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I think I can: The Effectiveness of a Biofeedback Intervention on Surgical Patients' Self-Efficacy

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by

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In pursuit of the Quadruple Aim, hospitals and health care clinics are adapting a biopsychosocial perspective in order to best meet both patient and system needs. One specialty area of healthcare with stark interactions of biological, psychological, and social factors is orthopedic surgery. Literature suggests self-efficacy may be an important factor for improving health outcomes post-surgery; biofeedback interventions have been repeatedly shown to increase patient self-efficacy. The current study examined effectiveness of a biofeedback intervention on orthopedic patients' self-efficacy, pain interference, and physiological regulation. Researchers recruited 12 orthopedic patients to participate in the study and randomly assigned them to either the control or experimental condition. All participants completed pre/post self-report measures and biofeedback measurements as well as engaged in a daily self-regulation exercise; participants in the experimental condition also partook in weekly biofeedback interventions. Results were analyzed using a mixed two-way MANOVA and a three-way ANOVA with repeated measures. Although there were no statistically significant results, there were clinically significant effect sizes in patients' pain interference and self-regulatory abilities, suggesting biofeedback interventions are an effective strategy for teaching pain management and self-regulation. Together, these findings provide further evidence to support a holistic approach to healthcare and have numerous implications for post-operative rehabilitation.

Keywords: self-efficacy, biofeedback, pain interference, orthopedic surgery

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Chapter 1

Introduction

Efficiency in Healthcare

Healthcare in the United States is a provocative, complicated, and widespread issue. Over the past several decades there have been numerous policies designed to increase the effectiveness and efficiency of the healthcare system. One of the most influential milestones in healthcare reform was the development of the Triple Aim initiative. In 2007, the Institute for Healthcare Improvement (IHI) introduced the innovative Triple Aim, more recently converted to the Quadruple Aim, to optimize system performance while simultaneously improving care. Specifically, the Quadruple Aim seeks to enhance the experience of care for individuals, increase the health of populations, reduce cost per capita, and reduce system strain and burnout (Berwick et al., 2008).

The Quadruple Aim was created in response to the United States' inferior healthcare standards. In order to systematically improve healthcare, the United States needed a standardized and comprehensive approach to care. This overarching mission fueled the development of the Triple Aim (Berwick et al., 2008), and eventually the Quadruple Aim (Bachynsky, 2020). The goals of the Quadruple Aim (i.e., concurrently improve the quality of individual healthcare, increase the health of populations, and reduce the overall cost, reduce provider burnout) are inherently interconnected. Meaning, progress towards one goal naturally impacts the progress (or regression) of the other goals. Although the process of achieving the Quadruple Aim is an elusive balancing act, there is tremendous potential in attaining a high-quality, sustainable model. As such, clinics and hospitals throughout the nation work diligently to achieve the Quadruple Aim.

The Biopsychosocial Perspective

Healthcare organizations can more adeptly achieve their Quadruple Aim goals if they incorporate a multidisciplinary approach to treatment. In order to provide excellent care to patients while also valuing efficiency, patients must be addressed *holistically*. In 1977, George Engel, a physician, introduced this concept of well-rounded healthcare. In his publication, Engel suggested health and illness are not limited to biological origins. Rather, there is a complex interplay between physical, mental, and emotional factors working together to influence an individual's health. Accordingly, Engel formally suggested the "biopsychosocial model" as a contextual framework designed to complement the traditional medical model (Ayers et al., 2013). The biopsychosocial model emphasizes a comprehensive approach to understanding patients. Moreover, the model examines how the three domains interact with one another to develop and maintain one's symptoms (Engel, 1977). It also considers protective and risk factors to inform patient presentation, treatment, and outcome. This model of conceptualization is especially beneficial as the majority of patients present with symptoms related to psychosocial issues (Monson et al., 2012).

The biopsychosocial model has made a significant impact on how healthcare professionals conceptualize patients. There is now greater understanding on how psychological factors can influence chronic conditions such as persistent pain and irritable bowel syndrome. Conversely, there is also consensus that psychosocial and lifestyle factors can predispose individuals to biological illnesses (i.e., Type-II diabetes; Ayers et al., 2013). As a result, there is a growing body of evidence supporting the role of behavioral health providers (BHPs) in primary care settings (Peterson et al., 2017). BHPs collaborate in the care of patients by addressing the relevant psychosocial factors. BHPs provide interventions and clinical assessments, as well as help improve the care team's biopsychosocial conceptualization (Hunter et al., 2017). Some of the most prominent benefits of implementing BHPs include improved clinical outcomes and reduced costs (Peterson et al., 2017). Furthermore, Franko (2015) found the integration of behavioral health resulted in increased utilization of primary care and decreased utilization of more expensive treatment options (i.e. emergency care, hospitalizations, surgeries). This led to a 22% cost savings over a 3-year period (Franko, 2015). These financial benefits, paired with the enhanced quality of care and patient satisfaction, support the viability and value of behavioral health integration. Failure to implement behavioral health may be associated with poorer health outcomes and inefficient allocation of resources, ultimately resulting in failure to achieve the Quadruple Aim. For instance, historically the field of surgery has received relatively minimal behavioral health integration. Yet, surgery presents very discernable intersections of biological, psychological, and social factors. In the realm of surgery, positive outcomes are interwoven with patient biological factors (e.g., age, weight, comorbid disease), psychological factors (self-efficacy, motivation), and social supports (e.g., family members to encourage movement in the rehabilitation process, access to activities to facilitate improvement). Surgery is also one of the most expensive and demanding areas of care, making the Quadruple Aim even more essential.

Surgery: Increasing Demand

The rate of surgical procedures is steadily rising. The rate of procedures performed in ambulatory surgery centers increased by 300% in the 10-year period from 1996 to 2006. Experts estimate this trend will continue as disease prevalence increases (National Quality Forum, 2017; Rose et al., 2017). The vast increase in surgery prevalence is seen in the specialty area of orthopedic surgery. In 2014 alone there were approximately 600,000 total knee replacement surgeries, with a projected increase to 1.5 million by 2020 (Annual Orthopedic Summit, 2017). The fastest growing subgroup of this surgical population is adults over the age of 65, commonly referred to as "baby boomers." With the number of adults over age 65 steadily growing (this age group is predicted to increase to 53.2% by 2020), there is a corresponding increase in the demand for medical procedures, including orthopedic surgeries (Etzioni et al., 2003; Haralson & Zuckerman, 2009; Sheldon, 2010). The obesity epidemic also contributes to the rise in surgeries: between 2015 and 2016, approximately 40% of the U.S. adult population and 18.5% of children were considered obese. These rates increased by 6% and 2%, respectively, from 2008 to 2009 (Hales et al., 2018) and the incidence continues to rise. In fact, it is estimated that one in every three Americans is overweight (Guenther et al., 2015). Obesity is correlated with a variety of medical conditions, including increasing one's likelihood for needing a knee and/or hip arthroplasty because there is more pressure on the joint (Jasinski-Bergner, Radetzki, Jahn, Wohlrab, & Kielstein, 2017). In short, a higher BMI leads to an increased risk of needing joint replacement surgery (Guenther et al., 2015). Due to these population demands on surgery, it is increasingly necessary to develop innovative ways to manage the increased workload without sacrificing quality of care (Etzioni et al., 2003). One possible solution could be to hire more surgeons to meet the need; however, this is a costly route as the mean salary for orthopedic surgeons is $355,704 (Anupam et al., 2016). Additionally, the number of surgeons is declining (Sheldon, 2010). Due to numerous factors, including small class sizes in medical schools, policy reform in Washington DC, and the push for more osteopathic programs to fuel primary care, the medical-political climate has created a perfect storm in which there is a lower supply of providers attempting to meet an increased demand for surgical procedures (Sheldon, 2010). This may be especially problematic for rural areas where there are fewer orthopedic surgeons compared to urban cities (Fu et al., 2013). Thus, the need to reduce the burden for the already over-worked surgical system has perhaps never been more critical.

Self-Efficacy

The Quadruple Aim and the biopsychosocial perspective highlight the importance of patient variables in healthcare. A patient's experience is often determined, in part, by a variety psychological and social factors; self-efficacy is one factor that has been consistently identified as a predictor for response to treatment and healthcare management (Sheeran et al., 2016). Self-efficacy is an individual's belief in their ability to succeed in a given situation (Bandura, 1977). The construct of self-efficacy was first introduced in 1977 by social psychologist Albert Bandura. Self-efficacy is an exponentially important variable because it directly affects how an individual engages in life. Self-efficacy theory posits psychological processes (i.e. thoughts, attitudes, beliefs) alter the strength of self-efficacy (Bandura, 1977). Self-efficacy is also correlated with pro-health actions (Waldrop et al., 2001). It is important to note efficacy expectations are different than outcome expectations. Outcome expectancy is defined as a person's estimate that a particular behavior will lead to a certain outcome, whereas efficacy expectancy is a person's confidence in their ability to successfully perform a behavior. For example, an individual may believe a course of action will lead to a desired outcome, but if they doubt whether or not they can perform the necessary steps to achieve the desired outcome, they will likely not act on their knowledge. Put another way, outcome expectancies do not influence behavior if self-efficacy expectations are lacking.

