfortunate ways as they suffer unnecessarily with pain, creating a cycle of pain, narcotics, dependence, abuse, rapid deterioration, and death. Most primary care providers resort to medications and invasive interventions as a first line treatment. "As opioid prescriptions and use have 'skyrocketed' over the past 20 years, the striking increase has paralleled surges in opioid overdoses and treatment for dependence on prescription painkillers" (Reuben et al., 2015, p. 296). The opioid epidemic is a catastrophic crisis and drastic interventions are needed. In the United States, from 1999 to 2014, more than 165,000 persons died from overdoses correlated to opioid pain medication (CDC, 2016). The incursion of counterfeit pills, closely resembling oxycodone, Xanax, and Norco, has augmented fentanyl overdoses by individuals acquiring them on the illicit drug market (CDC, 2016). Fentanyl, a drug used for pain management, is responsible for many recent overdoses (CDC, 2016). In July

2016, the Drug Enforcement Administration delivered a nationwide report signifying that hundreds of thousands of counterfeit pills have been entering the U.S. drug market since 2014, some containing deadly amounts of fentanyl and fentanyl analogs (CDC, 2016). The CDC report disclosed that the most important recommendation was non-opioid therapy as the preferred treatment for chronic pain (Dowell, Haegerich, & Chou, 2016). Opioids should only be used when benefits for pain and function are expected to outweigh the risks (Dowell et al., 2016).

The successful use of the Micro-Pulse in lieu of surgical interventions or narcotics demonstrates that holistic modalities are a viable option for patients. In comparison to traditional allopathic interventions and medications, the Micro-Pulse, a caring/healing modality, is less invasive; has fewer side effects; promotes patient autonomy; decreases the risk of addiction, overdose, and death; and effectively relieves pain. Federal policies and future research are essential in areas of pain assessment, treatment, management, education, and funding.

Integration of the Micro-Pulse can improve safety and effectiveness of pain treatment, reducing risks of opioids and other drugs, and enabling individuals to live by design instead of default. Holistic approaches for pain management should be implemented more frequently as a first resort, not as a last one. Findings could afford an origin for theory development and offer insight into safer ways of treating pain.

Nurses are on the frontlines with college students and the first year of college is an opportune time to educate students, individually and in groups. By identifying students at risk for drug abuse, further educational resources and interventions could be provided, thereby decreasing adverse outcomes. A possible solution to the influx of drugs onto

college campuses is to identify and support students at risk with early detection, education, interventions, and continued care. Influencing government policymakers to implement laws is the next step of this health policy recommendation.

The theory of human caring (Watson, 2018) served as a blueprint for this research and will continue to guide a career based in caring-healing: grow-seek-be-learn-become. This nurse researcher strives to become a Caritas™© scholar, spreading the teachings of Watson and advancing caring science, especially now as the opioid epidemic is snowballing.

According to Rosa (2017),

We are currently witnessing firsthand the widespread consequences of our individual and collective choices on the planet and beginning to see how the foundational premise of nursing - to preserve and protect human dignity in the promotion of good health and well-being - must now be expanded in order to create and sustain a more equitable and inclusive world. (preface)

As emphatically stated by Ki-Moon (2018) at the Center for Global Citizens, “We can only empower those in need, if each and every one of us acts with passion and compassion as a global citizen.”

APPENDICES

Appendix A. Literature Matrix

Study/Type/Country	Design, Sample, Time Frame, Control Condition	PEMF Device/Dosage	Pain Assessment Tool/Results
Abdelhalim & Samhan, (2018). Long term effects of low-frequency magnetic field therapy in treatment with patients with low back pain. Country - Saudi Arabia	Evaluate long-term effects of low-frequency magnetic field therapy for LBP. RCT, 40 pts- $n=22$ m, $n=18$ -f, 1 year, ages-40-50, control group of 20 patients had the same as the treatment group but with power off.	Magneto 4-adjustable to pts tolerance 1-100 Hz PEMF 30 min, 3 x a wk x 4 wks (12 sessions).	VAS $p=0.001$. VAS was the outcome measure and results revealed a reduction of pain for the control group.
Aboeleneen & Darwesh (2015). Effect of pulsed magnetic field on cervical dysfunction. Country - Egypt	Twenty male patients with cervical spondylosis were involved, ages between 35–50 years old. The patients were divided into two equal groups. Patients in the first group (control group) received a therapeutic ultrasound. Patients in the second group received pulsed magnetic field and therapeutic ultrasound. Treatment was done 2 times a week for 6 weeks.	MAGNETO 2 chinesport Low frequency (1-100 Hz) magnetic therapy device, with power of 100 Gauss, its model is (EL0064).	VAS. Baseline bubble inclinometer. Pulsed electromagnetic field, in conjunction with ultrasound, was effective in improving pain level and cervical ROM in patients with chronic cervical dysfunction.
Alayat, Abullah Alshehri, & Mohamed Ibrahim Salem (2017).	RCT examined the efficacy of PEMF on pain and function in chronic	PEMF was applied with 20 Hz, 0.8 mT for 20 minutes 2 sessions a week for	VAS- PEMF t EX group with a reduction of pain and increased neck

<p>Efficacy of pulsed electromagnetic field on pain and function in chronic mechanical neck pain: A randomized controlled trial. Country - Egypt</p>	<p>mechanical neck pain. 60 male patients were randomly assigned to two groups- Group 1 was treated with PEMF plus exercises (PEMF t EX) Group 1 and Group 2 (30 patients) treated with placebo magnetic plus exercise (PLTEX).</p>	<p>6 weeks.</p>	<p>function more than exercise alone.</p>
<p>Ammar & Abdel (2016). Pulsed electromagnetic field versus microcurrent electrical nerve stimulation in patients with lateral epicondylopathy. Country - Egypt</p>	<p>Study was designed to compare between the effects of PEMF and microcurrent electrical nerve stimulation (MENS) on improving pain intensity, threshold, and grip strength in patients with lateral epicondylopathy.</p>	<p>Eighty-four subjects were randomly assigned into three equal groups with group 1 receiving PEMF and exercises, group 2 receiving MENS and exercises, and group 3 receiving exercises alone. Three visits a week for 4 weeks.</p>	<p>VAS- improvements in all dependent variables but subjects who received PEMF and exercises had the most significant effects. PEMF may be more effective than MENS in treating lateral epicondylopathy by reducing pain intensity and disability and increasing grip strength.</p>
<p>Andrade, Duarte, Pereria, Lopes, Pereira, Rocha, & Esprequeira-Mendes (2016). Pulsed electromagnetic field therapy effectiveness in low back pain: A systematic review of randomized controlled trials.</p>	<p>(RCT), 50 male pts. PEMF w US 15 min 2 x wk. for 6 wks.</p>	<p>MAGNET02 chinesport low frequency- 230v at 50HZ (low dose).</p>	<p>Pain VAS- $p=0.009$. Cervical ROM- extension $p=0.045$.</p>

Country - Portugal

Arneja, Kotowich, Staley, Summers, & Tappia (2016). Electromagnetic fields in the treatment of chronic lower back pain in patients with degenerative disc disease.

Double-blind, randomized and placebo controlled. control group underwent same procedures, except the device was turned off.

Patients were randomly assigned to either the control ($n = 7$) or EMF treatment ($n = 14$) arm.

EMF using a medical device resonator; exposed to five treatment sessions (visit 2 through to visit 6) during a 2-week period, for 60 min per treatment, whereas subjects assigned to the placebo group underwent all procedures.

Pain reduction and mobility.

Improvements in overall physical health, social functioning and reduction in bodily pain were observed in the PEMF group. The pain relief rating scale showed a higher level of pain relief at the target area in the EMF group.

Country - Canada

Brignardello-Petersen (2018). Pulsed electromagnetic field seems to decrease pain levels in females from 24 through 72 hours after initial archwire placement.

Systematic review of RCTs, six studies were eligible on the qualitative analysis and five into the quantitative analysis included a total of 210 participants (90 men and 120 women) with an overall mean age of 43.3 years old.

Various PEMF devices and treatment protocols. Application ranged from 5 days to 3 weeks with PEMF applications of 4 times a day to twice a week.

VAS.

The effect sizes indicated a clear tendency to reduction of the pain intensity for the PEMF groups.

Country - Canada

Glance de Freitas, Monteiro, Marcondes, Vantin, Fukuda, & Rosa, Mores-Barros Fucs (2014). Pulsed electromagnetic field and exercises in patients with shoulder impingement syndrome.

Double-blind RCT, 56 patients 9 treatments.

Evaluating the effectiveness of PEMF in reducing pain, improving function and muscle strength in patients with shoulder impingement syndrome (SIS).

Magnetherp 330 Meditea brand-2007 w PEMF 30 min. q 48 hrs. x 3 wks.

The combination of PEMF and shoulder exercises is effective in improving function and muscle strength and decreasing pain in patients with SIS.

Country - Brazil

<p>Harper, Schmidt, Kubat, & Isenberg, (2015). An open label pilot study of pulsed electromagnetic field therapy in the treatment of failed back surgery syndrome pain.</p> <p>Country – United States</p>	<p>Open-label exploratory pilot study.</p> <p>13 subjects per study site PEMF twice daily over a 45-day period in 34 subjects (68% female).</p>	<p>Provant Therapy System Model 4201; Regeneration Biomedical Inc. at 27.12 MHz.</p>	<p>NPRS -33% reported a clinically meaningful (30%) reduction in PI. Relative to baseline, responders reported an average 44% and 55% reduction in back PI and leg PI (respectively), and an average 13% improvement in Oswestry Disability Index scores.</p>
<p>Hatef, Hashemirad, Meftahi, Simorgh, L., Jahromi, Rahimi, & Togha (2016). The efficacy of pulsed electromagnetic field in refractory migraine headaches: A randomized, single-blinded, placebo-controlled, parallel group.</p> <p>Country - Iran</p>	<p>Double-blind RCT, 5 centers, 68 pts., follow for 1 year. 34 pts each group.</p>	<p>Coil- 1.5 mT, 75 Hz after arthroscopy, 4 hrs./day x 60 days.</p> <p>IGEAmMedical, Carpi, Italy.</p>	<p>Able to resume sports during 12 mo. f/u, Time to resumption of work.</p> <p>AOFAS- Ankle-Hindfoot Scale. QOL, Numeric scale, satisfaction, CAT Scan.</p> <p>Descriptive statistics, <i>t</i>-test.</p> <p>VAS- : PEMF (10 Hz, 4-5mT) can be considered as a beneficial and persistent prophylactic treatment option for refractory migraine.</p>
<p>Hedén & Pilla (2008). Effects of pulsed electromagnetic fields on</p>	<p>Double-blind, randomized, placebo-controlled pilot study. Forty-two healthy females</p>	<p>PEMF– unable to obtain device & dosage</p>	<p>(VAS) and pain recordings were obtained twice daily through postoperative day</p>

postoperative pain:
A double-blind
randomized pilot
study on breast
augmentation.
Country - Sweden

undergoing breast
augmentation for
aesthetic reasons
entered the study.
They were
separated into three
cohorts, one group
($n = 14$) received
bilateral PEMF
treatment, the
second group ($n =$
 14) received
bilateral sham
devices, and in the
third group ($n = 14$)
one of the breasts
had an active
device and the other
a sham device. A
total of 80 breasts
were available for
final analysis.

(POD) 7.
VAS data showed
that pain had
decreased in the
active cohort by
nearly a factor of
three times that for
the sham cohort by
POD 3 ($p < 0.001$)
and persisted at
this level to POD
7. Patient use of
postoperative pain
medication
correspondingly
also decreased
nearly three times
faster in the active
versus the sham
cohorts by POD 3
($p < 0.001$). Pulsed
electromagnetic
field therapy,
adjunctive to
standard of care,
can provide pain
control with a
noninvasive
modality and
reduce morbidity
due to pain
medication after
breast
augmentation
surgery.

Iannitti, Fistetto,
Esposito, Rottigni,
& Palmieri (2013).
Pulsed
electromagnetic field
therapy for
management of
osteoarthritis-related
pain, stiffness and
physical function:
Clinical experience

Total of 28 patients
between 60 and 83
years old received
PEMF on the right
leg for three 30-
minute sessions per
week for 6 weeks,
while the left leg
did not receive any
treatment.

Magneto pulsar- 16
Hz, intensity was 8
mT for 15
minutes/day for 2
weeks/total
treatments- 6
weeks.

Changes in VAS
scores were
calculated for both
knees as baseline
minus post-
treatment.
A sample
Student's *t*-test
comparing change
in knee-related

in the elderly.
Country - Italy

VAS pain for PEMF- treated leg vs control leg showed a significant decrease in pain in the PEMF treated leg ($p < 0.001$).

Javaherian, Tajali, & Hadizadeh (2017). Effects of pulsed electromagnetic and static magnetic fields on musculoskeletal low back pain: A systematic review.
Country - Iran

Systematic review to evaluate the effects of PEMF and static magnetic fields (SMG) on pain and functional improvement in patients with musculoskeletal LBP. Systematic review/1505 abstracts, 1448 excluded, 6 articles used in review/time frame.

Various devices & doses.
Studies extended 1 year.

The main finding of this systematic review was that PEMF therapy reduces pain intensity and increases functionality in individuals with low back pain.

Jung, Park, & Kim (2017). Effectiveness of pulsed electromagnetic field for pain caused by placement of initial orthodontic wire in female orthodontic patients: A preliminary single-blind randomized clinical trial.
Country - Korea

Open-label single-arm pilot study, 13 pts per site x 4 sites, pts treated at home PEMF 30 min., 2 x a day x 45 days.

Provant Therapy System- 42+4 microseconds repeated every 1000 microseconds.
Other treatments- opioids, NSAIDS, muscle relaxants

ODI, NPRS, VAS. Overall outcome in this study for patients was decreased pain and narcotic use. Subjects responded to PEMF therapy with a clinical decrease in pain. Pain intensity dropped by 44% (back) and 55% (leg) during the course of treatment.

Kramer, Horton, & Tumilty (2015). Pulsed electromagnetic

A randomized, double-blind, placebo-controlled clinical trial with a

3 weeks of active or placebo PEMF, Magnetherp 330 Meditea brand-

VAS, outcome measures. Patients in the active PEMF group had a

energy as an adjunct to physiotherapy for the treatment of acute low back pain: A randomized controlled trial. Country - New Zealand	3-month posttreatment follow-up. Patients ($N=56$) between 40 and 60 years of age, with a diagnosis of SIS, were randomly assigned to receive active PEMF.	2007 9 treatments w PEMF 30 min. q 48 hrs. x 3 wks., both groups performed the same program of exercises that focused on shoulder strengthening.	higher level of function and less pain at all follow-up time frames compared with baseline ($P<.05$)
Kroeling, Gross, Graham, Burnie, S.J., Szeto, Goldsmith, Haines, & Forget (2013). Electrotherapy for neck pain. Country - Germany	Systematic review of 20 small trials for adults; a range of 16 to 336 participants with acute whiplash or non-specific neck pain, chronic neck pain including degenerative changes, myofascial pain or headaches that stem from the neck, studied 1239 participants. Search of CENTRAL, MEDLINE, EMBASE, MANTIS, CINAHL, and ICL	Types and doses of PEMF.	About 70% of the trials were poorly constructed studies. The data were sparse and imprecise, which suggest the results cannot be generalized to the broader population; contributes to the reduction in the quality of the evidence.
Miladinovic, Vavra-Hadziahmetovic, Kadic, & Vrabac (2015). Pulsed electromagnetic field and transcutaneous electrical nerve stimulation in the treatment of lumbar pain syndrome. Country - Bosnia & Herzegovina	Analyze effects of PEMF and TENS in the treatment of lumbar back pain syndrome as single physical modalities, as well as analyze the overall effect of both therapies. 33 patients, double blind placebo RCT, 16 treated w TENS/17 w PEMF/2 weeks.	Magneto pulsar- 16 Hz, intensity was 8 mT for 15 minutes/day for 2 weeks/total treatments=10	VAS- PEMF: SD=1.297 TENS: SD=1.087

