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Biopsychosocial Occupational Therapy Interventions for Complex Regional Pain Syndrome – A Pilot Manuscript

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BIOPSYCHOSOCIAL OCCUPATIONAL THERAPY INTERVENTIONS FOR COMPLEX REGIONAL PAIN SYNDROME- A PILOT MANUSCRIPT

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Abstract

Occupational therapists (OTs) have an essential role in the treatment of upper extremity Complex Regional Pain Syndrome (CRPS) in outpatient therapy settings. Occupational therapy (OT) guidelines and research focus treatment on the Budapest Criteria's biological signs and symptoms. The International Association for the Study of Pain (IASP) now recognizes CRPS as a primary chronic pain condition and not an autonomic disorder, as it was thought to be in the past. This recognition, along with the psychological and social impacts of the condition, highlight the need for updated OT treatment interventions incorporating a biopsychosocial model. Combining evidence-based CRPS OT interventions for signs and symptoms with current research-based, psychosocial treatments for chronic pain management provides a more comprehensive treatment approach for people with CRPS. Additionally, this aligns with the OT profession's commitment to the "whole-person" approach to treatment.

This culminating paper describes the background, need, research, justification, and journey for developing the capstone project. The capstone project itself is a pilot manuscript, with details in an outline format in the appendices, developed for OTs to guide their treatment of upper extremity CRPS in an outpatient setting. The manuscript is based on the most up-to-date research available at the time of publishing for CRPS and chronic pain management. It provides pertinent goals, assessments, and an 8-week biopsychosocial treatment intervention plan to be utilized in conjunction with clinical reasoning skills.

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Dedication

To my children who look at me in a way that inspires me to be vulnerable, resilient, curious, and open to change. I love you more than you can imagine!

To my brothers who have been there for me through it all. You mean the world to me!

To Sam who brings me joy, adventure, and companionship. I am so thankful I met you!

To all my wonderful friends in my personal and work life who have encouraged me on this journey. I couldn't have done it without you!

To my patients who have openly spoken and shared with me the lived experiences of their journeys. I dedicate this work to you!

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Section One: Introduction

Complex Regional Pain Syndrome (CRPS), like many syndromes, presents with an unknown cause. Presently, there is no known cure for CRPS. Continued research advances knowledge regarding risk factors and associations with conditions that may increase incidence of CRPS. Additionally, advanced research helps unravel the physiology of the condition. Further research continues to provide innovative treatments in disciplines such as pain management. However, with no cure in sight multidisciplinary treatment remains the standard of care.

Occupational Therapy and CRPS

Occupational therapists (OTs) are an integral part of a multidisciplinary team for CRPS treatment. However, within the occupational therapy (OT) discipline, best practices guidance is sparce. Additionally, available guidance focuses on treatment of the Budapest Criteria of signs and symptoms. These treatments directly address only the physical and biological aspects of a person with CRPS. As people are multidimensional beings, physical changes in a person lead to psychological and social changes. In turn, the psychosocial changes affect the person's physical state. There are no disconnects between a person's biological, psychological, and social states (Bevers et al., 2016).

Providing OT interventions for only the physical signs and symptoms of CRPS omits important opportunities to treat psychosocial aspects. Treating chronic pain through a biopsychosocial model of care is established best practice. As CRPS is designated under the umbrella of chronic pain, treating CRPS through the biopsychosocial model is defensible. Combining evidence based CRPS OT interventions for signs and symptoms with current

research based, psychosocial treatments for pain management provides a more comprehensive OT treatment approach for people with CRPS.

Problem Statement and PICO Question

Available OT guidelines for CRPS interventions are focused on treating biological signs and symptoms and fail to integrate research-based psychosocial interventions for chronic pain management. Therefore, the pursuit of this capstone project aimed to address the following question: Does providing occupational therapists (OTs) with a pilot manuscript for evidence-based, biopsychosocial interventions increase outcomes measurements and quality of life for persons with upper extremity Complex Regional Pain Syndrome (CRPS)?

Section Two: Literature Review

Complex Regional Pain Syndrome Overview

CRPS is a rare and debilitating chronic pain disorder affecting the peripheral and central nervous systems. CRPS is characterized by regionalized pain out of proportion in magnitude or duration to an inciting trauma compared to the usual course connected with such a trauma (DeDi, 2023; Treede et al., 2019). Recent updates from the International Association for the Study of Pain (IASP) redefine CRPS from the classification of "focal or segmental autonomic disorder" to "chronic primary pain" (Goebel et al., 2021). Goebel et al. (2021) concluded 30 years of research has proven CRPS is not an autonomic disorder, rather it is a pain disorder in its own right. This is important as chronic pain is a biopsychosocial phenomenon and requires a biopsychosocial model for treatment (Thompson et al., 2018). The IASP defines chronic primary pain as pain in one or more bodily regions persisting for greater than three months and is associated with significant interference with activities of daily life and participation in social roles and can't be accounted for by another chronic pain condition (WHO, 2018). Furthermore, CRPS is now classified into four subtypes. CRPS I presents without discrete nerve damage, CRPS II presents with discrete peripheral nerve damage with symptoms extending beyond the area of the damage, CRPS Not Otherwise Specified (NOS), and CRPS with Remission of Some Features (Goebel et al., 2021). These definition changes and reclassifications help better understand CRPS and treat it more effectively.