Perceived self-efficacy influences individuals' initiation and persistence of coping behaviors (Bandura, 1977). Efficacy expectations determine how much effort people will put forth and how long they will persist in the face of obstacles and adverse circumstances (Bandura, 1977). Typically, people with greater perceived self-efficacy will exert greater efforts; therefore, it is not surprising people with high self-efficacy tend to also display a growth mindset (Rhew et al., 2018). Perceptions of self-efficacy are reinforced through experiences; an individual who persists in spite of adversity will have confirming experiences, reinforcing their level of self-efficacy. In contrast, an individual who ceases their coping behaviors prematurely will maintain their self-debilitating expectations (Bandura, 1977). A person can develop their self-efficacy through mastery experiences (i.e., performing a task successfully), social modeling (i.e., observing another person succeed at a task), and/or social persuasion (i.e., receiving positive encouragement when working toward a goal). Furthermore, psychological influences such as stress, moods, emotional states, and physiological reactions can also impact one's self-efficacy (Ayers et al., 2013).

Self-efficacy theory infers that when people feel more confident in their abilities, they are more likely to engage in activities, which in turn reinforces their self-efficacy beliefs. In healthcare settings, this is especially important for motivation and adherence to treatment. Therefore, it is reasonable to assume that as patients feel more efficacious about their abilities, they will feel more empowered and more likely to engage in health behavior change, including the recommendations following a medical procedure, consequently strengthening their self-efficacy while also improving their health outcomes. For example, a patient undergoing joint replacement surgery will be more likely to engage in their post-operative physical therapy exercises if they believe their actions will benefit their healing. More generally, they will be more motivated to engage if they believe they have agency in their recovery. Previous research has established a positive relationship between self-efficacy and post-operative orthopedic outcomes, suggesting providers can improve patients' recovery by enhancing self-efficacy (Waldrop et al., 2001). This begs the question, how do providers increase their patients' self-efficacy?

Biofeedback

Biofeedback interventions are clinician led, technology-based designed to increase relaxation in participants (McKenna et al., 2019; Teufel et al., 2013). In biofeedback therapy, patients receive visual and/or auditory stimuli representing physiologic measures such as electrodermal activity (EDA), heart frequency, skin temperature, or electromyogram. The primary goals of biofeedback include modifying the pathophysiology underlying a respective medical condition (if applicable), increasing one's self-efficacy, and improving coping behaviors (Teufel et al., 2013). During biofeedback, patients learn how to monitor and control their physiological arousal, in doing so they bolster their internal locus of control and health self-efficacy (Teufel et al., 2013). The eventual goal of biofeedback therapy is for patients to gain the ability to interpret their physiological cues without the assistance of the biofeedback equipment and/or clinician. As patients become more adept and independent in this skill, they can subsequently self-implement physical and cognitive down-regulation strategies to modulate breathing, heart rate, and emotional coping (McKenna et al., 2019). Biofeedback emphasizes the importance of the mind-body connection, especially in regards to regulating one's physical and psychological distress. Unsurprisingly, biofeedback is an effective strategy for pain management. In biofeedback, patients in pain are able to reduce the activation of their sympathetic nervous system; the parasympathetic nervous system is then more able to engage in its restorative operations (McKenna et al., 2019).

Relationship Between Biofeedback and Self-Efficacy

The relationship between biofeedback and self-efficacy has been effectively established in numerous research studies (Goessl et al., 2017; Paul & Garg, 2012; Takamura & Inamitsu, 2008; Teufel et al., 2013). As patients learn how regulate their physiological responses through the biofeedback therapy, they simultaneously build their self-efficacy through mastery experiences. Biofeedback interventions are already being used to help treat a variety of medical conditions, but there is a lack of research exploring the use of biofeedback in surgical settings. Therefore, exploring the potential of biofeedback to improve post-operative rehabilitation may lead to a valuable contribution to the literature.

One application where biofeedback might prove especially valuable is in the realm of orthopedic surgery. To be eligible for a total joint replacement, patients need a diagnosis of either osteoarthritis (OA) or rheumatoid arthritis. Arthritis is the leading cause of disability in the US, and is associated with work disability, limited activity, reduced quality of life, and high health care costs (Haralson & Zuckerman, 2009). Fortunately, orthopedic surgery has shown to be a very effective procedure for restoring physical function and alleviating bone and joint pain from OA. Yet, despite the high success rates of orthopedic surgeries, functional improvement after surgery varies greatly. These variations exist in spite of modern surgical techniques and are independent of postoperative complications (Ayers et al., 2013). One known challenge is poorly managed postoperative pain. Uncontrolled postoperative pain is associated with increased morbidity, functional and quality-of-life impairment, longer recovery time, prolonged duration of opioid use, and higher healthcare costs (Gan, 2017). Postoperative pain continues to be a barrier to recovery and necessitates intervention.

Most of the research on orthopedic outcomes has focused almost exclusively on anatomical functioning, consequently neglecting the role of mental and emotional health. However, research supports a considerable relationship between poor functional outcomes and poor emotional health (i.e., depression, anxiety, limited social support, poor coping skills, low self-efficacy; Ayers et al., 2013). This is a major limitation to the literature and has created a gap between theory and practice. This gap needs to be addressed in order to systematically improve orthopedic surgery outcomes.

Purpose of this Study

Given the previous research in the areas of self-efficacy, biofeedback, pain management, and integrated care, one might submit that biofeedback therapy would be a valuable asset for medical surgery departments. As surgery prevalence continues to rise, biofeedback therapy offers a unique capacity to decrease costs, increase the quality of care, and improve patients' quality of life. The current study is designed to examine the effectiveness of a biofeedback intervention on orthopedic surgical patients' self-efficacy. I present three hypotheses: First, self-regulation practice will increase patients' perception of self-efficacy (as measured by PROMIS self-report self-efficacy scores), with those in the experimental condition exhibiting significantly greater improvements in self-efficacy. Second, self-regulation practice will decrease patients' perception of pain (as measured by PROMIS self-report scores), with patients in the experimental condition showing a significant reduction in their pain perception. Finally, self-regulation practice will increase patients' ability to regulate their physiological arousal (as measured by EDA and PPG), with those in the experimental condition showing a significantly greater ability to control their physiology. The findings from this study can add to the current empirical literature surrounding self-efficacy, alternative pain management, and biofeedback, as well as serve as a springboard for incorporating biofeedback therapy as a regular part of orthopedic surgery protocol.

Chapter 2

Methods

Participants

Following Human Subject Review Committee approval, participants were recruited through a rural hospital's orthopedic surgery department. Specifically, participants were recruited at the end of a required procedure and pain education class taken by all perioperative patients. Participation in behavioral health and biofeedback services was an elective addition to perioperative requirements and did not impact an individual's candidacy for surgery. All of the participants included in the study had received preliminary approval to receive orthopedic surgery (i.e., hip, knee, or shoulder replacement). Participants were divided into two groups using random assignment; one group was assigned to the self-regulation and biofeedback intervention (experimental group) while the other group was assigned to the self-regulation only intervention (control group). All participated were compensated for their time with an $80 gift card.

Materials

Electrodermal Biofeedback

Electodermal biofeedback equipment produced by Biopac Systems Inc.® was used to quantify physiological arousal (H1), as measured by electrodermal activity (EDA) and heart rate. The EDA channel—also known as electrodermal response, skin conductance activity/response, or galvanic skin response (GSR)— indicates the presence of eccrine (skin sweating) activity (Scrimali et al., 2015). Two electrodes were placed on opposite ends of the participant's palm to measure microseamens indicating an electrodermal response. While participants' EDA was being recorded, participants' heart rate or photoplethysmography (PPG; i.e., the rate of blood flow controlled by the heart's pumping action) was simultaneously measured. To measure PPG, a single sensor was placed on the inside of the participant's right index finger. PPG was then converted to heart rate variability or root mean square of the successive differences (RMSSD) for analysis. The biofeedback equipment also included a visual monitor that provided real-time feedback showing EDA and PPG for participants to observe changes in their skin response and heart rate.

PROMIS

PROMIS® (Patient-Reported Outcomes Measurement Information System) is a subdivision of HealthMeasures, a health measurement corporation sponsored by the National Institute of Health (NIH). PROMIS was developed using advanced psychometric methods and has since been used in thousands of research studies put on by the NIH, Mayo Clinic, Food and Drug Administration, and other prestigious organizations. PROMIS is a set of person-centered measures that evaluates and monitors physical, mental, and social health in adults and children. It can be used with the general population and with individuals living with chronic conditions. PROMIS questions are administered using a compute adaptive test (CAT) protocol. The specific PRMOIS measures used in this study were self-efficacy of managing symptoms, pain interference, fatigue, and depression. PROMIS was administered to participants electronically through use on an iPad.

Opioid Risk Tool

The Opioid Risk Took (ORT) is a brief screening used to assess patients' risk for opioid misuse in primary care settings. Patients who are categorized as "high risk" are at an increased likelihood for future narcotic abuse. Additionally, the ORT shows strong predictive validity (c = .82 for males, c = .85 for females; Webster & Webster, 2005). In an effort to meet clinic and provider needs, the ORT will continue to be administered to patients but the data will not be included in this dissertation.

Qualitative Questions

Three months post-operation, participants in the biofeedback condition were called for feedback on the pilot intervention. Researchers asked participants the following questions: *How was the biofeedback program helpful, what parts did you like best*, and *do you have any advice or recommendations for program improvement.* Participants' answers were recorded.

Procedure

After providing informed consent, all participants were assessed using the biofeedback equipment and asked to complete the PROMIS measures. For the initial and final assessments, participants' physiology was measured for a total of seven minutes divided into three distinct phases: rest one, stimulus, and rest two. During rest one, participants were asked to simply relax for two minutes. Then, during the stimulus phase, participants were asked to complete a series of multiplication and long division math questions for three minutes. Finally, participants were asked to relax again just like they were prior to solving the math problems (2 minutes).