	TENS were control group, w 15 min treatments/day for 2 weeks/total treatments=10		
Mumtaz, Ahmad, Waheed, & Shah (2014). Role of pulsed electromagnetic therapy in the management of backache: A study conducted at Armed Forces Institute of Rehabilitation Medicine, Rawalpindi. Country - Pakistan	To determine whether adjunctive treatment with PEMF produced significant variability in chronic low back pain symptoms and secondary health related quality of life, mental health, and disability outcomes.	Quasi Experimental Study Prospective RCT/65 military patients (43m/22F)/PEMF 10 to 20 mins x3/week/total of 3 weeks + usual care. Magnetomed 2000-0 to 100 Hz, intensity 50 to 100 gauss.	NPRS- reduction in pain and functionality.
Nayback-Beebe, Yoder, Goff, Arzola, & Weidlich (2017). The effect of pulsed electromagnetic frequency on health-related quality of life in military service members with chronic low back pain. Country - United States	U.S. military- Prospective, randomized pilot study with repeated measures at baseline, post-treatment, and 1-month follow-up for two groups: usual care (UC) vs. UC + PEMF.	Computer generated random integer generator/low dosage. PEMF 30 minx3/week for 4 weeks, self-administered.	Adjunctive treatment with PEMF demonstrated improvements in service members' overall physical health-related quality of life with expected, yet statistically nonsignificant, improvements in reported pain and LBP-related disability. There were significant[1] differences between groups in anxiety symptom severity with higher symptoms reported by the UC + PEMF group; surprising findings that warrant

<p>Negm, Lorbergs, & Macintyre (2013). A systematic review with meta-analysis examined efficacy of PEMF and low frequency pulsed subsensory threshold electrical stimulation vs placebo on pain and physical function in people with knee osteoarthritis.</p> <p>Country - Canada</p>	<p>Systematic review- 1505 abstracts, 1448 excluded, 6 articles used in review.</p>	<p>Various/various.</p>	<p>further investigation.</p> <p>1 year , VAS- $p=0.024$, Somatosensory evoked potentials (SSEPs) $p=0.001$, OSW-$p=0.009$.</p> <p>Evidence suggests low frequency (≤ 100 Hz) pulsed subsensory threshold electrical stimulation produced either through PEMF/PES vs sham PEMF/PES is effective in improving physical function, but not pain intensity, at treatment completion in adults with knee OA.</p>
<p>Nelson, Zvirbulis, & Pilla (2012). Non-invasive electromagnetic field therapy produces rapid and substantial pain reduction in early knee osteoarthritis: A randomized double-blind pilot study.</p> <p>Country – United States</p>	<p>RCT enrolled 34 patients with an initial VAS > 4.</p>	<p>Quec Phisis 100 KHz.</p>	<p>Results revealed VAS pain score decreased in the active cohort by 50 ($p<0.001$).</p> <p>The results suggest that PEMF can have a significant and rapid impact on pain due to OA.</p>
<p>Niezgoda, Hardin, Kubat, & Acompanado, (2014). The</p>	<p>Case describes a 51-year-old woman who reported experiencing</p>	<p>Recovery RX- 1000 pulses/second with 0.03 mT.</p>	<p>When pulsed electromagnetic field therapy was added, the need for</p>

management of intractable pain with adjuvant pulsed electromagnetic field therapy. Country – United States	severe, constant pain, diffusely located in the region of her right mandible neck.		BTX injections decreased, with the patient reporting a noticeable decrease in pain intensity and an improvement in quality of life measures.
Oke & Umebese (2013). Evaluation of efficacy of pulsed electromagnetic therapy in the treatment of back pain: A randomized controlled trial in a tertiary hospital in Nigeria. Country - Nigeria	RCT- A total of 16 patients (mean age: 42.82 ± 8.63 years). Patients were randomly assigned into two groups. Group A had eight patients treated with PEMF plus medications (analgesics, nonsteroidal anti-inflammatory – diclofenac sodium) while the eight patients in group B were treated with only standard medications.	PEMF device (device & dosage not stated) was applied in group A four times a day for the period the patients were admitted (maximum of nine days).	Reduction in pain as assessed with numeric pain rating scale (NPRS) Paired and independent <i>t</i> -test to test the significant efficacy of the treatment outcomes in the two groups. There was a statistically significant faster pain relief and resumption of active functions in patients treated with PEMF plus analgesic compared with the rates exhibited by patients treated with standard analgesics alone.
Omar, Awadalla, & El-Latif (2012). Evaluation of pulsed electromagnetic field therapy for discogenic lumbar radiculopathy. Country - Egypt	Double blind placebo RCT, 40 patients suffering from lumbar radiculopathy due to lumbar disc prolapse were randomly assigned to one of two groups: a study group that included	PEMF therapy Magneto pulsar- 16 Hz, intensity was 8 mT for 15 minutes.	2 weeks VAS. PEMF therapy is an effective method for the conservative treatment of lumbar radiculopathy caused by lumbar disc prolapse. In addition to

	20 patients who received PEMF therapy and a control group that included 20 patients who received placebo treatment. Both groups were evaluated at baseline and after 3 weeks.		improvement of clinically observed radicular symptoms, PEMF also seems effective in reducing nerve root compression as evidenced by improvement of SSEP parameters after treatment.
Park, Sun, Lee, Kang, Lee, Hwang, & Cha (2014). Effect of pulsed electromagnetic field treatment on alleviation of lumbar myalgia: A single center, randomized, double blind, sham-controlled pilot trial study. Country - Korea	RCT- To investigate the efficacy of PEMF on the alleviation of lumbar myalgia. Randomized real-sham double-blind pilot study/38 patients/PEMF on acupuncture points 3/week for 2 weeks 2 groups-18 patients (lost 1) same as TrGrp but w power off.	NUGA MRT-II- 820 mT and 8.56 KHz.	VAS, $p=0.0007$ - reduction in pain for control group.
Pawluk, Dennis, & Tommerdahl (2017). Tracking the effects of pulsed electromagnetic field (PEMF) on individuals with a history of traumatic brain injury (TBI) with the Brain Gauge. Country – United States	Eight participants who had suffered mild, moderate, and severe TBI.	Magnetomed 2000-0 to 100 Hz, intensity 50 to 100 gauss.	Brain Gauge- Results revealed that patients reported improvements in brain health and cognitive function over the course of the study. Significant improvements were in patients' CNS function and overall brain health.
Rawe (2016). Pulsed radio frequency electromagnetic field	Quasi experimental prospective, randomized pilot	Computer generated random integer generator-	Pain was reduced substantially on a daily basis, with

<p>therapy for menstrual pain: A double blind, randomized and placebo-controlled pilot study. Country - England</p>	<p>study. 91 women with self-reported pain randomly assigned a number coded PEMF device, either active or placebo.</p>	<p>low dosage. PEMF- wore the PEMF device from the onset of their symptoms, for 24 hours a day for 5 days, while recording their VAS pain scores.</p>	<p>the study group reporting a 31% decrease in pain compared to the placebo group 77% study group subjects reported a decrease in pain compared to the 14% in the control group. Results suggest that PEMF can be used as a drug-free treatment modality for women suffering from dysmenorrhea.</p>
<p>Robertson Juen, Theberge, Weller, Drost, Prato & Thomas (2010). Evidence for a dose-dependent effect of pulsed magnetic fields on pain processing. Country - Canada</p>	<p>Functional magnetic resonance imaging (fMRI) was used to investigate the dose-response relationship (sham, 100, 200, 1000 microT) between a pulsed extremely low frequency magnetic field (ELFMF) and acute thermal pain on the dominant right hand.</p>	<p>Forty-seven participants were recruited, and pulsed ELFMF was applied through the MRI gradient system using a novel technique. NUGA MRT-II- 820 mT and 8.56 KHz.</p>	<p>Significant correlations between applied field strength and change in BOLD activity were found in the anterior cingulate and the ipsilateral insula, indicating that there might be either a dose response or a threshold effect of the ELFMF.</p>
<p>Rodhe, Chiang, Adipoj, Casper, & Pilla (2009). Effects of pulsed electromagnetic fields on IL-1beta and post-operative pain: A double-blind, placebo-controlled pilot study in breast</p>	<p>Prospective, double-blind, randomized trial of 40 patients, 3 cohort groups: (1) patients with bilateral PEMF treatment, (2) patients with bilateral sham devices, and (3)</p>	<p>PEMF devices were placed in compression bras.</p>	<p>VAS, pain recordings were obtained twice daily through postoperative day (POD) 7. Patient use of postoperative pain medication correspondingly also decreased</p>

reduction patients. Country – United States	patients with 1 sham and 1 PEMF device.		nearly three times faster in the active versus the sham cohorts by POD 3 ($p < 0.001$). PEMF can significantly reduce pain as well as narcotic use in the postoperative period.
Saggini, Bellomo, Saggini, Iodice, & Toniato (2009). Rehabilitative treatment for low back pain with external pulsed electromagnetic fields. Country - Italy	30 subjects have been studied suffering from LBP with monolateral sciatica.	Quec Phisis- f 40 minutes to a sequence of electromagnetic fields of low intensity (at the most 1-2of the value of the earth’s magnetic field) with inferior frequencies at 100 KHz for a number of 10 sessions every three weeks.	The study of the VAS has shown a meaningful variation with initial values of 8 and final of 3.8.
Sorrel, Muhendorf, Moffett, Stevens, & Kesten (2018). Evaluation of pulsed electromagnetic field therapy for the treatment of chronic postoperative pain following lumbar surgery: A pilot, double-blind, randomized, sham-controlled clinical trial. Country – United States	RCT conducted in a tertiary hospital in Nigeria. 16 patients (mean age: 42.82) were randomly assigned into two groups. Group A had 8 patients treated with PEMF plus medications, while the eight patients in group B were treated with only standard medications.	Empulse 301 Participants underwent 15 months of treatment- 4 times a day for 9 days	Numeric pain rating scale. Data were analyzed with paired and independent <i>t</i> -test to test the efficacy of treatment outcomes. Patients treated with PEMF experienced faster pain relief and resumption of active functions compared to patients treated with only medications.
Sværdborg, Momsen, & Damsgaard (2016). Pulsed	Double-blind, placebo-controlled study; 60 healthy women were	The PEMF device was placed, covering the entire breast mound on	VAS-Results were inconclusive, and researchers were unable to verify

<p>electromagnetic fields for postoperative pain treatment after breast augmentation: A double-blind, placebo-controlled study.</p> <p>Country - Denmark</p>	<p>treated with PEMF after having a submuscular breast augmentation for aesthetic reasons ($n = 30$) or inactive ($n = 30$) treatment with PEMF after their surgery.</p>	<p>each side.</p>	<p>earlier reports regarding the effect of PEMF on postoperative pain after breast augmentation.</p>
<p>van Bergen, Blankevoot, Hann, Sierevelt, Meuffels, d'Hooghe, Frips, van Damme, & van Dijk (2009). PEMF after arthroscopic treatment for osteochondral defects of the talus: Double blind randomized controlled multicenter trial.</p> <p>Country - The Netherlands</p>	<p>Prospective, double-blind, RCT multi-center trial in the conducted in five centers. PEMF was applied after arthroscopic surgery on 68 patients.</p> <p>Participants were randomized to receive either active PEMF-treatment or sham device.</p> <p>All patients, physicians, and medical assessors were blinded.</p>	<p>PEMF at 1.5 mT, 75 Hz after arthroscopy for 4 hrs./day x 60 days</p>	<p>Numeric scale.</p> <p>PEMF use improved all outcome measures and may be particularly suitable for ODs of the talus since its bone-healing capacity has been proven.</p>
<p>Vavken, Arrich, Schuhfried, & Dorotka (2009). Effectiveness of pulsed electromagnetic field therapy in the management of osteoarthritis of the knee: A meta-analysis of randomized controlled trials.</p> <p>Country – Unied States</p>	<p>A systematic review of PubMed, EMBASE, and the Cochrane Controlled Trials Register.</p> <p>RCTs reporting on the blinded comparison of pulsed electromagnetic fields with placebo were included.</p> <p>RCT, 40 pts 20 had PEMF, 20 placebo, 20 min daily x 3 wks.</p>	<p>Nine studies, including 483 patients, were pooled. No significant difference could be shown for pain (weighted mean difference 0.2 patients; 95% confidence interval (CI): -0.4 to 0.8) or stiffness (weighted mean difference 0.3; 95% CI: -0.3 to 0.9). There was a significant effect on</p>	<p>Pulsed electromagnetic fields improve clinical scores and function in patients with osteoarthritis of the knee and should be considered as adjuvant therapies in their management. There is still equipoise of evidence for an effect on pain in the current</p>

<p>Weintraub, Herrmann, Smith, Backonja, & Cole (2009). Pulsed electromagnetic fields to reduce diabetic neuropathic pain and stimulate neuronal repair: A randomized controlled trial. Country – United States</p>	<p>Randomized, double-blind, placebo-controlled parallel study. Subjects ($N=225$) with DPN stage II or III were randomly assigned to use identical devices generating PEMF or sham (placebo) 2 h/d to feet for 3 months.</p>	<p>activities of daily living (weighted mean difference 0.8; 95% CI 0.2-1.4, $p = 0.014$) and scores (standardized mean difference 0.4; 95% CI: 0.05-0.8, $p = 0.029$). Only statistically insignificant differences seen between studies with different treatment protocols.</p> <p>PEMF- device?- & dosage?</p>	<p>literature.</p> <p>Pain reduction scores using a visual analog scale (VAS), the Neuropathy Pain Scale (NPS), and the Patient's Global Impression of Change (PGIC). A subset of subjects underwent serial 3-mm punch skin biopsies from 3 standard lower limb sites for epidermal nerve fiber density (ENFD) quantification. No significant differences between PEMF and sham groups in the NP intensity on NPS or VAS.</p>
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Appendix B. IRB APPROVAL



Institutional Review Board
Division of Research
777 Glades Rd.
Boca Raton, FL 33431
Tel: 561.297.1383
fau.edu/research/integrity

Michael Whitehurst, Ed.D., Chair

DATE: January 24, 2019

TO: Dr. Charlotte Barry, PhD
FROM: Florida Atlantic University Health Sciences IRB

PROTOCOL #: 1365705-1
PROTOCOL TITLE: [1365705-1] Descriptive Exploratory Study of Individuals Use of Pulsed Electromagnetic Fields, the Micro-Pulse, for Pain Relief

SUBMISSION TYPE: New Project
REVIEW CATEGORY: Exemption category # A2

ACTION: DETERMINATION OF EXEMPT STATUS
EFFECTIVE DATE: January 21, 2019

Thank you for your submission of New Project materials for this research study. The Florida Atlantic University Health Sciences IRB has determined this project is EXEMPT FROM FEDERAL REGULATIONS. Therefore, you may initiate your research study.

We will keep a copy of this correspondence on file in our office. Please keep the IRB informed of any substantive change in your procedures, so that the exemption status may be re-evaluated if needed. Substantive changes are changes that are not minor and may result in increased risk or burden or decreased benefits to participants. Please also inform our office if you encounter any problem involving human subjects while conducting your research.

If you have any questions or comments about this correspondence, please contact Donna Simonovitch at:

Institutional Review Board
Research Integrity/Division of Research
Florida Atlantic University
Boca Raton, FL 33431
Phone: 561.297.1383
researchintegrity@fau.edu

* Please include your protocol number and title in all correspondence with this office.

**This letter has been electronically signed in accordance with all applicable regulations,
and a copy is retained within our records.**

Appendix C. Letter of Cooperation

Micro-Pulse LLC

Letter of Cooperation

10 October 2018

To the Florida Atlantic University (IRB):

I am familiar with Stacey Ravid RN, MSN, CNS, PhD Candidate's research project entitled Individuals Experience of Using (PEMF)- the Micro-Pulse, for Pain Relief.

I understand that the involvement of my company, Micro-Pulse LLC, to be to invite our customers to volunteer to be interviewed by Stacey Ravid for her research project.

I understand that this research will be carried out following sound ethical principles and that participant involvement in this research study is strictly voluntary and provides confidentiality of research data, as described in the protocol.

Therefore, as the institutional authority of Micro-Pulse LLC, I agree that Stacey Ravid RN, MSN, CNS, PhD Candidate's research project may be conducted in collaboration with my office.

Sincerely,



Robert G Dennis, Ph.D.

Owner and Chief Scientist, Micro-Pulse LLC

Appendix D. Micro-Pulse Equipment



Appendix E. Email Correspondence to Participants

Hello,

I would like to introduce you to Stacey Ravid RN, MSN, CNS, Ph.D. Candidate who is conducting valuable nursing research on the Micro-Pulse. She has been a nurse for 23 years and is completing her PhD in nursing at Christine E. Lynn College of Nursing at Florida Atlantic University. This graduate researcher's focus is Solutions for the Opioid Epidemic- Holistic Modalities for Pain Relief.

For any period of time, if you have used the Micro-Pulse and experienced pain relief of any kind, or even if you did not experience pain relief, would you be willing to be interviewed by this researcher?

Objectives of this research study:

1. Explore solutions for the opioid epidemic.
2. Understand the individuals' experience who have used, or are using, the Micro-Pulse for pain relief, including those individuals who used the Micro-Pulse for other purposes, but experienced pain relief.
3. Develop a holistic approach to care for individuals in pain; including assessments, treatment, and management of painful conditions.