All participants were also taught a brief (2-minute) deep breathing exercise accompanied by a related handout; participants were asked to practice this exercise three times per day. In addition to engaging in daily down-regulation exercises, the six participants in the experimental group received a brief biofeedback intervention once a week for three or four weeks. The biofeedback therapy consisted of a 10-minute, guided relaxation/grounding exercise while the participants' EDA and PPG were recorded. The participants were able to visually observe their physiological responses via a laptop computer. After four weeks, all participants were reassessed using the biofeedback equipment and PROMIS measures. Patients in the experimental condition also received follow-up phone calls to gather qualitative data.

Design

The current study is a 2 X 2, quantitative, mixed factorial design. As such, the data was analyzed using a mixed two-way MANOVA as well as a three-way ANOVA with repeated measures, which allowed us to explore the potential strength of relationships according to theoretically constructed hypotheses. A qualitative analysis was used to identify themes in the participants' answers.

Chapter 3

Results

Demographics

Twelve patients (3 men, 9 women; 10 knee, 1 hip, 1 shoulder surgery) expressed interest in participating in a pain management intervention and were invited to participate in the study. The mean age of the participants was 63.9 (*SD* = 8.74) and the majority of individuals had private insurance (two with Medicare, four with private Medicare, six with private). All participants identified as Caucasian.

PROMIS Self-Report

Descriptive statistics for self-report Patient-Reported Outcomes Measurement Information System (PROMIS) data and measurements of self-efficacy, fatigue, depression and pain-interference can be found in Table 1. Results were analyzed using a mixed, two-way MANOVA. Due to limited statistical power, the results did not indicate statistical significance. However, there were meaningful effect sizes between the independent and dependent variables. Most notably, for patients' pain interference, there was an effect of time with a moderate effect size ($\eta^2 = .26$), indicating all participants reported reductions in pain between the initial and final assessments There was also an interaction of group and time ($\eta^2 = .11$; see Figure 1), indicating participants in the experimental condition reported even greater reductions in pain interference compared to individuals in the control group; together, these results affirm the second hypotheses. Regarding self-efficacy and the first hypothesis, there was no effect of time ($\eta^2 = .001$). There was also a negative interaction of group and time, suggesting participants in the experimental condition reported decreased self-efficacy compared to participants in the control condition ($\eta^2 = .28$).

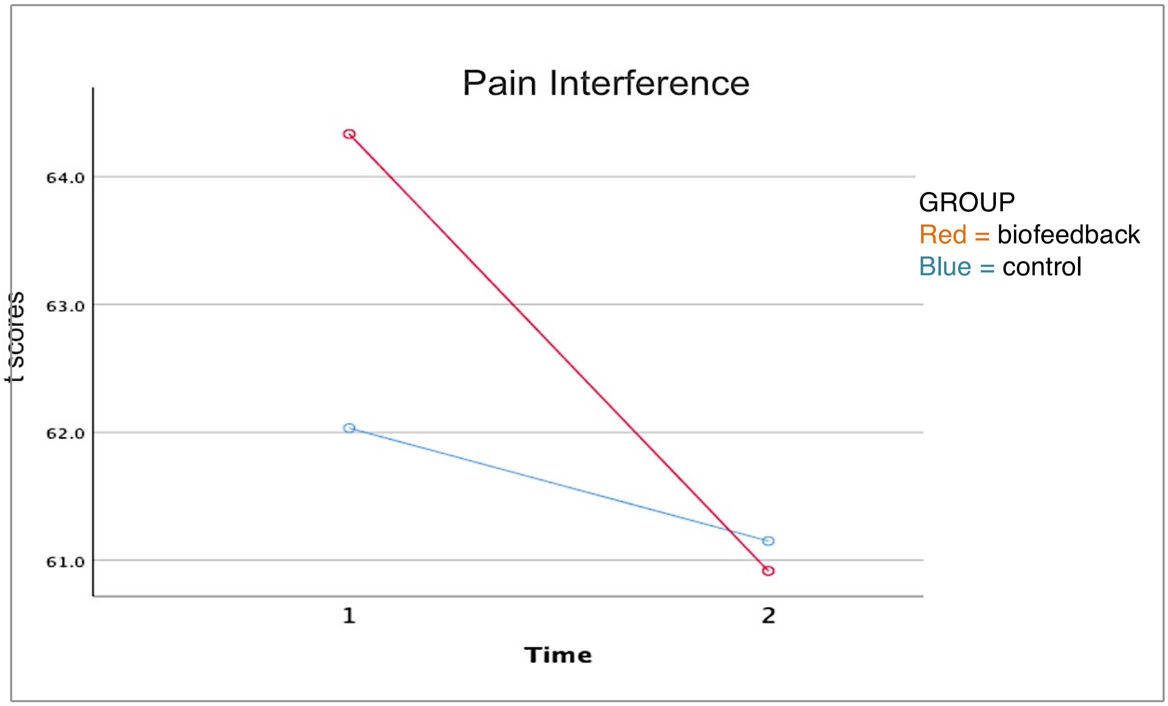
Table 1

Descriptive Statistics for PROMIS Self-Report

	n	*M*	*SD*
Pre-Pain Interference			
Control	6	62.03	4.90
Experimental	6	64.33	2.23
Total	12	63.18	3.84
Pre- Self-efficacy			
Control	6	43.08	3.57
Experimental	6	46.45	2.23
Total	12	44.77	3.34
Pre- Fatigue			
Control	6	58.17	5.18
Experimental	6	61.27	7.75
Total	12	59.72	6.49
Pre- Depression			
Control	6	49.72	5.25
Experimental	6	51.35	5.41
Total	12	50.53	5.15
Post- Pain Interference			
Control	6	61.15	5.48
Experimental	6	60.97	5.42
Total	12	61.03	5.20
Post- Self-efficacy			
Control	6	44.95	2.84
Experimental	6	44.40	3.22
Total	12	44.68	2.91
Post- Fatigue			
Control	6	59.15	8.62
Experimental	6	56.93	7.78
Total	12	58.04	7.91
Post- Depression			
Control	6	49.80	4.07
Experimental	6	48.77	6.69
Total	12	49.28	5.31

Figure 1

Interaction (η^2 = .11) of Group and Time for PROMS Self-Report "Pain Interference" Data



EDA

Descriptive statistics for physiological data, electrodermal activity (EDA) and heart rate variability, signified by root mean square of the successive differences (RMSSD), can be found in Tables 2 and 3, respectively. Results were analyzed using two-way ANOVAs with repeated measures. In the EDA data, there was a statistically significant trend (p = .058, η^2 = .612) for a main effect of phases (see Figure 2). This suggests all participants showed statistically different electrodermal responses in the three distinct phases (i.e., Rest 1, Stimulus, Rest 2). Outside of this significant trend, no other statistically significant findings were identified, likely due to limited statistical power. Still, there were meaningful effect sizes, including an interaction between phases and group with moderate to large effect size (η^2 = .219). This finding showed participants in the experimental condition had different electrodermal responses in the three distinct phases compared to participants in the control condition (see Figure 3). There was also an interaction between time and phase with a large effect size ($\eta^2 = .366$) indicating all participants showed less electrodermal activity in the stimulus phase during the final assessment (Time 2) compared to the initial assessment (Time 1; see Figure 4).

Table 2

Descriptive Statistics for EDA

	n	*M*	*SD*
Pre-Rest 1			
Control	5	3.46	1.50
Experimental	4	3.15	2.91
Total	9	3.32	2.08
Pre- Stimulus			
Control	5	4.97	3.35
Experimental	4	4.73	3.84
Total	9	8.86	3.34
Pre- Rest 2			
Control	5	5.66	3.35
Experimental	4	3.68	3.84
Total	9	4.78	3.42
Post- Rest 1			
Control	5	3.38	1.47
Experimental	4	4.59	4.04
Total	9	3.91	2.76
Post- Stimulus			
Control	5	3.65	1.88
Experimental	4	5.19	4.65
Total	9	4.33	3.25
Post- Rest 2			
Control	5	4.64	2.48
Experimental	4	5.62	4.94
Total	9	5.07	3.54

Figure 2

Statistical Trend (p = .058, η^2 = .612) Indicating a Main Effect of Phases in EDA Data

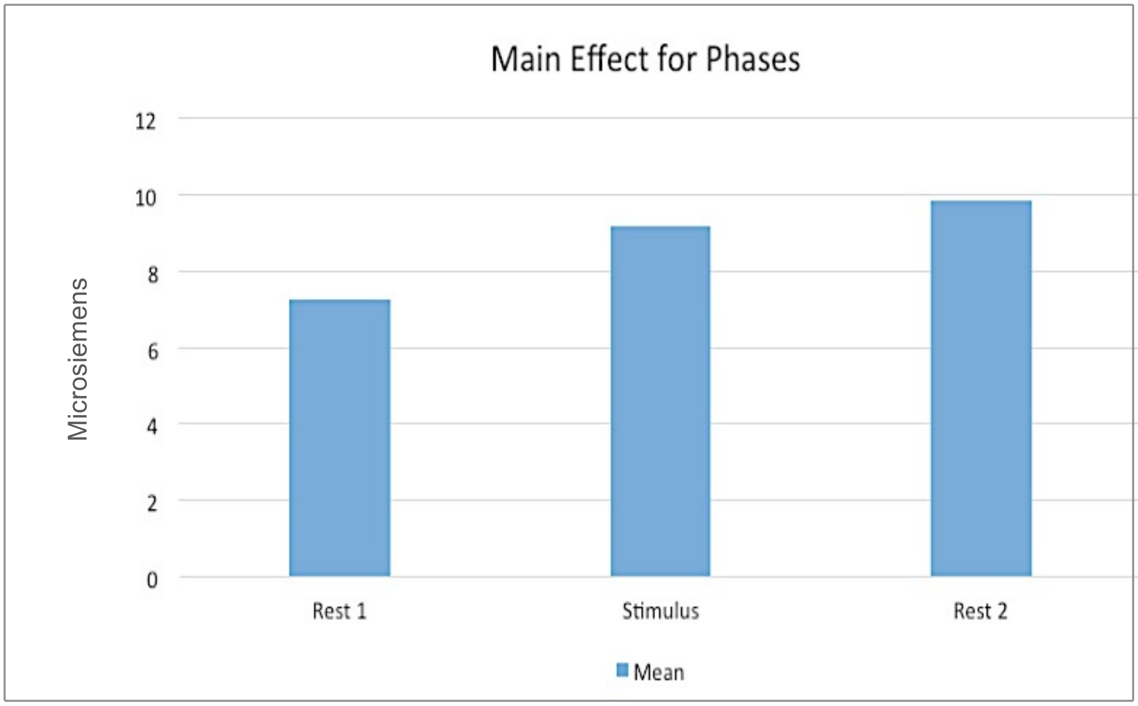


Figure 3

Interaction (η^2 = .219) of Phase and Group for EDA Data

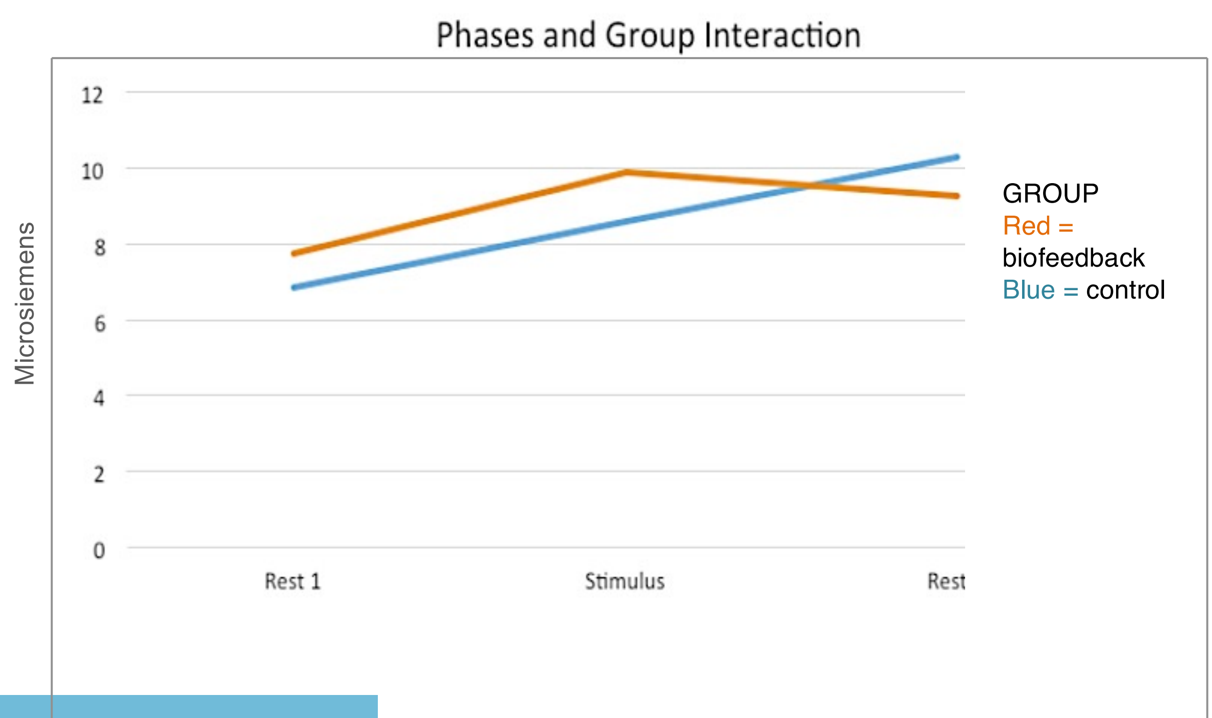
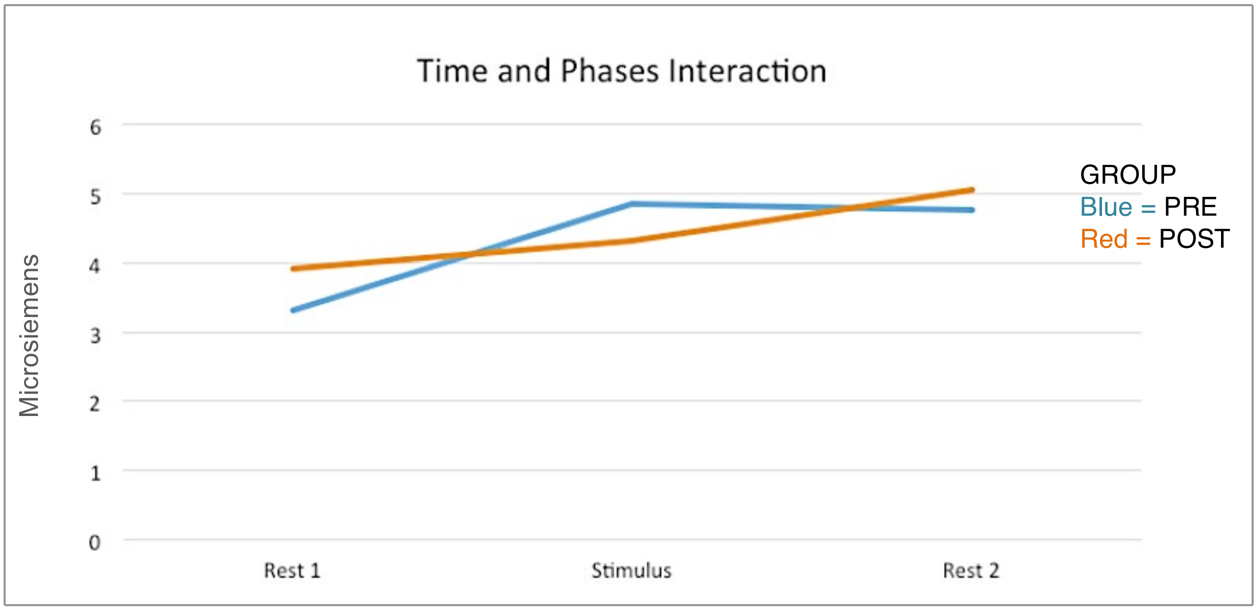


Figure 4

Interaction (η^2 = .366) of Time and Phases for EDA Data



RMSSD

There were no statistically significant findings in the RMSSD data (see Table 3). However, there were two interactions with meaningful effect sizes: phase by time and phase by group. For phase by time, there was an interaction with a very large effect size (η^2 = .378) indicating all participants developed an increased ability to regulate their heart rate at each phase at the final assessment compared to the initial assessment (see Figure 5). In the phase by group interaction, the effect size was also very large (η^2 = .369). From this interaction, results suggest participants in the experimental group exhibited lower heart rates in the stimulus phase compared to participants in the control condition (see Figure 6).

Table 3

Descriptive Statistics for RMSSD

	n	*M*	*SD*
Pre-Rest 1			
Control	5	95.46	93.18
Experimental	4	65.24	67.67
Total	9	82.03	79.45
Pre- Stimulus			
Control	5	64.85	59.19
Experimental	4	84.35	28.10
Total	9	73.52	46.41
Pre- Rest 2			
Control	5	56.40	56.16
Experimental	4	35.95	35.43
Total	9	47.31	46.52
Post- Rest 1			
Control	5	130.02	173.10
Experimental	4	118.69	137.60
Total	9	124.98	148.72
Post- Stimulus			
Control	5	123.98	141.18
Experimental	4	111.48	120.86
Total	9	118.42	124.44
Post- Rest 2			
Control	5	156.07	161.24
Experimental	4	98.98	128.73
Total	9	130.69	141.84

Qualitative Responses

A content analysis was used to identify themes in the biofeedback participants' answers to three open-ended questions. Regarding the helpfulness of the intervention (Q1), two primary constructs emerged: decreased pain ("it helped me deal with the pain; I had left over oxycodone") and regulation of physiological activation ("it helped me calm down so I could