Participants Contributions:

- Complete a phone or skype interview with the researcher.



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Approved On:	January 21, 2019
Expires On:	Not Applicable

Appendix E. Email Correspondence to Participants

- Answer 7 demographic questions.
- Answer 9 questions about your experience using the Micro-Pulse.
- Tell your story about your illness, if you choose to.
- Your total time commitment will be approximately 30-60 minutes.
- Phone or skype interview will be conducted when it is most convenient for you.
- Any information you share will be kept confidential and secure and your name will not be revealed.

The researcher will conduct the interview alone from her home office in North Carolina. There is no reward or compensation for your participation in this research study. This study will address the gaps of prior research related to the Micro-Pulse for pain relief.

If you are willing to be a part of this research, please respond to this email by letting me know if you are interested in participating.

Then I will forward the email to the researcher and she will contact you.

Thank you for your consideration in this research study.



1365705-1	
Approved On:	January 21, 2019
Expires On:	Not Applicable

Appendix F. Consent Form

ADULT CONSENT FORM

Consent Form Version & Date Version 4.0 – January 16, 2019

1) Title of Research Study: Descriptive Exploratory Study of Individuals Use of Pulsed Electromagnetic Fields, the Micro-Pulse, for Pain Relief

2) Investigator(s): Dr. Charlotte Barry PhD- PI, Stacey Ravid -Graduate Student Researcher

3) Purpose: The objective of this descriptive exploratory study is to understand the experience of using the Micro-Pulse for pain relief.

4) Procedures:

- You will complete a 30-60-minute phone or skype interview.
- You will complete 7 demographic questions through a secure link via REDCap.
- You will be asked 9 questions about your experience using the Micro-Pulse.
- Your total time commitment will be approximately 60 minutes.
- The phone or skype interview will be conducted when it is most convenient for you.
- There is no reward or compensation for your participation in this research study.

5) Risks:

Risks to the participants include the potential to elicit emotions and feelings that might be difficult while answering and reflecting on the research questions. A provision to diminish these risks include: allow you to share as much of your story as you want to share, do not interrupt, and the researcher will be an active listener. Otherwise, there are no foreseeable risks for participating in this study.

6) Benefits:


Participation in this study may not directly benefit you. Participants may feel that they are contributing to nursing research and the body of knowledge related to pain treatments due to their involvement in this study. The benefits of this research study could contribute to nursing science by understanding patients in pain, their decisions around treating their painful conditions, benefits or detriments of implementing holistic modalities, and strategizing solutions for patients care based on these understandings. This deeper understanding is necessary for implanting solutions that could potentially decrease the number of individuals using opioids, addicted to opioids, and overdosing on opioids.

7) Confidentiality/ Data Collection & Storage:

Data will only be accessed on the BHRIC, maintaining confidentiality for all the information. The College of Nursing IT Director provided the researcher access to the BHRIC via computer with two-factor authentication. These qualitative data interviews will be transcribed by the researcher. There will be no other identifiers that link the individual to the interview. The researcher plans to use this information for a nursing PhD dissertation study and publish and present what is learned from this study.

REDCap and BHRIC data management programs will be used to maintain confidentiality. Any information from you will be kept confidential and secure and only members of the research study team will see your data, unless required by law. The electronic and paper data will be kept for three years in electronic and paper format. After three years, the paper copies will be destroyed by shredding and electronic data will be deleted. Sometimes researchers need to share information that may identify you

Consent_1_Adult Consent Template FAU/RI: Version 5.0 – 8/23/2018

	1365705-1	
	Approved On:	January 21, 2019
	Expires On:	Not Applicable

and your research records with people that work for the University, the Institutional Review Board (IRB), Research Integrity staff, regulators or the study sponsor. These people are responsible for making sure the research is done safely and properly. If this does happen, we will take precautions to protect the information you have provided. We may publish what we learn from this study. However, your name and organization will not be provided in either the presentation or publication.

8) Contact Information:

- If you have questions about the study, you should call or email the investigators **Dr. Charlotte Barry (561)-297-2998 or cbarry@health.fau.edu** or **Stacey Ravid** at [REDACTED] or sravid@health.fau.edu
- If you have questions or concerns about your rights as a research participant, contact the Florida Atlantic University Division of Research at (561) 297-1383 or send an email to researchintegrity@fau.edu.

9) Consent Statement:

-
- I have read or had read to me the information describing this study.
- All my questions have been answered to my satisfaction.
- I am 18 years of age or older and freely consent to participate.
- I understand that I am free to withdraw from the study at any time, for any reason, without penalty.

I have received a copy of this consent form


I agree ___ I do not agree ___ be audiotaped/videotaped.

Printed Name of Participant: _____

Signature of Participant: _____ Date: _____

Printed Name of Investigator: _____

Signature of Investigator: _____ Date: _____

	1365705-1	
	Approved On:	January 21, 2019
	Expires On:	Not Applicable

Appendix G. Survey Questions

1. Tell me about the pain you are experiencing, including cause for pain, location, type, frequency, and duration of pain.
2. What do you do to manage/relieve your pain? How well have those treatments worked for you?
3. Why and when did you begin using the Micro-Pulse? How is it used ... where do you apply, for how long at each time, how frequently is it used? How many times each week?
4. How did you learn about the Micro-Pulse?
5. Does your physician (or other primary care provider) know about your use of the Micro-Pulse? If they do know, are they supportive of you using it?
6. Effectiveness of the Micro-Pulse: Does the Micro Pulse reduce your pain?
 - a. If there is a reduction of pain, generally how much does your pain decrease, for how long? (use the NRS 1-10)?
 - b. How does the Micro-Pulse compare to other pain management techniques that you have used?
 - c. Have you continued to use other methods or medications along with the Micro-Pulse?
 - d. Will you continue to use the Micro-pulse? Why or Why not?
7. How much has it cost you to use the Micro-Pulse?
8. How has dealing with pain affected your life, work, and relationships?
9. Is there anything else you would like to tell me about your experience of using the Micro- Pulse for pain relief?

Appendix H. Participant Statement Grid

1. Tell me about the pain you are experiencing including; cause for pain, location, type, frequency, and duration of pain?

Hip, back, arthritis pain in my elbows, sciatic pain from my groin down to my knee, nerve pain, blown a disc, tennis elbow, headaches.

I used it on my mom. She had Alzheimer's, Used it- 6 months or so.

Degenerative disc disease in my back. My pain was pretty bad. It did not take long, it wasn't minutes. It was gradual then it was gone.

I started developing gut problems from Accutane. I dislocated a rib and tore a muscle. I still had joint pain and aches and pains that I attributed to possibly malnutrition, possibly stunted growth from Accutane, almost certainly some injuries from exercising and working out too hard when I was in my early 20's. I had knee problems and that I couldn't walk related to the bone issues

So, at that point, I was dealing with arthritis, particularly in my shoulders. It was very hard to raise my hands, it was

I have been diagnosed with hypermobility syndrome. Pain is more than neck and upper back since my late twenties, Not sure of the cause but I knew it as excruciating. My neck had actually become unstable.

One of them is the low back where I have the stenosis, and the other one are my hips.

sciatica down the left leg, 9 mm hematoma in my lumbar region. pain on my hips.

Around 2006, I had surgery done on both knees, and I just had my left one done again about two weeks ago. the right knee about four years ago, I started getting a lot of pain, sharp pain on it.

Plantar fasciitis in my heels in my feet. I believe I walked the Tungaria crossing in New Zealand in a flimsy pair of shoes. So, I think that is what caused it.

I have degenerative disc disease in my back the pain is more than neck and upper back since my late twenties, Not sure of the cause but I knew

It was not a specific problem I had it was occasional things back pain but what surprised me after got it. I have migraines, I get the aura, since I was in junior high. I'll put it on my low back when I'm driving, and I don't get that sore back when I'm driving.

I have migraines, I get the aura, since I was in junior high.

diagnosed with hypermobility syndrome, I would have horrible muscle pain, They tighten up so tight but when I put this on, oh my goodness, it just relaxes.

Partial herniation at L5 S1, Right now, I have displaced rib around and it has been kind of bugging me and I decided to put the Micro-Pulse on it and already it feels better. Another week of this, I'm guessing that it will be resolved.

I had originally bought the Micro-Pulse for my daughter. She had suffered from back pain for many, many years. It was becoming debilitating and she was becoming desperate.

2. What do you do to manage/ relieve your pain? How well have those treatments worked for you?

difficult to sleep, and I didn't want to take pills. So, I said I'll get a Micro-Pulse and use it for that.

pain is at the tail bone.
sacral pain in the L3, L4,.

I blew out my L5 disc. We learned about the Micro-Pulse because my wife had Huntington's.

I tried every modality that I knew at the time: magnesium soaks, mag oil, prolozone injections, TENS device, turmeric and bromelain.

But, after I started using the Micro-Pulse and going to the osteopath there was significant improvement, in whatever terms the osteopath would use to adjust what had to be fixed. It's like the body had the energy to stay put.

Oxycodone.

I have tried cold laser, but his device has been the most effective for me. Cold laser has been

it as excruciating. I had an upper respiratory about two years ago. I coughed and coughed, and I started having incontinence.

Both knees.

I learned about the Micro-Pulse technology two and a half years ago. I read about it on a blog.

I am on zero medication. spinal decompression, chi machine, inversion, Evasia.

Medications

But I no longer take anything for pain whatsoever.

stem cells.

I was going for a little physical therapy here and there. It would help a little bit but not too much, so I decide to use Bob's Micro-Pulse. I take nutrients also; I take a lot of nutrients.

bio resonance device, I had some really good results, but I have to keep using something to help

The main thing I got it for was, actually, my dog. Because he couldn't get up in the car and he could get up in the car after I used it. I used it on myself the first day before I put it on him. I had an ankle injury from I think 2010, 2011. I had a foot and ankle injury.

I started using the Micro-Pulse about two years ago, around January of 2017. dislocated a rib and tore a muscle.

a pulled muscle but it was severe pain in my lower back.

Drink a strong coffee or take ginger and then lay down and shut my eyes.

I usually do things like drink a strong coffee or take ginger and then lay down and shut my eyes.

Then I remembered the Micro-Pulse, so I put that on my hip, and that's gone. I hurt my knee, I put that on, within a few days that was gone. I've used it on my wrist, my back, my knee. If I lift something heavy, I use it. I always have the Micro-pulse with me. I wear it a lot.

something that's been good too. I have used off and on hydrocodone. I've done things like that. I try to really stay away from any oral medication or pharmaceuticals cause this has really been the most effective thing I could do.

me. I have done the ketogenic diet with success for inflammation, basically.

They put me in a cast, and I did physical therapy in about 12 weeks. I was limping along. Then it went into the winter and it still really hurt. What I noticed over the next couple of years is it really hurt in the winter, in particular. I could tell the weather from my ankle and foot. I had to put my feet up, they would swell. They sent me to a place to get special shoes that had ankle stability and insoles. I would ice it, heat it and elevate it a lot. I lost the ability to walk upstairs normally or walk downstairs. It definitely impacted walking the dog. Sometimes my sleep would be affected. There was definitely pain and immobility. Years later, I was still dealing with the swelling.

I would go in and they would give me Motrin 800 and they always told me you are fine.

I had bursitis in my hip, it was disabling. It hurt so bad. He gave me a steroid shot that wore off, another steroid shot,

I would say the unit definitely works.

the only thing that really helped was the Tylenol- Norco, with hydrocodone and Tylenol in it.

Motrin 800 and they always told me you are fine.

osteopathic doctor.

that wore off, they said the next thing you are going to have to have is an epidural.

physical therapist,
DMSO.

3. Why and when did you begin using the Micro-Pulse? How is it used... where do you apply, for how long at each time, how frequently is it used? How many times each week?

I slept with it all night, So I put it up my back on the wing bones toward the left side and then up that side of my neck to the hairline.

I put the unit on my knee at the bottom and I was wearing it every day from September to Christmas, about 4 or 5 months, every day I was wearing it from ten to 20 hours a day. I try to wear it every day. - A minimum of 10 hours. The longer you wear it, the better you are. Something like this- I use it on a high setting, too. I used it March, April, May, June, say 5 months.

The Micro-Pulse- I have been using over the last three years. I bought a bigger Micro-Pulse and it had 4 big attachments.

I can tell you it is very soothing. I can carry it wherever I go. I can wear it like several hours a day.

I put it on my lower back. I wish I could remember how long

We put it on either side of her head, two hours in the morning and two hours in the afternoon. She was at a point where she couldn't read or comprehend, couldn't focus.

wearing one almost every day.

My wife and I have been using it.

The heels are on the liver line, so I put the coils on my liver on either side of my body, and that actually started to relieve the pain in my heels. initially for one hour and it was 10 - 15 of power, the setting.

Every morning I use it and if I have time at night, I use it. That's like 20 minutes max in the morning. In the night, when I get home, I try to use if, maybe lay down for 20 minutes.

My wife and I would turn the device onto 4 hertz at 5 pulses per second and we would put the dial, the coil on a suspected area of

I first got the Micro-Pulse in May of 2016, I learned about it on the internet just surfing around. I just put it on my neck and within minutes, the migraine went away.

on the lowest setting is enough for me, The relief it would give is amazing. My back muscles don't hurt anymore.

So, I met Bob many years ago because I was really interested in his pulsed electromagnetic fields and decided to try and put that on there.

I bought the Micro-pulse and I used it for a couple of weeks before it made much difference.

It would feel like somebody oiled my entire neck. The inflammation was gone. The pain was gone.

I put the unit on my knee at the bottom and I was wearing it every day from September to Christmas, about 4 or 5 months, every day I was wearing it from ten to 20 hours a day.

it took. It did not take long, Since then I've used it for lots of stuff.

I started using the Micro-Pulse about two years ago, around January of 2017. I saw a practitioner and he was using it in Nashville, Tenn. In 2012. I was going on YouTube and I was reading about magnet therapy. It was actually Joe Cohen's interview with Dr. Dennis in the fall of 2016. I let it go for about 4 hours and then I couldn't tolerate it anymore. It didn't hurt but my body was truly, I could feel, regenerative energy. I wore it like that every day for a year

If I get in a bad situation, with muscle spasms, I know to wear it. I'll come home and I'll wear it. I'll wear it before I go to work. Sometimes, I find it super effective. Other times, it is not as effective especially because of the placement of the coils. But if I'm really having a hard time, you know, it brings me down from an 8 to a 4 pretty quickly. When I say quickly, in a 30- minute time frame, especially if I lay

injury. I would put it on my collar bone. Then I would use muscle response testing, because I was familiar with the type that Dr. Roth was using that is more complicated. I would put the coil on a suspected area of injury and then my wife would test my arm strength.

I take two of his units with me to work every day. The A-9 units on my lower back and hips, sometimes I move it to the front of my hips. I just pull it where it hurts, and I put it there. 3 hours post op, I put on a Micro-Pulse over the incision over a bandage. The only time I took it off was when I took a shower. I wore it for six weeks.

Looked online and I thought I'll try it and when the neck would get so stiff, I got the A-9. That particular one that has the two extensions. Because the rise in my neck I could only place them directly there, use it for like approximately 20 minutes.

I try to wear it every day. - A minimum of 10 hours.

I just remember I immediately felt something. I could feel it. I let it go for about 4 hours. My wife and I would turn the device onto 4 hertz at 5 pulses per second and we would put the dial, the coil on a suspected area of injury.

So I use it adhoc, as needed treatment. With his coils, I came back around 5 months. Which is pretty good. So, putting two coils side by side right on L5 S1, and did it like all day and all night too.

down with it. I've used it on and off for these two and a half years. I used this this technology religiously. . I am not completely out of pain. I don't want that to be something I relay across. It's been super effective the more I can use it. My biggest problem is as I start to feel better with it, and you want to go do things.

4. How did you learn about the Micro-Pulse?

Heard about it from Dr. Shallenberger's. He's an MD Naturopath.

I saw Dr. Dennis on a video with Joe Cohen.

In research, I came across the PEMF technology and then more and more I got into it.

Then in research in trying to figure out how to get off these pills, I came across PEMF.

It was through Dave Asprey. Are you familiar with bulletproof.com? I met Bob and we have been in touch for many, years over.

My brother is a horse trainer and he uses the Micro-Pulse on horses for muscles and he has seen results from that.

Then in research in trying to figure out how to get off these pills, I came across PEMF. In particular, the ICES.

I found out about the Micro-Pulse on YouTube.

I found about it on accident.

I went on the internet and researched chronic pain and then I found articles, because I like to go to PubMed. I found articles on pulsed EMF. In researching different methods of the pulsed EMF, I came across the Micro-Pulse online.