Figure 5

Interaction (η^2 = .378) of Phase and Time for RMSSD Data

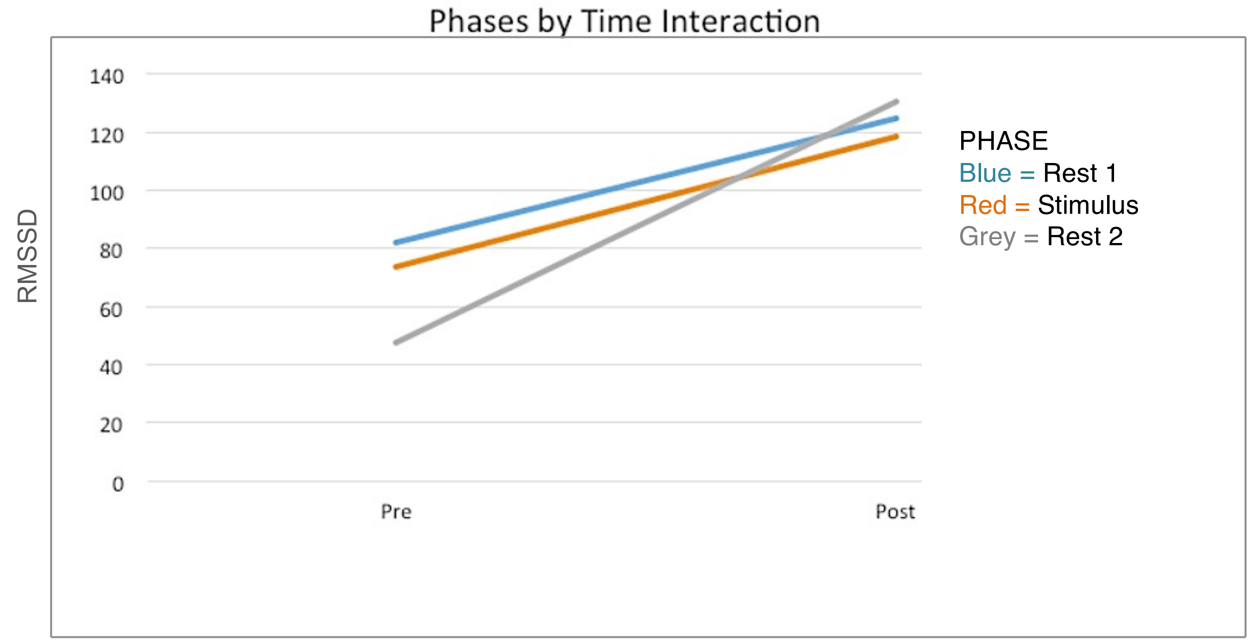
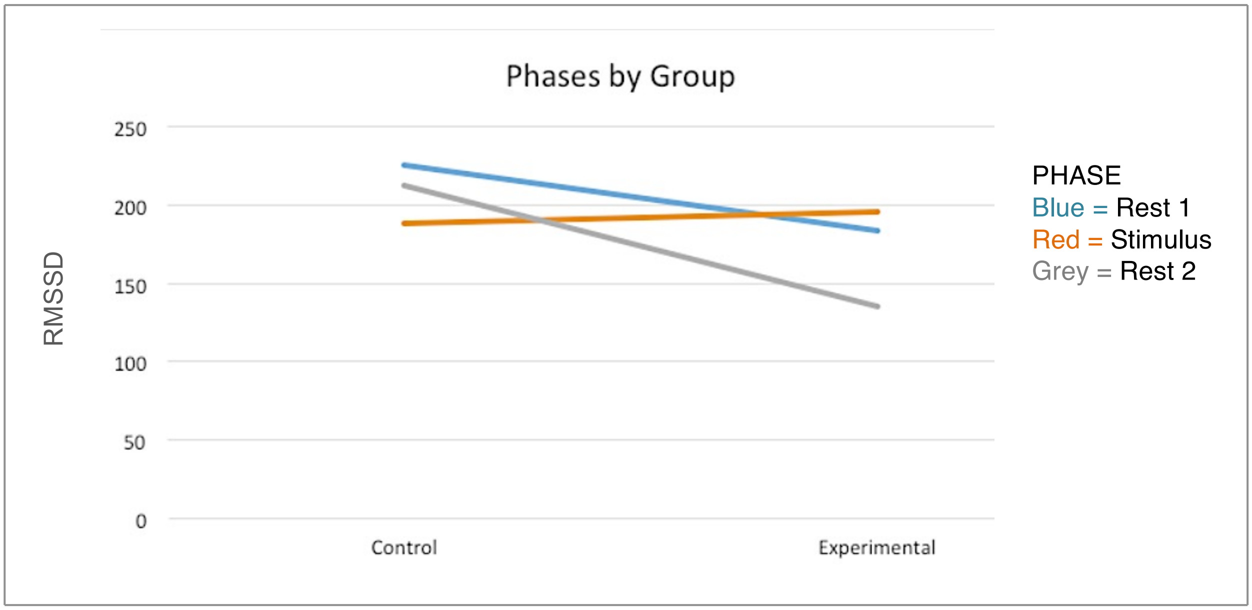


Figure 6

Interaction (η^2 = .268) of Time and Group for PROMS Self-Report "Fatigue" Data



focus more”). Regarding participants' favorite aspect of the program (Q2), three themes arose: experiential learning (“I liked seeing the monitor and getting into position ... I liked the visual aspect”), therapeutic engagement (“I enjoyed meeting with you”), and agency in pain control (“learning that I can do that, how I could contribute to controlling my pain”). Lastly, when asked about their recommendations for the BFB program (Q3), participants responded with two primary ideas: lack of ease in the BFB display (“the bar kept bouncing around”) and no recommendations but overall satisfaction with the helpfulness of the program (“no, it was very helpful. I still use it”).

Chapter 4

Discussion

Discussion of Hypotheses

Hypothesis 1

The first hypothesis (H1: all participants' self-efficacy will increase, with participants in the experimental condition demonstrating even greater improvements in self-efficacy) was not supported. Surprisingly, there was a negative interaction for group and time, suggesting participants in the control condition reported reductions in self-efficacy compared to participants in the control condition ($\eta^2 = .28$). This is a very surprising finding given the established relationship between biofeedback and self-efficacy (Teufel et al., 2013; Takamura & Inamitsu, 2008; Paul & Garg, 2012; Goessl, et al., 2017).

Potential explanations for this unexpected outcome include a ceiling effect. As a part of the recruitment process, patients interested in participating in the study were required to stay after class to sign up and meet the behavioral health provider. The process of signing up for this study inherently required a healthy baseline of initiative and belief in one's ability to be successful. Therefore, the combination of selection bias and a small sample size likely resulted in a ceiling effect rather than an actual reduction in participants' self-efficacy. Another likely explanation for this result is measurement error. Due to restrictions in the available PROMIS software, only a "self-efficacy for managing symptoms" question-bank was available. Questions from the "self-efficacy for managing symptoms" bank include: *I can manage my symptoms in an unfamiliar place*, *I can keep my symptoms from interfering with my personal care,* and *I can* *manage my symptoms when I am at home.* These questions do not accurately encapsulate the general construct of self-efficacy researchers were intending to measure, likely contributing to our unsupported hypothesis. A third possibility is participants' expectations changed as they progressed throughout the intervention. Meaning, as patients' perceived pain interference and fatigue decreased, their expectations of their ability to manage their symptoms may have been overly optimistic in light of their progressing osteoarthritis.

Hypothesis 2

The second hypothesis (H2: all participants' self-reported pain interference will decrease, with participants in the experimental condition demonstrating even greater reductions in pain interference) was supported. There was an effect of time, indicating participants in both the experimental and control condition reported clinically significant reductions in their pain interference ($\eta^2 = .26$). Additionally, there was an interaction between group and time, suggesting participants in the biofeedback condition reported even greater reductions in pain interference compared to participants in the control condition ($\eta^2 = .11$). This finding is consistent with previous research, providing additional support for biofeedback as an effective strategy to improve individuals' pain management capabilities.

Hypothesis 3

The third hypothesis (H3: all participants' ability to regulate their physiological arousal will increase, with participants in the experimental condition demonstrating even greater improvements in self-regulation) was supported on four accounts. The interaction between EDA phase and group ($\eta^2 = .219$), demonstrates participants in the experimental condition exhibited different electrodermal responses in the phases compared to participants in the control condition. Although these participants appeared more distressed than participants in the control condition during rest one and stimulus phases, they were able to effectively self-regulate and lower their electrodermal response during rest two. This is in contrast to individuals in the control condition who showed a continued rise in their EDA, suggesting they were unable to self-regulate. Additionally, the interaction between EDA time and phase revealed all participants developed an increased ability to self-regulate over the course of the intervention (i.e., lower EDA in the final assessment compared the initial assessment), especially during times of stress (i.e. stimulus phase). The interaction ($\eta^2 = .369$) between RMSSD phase and group complements this: even though the individuals in the experimental condition displayed higher heart rates (i.e., higher sympathetic nervous system activity, increased physiological arousal) during both the rest periods, their heart rate dropped during the stimulus phase. This is especially notable when compared to the participants in the control condition who displayed a higher heart rate during the stimulus phase. Meaning, when participants in the experimental condition were presented with a stressor, they were better at self-regulating compared to the participants in the control condition. Put another way, the experimental group was able to move into more vagal tone, and by extension the parasympathetic nervous system, when presented with a stimulus compared to the control group, suggesting they were less stressed. This is particularly meaningful because being able to self-regulate during times of stress is more helpful and adaptive than being able to self-regulate in times of calm. Finally, the interaction of RMSSD time and phase signified all participants had lower heart rate during each of the three phases in the final assessment compared to the initial assessment. Again, this indicates all participants improved in their self-regulatory abilities over the course of the intervention.

Exploratory Findings

In addition to measuring pain interference and self-efficacy, patients' fatigue and depression were also assessed. Regarding fatigue, there was an effect of time ($\eta^2 = .127$) and an interaction between group and time ($\eta^2 = .268$; Figure 7). These noteworthy effect sizes indicate all participants endorsed clinically significant reductions in their fatigue, with those in the biofeedback condition indicating even greater reductions in fatigue over the course of the intervention. This is an unexpected yet encouraging finding, as fatigue is a common patient variable that often impacts patients' ability to engage meaningfully in treatment. Concerning patients' depression scores, there was an effect of time ($\eta^2 = .07$) and an interaction between time and group ($\eta^2 = .08$; Figure 8). Although these effect sizes are relatively small, these findings suggest increased mood may be a natural byproduct of reduced pain interference and/or other psychological factors discussed. These findings provide additional evidence to support the vast benefits and potential of self-regulation practices and biofeedback interventions.

An important observation from the qualitative responses is how patients endorsed increased self-efficacy despite the lack of evidence in the quantitative data. The majority of biofeedback participants indicated a primary benefit of the intervention was their increased agency in their pain control and improved confidence in their ability to regulate their physiology. Again, this suggests the absence of self-efficacy enhancement in the quantitative data is likely due to a ceiling effect rather than an actual reduction in participants' self-efficacy.