I got on YouTube and put in PEMF, researching you YouTube and I found Dr. Dennis and I saw that the Dr. who was paralyzed for 25 years and they put it on him, and he started running again. bought the Micro-Pulse looking at the QRS and Bob Dennis' research.

I saw Dr. Pawluk had it.

My wife had learned about it. I did a lot of research online. I am a nurse myself. I was impressed with Dr. Dennis' research and thought I would give it a try.

I learned about it online and I was actually looking for something for my dog because he stopped jumping up into my car. My sister in law tore up the meniscus in her knee.

5. Does your physician (or other primary care provider) know about your use of the Micro-Pulse? If they did know are they supportive of you using it?

I saw Dr. Dennis on a video with Joe Cohen.

I think I was looking at PEMF units and ...oh man, it must have been something online, I saw Dr. Pawluk had it.

Yes, supportive.

I told them but nobody even cares.

No.

Nobody looked into it any further or wanted to know more information.

No I don't tell them. You know? Modern medicine today, they don't believe in any stuff like that. They don't. I showed it to my physical therapist and she said if it works, do it.

My surgeon was supportive, he said I understand there are

I had been interested in looking at something that was PEMF or the other machines that use coils, word of mouth from Australia.

No, cause I wasn't really ready to advertise that I was using the machine on my mom's head that we use on horses muscles.

I've told them about it, but I don't think they even have a clue.

I told them but nobody even cares.

I do not use doctors or practitioners. I treat myself.

Yes, actually my orthopedic surgeon knew that I was using it. In fact, I've actually told him and any main doctor that has been involved in my spine issues, I've told them about it.

In fact, my therapist he's been very fascinated by it, He

These two things happened at the same time. So, I was looking for something more. I was thinking for other people. I was looking at PEMF, infra-red, cold laser. I was looking at everything.

I saw a practitioner and he was using it in Nashville, Tenn. In 2012.

Actually yes. But I have a unique physician. I go to a longevity clinic. So, they are more open. In fact, she asked me to send her links with information and she told some of her other patients. She got feedback from one of them she knows bought it and she told me they cut their pain meds in half by using that.

I haven't talked to my doctor about it and I don't think he would be supportive because it is pretty out there.

My personal care physician was a little more progressive and

6. Effectiveness of the Micro-Pulse: Does the Micro Pulse reduce your pain?

many things that help different people.

Since then, I've searched out more open providers and they are more supportive of it. My chiropractor knows about it. She has seen some amazing results with this one woman who had a broken foot and basically was up and walking within 3 weeks. Pretty amazing. Used the device every single day on it for a six-week, possible recovery got cut in half.

It was really helpful in relieving the headache and tension through the back.

Excruciating pain. The relief it would give is amazing. My back muscles don't hurt anymore.

I went to a physical therapist and put my Micro-Pulse on, and it was gone.

I don't do it every day like medicine

I didn't read the directions and I put the bump sides on my body, on my ankle because that had been hurting me the most at that time. I just remember I immediately felt something. I could feel it. I looked at the directions and I was like, oh, my gosh, I

wants to see it. My surgeon was supportive, he said.

I understand there are many things that help different people.

No, I did not. I will tell you something. When you are trying things that are on the internet, people who are professionals tend to be weary of it anyway.

Within a few days, we could see she was more aware of what was going on. Within a week, she was able to start reading a newspaper again which she always liked to do.

So, I started wearing it at least 8-10 hours a day and it significantly reduced the pain to where it was manageable. I literally just taped it on my back, the circles.

Overall, I have down and out days. What I had to deal with was ridiculous pain and now I don't deal with that ridiculous pain. Before it was a 9, honestly, I was at my wits end. I will tell you the drug they gave me did not help

he didn't have a problem with it. I don't know if he ever looked into it. He did take down the information on it.

No, I don't tell them.

He didn't really comment on it. I don't think he had a framework for what was going on.

But I think it helped it to heal much faster from sleeping on that mat. I carried it around, but I continued to heal while sleeping on that mat. I don't use it as much for chronic pain. I use it for a preventative and to help take inflammation down and to prevent migraines.

The thing works well for any type of inflammation. Before, it was constant, horrific, ridiculous pain that affected everything in your life, Now, I feel like I'm normal for me that I didn't have in a long time.

It's the most effective pain reliever I have found. It has been the

did this wrong. I wrapped it with some gauze and I put the setting on low, it was so potent on low and I just, when I turned it up, I felt like someone was just squeezing my knee, there was no pain but it was very evident that the body was doing something, locally in that area.

That was like a 3 to 4 level pain all the time, especially in the winter. I cannot remember the last time I was in pain. I can't remember the last time I hesitated walking up or down stairs. I bought regular sneakers without spending money for the insoles. But it was almost overnight, I put it on my ankle, and I could move my ankle and foot. And I am going to tell you, it never went back. I never got a level 3 pain again. From the time I started using it got better so fast that I tried it on my shoulder and the lower back. I had the same experience with the shoulder.

a. If there is a reduction of pain, generally how much does your pain decrease, for how long? (use the NRS 1-10)?

last night, my elbow pain was about a 7 or 8, this morning it is a 0. It was about a 6 to 7. After using it for about two days, it was a 1.

me it made it worse because of the inflammation and my sensitivity to histamines.

One night at work, I was limping really badly, then after 4 or 5 months I was not limping.

I think it's the Micro-Pulse, 100 %, got me back faster.

It's very effective for muscle spasms. I will say, the more time you can commit to wearing it, the better results you get. It's really been a life saver for me.

I could not sit through church service and I could not sit in dining room chairs because of my back. That has not happened since I used this machine.

I know, I feel, I can't prove it obviously, it extended her life, so to speak, better quality, if you can understand at that stage.

most effective thing for me. The hardest thing for me has been to carry it around at work. People don't understand if you want to put coils on your neck.

But eventually the pain went away and I don't have any pain in my shoulders now. I've used it on my teeth. I have had two teeth extracted at different times and a dental implant put in with the last one. I have found the Micro-Pulse to be very helpful with the pain and swelling. I haven't had to take any pain medications after the implant or after the extractions. It has kept all the symptom to a minimum. So, I have used it for that as well. I've used it for plantar fasciitis. I used to get bouts of plantar fasciitis. When I feel it coming on, I just put the zapper on it and it will fade away again. I use it for a lot of different things.

my pain was probably a 7, at times, it was down to 4 or 5.

8, after, it was 0.

6-to 7 the most. After I used it, after 4-5

at the time it was a 10, Now, it's not there.

From a 3 to a 1.

I'm sure at the time it was a 10, Now, it's not there.

It was around 6-to 7 the most. After I used it, after 4-5 months, it was a 0.

Before it was a 9, my pain level is a 0, Before, it was constant, horrific, ridiculous pain that affected everything in your life. Now, I feel like I'm normal for me that I didn't have in a long time.

b. How does the Micro-Pulse compare to other pain management techniques that you have used?

I think a part of that is getting on top of that at the beginning of the pain cycle.

I did not try other.

I used it every day for at least a half an hour to an hour.

chiro, deep tissue therapy.

the only thing I tried was heat and ice. it's the most effective pain reliever I have found.

Acupuncture, chiropractic, I did do

I lived at like 6 to 7. After, I was like 3 to 4.

It never gets up into the tens like it used to, a 7 or an 8. I put this on and I guess it goes down to... it's hard to say, a zero.

10, it was pretty intense. After the Micro-Pulse, it gets dull. I would say around 4 or 5, half the intensity.

With the shoulder, when I did not use the shoulder, it didn't hurt. If I tried to move it, if I forgot and reached up for something, it was pretty bad. I would say 7 to 8 on the scale. It was really limiting my movements because it was so painful. After I finished using it, I basically don't have any pain anymore.

My daughter was having stomach problems, she was constipated. Thirty minutes after putting it on her stomach she had a bowel movement.

Cerium.

Well, I have used ice, massage, and hot baths. I have tried Ibuprofen and Tylenol 3s. I don't like Tylenol 3s. They are terrible for you. My daughter has tried

months, it was a 0. my pain level is a 0 while I'm talking to you.

I would say most of the time it was like a 6-8, something around there. Then during the day, it would drop down to 2 with the device on.

8 to a 3. I am in o pain. O back pain, 0 shoulder pain and 0 ankle pain.

I don't think I've taken any Tylenol or any of that since I got the ICES.

I did acupuncture, it helped a little bit, and it was arbitrary.

Let me go back to one more thing. I used it on my neck because my arm really started hurting and my fingers were numb at the tip. I went to the ER and it terrified me, of

cold laser, but I didn't know how to do it on my back. I found it not convenient. This was convenient because I could wrap it around my ankle and wrap it around my shoulder. I liked infrared heat. I liked it a lot, but it used up so much of my electricity, plus I lent it out. I liked that it helped, even the warmth helped.

I feel like my circulation improved. I can definitely look at my feet and I do not have one swollen and one not. I don't have cold hands and feet anymore. It feels like something really happened. The infrared I was interested in was 20,000. I may have gotten one for 5,000.00.

c. Have you continued to use other methods or medications along with the Micro-Pulse?

Advil, Occasionally, I'll take an Alievie. Typical medication and I did take it. Then I stopped.

I was using infrared, too. I remember talking to my mother, it was like the 1980's when my shoulder hurt, and I was at a high-level pain. It was a low-level pain when I woke up in the morning. Sometimes I wouldn't lift my arm to high. I know I went to a chiropractor in the 80's for my

a whole bunch of different things. My daughter had tried everything, I mean everything for her back pain. Yoga, acupuncture, injections. Botox or some dammed thing. She had all kinds of things, none of them made a difference. She also took very strong pain killers and went to the back-pain clinic and talked to someone about possible surgery and she decided not to proceed with it. Her pain was much worse than mine.

We started using medicine to keep her comfortable.

I'm very anti meds. This has always been better than pain medication, always. I'll use DMSO. That helps.

On no, I stay away from that stuff, I hate that stuff.

course. They said go to the heart hospital. They want to give you medication. Everyone wants to give medication. I went to a physical therapist and put my Micro-Pulse on and it was gone.

I've always avoided taken pain medications. It totally replaces any other pain meds for me.

OxyContin and OxyContin MR.

shoulder and back pain. When I first got the injury, I took Advil. I remember one whole weekend when I had to lay still. The Advil worked eventually. All of it was low level pain. At times I wouldn't be able to do anything for a whole weekend because of the back pain.

hydrocodone and a muscle relaxer, Tylenol- Norco, with hydrocodone and Tylenol in it.

oxycodone before, heat and ice.

d. Will you continue to use the Micro-pulse? Why or Why not?

Yes.

Yes.

yes, This has always been better than pain medication, always.

I'll tell friends who are having pain. Its \$400.00 and nobody is going to take a chance on it. I wish there was some way they could rent one for a month and take their credit card. Let them use it. I think if anybody uses it, they would love it. But nobody will spring for that. I am so glad I did. Because. It's worth much more. It is fabulous, wonderful. I've started trying to use it for something else right now.

100 percent. It beat everything else. The things I would

Yes, I have no way to prove that the Micro-Pulse did that. My opinion, my brother's, my wife's opinion, my two daughters opinion is, people that were with her all the time, see a difference. In my opinion, without a doubt, the Micro-Pulse stimulated something in her brain to make something connect or something work better.

Oh yeah, I have it on right now as I speak with you.

Oh yea, I've got like 6 of these things. I've had about to 4 on my body at one time.

I use the Micro-Pulse for other things too. I had a problem with muscles in my back

Absolutely and more and more as I learn more. I think it is effective for most pain, if you know where to put it. That's the main thing, knowing where to put it.

Oh yeah, I have it on right now as I speak with you.

Yes.

Oh God yes. It has been a lifesaver. If I lost today, I would buy one tomorrow. I wouldn't tell Dr. Dennis this, if he jacked up the price on this, it wouldn't matter. I would continue to buy it because it has been so effective for me.

continue to use would be the Micro-Pulse and infra-red. That really added to my...I felt the heat really did help. The Micro-Pulse out of all of the stuff worked...it healed me. I had that pain in my back and I started going to a chiro.

and finding that very painful. In particular, one time for 6 weeks I was incapacitated I couldn't bend over. I couldn't roll over. I was useless. So now, if I twinge my back, I will use it prophylactically. I will use the Micro-Pulse on it and it won't develop, it won't get bad.

7. How much has it cost you to use the Micro-Pulse?

\$500
\$ 425, \$1500 altogether
\$400
\$380
500
\$400-450
\$600
\$429
\$675
\$ 425, \$1500 altogether

\$400, I actually bought two of them. It cost me in Australian dollars around \$750, and 600\$ US. It is Canadian funds, so I think it was about \$500 to 600. Something like that.

The small one was around \$1200; no I mean \$400.00. The big one was around \$1200.

I bought his older device. The first one I bought was \$400.00, this last one that you can change, the M1, \$600 for it.

8. How has dealing with pain affected your life, work, and relationships?

It really banged me up and made me goofy, headaches. Cannot work, I couldn't drive a car. Because of the stiffness in my neck. Before I had the Micro-Pulse, it was miserable. So going any place wasn't fun. I remember we were in Amsterdam and I was just miserable. My back hurt. But if I didn't do this... a lot of people depend on me. Again, I am super girl and I am so glad I have this. Before I had the

It made me mean and very short tempered. It has been really difficult. I wear one most every day cause I know my hips are going to eventually hurt. I don't know. I joke that I'm kind of a tough guy. So, I am stoic with respect to pain. I roll with it. People were cringing when they saw me. After, it was just a tremendous amount of energy. Cannot work because my work as a paralegal is research,

I don't think there been a lot of, it's not like I have a chronic pain problem. It's not that applicable to me. Pain is not a huge issue for me. I look at this more as a house thing.

It can be annoying. I don't do any physical work. I sit in a chair all night. Some people don't do anything, they just take pills, and it just destroy your liver after a while.

The pain, when it is bad, does affect relationships because

Micro-Pulse, it was miserable. So, going any place wasn't fun. I would take pain medication. That's no good. The pain goes away for a little while, but you feel awful. Having pain affects my life a lot. Not having pain, makes me super girl.

Oh gosh. It has definitely affected every part of my life. It has made work a struggle. You can't explain it to somebody if they haven't been through a chronic pain state. I use a little device on my neck in the mornings and at night. It is a challenge. It is an absolute challenge. I am divorced. I think that is a big part of my divorce.

It definitely affected it. I couldn't participate in things. I mean walking up and down stairs, I looked like an elderly person. I had to spend a lot of money on sneakers. I mean just the financial burden of dealing with pain and then you do try everything. You try turmeric and supplements. These didn't really help at all. They cost a whole lot of money. And it did not help. If this didn't help, I would

computer work. It gets excruciating, I can't hold a grandchild. I have 8 grandchildren; I can't hold them.

It can be annoying. I don't do any physical work. I sit in a chair all night and route quality control for the network.

It affects every part of your life and it is truly hard to explain that to someone.

Although I can't say the device is a curing agent of pain, maybe I haven't used it so continuously and maybe it would be. I couldn't imagine life without it since I found it. It's enabled me to be able to do things and go to work. It destroys every aspect of your life, it really does.

there is a look on your face that people read and they think you are upset with them, or angry. It is just that you are in pain. You just look happier when you are not in pain. People respond to you a lot better. There are people that don't understand what it is for a person to have physical pain, they get impatient with you.

The shoulder pain made it hard to just do things around the house. It was very hard to lift stuff. It was hard to reach things in the cabinet. I was always having to get someone to help me or it was just kind of an impediment in getting stuff done. I retired about the same time. I had retired just before, so it did not affect my work at all. The plantar fasciitis, I couldn't walk I couldn't get very far at all. The shoulder pain was the worst. That went on for quite a while. A year or two. It was not very much fun. If you talk to my daughter, her pain went on for 20 years. It was much more significant and much more limiting with her work.

have been buying a beamer or something else. You just keep trying. I haven't had to think about pain. I have friends who are still in pain. You don't want to go out socially. You're kind of this outsider doing a different experience.

I don't think it affected my life too much. It's annoying because sometimes you realize the discomfort, but not to the extent of affecting my activities or my independence.

The PEMF has helped me to have a better quality of life, I'm more free and I can drive a car. I couldn't drive a car. Because of the stiffness in my neck. I can place the PEMF there and actually go drive a car, my neck feels like it is oiled. It helped my muscles to feel like they healed.

Chronic pain is not well managed. Physicians are not very understanding of chronic pain. You know, for us the Micro- Pulse has given my daughter a new lease on life. She has been able to enjoy her life. She is only in her 40's. It was very upsetting for me to see her struggling. She does lots of things to keep her pain under control, but the Micro-Pulse is a big part of it.