An additional meaningful finding from the qualitative data is the prominence of the therapeutic relationship. In addition to benefiting from the actual biofeedback intervention, participants also reported enjoying the therapeutic alliance with the researcher. There is a robust literature demonstrating the significant, positive effects of patient-provider relationships on

Figure 7

Interaction (η^2 = .268) of Time and Group for PROMS Self-Report "Fatigue" Data

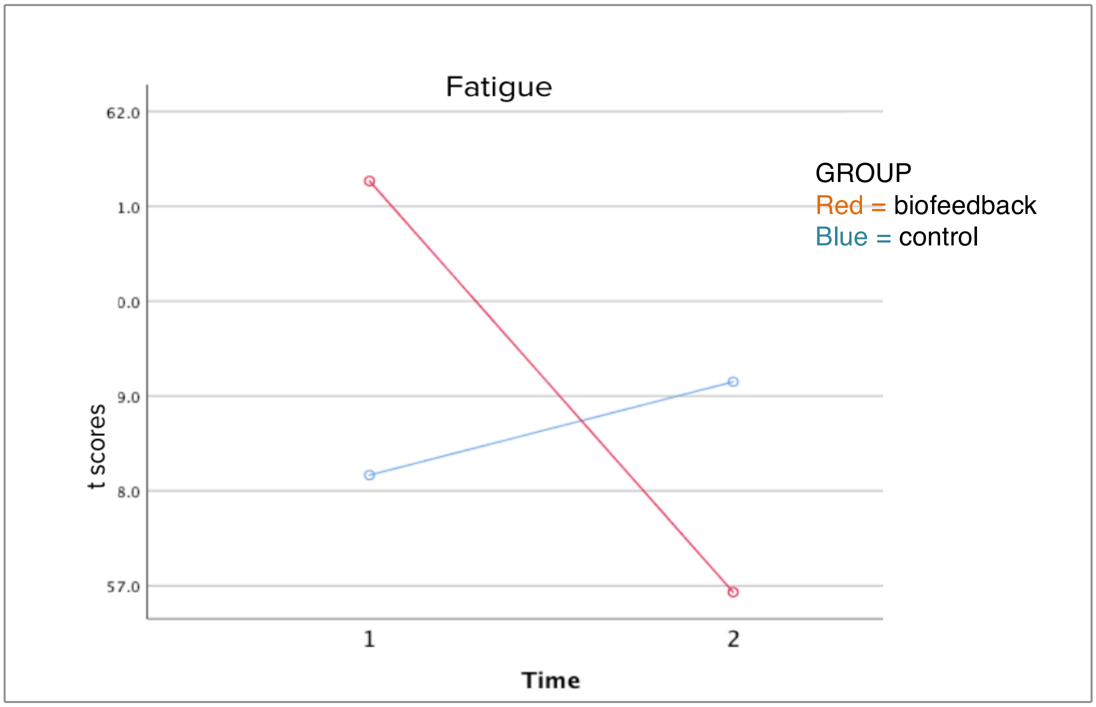
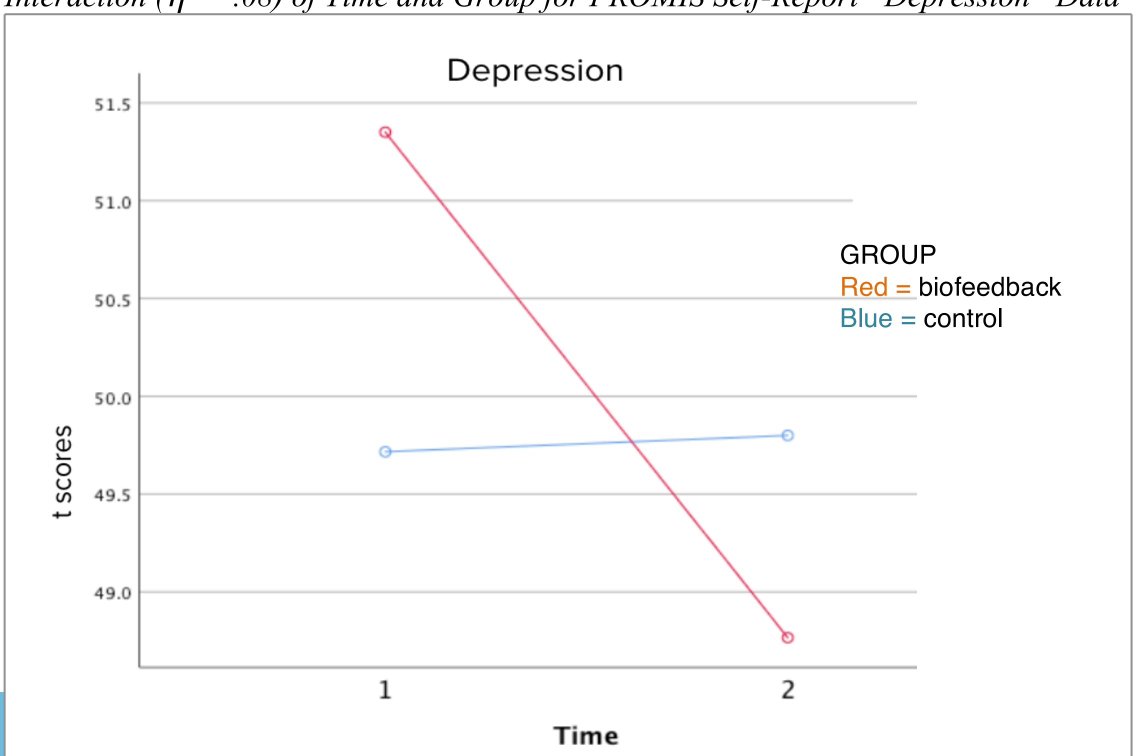


Figure 8

Interaction (η^2 = .08) of Time and Group for PROMIS Self-Report "Depression" Data



health outcomes (Birmingham & Hold-Lunstad, 2018; Brenk-Franz et al., 2017). Therefore, it is logical to assume a meaningful connection with any type of provider has the potential to improve patient's health, satisfaction, and treatment engagement.

Limitations

There are limitations to this study, most notably the small sample size. Due to scheduling restrictions and time restraints within the established system of care, in addition to unavoidable barriers for patients (work, childcare, finances, time, etc.), only 12 participants were able to successfully complete the study. The small sample reduced the statistical power, hindering the ability to identify an effect. The small sample may hinder the external validity of the study and its ability to generalize to other populations. Also, the stimulus used during pre/post testing (multiplication and long division arithmetic problems) may not have been a suitable stressor for all participants, possibly impacting results of the study. Another potential limitation to this study is human error, specifically regarding the administration of biofeedback equipment. For instance, at one point during the study, the communication between the EDA lead and computer malfunctioned. While these errors are minimal, they may have mildly impacted the internal validity of the study. For these reasons, this study is best considered a pilot and serves as useful springboard for future research.

Implications

Together, these results suggest biofeedback interventions are effective at decreasing patients' pain interference and increasing patients' ability to regulate their physiology. These findings are very relevant for patient care and therefore should be readily considered in healthcare systems. First, this study provides additional support for the intersection of physiology and psychology. It can be tempting for medical providers to think strictly from a biological perspective. However, this study further demonstrates in order to accurately understand and care for patients' health, providers must conceptualize from a holistic framework. Psychological factors such as self-efficacy, self-perception, learned helplessness, trauma, attachment, etc. inevitably influence how individuals interact in the world and, by extension, how they interact in their healthcare. This will naturally inform patients' healthcare outcomes and overall health trajectory. Addressing all facets of a person is essential in order to provide patients with the highest quality of care.

Perhaps the most groundbreaking application of this research is the potential to incorporate biofeedback interventions into standard treatment. Guided biofeedback interventions have the capacity to improve a myriad of patient variables, including pain interference, self-efficacy, stress management, and self-awareness. As previously stated, these variables will have a direct impact on patients' overall wellbeing and health outcomes. It is in the best interest for healthcare facilities to further integrate a biospsychosoical framework by including biofeedback because it enables healthcare facilities to more proficiently achieve the Quadruple Aim. Fortunately, biofeedback interventions can seamlessly be incorporated into a variety of healthcare settings and be used for a multitude of medical and psychological conditions. For instance, as unmanaged pain is one of the most common post-operative complications (Gan, 2017), brief biofeedback interventions aimed at improving patients' pain coping may be a valuable addition to surgical protocols (orthopedic, general, etc.). Primary care clinics can also benefit from biofeedback interventions to address anxiety disorders, stress, chronic pain, hypertension, and other common presenting problems.

Aforementioned, poorly managed post-operative pain is a frequent barrier to successful recovery and healthcare maintenance. After surgery, ineffective pain management directly impacts one's ability to meaningfully engage in post-operative rehabilitation (i.e. physical therapy, occupational therapy, cardiac rehab), likely hindering their overall recovery. However, if patients are better able to manage their pain, they also increase their capacity to engage in the necessary rehabilitation services, thereby improving their trajectory. In fact, if patients begin rehabilitation with a high level of pain coping and self-efficacy, research suggests they will have improved functional outcomes (Ayers et al., 2013; Chmielewski & George, 2019). This is incredibly valuable for both patients and clinicians. In short, improving patients' agency in pain management may have lasting, positive impacts on patients' physical outcomes.

In light of United States' opioid crisis, surgical care teams are being urged to pursue alternative pain management strategies to lessen copious prescribing. Currently, prescription pain relievers, often opioids, are first-line treatment for the majority post-operative pain management. Yet, recent research indicates this is no longer best practice as post-operative use of opioids increases one's likelihood of using opioids chronically. (Hah et al., 2017; Helmerhorst et al., 2014). Opioid prescribing has quadrupled since 1999, paralleling the number of overdoses. The economic cost of prescription opioid-related overdose, abuse, and dependence is monstrous, exceeding $78.5 billion annually. Notably, the highest incidence of chronic opioid use occurred after total knee arthroplasty (Hah et al., 2017). For patients' wellbeing and safety, it is essential care teams promote holistic pain management strategies to augment opioid use, including physical therapy, NSAIDs, ice, mindfulness, deep breathing, progressive muscle relaxation, and biofeedback interventions. Innovative

Another important takeaway from this study is time needed for effective self-regulation. As seen in the statistical trend in participants' EDA during the three phases, all individuals had significantly different electrodermal responses in the distinct phases. Interestingly, on Rest 2, the total participants' EDA was higher than it was during the Stimulus phase. This is unexpected and slightly obscure, especially considering there was a meaningful interaction of phase and group showing participants in the experimental condition were able to self-regulate to lower their EDA between the Stimulus phase and Rest 2. Therefore, this trend represents the insufficient time allotted for participants to successfully self-regulate to return to their baseline activation. In this study, participants were given two minutes after the stimulus to attempt to return to their baseline. Clearly, this is not enough time. In order to maximize the effects of self-regulation and mindfulness practices, they need to be longer than two minutes. This is applicable for a wide-variety of settings, from mental health therapists, business executives, grocery store clerks, emergency department physicians, and stay-at-home moms. It appears the majority of people need longer than two minutes to self-regulate. Thus, providers must be cognizant they are granting their patients enough time to adequately take care of their mental and emotional health.

Therapeutic engagement available through guided biofeedback interventions is also an important facet of the intervention. A strong patient-provider relationship is strongly associated with greater patient outcomes (Birmingham & Hold-Lunstad, 2018; Brenk-Franz et al., 2017). In this study, the developing alliance between the provider administering the biofeedback intervention and the patient receiving treatment cannot be undervalued; not only do patients benefit from the intervention itself but also from the provider's warmth, compassion, and support. Unfortunately, the relationship as an intervention has historically not been emphasized in medical programs, possibly resulting in diminished care. This research, as well existing literature, confirms the patient-provider alliance is an invaluable tool that all types of providers should strive to cultivate. Additionally, patients may be more inclined to partake in biofeedback interventions because of the innovative nature of the treatment. As described in participants' qualitative response, many individuals noted one of their favorite features was experiential learning. Novel and engaging treatments, such as biofeedback, help improve patient satisfaction in turn improving overall healthcare satisfaction and health outcomes.

Another noteworthy implication from this study originates from our unsupported hypothesis. In this study, there was lost specificity by using the "health efficacy for managing symptoms" scale rather than a measure for general self-efficacy. As a result, there was neither a main effect nor a meaningful interaction of self-efficacy because of measurement error. When researchers embark on cross-disciplinary endeavors, there must be an additional level of caution and awareness, especially when choosing assessment tools.

Future Directions

Due to the small sample available for this study, the current research is best thought of as a pilot. Therefore, it would be very advantageous and fruitful to continue this investigation on a larger scale. It would also be rewarding to pursue this research over time (i.e., longitudinally) in order to gather post-operative outcomes such as functional assessment, pain interference, medications, and so forth. Another possible avenue for this research is to broaden its application to other specialties, such as general surgery, labor and delivery, or oncology.

Conclusion

The results from this study clearly demonstrate the powerful relationship between psychology and physiology. Specifically, the research provides further evidence to support the prominence of the biopsychosocial model and the necessity of behavioral health integration (BHI) in healthcare settings. Through tangible biofeedback interventions, behavioral health providers can help patients learn alternative pain management strategies, decrease fatigue and depression, and likely increase self-efficacy to aid in their recovery journey. The potential implications from self-efficacy research are vast and will almost certainly inspire new ways for all types of healthcare facilities to more efficiently work towards the Quadruple Aim.

As demonstrated in this study, BHI has a great capacity to improve the health of populations. This study highlights the growing influence BHI can have in surgical and rehabilitation settings. As behavioral health providers educate and train providers from other disciplines they are consequently able to impact patients they never come into contact with. Thus, the breadth of BHI influence widens exponentially and indirectly helps improve the lives of countless individuals.

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Appendix A

Surgery Rehabilitation

Informed Consent for Research Participants

Background Information:

The purpose of this research is to examine the influence of sympathetic deactivation on orthopedic surgery rehabilitation. The study will last six weeks. If you choose to participate, you will be asked to complete a questionnaire packet comprised of demographic questions and screeners, partake in daily breathing exercises at home, and share your experiences with the researchers, and participate twice in Biofeedback administration at Providence Newberg Medical Clinic. You may be asked to participate in a weekly Biofeedback intervention at PNMC.

Signing this informed consent form will be considered assent to all of the above. Great care will be taken to provide as much confidentiality as possible. Each returned packet will be numbered and the numbers matched with names. These will be kept in a locked file with access limited to the researcher and her clinical supervisor and research advisor.

If you have any questions or concerns about your participation in this research, you may contact the researcher, Jessica Paxton, via email: jpaxton16@georgefox.edu, Dr. Jeri Turgesen, PsyD, ABPP via jturgesen@georgefox.edu, or Dr. Mary Peterson, PhD, ABPP via mpeterso@georgefox.edu

Consent:

I have read the description of this research regarding mindfulness practices and surgery rehabilitation, and have voluntarily chosen to participate. I understand that my participation in this research project is voluntary and that I can withdraw from the project at any time without penalty. I understand that this material will be used for Jessica Paxton's (researcher) Doctoral Dissertation (and may be published in a scholarly journal) as well as for an orthopedic surgery program evaluation for Providence Medical Group Newberg. I further understand all data will be kept confidential with only the investigator of this research and a faculty advisors having access to my name and identifying information. The only demographic information that will be published will be my gender, age, and type of surgery. There will be no reference to my name on any of the research material or public indication that I participated in this project. I also understand the investigator is required by State law to disclose any report of suicidality, homicidality, or abuse of a child or elder. I understand that I may contact Dr. Mary Peterson at (503) 554-2377 if I have questions or concerns about my participation in, or any part of, the research project. By signing, I agree to participate in the research project, under the terms noted above.

______________________________________ ______________

Signature of Participant Date

Appendix B

Orthopedic Surgery Biofeedback Program

1. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

2. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

3. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

4. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

5. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

6. Name/DOB: ____ Phone: _______________
   Type of Surgery: Knee Hip Shoulder Date of Surgery: _________
   Gift Card: Amazon Fred Meyer Visa

Appendix C

BIOPAC Product Sheet

See: https://www.biopac.com/wp-content/uploads/MP160-Systems.pdf

Appendix D

Biofeedback Guided Grounding and Relaxation Intervention Protocol

Initial Session – Week 1

Resting (2 min): Just relax, and try to keep your arm and hand as still as you can.

Stimulus (3 min): Now I'm going to give you some math problems to solve. Try to solve as many and as quickly as you can, while keeping your other arm as still as possible. Please don't write on the packet, use the blank sheet of paper. Just try your best.

Resting (2 min): Now try to relax, just like before you solved the math problems.

Biofeedback Intervention Protocol
Weeks 2 – 5

Intro: We're going to practice some relaxation exercises today. This top part is your heart rate, and the bottom part is your skin conductance or skin sweat response, which is very sensitive to any anxiety or stress. You can see the green bar increase or spike when you think about stressful things or anything else that is worrying you.

4 minutes: Focus on this green bar and the number below it. Try to relax to get the green bar and number down as low as you can. Use the breathing technique you've been practicing throughout the week on your own. Try your best to empty your mind, and just focus on your breathing pattern.

4 minutes: Continue to focus on your breathing, slowing it down and breathing in and out deeply. Focus on how your body is feeling right now. Place your other hand on your stomach and feel how it moves out as you breathe in through your nose, and moves in when you breathe out through your mouth. Try that several more times.

7 minutes: Focus on how your body feels as the number or green bar decreases. Pay attention to your breathing and how the different parts of your body feel.

- Let's start from your feet, notice how your feet feel in your shoes, against the ground, if there's any tension there or clenching, try to release that. (pause for several seconds)…
- Move your attention up to your lower legs/calves, release any tension in your muscles…
- Move your attention up to your upper legs/thighs, release any tension in your muscles, notice how your legs feel against the chair…
- Focus on your back and your posture, how it feels against the chair…
- Your stomach and the rhythm as you breathe in and out…

- Your chest and your shoulders, if there is any tension or knots, let those go…
- Relax your arms…
- Pay attention to if there's any strain in your neck and relax…
- Focus on your head and your face, notice any tension in your eyebrows, any clenching in your jaws, and relax those.

As you keep breathing in and out slowly, continue to notice how each part of your body feels.

Great job. Try to remember what we practiced here for our next biofeedback session.

Final Session – Week 6

Resting (2 min): Just relax, and try to keep your arm and hand as still as you can.

Stimulus (3 min): Just like our first session, I'm going to give you some math problems to solve. Try to solve them as quickly as you can, while keeping your other arm as still as possible.

Resting (2 min): Now use the relaxation skills you've learned these past several weeks to relax, just like before you solved the math problems.

Appendix E

Diaphragmatic Breathing

The diaphragm is the most efficient muscle of breathing. It is a large, dome-shaped muscle located at the base of the lungs. Your abdominal muscles help move the diaphragm and give you more power to empty your lungs. Diaphragmatic breathing is intended to help you use the diaphragm correctly while breathing to:

- Strengthen the diaphragm
- Decrease the work of breathing by slowing your breathing rate
- Decrease oxygen demand
- Use less effort and energy to breathe

To perform this exercise while sitting in a chair:

1. Sit comfortably, with your knees bent and your shoulders, head and neck relaxed.

2. Place one hand on your upper chest and the other just below your rib cage. This will allow you to feel your diaphragm move as you breathe.