9. Is there anything else you would like to tell me about your experience of using the Micro-Pulse for pain relief?

I am having absolutely no pain this morning. It is amazing.

I can place the PEMF there and actually go drive a car, my neck feels like it is oiled. It helped my muscles to feel like they healed. Somehow it has done something to my back muscles which is positive and extremely helpful.

The company is wonderful. I really

I know it helps I know it helped my mom. My brother and I are both convinced it helped her. In the later part of her life to help her not be as confused. I know it worked.

I concentrated it on my wrist, and I don't have carpal tunnel anymore.

She has used it for menstrual cramps which go away in about ten minutes.

It excites me to think there is something that's out there and I wish our medical establishment was more open to things like this.

It is not like a magic bullet; it is a gradual thing. If somebody burns their hand, put the Micro-Pulse on it, wrap it, and forget about it, get yourself 9-volt batteries, keep using it and eventually it will get

appreciate them. His CV is phenomenal and he's brilliant. He cares about people and wants to bring this to the public as inexpensively as he can. I know he's done that. Hopefully, insurance will pay. Maybe you can do that, get insurance to pay for it. Because it will save a lot of money in the long run.

The device is very safe and soothing.

She said her daughter is pain free. She's been using it every day and she has no more pain.

It surprised me. I don't know how it works.

Yes, and did they use it, no. I will tell you they are skeptical of internet stuff. They are skeptical of all of it. The pain I can tell you – the tangible things. I thought it was very soothing. Just my circulation. I felt like there was help that came with it. I could feel my circulation moving. I could feel my hands and feet weren't so cold. I could go outside longer. I still

The battery one is weaker, and I put it around my neck where the fusion is. Around it on a low setting was sufficient. The new one is more powerful. It helps but I do it on a low setting for less time. Somehow it has done something to my back muscles which is positive and extremely helpful.

The company is wonderful. I really appreciate them.

I just say, anybody can use it. I recommend using it a minimum of 10 hours a day. If they are going to use it like half an hour, it is not like a magic bullet, it is a gradual thing.

I am really happy some research is being done on it, needs some more scientific corroboration. You know any persons lived experience is worth something, but I do think that research can provide much more in the way of evidence for it. It really needs to be evidenced based before physicians are going to go for it. Finding out more

better.

The main thing I want to tell you is just how the benefits are. It's very helpful with spasms. It's almost like, if you've ever gotten a steroid injection, it feels very similar to that. In fact, if you're having really bad spasms and I am having a limited range of motion, I can use the device and the motion will come back. I can move and hear some clicking where things are moving. I know it's amazing. The inflammation is just gone. It doesn't last some effects last with it the more I use it. My mom has used it and she has seen benefits too. I gave her my old device and I bought the new one. She uses it on her knee.

The hardest thing is I hold the coils up. Sometimes it is just challenging. If I could just tape it somehow, and do things, and do something quick and easy. It would help. Something else people have asked Dr. Dennis about is making the mat too. I feel like if I could get more surface area, I would have greater benefits. If I can place it in the right











couldn't convince them to try it. There are a couple of people who are in serious pain but wouldn't even try it. I feel indebted to Bob; I don't even remember his last name. He put this product out at a reasonable price. That was the goal. I remember I saw this video. He was trying to put it out for the cheapest. Even as a thank you for him that he did that. I have friends that are on opioids. I do not want to be on pain meds- ever.

I think as you get older that becomes a bigger fear. Pain becomes a bigger fear as you start to head toward being elderly. Pain is one of the biggest fears. Thank Bob. I appreciate being able to do this for his product. I believe in it and want to give back.

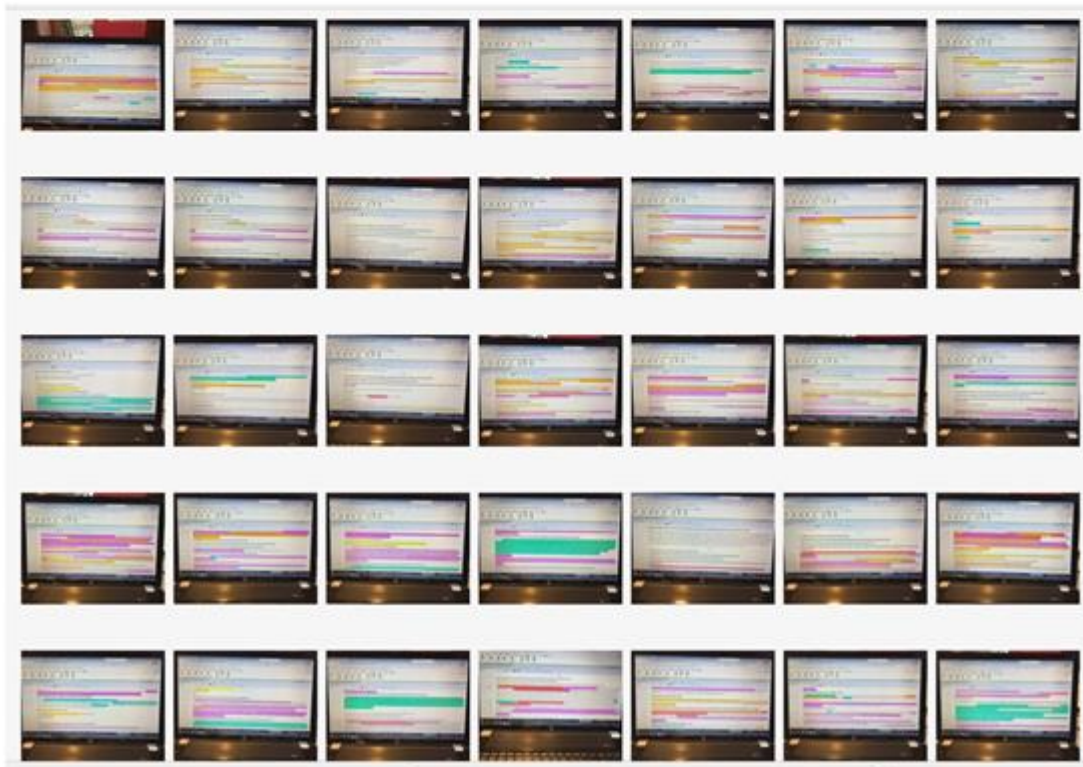
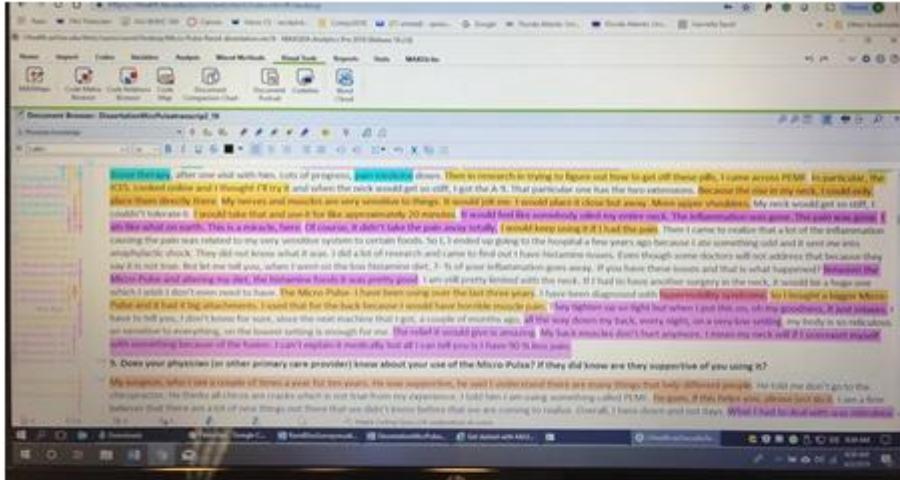
about it is crucial to it being more widely accepted. People still think of it as being a bit wacky because they don't understand it, you know, because. Even Dr. Dennis doesn't know exactly how it works, the science. It is always an impediment by getting it accepted by the established medical. Because it has such low risks, I have recommended it to several people.

spot, man, I can get some really good pain relief. I mean really good pain relief. Sometimes I'm just challenged on hitting the right spot. I've even bought the one with the 4 attached coils to it, but it almost seems like the single coils were more effective because when you send the same amount of power through 4 coils. It covers more surface area but is it sending as much power through each coil? I'm always tempted to go to the single coil but I'm trying to cover a surface area and move it around. But it is very effective.

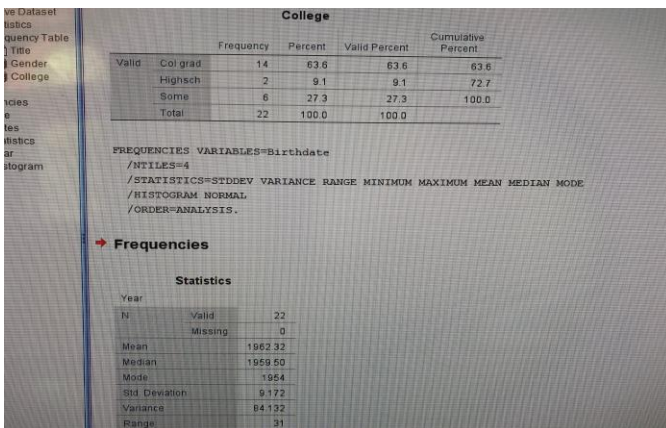
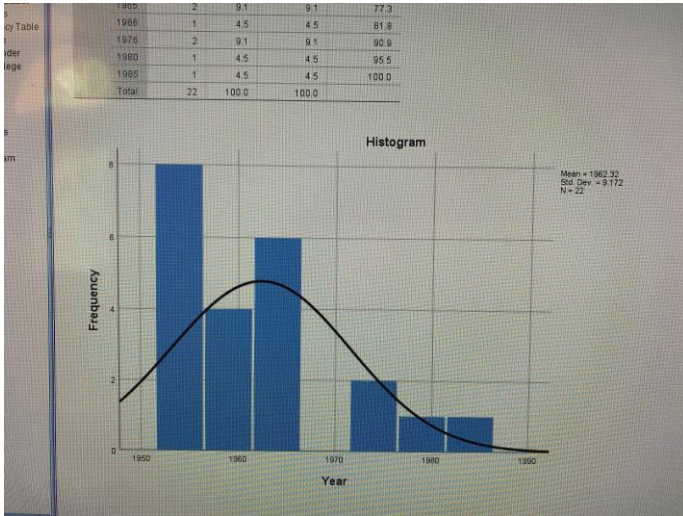
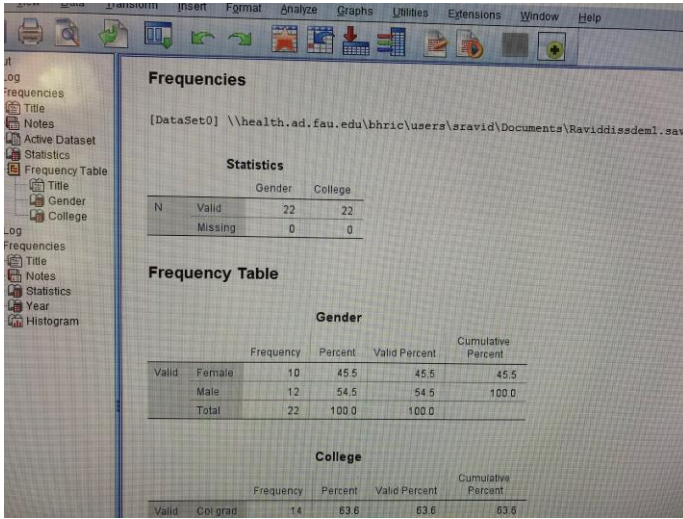
Appendix I. Dissertation Study Timeline

Research Study	Month 1	M 1	M 2	M 3	M 4	M 5	M 6	M 7		
Write Proposal						TIME	LINE			
IRB Approval										
IRB Approval										
Qualitative Data collect										
Qualitative Data collect										
Data Analysis										
Preliminary Draft										
Draft Revision										
2 nd & 3 rd draft revision Submit										
Final Paper Submitted										

Appendix J. MAXQD Coding Results



Appendix K. Demographics Output



Appendix L. Participants' Themes and Descriptive Statements

Participant #1 Themes	#1 Descriptive Statements
Feeling Hopeless	We were at a point with my mom where we were ready to try anything. She was at the late stages of Alzheimer's.
Engaging in Self-Care	We put the Micro-Pulse on her about two hours in the morning and two hours in the afternoon.
Finding Pain Relief	Within a week, she was able to start reading a newspaper again which she always liked to do. In the later part of her life to help her not be as confused. I know it worked.
Sharing the Experience of Pain Relief	My daughter was having stomach problems, she was constipated. Thirty minutes after putting it on her stomach she had a bowel movement.
Modifying the Use of Pharmaceuticals	N/A
Participant #2 Themes	#2 Descriptive Statements
Feeling Hopeless	I gave up, really
Engaging in Self-Care	But ever since then, I've never had a migraine come to fruition because I've always been able to abort it with the ICES device. I carry one for that. I sleep on it now.
Finding Pain Relief	It feels like magic, but I know it's not. My body likes it a lot.
Sharing the Experience of Pain Relief	I've had other family members that have used it, my nephew, my niece.
Modifying the Use of Pharmaceuticals	I don't think I've taken any Tylenol or any of that since I got the ICES. It totally replaces any other pain meds for me.
Participant #3 Themes	#3 Descriptive Statements
Feeling Hopeless	The pain, excruciating pain. Basically, the pain is more than neck and upper back since my late twenties. Not sure of the cause but I knew it as excruciating.
Engaging in Self-Care	I don't know if it's just that, but I depend on those machines. Now, I feel like I'm normal for me that I didn't have in a long time. If it comes back, I go to the machine; I'm more free and I can drive a car.

Finding Pain Relief	It would feel like somebody oiled my entire neck. The inflammation was gone. The pain was gone. The relief it would give is amazing. My back muscles don't hurt anymore.
Sharing the Experience of Pain Relief	N/A
Modifying the Use of Pharmaceuticals	They prescribed hydrocodone and a muscle relaxer, which I kind of depended on. Then in research in trying to figure out how to get off these pills, I came across PEMF.

Participant #4 Themes	#4 Descriptive Statements
Feeling Hopeless	I think I've had this for a long time. Degenerative disc disease in my back. My pain was pretty bad.
Engaging in Self-Care	I always have the Micro-Pulse with me. I wear it a lot. Then take it off.
Finding Pain Relief	It was gradual then it was gone. I would be terrified if I didn't have this machine. It is fabulous.
Sharing the Experience of Pain Relief	I have such an epic for this. I'll tell friends who are having pain
Modifying the Use of Pharmaceuticals	He gave me a steroid shot that wore off, another steroid shot, that wore off, they said the next thing you are going to have to have is an epidural. I didn't want to do that. Then I remembered the Micro-Pulse, so I put that on my hip, and that's gone.

Participant #5 Themes	#5 Descriptive Statements
Feeling Hopeless	I blew out my L5 disc, failed back surgery They took out too much of the disc and I have had pain ever since then very, very bad. Since then, I've had chronic pain, the whole time, the lower back primarily.
Engaging in Self-Care	I used it on my back.
Finding Pain Relief	It didn't completely remove the pain, but it took the sharpness away.
Sharing the Experience of Pain Relief	N/A
Modifying the Use of Pharmaceuticals	I'm very anti meds. I don't like any kind of pharmaceutical meds. Don't need them now.

Participant #6 Themes	#6 Descriptive Statements
Feeling Hopeless	Sciatica down the left leg. I'm still in pain walking around in pain
Engaging in Self-Care	I've been wearing one almost every day.
Finding Pain Relief	It goes away and is very tolerable. When it goes away, I forget about it.
Sharing the Experience of Pain Relief	I put the ICES on the lady this weekend while she was working, and put a rubber band around her wrist, and put the 2 electrodes on her wrist, and after 2 – or 3 hours, she said it was like 80 % gone. She was feeling so much better.
Modifying the Use of Pharmaceuticals	All the pain I've been drinking about every night - gin, rum, was trying dope, too, so I wouldn't have to feel the pain so bad. But all the pain after I got up off the end of that bed was gone. I went and didn't drink that night. But I no longer take anything for pain whatsoever.