3. Breathe in slowly through your nose so that your stomach moves out against your hand. The hand on your chest should remain as still as possible.

4. Tighten your stomach muscles, letting them fall inward as you exhale through pursed lips. The hand on your upper chest must remain as still as possible.

Note: You may notice an increased effort will be needed to use the diaphragm correctly. At first, you'll probably get tired while doing this exercise. But keep at it, because with continued practice, diaphragmatic breathing will become easy and automatic.

How often should I practice this exercise?

At first, practice this exercise 5-10 minutes about 3-4 times per day. Gradually increase the amount of time you spend doing this exercise, and perhaps even increase the effort of the exercise by placing a book on your abdomen.

Appendix F

Opioid Risk Tool

This tool should be administered to patients upon an initial visit prior to beginning opioid therapy for pain management. A score of 3 or lower indicates low risk for future opioid abuse, a score of 4 to 7 indicates moderate risk for opioid abuse, and a score of 8 or higher indicates a high risk for opioid abuse.

Mark each box that applies	Female	Male
Family history of substance abuse		
Alcohol	1	3
Illegal drugs	2	3
Rx drugs	4	4
Personal history of substance abuse		
Alcohol	3	3
Illegal drugs	4	4
Rx drugs	5	5
Age between 16—45 years	1	1
History of preadolescent sexual abuse	3	0
Psychological disease		
ADD, OCD, bipolar, schizophrenia	2	2
Depression	1	1
Scoring totals		

Questionnaire developed by Lynn R. Webster, MD to asses risk of opioid addiction.

Webster LR, Webster R. Predicting aberrant behaviors in Opioid-treated patients: preliminary validation of the Opioid risk too. Pain Med. 2005; 6 (6) : 432

Appendix G

Curriculum Vitae

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Education

George Fox University l Newberg, Oregon

- Doctoral candidate (PsyD) in the Graduate School of Clinical Psychology l Expected graduation: May 2021
- 3.99 GPA

Linfield College l McMinnville, Oregon

- Bachelor of Science in Psychology l December 2015
- 3.85 GPA, Magna Cum Laude Graduation Honors

Clinical Experience

Practicum 2 and Pre-Internship l Providence Medical Group Newberg

June 2018 – Present

I have worked as a BHP in an integrated primary care clinic for over the past year. In this role, I work with patients across the lifespan to address a wide range of both mental health and physical health concerns. In this setting, I work with patients from a variety of diverse backgrounds and deliver effective, evidence-based treatments in a 30-minute model. I collaborate with both Internal and Family Medicine, in addition to a rotation with the Orthopedic Specialty Care. With the orthopedic unit, I conduct structured interviews and utilize PROMIS health measures to assess patients receiving joint replacement surgeries. Supervised by Jeri Turgesen, PsyD, ABPP.

Crisis Consultant l Behavioral Health Crisis Consultation Team

May 2018 – Present

As a part of a supplemental practicum, I serve on the Yamhill County Behavioral Health Crisis Consultation Team. This is a unique opportunity offered through George Fox University to develop acute risk assessment and diagnostic skills. Through this experience, I have developed proficiency in suicide risk assessment along with risk assessments for psychosis, mania, and other mental health concerns. I am able to efficiently identify stable and dynamic risk and protective factors for patients presenting with high-risk symptomology. Additionally, this training program has enhanced my systems management and consultation abilities. Supervised by William Buhrow, PsyD, Luann Foster, PsyD, and Mary Peterson, PhD, ABPP.

Practicum 1 I George Fox University Health and Counseling Center

August 2017 – April 2018

At the HCC, I provided individual counseling to undergraduate students at the University. At this site, I refined my clinical skills and enhanced my ability to establish an effective therapeutic relationship. I also learned how to work within a co-located system and communicate efficiently with peers, supervisors, and office staff. I maximized my learning by using skills I learn in classes, including techniques from cognitive behavioral therapy (CBT), acceptance and commitment therapy (ACT), and motivational interviewing (MI). Supervised by William Buhrow, PsyD and Luann Foster, PsyD.

School Counselor Intern I Grandhaven Elementary School

September – December 2015

During my undergraduate education I spent a semester working alongside an elementary school counselor. In this setting, I facilitated multiple social-skills groups. The aim of these small groups was to enhance relational competency in children who had demonstrated consistent behavioral problems or social inhibition. In these groups, we focused on developing social skills, emotion regulation, problem solving, perspective taking, etc.

Research Experience

Researcher I George Fox University

March 2018 – Present

I am the primary investigator on my dissertation, examining the effectiveness of a biofeedback intervention on patients undergoing knee, hip, and should replacement surgeries. The goal of my research is to increase patient self-efficacy and decrease pain interference and by extension decrease medical utilization.

Research Assistant I George Fox University

September 2016

I assisted with a doctoral dissertation as a research assistant running electroencephalography (EEG) tests on collegiate athletes.

Researcher I Linfield College

February 2015 - May 2015

I conducted an individual research project with the collaboration of an advising professor. Our study examined the way in which people perceive members of a terrorist organization and their related fear of terrorism. For the project, I collected extensive background research, designed the methodology, utilized SPSS for a variety of statistical tests, as well as analyzed and applied my results. I presented my findings in a professional manuscript and presentation.

Research Assistant l George Fox University
August 2013 - May 2014

I assisted in the data compilation, coding, and writing of a poster for a graduate research project assessing the effectiveness of S.E.L.F. group curriculum in young adolescents. The S.E.L.F group curriculum was designed to strengthen skills for personal safety, affect regulation, dealing with loss, and future empowerment. The project was showcased at the annual Oregon Psychological Association conference in May 2014 and was awarded the Research Award for Competency in Education and Systems.

Research Assistant l George Fox University
October 2014 - May 2015

I was involved in a doctoral dissertation examining the efficacy of social support groups for individuals who had undergone bariatric surgery. Throughout the duration of the study, I conducted face-to-face interviews, coded quantitative data, and transcribed qualitative data. In addition to being applied in the dissertation, the qualitative data gathered from this research was also used for a professional poster that was presented at the 2015 Oregon Psychological Association conference.

Teaching Experience

- **Co-leader of monthly psychoducation class about pain for patients scheduled to receive total joint replacement surgery l Providence Newberg Medical Center l August 2018 – Current**
- Teaching Assistant for Learning, Emotion, and Cognition class l George Fox University l May 2018; 2019
- Guest presenter for Behavioral Health Crisis Consultation Team l August 2019

Professional Posters and Publications

- *Examining Military Family Satisfaction*. Poster Presentation at the Annual APA Conference in Chicago, IL (2018).

- *Exploratory Leadership Factors in a Graduate Clinical Psychology Program*. Poster Presentation at the Annual APA Conference in San Francisco, CA (2017).
- *Chronic Pain*. Poster Presentation at the APA Conference in San Francisco, CA (2017).

University and Professional Experience

GSCP Writing Tutor I George Fox University

September 2017 – Present

I currently serve on the Graduate School of Clinical Psychology Writing Team as a tutor for students struggling with writing. Over my three years as a tutor I have worked collaboratively with a handful of students to improve their understanding of sentence structure, organization, grammar, and APA format.

External Consultant I Grace City Church

December 2018 – July 2019

I was one of four students who provided consultation in the form of a program evaluation for a local church. Specifically, our evaluation assessed the church's attitude and relationship towards mental health. We provided feedback of our results in a professional presentation at a church staff meeting.

Psi Chi Psychological Honor Society President I Linfield College

August - December 2015

Psi Chi Psychological Honor Society Vice President I Linfield College

August 2014 - April 2015

Related Work Experience

Resident Advisor I Linfield College

August 2013 - December 2015

While serving as a resident advisor, I oversaw and managed over 80 students in college housing. I planned and led numerous events and service projects while promoting civic engagement and multicultural competency. I was an advocate for those who could not represent themselves, provided students with tools and resources to help them succeed, and adapted to changing environments. I mediated many interpersonal conflicts and regularly attended to struggling students with empathy and understanding.

Psychology Department Tutor l Linfield College
February 2014 - December 2015

As a tutor for the Linfield Psychology Department, I aided numerous students in many sub-disciplines including social psychology, biological psychology, abnormal psychology, and quantitative and qualitative research methodology. I demonstrated mastery of the content, along with strong listening and communication skills. I also exhibited problem solving, creativity, flexibility, and adaptation as I tailored instructions to each individual's needs.

Psychology Department Front Desk l Linfield College
September 2013 - December 2015

I worked the front desk of the Linfield Psychology Department. In this position, I performed regular office tasks and organized materials for professors. This role further developed my interpersonal skills and customer service, as well as exposed me to a variety psychological discourse.

Volunteer Activities

Serve Day Participant l George Fox University
September 2016, 2017, 2018, 2019

High School Youth Ministry Intern l Sunset Presbyterian Church
April 2014 - August 2014

I served as the High School Youth intern at Sunset Presbyterian Church. Throughout my time in this position, there were approximately 75 youth between the ages of 14 and 18 attending. In this role, I met regularly with the youth, both in large and small groups. I facilitated many small-group discussions and bible studies, as well as delivered a formal lecture. At the end of the summer, I also constructed a formal program review to evaluate the inner-workings of the church ministry.

Professional Memberships

- Psi Chi Psychology Honor Society (2014-present)
- American Psychological Association (2016-present)

References

1. Glena Andrews, PhD, ABPP l 503-554-2386 l gandrews@georgefox.edu

2. Marie-Christine Goodworth, PhD l 503-554-2382 l mgoodworth@georgefox.edu

3. Mary Peterson, PhD, ABPP l 503-554-2377 l mpeterso@georgefox.edu

4. Jeri Turgesen, PsyD, ABPP l 503- 537-5900 l jturgesen@georgefox.edu