Participant #7 Themes	#7 Descriptive Statements
Feeling Hopeless	Pain is at the tail bone. That's been going on for several years. I did a colonoscopy, ultrasound, and they found nothing there.
Engaging in Self-Care	I put it here, I put it there, wherever I need it.
Finding Pain Relief	I can tell you it is very soothing. It is very safe.
Sharing the Experience of Pain Relief	My son has dislocated shoulder. He used PEMF 24/7 for like a month. The recovery was, it would take him 2 to 3 months, but he got it back functional in a week
Modifying the Use of Pharmaceuticals	N/A

Participant #8 Themes	#8 Descriptive Statements
Feeling Hopeless	A lot of sacral pain in the L3, L4, L4. It was excruciating pain, and no one could tell me what it was from
Engaging in Self-Care	So, I started wearing it at least 8-10 hours a day.
Finding Pain Relief	It significantly reduced the pain to where it was manageable. It helps your body heal whatever it is.
Sharing the Experience of Pain Relief	Then my wife broke her wrist. When she broke it, I immediately, knowing the pain relief I got, I used the one I had on her and I ordered another one

from Bob. I've also referred two or three of my friends who had pain, and basically, they had the same experience.

Modifying the Use of Pharmaceuticals

I am a believer with pain medication that the side effects are worse than what it actually helps you with.

Participant #9 Themes	#9 Descriptive Statements
Feeling Hopeless	Manifest itself as limping, the hip is probably going. It was bothering me, and I couldn't stand upright. It was painful. People would feel sorry for me.
Engaging in Self-Care	Basically, we came to the conclusion I needed the operation. The only other thing was the Micro-Pulse. The only time I took it off was when I took a shower. I wore it for six weeks.
Finding Pain Relief	I have very little tightness in the hip. There is tightness no matter what. The thing works well for any type of inflammation. So, what I think we were seeing with the Micro-Pulse, with my wife, is any inflammation or abnormalities in the heart were being adjusted by it. I don't know if it was helping the fibrosis of the heart which was causing the A-fib but she's A-fib free right now.
Sharing the Experience of Pain Relief	She has used it for menstrual cramps which go away in about 10 minutes. My wife has A-Fib or had A-Fib - I said try the Micro-Pulse.
Modifying the Use of Pharmaceuticals	They gave me OxyContin and OxyContin MR. One for them is a 24-hour pain reliever. Three hours post op, I put on a Micro-Pulse over the incision, over a bandage. He kept two patients, one of them gave up opioids after the second day.

Participant #10 Themes	#10 Descriptive Statements
Feeling Hopeless	Gut problems, I can't gain weight and my bones hurt.
Engaging in Self-Care	I could never get ahead. No matter what I did. It was an energy deficit.
Finding Pain Relief	I didn't find any help from Western medicine. I let it go for about four hours and then I would amp it up to the medium setting and it was even more healing. As I started to feel more comfortable with

it, I ran it through my pants pockets. I could feel something flowing in my body in that area and it didn't hurt anymore.

Sharing the Experience of Pain Relief

My wife used it on her eyes to help her vision.

Modifying the Use of Pharmaceuticals

She said these glasses are now too strong.

Participant #11 Themes	#11 Descriptive Statements
Feeling Hopeless	Surgery done on both knees
Engaging in Self-Care	I started getting a lot of pain, sharp pain on it, it would help a little bit but not too much
Finding Pain Relief	I put the unit on my knee at the bottom and I was wearing it every day from September to Christmas, about four or five months, every day I was wearing it from 10 to 20 hours a day. I was just changing batteries periodically. I use it on a high setting, too. Do not use it on a low setting. I move the rings to different areas. I put them on the side of the knee and sometimes, later in the day. I move them up, in the front of my kneecaps. The unit definitely works, it is a gradual thing and it is starting to feel better.
Sharing the Experience of Pain Relief	I just say, anybody can use it.
Modifying the Use of Pharmaceuticals	They gave me the oxycodone, pain killers for a couple of days. That was it but after that when I experience pain - used the Micro-Pulse, no, I just took vitamins that was it.

Participant #12 Themes	#12 Descriptive Statements
Feeling Hopeless	Low back where I have the stenosis, and the other one are my hips. Need a hip replacement.
Engaging in Self-Care	I continued to wear it in the back area for a couple of months. I would wear it while I slept, too. So, I took it upon myself to do something.
Finding Pain Relief	It was miraculous. In about a week, everything calmed down and the nerves calmed down. I owned my life again. It was so exciting. It was like, "Oh my God."
Sharing the Experience of Pain Relief	His wife, had been in a car accident, broke her knee really bad. They had been using the machine

for a year or so. So, he told me about it. I have told like seven or eight people about it who have all bought the device itself and it has been phenomenal.

Modifying the Use of Pharmaceuticals

I avoid drugs even over the counter as much as I possibly can since having it and being able to use it.

Participant #13 Themes	#13 Descriptive Statements
Feeling Hopeless	Plantar fasciitis in my heels in my feet. It was pretty intense.
Engaging in Self-Care	The heels are on the liver line, so I put the coils on my liver. It is inflammation of the fascia, so ICES seemed appropriate because it affects inflammation. I wanted to test it. Then I started wearing it for a walk. Then I would keep it on for hours and hours.
Finding Pain Relief	That actually started to relieve the pain in my heels. I sit down to meditate the coils help me be in the moment and appreciate the timelessness and not worry about time passing. A good grounding affect, I think. You can trick the brain and do it with ICES instead.
Sharing the Experience of Pain Relief	When I moved here, to Santé Fe, my land lady broke her knee and I gave it to her, and she wore it for a few days, and she had less pain. Just word of mouth from Australia.
Modifying the Use of Pharmaceuticals	I am pretty much against all that.

Participant #14 Themes	#14 Descriptive Statements
Feeling Hopeless	Partial herniation at L 5 S 1. And after all the time of rest, rest, rest, you think it is going to get better, and it never gets better.
Engaging in Self-Care	I've got like six of these things. I've had about four on my body at one time. I've used it for athletic recovery. What I've learned about Micro-Pulse is you got to really figure out what is wrong with you. With his coils, I came back around five months. But with this device on each elbow, it got better within two weeks.
Finding Pain Relief	It blew my mind. It has been kind of bugging me and I decided to put the Micro-Pulse on it and already it feels better. Another week of this, I'm

	guessing that it will be resolved. Pretty amazing. The Micro-Pulse shines when your tissues are damaged. They will heal like that.
Sharing the Experience of Pain Relief	My chiropractor knows about it. She has seen some amazing results with this one woman who had a broken foot and basically was up and walking within three weeks. I have a buddy of mine, had a cracked rib from snowboarding, pretty stupid about it. Within a week, he was back biking and running. His doctors and everybody were just amazed. Like how can you be out running and biking after you cracked your ribs?
Modifying the Use of Pharmaceuticals	On no, I stay away from that stuff, I hate that stuff.

Participant #15 Themes	#15 Descriptive Statements
Feeling Hopeless	Two spinal fusion surgeries in my cervical spine. So, I was desperate when I found the technology.
Engaging in Self-Care	If I get in a bad situation, with muscle spasms, I know to wear it. I'll come home and I'll wear it. I'll wear it before I go to work.
Finding Pain Relief	It's the most effective pain reliever I have found. It's very effective for muscle spasms. It's really been a life saver for me.
Sharing the Experience of Pain Relief	This is what I tell people who don't really know about PEMF. In fact, my therapist he's been very fascinated by it. He wants to see it. My mom has used it and she has seen benefits too. I gave her my old device and I bought the new one. She uses it on her knee.
Modifying the Use of Pharmaceuticals	I have used off and on hydrocodone. I've done things like that. I try to really stay away from any oral medication or pharmaceuticals because this has really been the most effective thing I could do.

Participant #16 Themes	#16 Descriptive Statements
Feeling Hopeless	Back pain, arthritis. If you talk to my daughter, her pain went on for 20 years. It was becoming debilitating and she was becoming desperate. My daughter had tried everything, I mean everything for her back pain.
Engaging in Self-Care	So now, if I twinge my back, I will use it prophylactically. I will use the Micro-Pulse on it,

	and it won't develop, it won't get bad.
Finding Pain Relief	But eventually the pain went away, and I don't have any pain in my shoulders now. I have found the Micro-Pulse to be very helpful with the pain and swelling. After I finished using it, I basically don't have any pain anymore.
Sharing the Experience of Pain Relief	I had originally bought the Micro-Pulse for my daughter.
Modifying the Use of Pharmaceuticals	I haven't had to take any pain medications after the implant or after the extractions. I have tried ibuprofen and Tylenol 3. I don't like Tyleno3. They are terrible for you. She also took very strong pain killers and went to the back-pain clinic.

Participant #17 Themes	#17 Descriptive Statements
Feeling Hopeless	I was limping along. Then it went into the winter and it still really hurt... could tell the weather from my ankle and foot. I had to put my feet up, they would swell. I remember talking to my mother, it was like the 1980s when my shoulder hurt, and I was at a high pain level. I mean just the financial burden of dealing with pain and then you do try everything.
Engaging in Self-Care	I was just trying it on my own. I got it for my dog that's where I started this whole thing. This was convenient because I could wrap it around my ankle and wrap it around my shoulder.
Finding Pain Relief	He could get up in the car after I used it. I cannot remember the last time I was in pain. I can't remember the last time I hesitated walking up or down stairs. And I am going to tell you, it never went back. I could not sit through church service and I could not sit in dining room chairs because of my back. . That has not happened since I used this machine. I feel like my circulation improved. I can definitely look at my feet and I do not have one swollen and one not. I don't have cold hands and feet anymore. It feels like something really happened.
Sharing the Experience of Pain Relief	My sister, I was thinking for other people. I believe in it and want to give back.
Modifying the Use of	I took Advil. I remember one whole weekend

Pharmaceuticals	when I had to lay still. The Advil worked eventually; I have friends that are on opioids. I do not want to be on pain meds - ever.
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Participant #18 Themes	#18 Descriptive Statements
Feeling Hopeless	Bursitis tendonitis, I said I'm all for anything at this point in time because the pain wasn't going away. One time I sat on my couch just crying in tears because the pain didn't go away
Engaging in Self-Care	I could do things I couldn't do before. Different ways to apply the Micro-Pulse to better intensify the area. So, I am working on that.
Finding Pain Relief	I was at shocked because within an hour and a half of having this on my arm, I felt something different. It didn't hurt like it was hurting before. I thought, no this is just in my mind. I just want it to work so badly. I didn't say anything to anybody for a while and it kept getting better. Literally each day, each hour, I feel improvement. It's pretty amazing.
Sharing the Experience of Pain Relief	Dr. Robert Dennis happens to be my next-door neighbor.
Modifying the Use of Pharmaceuticals	I was alleviating the pain as best I could with ice and ibuprofen or Aleve, which was recommended by the doctor. But after the regimen, he had me do it, it did not relieve the pain completely.

Participant #19 Themes	#19 Descriptive Statements
Feeling Hopeless	Injury to my back. It probably was an 8 and I don't like pain.
Engaging in Self-Care	Basically, for me, I use it when I have pain, I use it ad hoc, as needed treatment.
Finding Pain Relief	But within a half hour the pain was very manageable, I never let that to get to a high level of pain. It surprised me. I don't know how it works. It worked for me. Those things I have experience. I will continue to use it.
Sharing the Experience of Pain Relief	My wife had learned about it.
Modifying the Use of Pharmaceuticals	I do not take any aspirin. I tried to avoid the pain medications if I can.

Participant #20 Themes	#20 Descriptive Statements
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Feeling Hopeless	Degenerative arthritis bilateral knees. Pain at level 10 for years
Engaging in Self-Care	Uses it prophylactically. Wore it 24 hours day for four days, took a day or two off, then applied it, it didn't cure everything, but it reduced the pain quite a bit.
Finding Pain Relief	Pain decreased to level 4
Sharing the Experience of Pain Relief	Referred them to patients (dozens) and family, I have given them out to my patients. I refer them out a ton.
Modifying the Use of Pharmaceuticals	I don't like taking pain medications. I had an Advil in my pocket, and I would keep telling myself one more hour. I still have that in my drawer. I took it out and looked at it but never took it. I never used it.

Participant #21 Themes	#21 Descriptive Statements
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Feeling Hopeless	Knees - Chronic pain for years, could not ski anymore.
Engaging in Self-Care	Stays ahead of the pain. Self-administers on back, knees, and hands. On gums before injection by dentist.
Finding Pain Relief	Able to ski 60 times in a season after MP use, Within three weeks I was skiing again with no pain, amazing! It was rejuvenated.
Sharing the Experience of Pain Relief	Dentist, chiropractor, friends.
Modifying the Use of Pharmaceuticals	No meds needed, esp. before dental work.

Participant #22 - No relief	#22 Descriptive Statements
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Feeling Hopeless	CRPS - Complex Regional Pain Syndrome Spectrum of pain. Chronic pain for years.
Engaging in Self-Care	No
Finding Pain Relief	Not much pain relief, did not work for his pain. "Didn't holdup."
Sharing the Experience of Pain Relief	No
Modifying the Use of Pharmaceuticals	No

Participant #23 Themes	#23 Descriptive Statements
Feeling Hopeless	Numbness in arms from neck pain. Pain cause me a forced retirement form my job about 15 years ago
Engaging in Self-Care	Whenever I have pain in my neck or osteoarthritis, I use it. I use it on my hands and elbows and shoulders. I usually use it through the night. I strap it on my elbow. I put it on right away. I can wake up during the night with restless leg syndrome and put it on for 15 minutes. It takes it away and I go back to sleep.
Finding Pain Relief	In my neck, I just do not have too much pain anymore
Sharing the Experience of Pain Relief	My dentist is really excited about it. I gave her the information and she is purchasing one
Modifying the Use of Pharmaceuticals	I used to get injections for the pain plus take the Norco. I've use it for acid reflux, and I am off all my medications. It really works for a lot of things. For me, I just don't take any medications at all and that is due to using the Micro-Pulse.

Participant #24 Themes	#24 Descriptive Statements
Feeling Hopeless	I was kicked in knee by horse, Stepped off porch and fell on bad knee , was going to need foot surgery
Engaging in Self-Care	I used Micro-Pulse- it healed, and I avoided surgery
Finding Pain Relief	Any pain- I put it on there and it helps
Sharing the Experience of Pain Relief	I do, but some people really don't want to get better.
Modifying the Use of Pharmaceuticals	Took a lot of aspirin, Tylenol- not now

Participant #25 Themes	#25 Descriptive Statements
Feeling Hopeless	Skiing accident. Chainsaw cut big toe - slight scar, did not need stiches because of Micro-Pulse.
Engaging in Self-Care	Placed rings on the most painful spots, changed settings to low for optimum relief.

Finding Pain Relief	Toe healed perfectly. Healed hernia.
Sharing the Experience of Pain Relief	For mom for progressive dementia, stroke symptoms, restricted elbow, referred to friends & family.
Modifying the Use of Pharmaceuticals	Took aspirin. No meds now, no surgery because of the Micro-Pulse and Chinese oils.

Participant #26 Themes	#26 Descriptive Statements
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Feeling Hopeless	Sports injuries, MVC, pain since high school-20 years of pain. Since middle school, I have always had pain in my back & neck.
Engaging in Self-Care	Inexpensive way to heal himself, portable.
Finding Pain Relief	My neck pain was gone and stayed gone. "Everybody needs to have one of these." After one week of use - such great pain relief so quickly in my neck and back. Any time I get an injury, I use the PEMF device on it. It used to be two weeks of healing from an injury. Now with the MP it is two days. Injuries heal four times as fast. My neck and back pain is completely gone. I don't even have to wear it anymore. I feel normal.
Sharing the Experience of Pain Relief	Friends shared MP with him, cured his dog instead of putting "dog down" saved his dog. Wife avoided shoulder surgery. "Her shoulder is 100 %. It helped her bones grow back together." I tell everybody I know about this thing. I have had several friends and family buy this and have great results.
Modifying the Use of Pharmaceuticals	Stopped the ibuprofen , avoided surgery with the MP. My wife did not take one pain pill.

Participant Themes #27	# 27 Descriptive Statements
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Feeling Hopeless	I was hopeless. I will never be pain free.
Engaging in Self-Care	I used it in my own home!! No traveling to therapy appointments!
Finding Pain Relief	I finally felt pain free after, well...so long.
Sharing the Experience of Pain Relief	I am sharing it with as many people as I can
Modifying the Use of Pharmaceuticals	I am drug free now. Whoa.

Participant #28 Themes	#28 Descriptive Statements
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Feeling Hopeless	I was crippled. Tried 20 various modalities for pain, nothing really worked.
Engaging in Self-Care	I am spending time with friends, playing golf, exercising - first I apply the Micro-Pulse and then I go live my life.
Finding Pain Relief	I can't tell you how it feels to be at a pain level of a 1 or 2.
Sharing the Experience of Pain Relief	I help everyone I know who is in pain to show them another way.
Modifying the Use of Pharmaceuticals	I do not need anything for pain – drugs, that is.

Appendix M. Participants' Noteworthy Quotes

1. It is one of those things I think every family should have for their family's health because it is so powerful.

The PEMF device works faster and I think it has a healing aspect to it that the TENS device doesn't have.

2. I think every family should have one. At least one.

I actually wish we would have tried it sooner.

3. I sleep on it now. I got the big mat. I got the bigger one last September to have the mat down my back when I sleep.

She got feedback from one of them she knows bought it and she told me they cut their pain meds in half by using that.

I'm not afraid to use it or try it because it's such a low pulse it's really safe and I've never had any negative reactions to it.

Thank you so much for doing this. We need brave medical people like you.

I think it is effective for most pain, if you know where to put it. That's the main thing, knowing where to put it.

4. Between the Micro-Pulse and altering my diet, the histamine foods it was pretty good. I used that for the back because I would have horrible muscle pain. They tighten up so tight but when I put this on, oh my goodness, it just relaxes.

What I had to deal with was ridiculous pain and now I don't deal with that ridiculous pain.

It does something that makes it feel like someone has oiled my stiff joints and my ridiculously stiff ligaments. I can't explain it, I don't understand it, but I don't have the pain I used to have.

I can't hold a grandchild. I have 8 grandchildren, I can't hold them because of my fusion in the neck and when I do it is a mistake. The PEMF has helped me to have a better quality of life, I'm more free and I can drive a car.

5. I had bursitis in my hip, it was disabling. It hurt so bad. He gave me a steroid shot that wore off, another steroid shot, that wore off, they said the next thing you are going to have to have is an epidural. I didn't want to do that. Then I remembered the Micro-Pulse, so I put that on my hip, and that's gone. I hurt my knee, I put that on, within a few days that was gone. I've used it on my wrist, my back, my knee. If I lift something heavy, I use it. I always have the Micro-Pulse with me. I wear it a lot. Then take it off. I forget about it. I hurt something and put it back on. I would be terrified if I didn't have this machine. It is fabulous.

Not having pain, makes me super girl. I can do things.

I used a TENS unit a long time ago. But those really hurt. You can feel them. But this, there is no pain to the equipment. I'm the hugest fan of this ever. It's so much better than medication and it would save that opiate problem that we have now. So, I think Dr. Dennis is a genius.

6. My son has dislocated shoulder. He used PEMF 24/7 for like a month. He said, “The recovery was, he said it would take him 2 to 3 months, but he got it back functional in a week. He used it like 24/7.

It can actually be applied to anywhere. I read that some people put it on the head to avoid Alzheimer’s. What I’ve heard is that people can just put it anywhere and where there is discomfort.

I think, I think you are doing a great job.

7. I’ve also referred two or three of my friends who had pain, and basically, they had the same experience.

But the other thing it is doing is it is helping to heal by getting the blood flow into whatever the trauma is. It is not just relieving the pain; it’s helping the healing process. It is both.

It is such a great, powerful device. I think part of the problem is, it’s inexpensive. People look at it and go, “how good can it be for \$ 400?” Bob has done such a good job of trying to decrease the cost and increase the technology.

8. I may have to work just half a day and go back to the office and get in my recliner with an ice pack and make phone calls.

The pain I had was in my muscles. I used to call it, Random Acts of Pain.

If it gets too bad, it feels like an elephant standing on my foot. It makes me want to start drinking heavily again.

I bought like 4 or 5 like that on eBay. I’m amazed. I’m trying to tell everyone about it. I’ve dropped it from the countertop and kicked it across, and it still doesn’t break. It never stops. Everyone I’ve ever bought is so well made. I can drop it on concrete, and it is just fine.

It is diminishing his pain in the 10 minutes he had it on. Time and time again.

9. It’s like anybody with chronic pain says, is it going to be like this the rest of my life?

My wife has A-Fib or had A-Fib and we were going to go through ablation. She canceled the ablation, and the medication she was taking beforehand was really doing a number on her, so she stopped taking that. I said try the Micro-Pulse. She put it on her heart and the next day she had no A-Fib. 6 months out she has no A-Fib, her vital signs are back to normal, heart rate is normal. She went to the ER, they checked her, but she wasn’t A-fibbing. She went back to her cardiologist, who is a young guy, and he said you don’t have A-Fib now while I am checking you? What are you doing? So, she tells him about the Micro-Pulse and he immediately writes it down and says I am going to look into this. So, he was open to it. He was receptive.

I would be terrified if I didn’t have this machine. It is fabulous. Apparently, it works for everything in the world.

10. I have put that Micro-Pulse on every kind of pain I have. Every time I have an ache or whatever, I put it on. I swear, in like 30 minutes, or so, the pain is gone.

It would feel like somebody oiled my entire neck. The inflammation was gone. The pain was gone. . I can’t explain it medically but all I can tell you is I have 90 % less pain. If it comes back, I go to the machine. It does something that makes it feel like someone

has oiled my stiff joints and my ridiculously stiff ligaments. I can't explain it, I don't understand it but I don't have the pain I used to have.

11. I didn't find any help from Western medicine. I stopped seeking help from most medical people and started reading a lot. After about 3 months, and at 6 months later they thought I was seeing someone because I had so much energy. I felt so much better. Once I got to that point after a year went by, I saved so much money, and I paid off most of my debt. Harvard University Consegurity Theory, 20 years ago, that shows all cells are connected to each other like a woven fabric. He made the argument and did an excellent job of proving his argument-that like an empty water bottle, the body's fascia retains the cellular memory, the dents that are accumulated in the course of life, and if they are traumatic enough like, a TBI, or accident or a bad fall, the dents causes the body to have to compensate in other areas for the injury that it has absorbed. The body has these stored traumas. Psychologists would agree with this too and some of the osteopaths I have spoken with. My wife used it on her eyes to help her vision. She said these glasses are now too strong. So, I said, let's go to the doctor and have our vision checked.

You can walk around with it 24 hours if you have to, you know? The hard thing about it is to find something to keep it on the spot- a brace or a wrap or something. Bob says you can use it on the pancreas. There are so many ways you can use it. If somebody burns their hand, put the Micro-Pulse on it, wrap it, and forget about it, get yourself 9-volt batteries, keep using it and eventually it will get better.

12. I could feel something flowing in my body in that area and it didn't hurt anymore. My wife used it on her eyes to help her vision. She said these glasses are now too strong. So I said, let's go to the doctor and have our vision checked. We both have the same doctor, see the same person. We had that retinal scan. Not just the regular eye exam. We did that about a month apart. The doctor was kind of surprised. I mean we are early 30's, same age. She goes in and she is 20/20 in the right eye. He couldn't explain it. She was unchanged in the left eye but 20/20 in the right eye. He did the retinal scan and her right eye was just as clean and clear as it can be and the other eye... her right eye just popped. He was the doctor that told us, "Your vision can get better but not a lot." That's kind of the final frontier stuff to me, fixing three eyes.

13. It was various stages. One night at work and I was limping really badly, then after 4 or 5 months I was not limping.

Bob says you can use it on the pancreas. There are so many ways you can use it. I just say, anybody can use it.

14. But within a half hour the pain was very manageable. So, I use it adhoc, as needed treatment. I don't like pain. I am fortunate I don't have chronic pain. If I got to that point, I would use mental exercise and the device as much as I could to relieve that.

15. When I moved here, to Santé Fe, my land lady broke her knee and I gave it to her, and she wore it for a few days, and she had less pain.

I often use the Micro-Pulse on either side of my belly button because I have digestive problems. It will actually move food will move it through. The side effect is it will send me into a deep sleep.

I have used it over my head, one at the forehead and one at the base of the skull where the bump is at the base of the neck, on a very low setting, number 3, and it really makes meditation really trippy.

16. So I got an additional unit and sandwiched coils on both elbows and literally within 2 weeks, the pain and issue was completely gone. And after all the time of rest, rest, rest, you think it is going to get better, and it never gets better. But with this device on each elbow, it got better within two weeks. It blew my mind. Since then, I have used it for multiple things. I'm a big fan of the Micro-Pulse. I have some of the stuff you put on, your like, hmm, but this thing works every time. I have a buddy of mine, had a cracked rib from snowboarding, pretty stupid about it. Within a week, he was back biking and running. His doctors and everybody were just amazed. Like how can you be out running and biking after you cracked your ribs? Anyway, those are separate stories, not about me. I keep telling him, can you just build a big body unit I can lay on after I work out? The Micro-Pulse shines when your tissues are damaged. They will heal like that. If the pain is related to that, it will go away. If you posture stinks or it is a nerve pinch or nerve entrapment, forget it. It is not going to do anything for you

I empowered my life with the Micro-Pulse and no pain.

But with this device on each elbow, it got better within two weeks. It blew my mind. Since then, I have used it for multiple things.

17. It is the most effective pain reliever I have found

18. I've used it on my teeth. I have had two teeth extracted at different times and a dental implant put in with the last one. I have found the Micro-Pulse to be very helpful with the pain and swelling. I haven't had to take any pain medications after the implant or after the extractions.

I do want to tell you one weird thing with the ICES. I got a lump on my genitals; it might have been herpes. I used them, double coils on my crotch, three nights of that before I went to sleep. It went away. No problems.

19. From the time I started using it got better so fast that I tried it on my shoulder and the lower back. I had the same experience with the shoulder.

I have used off and on hydrocodone. I've done things like that. I try to really stay away from any oral medication or pharmaceuticals cause this has really been the most effective thing I could do.

Chronic pain is not well managed. Physicians are not very understanding of chronic pain. You know, for us the Micro- Pulse has given my daughter a new lease on life. She has been able to enjoy her life. She is only in her 40's. It was very upsetting for me to see her struggling. She does lots of things to keep her pain under control, but the Micro-Pulse is a big part of it.

20. I could not sit through church service and I could not sit in dining room chairs because of my back. That has not happened since I used this machine.

You know any persons lived experience is worth something, but I do think that research can provide much more in the way of evidence for it. It really needs to be evidenced based before physicians are going to go for it. Finding out more about it is crucial to it being more widely accepted. People still think of it as being a bit wacky because they don't understand it, you know, because. Even Dr. Dennis doesn't know exactly how it works, the science. It is always an impediment by getting it accepted by the established medical. Because it has such low risks, I have recommended it to several people.

The other question is are there other things that could help?

REFERENCES

- Abdelhalim, N., & Samhan, A. (2018). Long term effects of low-frequency magnetic field therapy in treatment of patients with low back pain. *International Journal of Medical Research & Health Sciences*, 7(4), 108-113.
- Aboeleneen, A., & Darwesh, A. (2015). Effect of pulsed magnetic field on cervical dysfunction. *Indian Journal of Physiotherapy and Occupational Therapy*, 9(1), 210-216.
- Alayat, M., Abullah Alshehri, A., & Mohamed Ibrahim Salem, M. (2017). Efficacy of pulsed electromagnetic field on pain and function in chronic mechanical neck pain: A randomized controlled trial. *International Journal of Physiotherapy and Research*, 5(2), 1930-1936.
- American Academy of Pain Medicine. (2018). *Pain information and resources for patients seeking the care of a pain medicine professional*. Retrieved from <https://painmed.org/clinician-resources/patient-education-resources>
- American Nurses Association. (n.d.). *State*. Retrieved from <https://www.nursingworld.org/practice-policy/advocacy/state/>
- American Nurses Association. (2018). *The opioid epidemic: The evolving role of nursing* (Issue brief). Retrieved from https://www.ncsbn.org/2018_ANA_Opioid_Epidemic.pdf
- American Pain Society. (2015, August 18). *NIH study shows prevalence of chronic or severe pain in U.S. adults* (Press release). Retrieved from

<http://americanpainsociety.org/about-us/press-room/nih-study-shows-prevalence-of-chronic-or-severe-pain-in-u-s-adults>

- Ammar, R., & Abdel., T. (2016). Pulsed electromagnetic field versus microcurrent electrical nerve stimulation in patients with lateral epicondylopathy. *International Journal of Therapy & Rehabilitation*, 23(11), 519-523.
- Andrade, R., Duarte, H., Pereira, R., Lopes, I., Pereira, H., Rocha, R., & Espregueira-Mendes, J. (2016). Pulsed electromagnetic field therapy effectiveness in low back pain: A systematic review of randomized controlled trials. *Porto Medical Journal*, 1(5) 156-163.
- Arneja, A., & Kotowich, A. Staley, D., Summers, R., & Tappia, P.S. (2016). Electromagnetic fields in the treatment of chronic lower back pain in patients with degenerative disc disease. *Journal of Future Science*, 2 (1), FSO105.
- Becker, R. O. (1990). *Cross currents: The perils of electropollution, the promise of electromedicine*. New York, NY: Jeremy P. Tarcher/Penguin Group.
- Benazzo, F., Zanon, G., Pederzini, L., Modonesi, F., Cardile, C., Falez, F., Ciolli, L., ... Massari, L. (2008). Effects of biophysical stimulation in patients undergoing arthroscopic reconstruction of anterior cruciate ligament: Prospective, randomized and double-blind study. *Knee Surgery, Sports Traumatology, Arthroscopy*, 16(6) 595-601.
- Bevan, S. (2015). Economic impact of musculoskeletal disorders (MSDs) on work in Europe. *Best Practices Clinical Rheumatology*, 29(3): 356-373.
- Breivik, H., Eisenberg, E., & O'Brien, T. (2013). The individual and societal burden of chronic pain in Europe: The case for strategic prioritization and action to improve

knowledge and availability of appropriate care. *BMC Public Health*, 13, 1229.
<https://doi.org/10.1186/1471-2458-13-1229>

Brignardello-Petersen, R. (2018). Pulsed electromagnetic field seems to decrease pain levels in females from 24 through 72 hours after initial archwire placement. *Journal of the American Dental Association*, 149(4), e75-e75.

Centers for Disease Control and Prevention. (2016). *Influx of fentanyl-laced counterfeit pills and toxic fentanyl-related compounds further increases risk of fentanyl-related overdose and fatalities*. Retrieved from <https://emergency.cdc.gov/han/han00395.asp>

Centers for Disease Control and Prevention. (2017). Drug and opioid-involved overdose deaths-United States, 2013-2017. *Weekly*, 67(5152), 1419-1427. Retrieved from https://www.cdc.gov/mmwr/volumes/67/wr/mm675152e1.htm?s_cid=mm675152e1_w&c_cid=journal_search_promotion_2018

Centers for Disease Control and Prevention. (2018). *Overview of the drug overdose epidemic: Behind the numbers*. Retrieved from <https://www.cdc.gov/drugoverdose/data/>

Costello, M. (2018). Watson's caritas processes as a framework. *International Journal of Caring Sciences*, 11(2), 641-642.

Creswell, J., & Clark, P. (2018). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Cvetkovic, D., & Cosic, I. (2009). Alterations of human electroencephalographic activity caused by multiple extremely low frequency magnetic field exposures. *Medical and Biological Engineering*, 47(10), 1063-1073.

- Dennis, R. G. (2014). *ICES DigiCeutical technical brief*. Retrieved from https://www.pemfwrap.com/docs/ICES_Tech_Brief_June_2014.pdf
- Denzin, N. K., & Lincoln Y. S. (1994). Entering the field of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 1-17). Thousand Oaks, CA: Sage.
- Deshaies, K., Akhtar-Danesh, N., & Kaasalainen, S. (2015). An evaluation of chronic pain questionnaires in the adult population. *Journal of Nursing Measurement*, 23(1), 22-39.
- Donovan, E., Ranney, M., Patry, E., McKenzie, M., Baird, J., & Green, T.C. (2017). Beliefs about complementary and alternative therapy-based chronic pain management program for a Medicaid population. *Pain Medicine*, 18(9), 1805-1868.
- Dowell, D., Haegerich, T., & Chou, R. (2016). *CDC guideline for prescribing opioids for chronic pain – United States, 2016*. *JAMA*, 315(15), 1624-1645.
- Froes Meyer, P., Santos-Filho, D. S., Ronzio, O. A., Bonelli, L., De Souza da Fonseca, A., do Ceu Clara Costa, ... Bernardo-Filho, M. (2007). Consequences of the magnetic field, sonic and radiofrequency waves, and intense pulsed light on the labeling of blood constituents with technetium-99m. *Brazilian Archives of Biology and Technology*, 50, 1-7. Retrieved from http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1516-89132007000600014

- Glance de Freitas, D., Monteiro, R. L., Marcondes, F., Vantin, K., Fukuda, T., & Mores-Barros Fucs, P. M. (2013). Pulsed electromagnetic field in patients with shoulder impingement syndrome. *The Journal of Applied Research, 13*(1), 28-33.
- Goldberg, D., & McGee, S. (2011). Pain as a global public health priority. *BMC Public Health, 11*, 770. <https://doi.org/10.1186/1471-2458-11-770>
- Habash, R. (2008). *Bioeffects and therapeutic applications of electromagnetic energy*. New York, NY: CRC Press.
- Harper, W., Schmidt, W. K., Kubat, N. J., & Isenberg, R. A. (2015). An open label pilot study of pulsed electromagnetic field therapy in the treatment of failed back surgery syndrome pain. *International Medical Case Reports Journal, 8*, 13-22. doi.org/10.2147/MCRS73068
- Hatef, B., Hashemirad, F., Meftahi, H. G., Simorgh, L., Jahromi, S.R., Rahimi, F., & Togha, M. (2016). The efficacy of pulsed electromagnetic field in refractory migraine headaches: A randomized, single-blinded, placebo-controlled, parallel group. *International Journal of Clinical Trials, 3*(1), 24-31.
- Hedén, P., & Pilla, A. A. (2008). Effects of pulsed electromagnetic fields on postoperative-pain: A double-blind randomized pilot study on breast augmentation. *Aesthetic Plastic Surgery, 32*(4) 660-666.
- Hubbard, D. K., & Dennis, R. G. (2012). Pain relief and tissue healing using PEMF therapy: A review of stimulation waveform effects. *Asia Health Care Journal, 1*(1), 26-35.
- Iannitti, T., Fistetto, G., Esposito, A., Rottigni, V., & Palmieri, B. (2013). Pulsed electromagnetic field therapy for management of osteoarthritis-related pain,

stiffness and physical function: Clinical experience in the elderly. *Clinical Interventions in Aging*, 8, 1289-1293.

Ibrahim, S., Khan, M., Nizam, I., & Haddad, F. (2013). Peri-operative interventions producing better functional outcomes and enhanced recovery following total hip and knee arthroplasty: An evidence-based review. *BMC Medicine*, 11, 37.
Retrieved from <http://www.biomedcentral.com/1741-7015/11/37>

Ingram, S. (2015). *Surgical management of pain*. New York, NY: Thieme.

International Association for the Study of Pain. (2017). *2017 global year against pain after surgery*. Retrieved from <https://www.iasp-pain.org/GlobalYear/AfterSurgery>

Jackson, T., Thomas, S., Stabile, V., Han, X., Shotwell, M., & McQueen, K. (2015). Prevalence of chronic pain in low-income and middle-income countries: A systematic review and meta-analysis. *Lancet*, 385(Supp 2), S10.
doi:[https://doi.org/10.1016/S0140-6736\(15\)60805-4](https://doi.org/10.1016/S0140-6736(15)60805-4)

Javaherian, M., Tajali, S., & Hadizadeh, M. (2017). Effects of pulsed electromagnetic and static magnetic fields on musculoskeletal low back pain: A systematic review. *Osteoporosis International*, 28, S153.

Jung, J. G., Park, J. H., & Kim, S. C. (2017). Effectiveness of pulsed electromagnetic field for pain caused by placement of initial orthodontic wire in female orthodontic patients: A preliminary single-blind randomized clinical trial. *American Journal of Orthodontics*, 152(5), 582-591.

Katz, J., & Rosenbloom, B. (2015). The golden anniversary of Melzack and Wall's gate control theory of pain: Celebrating 50 years of pain research and management. *Pain Research and Management*, 20(6), 285-286.

- Ki-Moon, B. (2018). *UN Secretary General's remarks at launch of Ban Ki-Moon Center for Global Citizens event*. Retrieved from <https://bankimooncentre.org/global-citizen-act-passion-compassion>
- Kramer, A., Horton, S., & Tumilty, S. (2015). Pulsed electromagnetic energy as an adjunct to physiotherapy for the treatment of acute low back pain: A randomized controlled trial. *New Zealand Journal of Physiotherapy*, 43(1), 16-22.
doi:10.15619/NZIP143.1.03
- Kroeling, P., Gross, A., Graham, N., Burnie, S. J., Szeto, G., Goldsmith, C. H., Haines, T., & Forget, M. (2013). *Electrotherapy for neck pain*. Retrieved from https://www.cochrane.org/CD004251/BACK_electrotherapy-for-neck-pain
- Lewczuk, B., Redlarski, G., & Arkadiusz Żak, A., Ziółkowska, N., Przybylska-Gornowicz, B., & Krawczuk, M. (2014). Influence of electric, magnetic, and electromagnetic fields on the circadian system: Current stage of knowledge. *BioMed Research International*, 2014. <http://dx.doi.org/10.1155/2014/169459>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- Loeser, J. D., & Treede, R. D. (2008). The Kyoto protocol of IASP: Basic pain terminology. *Pain Journal*, 137(3), 473-477. doi:10.1016/j.pain.2008.04.025
- Markov, M. (2007). Expanding use of pulsed electromagnetic field therapies. *Electromagnetic Biology and Medicine*, 26, 257-274.
doi:10.1080/15368370701580806
- Markov, M. (2011). How living systems recognize applied electromagnetic fields. *Environmentalist*, 31(2): 89-96.

- McKay, J. C., Prato, F. S., & Thomas, A. W. (2007). A literature review: The effects of magnetic field exposure on blood flow and blood vessels in the micro-vasculature. *Bioelectromagnetics*, 28(2), 81-98.
- Meit, M., Heffernan, M., Tanenbaum, E., & Hoffmann, T. (2017). *Final report: Appalachian diseases of despair*. Retrieved from https://www.arc.gov/assets/research_reports/AppalachianDiseasesofDespairAugust2017.pdf
- Melzack, R., & Wall, P. (1965). Pain mechanisms: A new theory. *American Association for Advancement in Science*, 150(3699): 971-979.
- Miladinovic, K., Vavra-Hadziahmetovic, N., Kadic, A., & Vrabac, D. (2015). Pulsed electromagnetic field and transcutaneous electrical nerve stimulation in the treatment of lumbar pain syndrome. *Journal of the Institute for Research and Development University Clinical Center Sarajevo*, 21(2), 89-93.
- Morioka, C. K. Howard, D. E., Caldeira, K. M., Wang, M. Q., & Arria, A. M. (2018). Affective dysregulation predicts incident nonmedical prescription analgesic use among college students. *Journal of Addictive Behaviors*, 76, 328-334. doi:10.1016/j.addbeh.2017.08.043; PMC5614879
- Mumtaz, N., Ahmad, K., Waheed, A., & Shah, S. H. (2014). Role of pulsed electromagnetic therapy in the management of backache: A study conducted at Armed Forces Institute of Rehabilitation Medicine, Rawalpindi. *Pakistan Armed Forces Medical Journal*, 64(2), 339-342.
- National Center for Complementary and Alternative Medicine. (2018). *What is CAM?* Bethesda, MD: Author.

- National Center for Complementary and Integrative Health. (2018). *The use of complementary and alternative medicine in the United States*. Retrieved from https://nccih.nih.gov/research/statistics/2007/camsurvey_fs1.htm
- Nayback-Beebe, A., Yoder, L., Goff, B., Arozola, S., & Weidlich, C. (2017). The effect of pulsed electromagnetic frequency on health-related quality of life in military service members with chronic low back pain. *Nursing Outlook*, 65(5), s26-s33.
- Negm, A., Lorbergs, A., & Macintyre, N. J. (2013). A systematic review with meta-analysis examined efficacy of PEMF and low frequency pulsed subsensory threshold electrical stimulation vs placebo on pain and physical function in people with knee osteoarthritis. *Osteoarthritis & Cartilage*, 21(9), 1281-1289.
- Nelson, F., Zvirbulis, R., & Pilla, A. A. 2013 (2013). Non-invasive electromagnetic field therapy produces rapid and substantial pain reduction in early knee osteoarthritis: A randomized double-blind pilot study. *Rheumatology International*, 33(8):2169-2173.
- Niezgoda, J. A., Hardin, S. T., Kubat, N., & Acompanado, J. (2014). The management of intractable pain with adjuvant pulsed electromagnetic field therapy. *Advances in Skin & Wound Care*, 27(5), 205-209.
- Oke, K., & Umebese, P. (2013). Evaluation of efficacy of pulsed electromagnetic therapy in the treatment of back pain: A randomized controlled trial in a tertiary hospital in Nigeria. *West Indian Medical Journal*, 62(3), 205-209.
doi:10.7727/wimj.2012.057

- Omar, A., Awadalla, M., & El-Latif, M. (2012). Evaluation of pulsed electromagnetic field therapy for discogenic lumbar radiculopathy. *International Journal of Rheumatic Diseases*, 15(5), e101-108.
- Padgett, D. K. (1998). *Qualitative methods in social work research: Challenges and rewards*. Thousand Oaks, CA: Sage.
- Park, W., Sun, S., Lee, S., Kang, B., Lee, J., Hwang, D., & Cha, Y. (2014). Effect of pulsed electromagnetic field treatment on alleviation of lumbar myalgia: A single center, randomized, double blind, sham-controlled pilot trial study. *Journal of Magnetics*, 19(2),161-169. doi:org/10.4283/JMAG.2014.19.2.161
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
- Pawluk, W. (2003). *Pain management with pulsed electromagnetic fields*. Retrieved from <https://altered-states.net/barry/newsletter203/painpemf.htm>
- Pawluk, W., Dennis, R., & Tommerdahl, M. (2017). *Tracking the effects of pulsed electromagnetic field (PEMF) on individuals with a history of traumatic brain injury (TBI) with the Brain Gauge*. Retrieved from https://downloads.corticalmetrics.com/pub/corticalmetrics_magazine_issue_1.pdf
- Pilla, A. (2006). Mechanisms and therapeutic applications of time-varying and static magnetic fields. In F. Barnes & B. Greenbaum (Eds.), *Handbook of biological effects of electromagnetic fields* (3rd ed.; pp. 1-79). Boca Raton, FL: CRC Press.
- Pilla, A., Fitzsimmons, R., Muehsam, D., Wu, J., Rohde C., & Casper, D. (2011). Electromagnetic fields as first messenger in biological signaling: Application to

- calmodulin-dependent signaling in tissue repair. *Biochemical Biophysical*, 1810(12), 1236-1245.
- Quinn, M. (2018). *6 months since Trump declared an opioid emergency, What's changed?* Retrieved from <http://www.governing.com/topics/health-human-services/gov-opioid-emergency-declaration-trump.html>
- Raffaelli, W., & Arnaudo, E. (2017). Pain as a disease. *Journal of Pain Research*, 2017(10), 2003-2008.
- Rawe, I. (2016). Pulsed radiofrequency electromagnetic field therapy for menstrual pain: A double blind, randomized and placebo-controlled pilot study. *Rheumatology*, 55(4), 755-762.
- Reuben, D., Alvanzo, A., Ashikaga, T., Bogat, A., Callahan, C., Ruffing, V., & Steffens, D. (2015). National Institutes of Health pathways to prevention workshop: The role of opioids in the treatment of chronic pain. *Annals of Internal Medicine*, 162(4), 295-300. doi:10.7326/M14-2775
- Robertson, J., Juen, N., Theberge, J., Weller, J., Drost, D., Prato, F., & Thomas, A. (2010). Evidence for a dose-dependent effect of pulsed magnetic fields on pain processing. *Neuroscience Letters*, 482(2), 160-162. doi:10.1016/j.neulet.2010.07.024
- Rohde, C., Chiang, A., Adipoju, O., Casper, D., & Pilla, A. (2009). Effects of pulsed electromagnetic fields on IL-1beta and post-operative pain: A double-blind, placebo-controlled pilot study in breast reduction patients. *Plastic and Reconstructive Surgery*, 125(6), 1620-1629. Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/20527063>

- Rosa, W. (2017). *A new era in global health: Nursing and the United Nations 2030 agenda for sustainable development*. New York, NY: Springer.
- Rothemeyer, S., & Enslin, J. (2016). Surgical management of pain. *South African Medical Journal*, 106(9), 858-860. doi:10.7196/SAMJ.2016.v 106i 9.11366
- Saggini, R., Bellomo, R., Saggini, A., Iodice, P. & Toniato, E. (2009). Rehabilitative treatment for low back pain with external pulsed electromagnetic fields. *International Journal of Immunopathology and Pharmacology*, 22(3), 25-28.
- Sandelowski, M. (2000). Whatever happened to qualitative description? *Research in Nursing & Health*, 23(4), 334-340.
- Saper, R. (2016). Integrative medicine and health disparities. *Global Advances in Health and Medicine*, 5(1), 5-8.
- Schulenburg, J. (2015). Considerations for complementary and alternative interventions for pain. *Pain Management*, 101(3), 319-326. doi:10.1016/j.aorn.2015.01.013
- Sieron, A., Labus, L., Nowak, P., Cieslar, G., Brus, H., & Durczok, A. (2004). Alternating extremely low frequency magnetic field increases turnover of dopamine and serotonin in rat frontal cortex. *Bioelectromagnetics*, 25(6), 426-30.
- Silberstein, S., Tfelt-Hansen, P., Dodick, D. W., Limmroth, V., Lipton, R. B., Pascual, J., ... Task Force of the International Headache Society Clinical Trials Subcommittee. (2008). Guidelines for controlled trials of prophylactic treatment of chronic migraine in adults. *Cephalalgia*, 28(5), 484-495.
- Sitzman, K., & Watson, J. (2018). *Caring-science-mindful practice. Implementing Watson's human caring theory* (2nd ed.). New York, NY: Springer.

- Sorrel, R. G., Muhenfeld, J., Moffett, J., Stevens, G., & Kesten, S. (2018). Evaluation of pulsed electromagnetic field therapy for the treatment of chronic postoperative pain following lumbar surgery: A pilot, double-blind, randomized, sham-controlled clinical trial. *Clinical Trial Report, 11*, 1209-1222.
<https://doi.org/10.2147/JPR.S164303>
- Sværdborg, M., Momsen, O. H., & Damsgaard, T. E. (2016). Pulsed electromagnetic fields for postoperative pain treatment after breast augmentation: A double-blind, placebo-controlled study. *Aesthetic Surgery Journal, 36*(6), NP199-NP201.
- Tappen, R. M. (2014). *Advanced nursing research: From theory to practice* (2nd ed.). Sudbury, MA: Jones and Bartlett Learning.
- Transparency Market Research. (2016, September 28). *Pain management therapeutics market to reach US \$83.0 billion by 2024* (Press release). Retrieved from <https://globenewswire.com/news-release/2016/09/28/875315/0/en/Pain-Management-Therapeutics>
- Turkel, M., Watson, J., & Giovannoni, J. (2018). Caring science or science of caring. *Nursing Science Quarterly, 31*(1), 66-71.
- van Bergen, C., Blanknkevoort, L., de Haan, R. Sierevelt, I., Meuffels, D., d'Hooghe, P., ... van Dijk, C. N. (2009). Pulsed electromagnetic fields after arthroscopic treatment for osteochondral defects of the talus: Double-blind randomized controlled multicenter trial. *BMC Musculoskeletal Disorders, 10*(83), 1-10.
- Vargas, C., Norberto, B., Carlos, B., Rodrigues, M., Zitko, P., Rojas, R., ... Espinoza, M. A. (2018). Cost and consequences of chronic pain due to musculoskeletal

disorders from a health system perspective in Chile. *Pain Reports*, 3(5), e656.
doi:10.1097/PR9.0000000000000656

Vavken, P., Arrich, F., Schuhfried, O., & Dorotka, R. (2009). Effectiveness of pulsed electromagnetic field therapy in the management of osteoarthritis of the knee: A meta-analysis of randomized controlled trials. *Journal of Rehabilitation Medicine*, 41(6), 406-411. doi:10.2340/16501977-0374

Watson, J. (1979). *Nursing: The philosophy and science of caring*. Boston, MA: Little, Brown & Company.

Watson, J. (1988). *Nursing: Human science and human care*. New York, NY: National League for Nursing.

Watson, J. (2018). *Unitary caring science: The philosophy and praxis of nursing*. Boulder: University Press of Colorado.

Weintraub, M. I., Herrmann, D. N., Smith, A. G., Backonja, M., & Cole, S. P. (2009). Pulsed electromagnetic fields to reduce diabetic neuropathic pain and stimulate neuronal repair: A randomized controlled trial. *Archives of Physical Medicine & Rehabilitation*, 90(7), 1102-1109. World Health Organization. (n.d.). *WHO's cancer pain ladder for adults*. Retrieved from www.who.int/cancer/palliative/painladder/en/

Yu-Hong, Z., Yong, Z., Tong-Jun, Z., Ya-Fei, C., & Chang-Qing, Y. (2009). Model for influences of magnetic fields on intracellular calcium oscillations. *Communications in Theoretical Physics*, 52(1), 168.