Etiology

The etiology of CRPS is unknown. It usually occurs after trauma from fracture, surgery, or sprain, but the triggering event is unknown in approximately 10% of cases (Zangrandi et al., 2021). The incidence and prevalence of CRPS varies according to sources. Sandorini et al. (2003) reported an incidence rate of 5.46 per 100,000 person years and period prevalence of 20.57 per 100,000. Sousa (2022) reported incidence as high as 25 per 100,000 people/year. Some population groups have higher rates. For example, the occurrence of CRPS after a distal radius fracture can be as high as 25% (Cowell et al., 2018). Additionally, post-surgical carpal tunnel surgery CRPS is reported in 2-5% of patients (Sousa, 2022).

Risk Factors

Risk factors associated with developing CRPS include being female, Caucasian, having a high median income, history of drug abuse, headaches, rheumatoid arthritis, and fibromyalgia (Taylor, 2021). Zangrandi et al. (2021) also reported more frequent occurrences in women and people in their fourth decade, but rarely occurs in children. Recent attention has turned to psychological risk factors. Taylor (2021) described an association between a CRPS diagnosis and a history of depression and post-traumatic stress disorder (PTSD). This supports biopsychosocial elements relating to risk factors. Additionally, developing CRPS has significant biopsychosocial consequences leading to poor mental health, function, and quality of life (Sweeting et al., 2018).

Physical Signs and Symptoms

CRPS presents with mechanism-specific signs and symptoms categorized by inflammatory, immunologic, and neurologic changes in the brain with central sensitization and cortical reorganization (Ghaly, 2023). These symptoms are characterized by pain, sensory alterations, autonomic changes, trophic changes, and motor sequela (Harden et al., 2013). The Budapest diagnostic criteria require a person to show one symptom in three or more categories and at least one sign in two or more categories of sensory, vasomotor, sudomotor/edema, and motor/trophic (Goebel et al., 2021). Further investigation and studies indicate people with CRPS may experience body perception disturbances and neglect of the affected body part (Kotiuk, et al., 2019). Persistent pain, with associated signs and symptoms, create physical and functional dysfunction in people with CRPS (Shafiee et al., 2023).

Psychosocial Consequences

In addition to physical and functional disturbances, CRPS presents with psychosocial consequences. Ghaly (2023) reported CRPS can impact a person's quality of life significantly and lead to disability, along with psychological distress. Likewise, Lohnberg and Altmaier (2013) concluded psychological sequelae from CRPS involve depression and anxiety, reduced quality of life, along with functional and occupational disability. Furthermore, Sweeting et al. (2018) determined biopsychosocial consequences of CRPS included restricted participation, decreased freedom of independence, decreased self-esteem, negative perception of appearance, changes in societal roles and social relationships, fatigue, poor sleep, affected cognition, decreased mood and affect, and negative emotional states.

Prevention

Prevention and recognition of early signs and symptoms of CRPS are extremely important. Studies have shown implementation of preventative measures can reduce the incidence of CRPS with the distal radius fracture population treated non surgically. These measures include avoiding overly tight or over-flexed casts (Gillespie et al., 2016). Additionally, when a patient reports a tight-fitting cast, feeling "claustrophobic," unmanageable pain, neglect or dissociation of the limb, and limited motion of unaffected joints an immediate cast change and referral to therapy should be initiated (Cowell et al., 2018). Implementing an interdisciplinary team prevention program in orthopedic settings is imperative in preventing CRPS. OTs are instrumental in recognizing and treating early signs and symptoms of CRPS in the orthopedic population.

Multidisciplinary and Multimodal Treatment Approaches

Due to the multifaceted nature and complexity of CRPS, multidisciplinary and multimodal treatment approaches tailored to individuals are recommended (Goswami et al., 2016; Shafiee et al., 2023). Treatment by a healthcare professional team consisting of disciplines including a pain specialist, physiotherapist, occupational therapist, psychologist, and social worker is recommended (Ghaly, 2023). OTs are an important part of the multidisciplinary team as they are trained in biopsychosocial treatments incorporating all aspects of a person.

Occupational Therapy Interventions for Pain

A recent position paper published by the American Occupational Therapy Association (AOTA) asserted OT practitioners are equipped to treat pain as part of interdisciplinary teams or independently. The authors reaffirmed OT practitioners' compatibility with pain treatment

techniques with focus on the whole person and engagement in occupations to improve all aspects of function and quality of life (Breeden et al., 2022). This paper offered guidelines for OTs treating pain conditions through evaluation and assessment, general interventions, occupation-based interventions, modalities, assistive devices and modifications, self-regulation, self-management, medication management, advocacy, and group and virtual interventions (Breeden et al., 2022).

Biopsychosocial Model

With the new IASP parent classification of CRPS as chronic primary pain, using chronic pain treatment interventions for people with CRPS is justifiable. Breeden et al. (2022) reported the biopsychosocial model is most widely used and recommended for treatment of pain. A biopsychosocial approach to chronic pain treatment considers the mind and body together with the influence of biological, psychological and social components of pain and illness (Bevers et al., 2016). Under this approach, a physiological stimulus is filtered and influenced by a person's biology, psychology, environment, and societal factors (Cheatle, 2016).

Gap in Literature

Evidence-based literature reveals quality studies and systematic reviews assimilating OT rehabilitation interventions for CRPS. However, quality studies incorporating psychosocial and occupation-based interventions with the CRPS population are lacking in the literature (Shafiee et al., 2023). Fortunately, much research exists for chronic pain, psychosocial-based interventions within the OT scope of practice.

Integrating Biopsychosocial Approach for CRPS Treatment

For simplicity, OT rehabilitation interventions for CRPS can be separated into two categories: 1) CRPS-specific biological treatments, and 2) evidence-based chronic pain psychosocial treatments. CRPS-specific interventions focus on treating biological signs and symptoms to improve a person's symptoms, function, and quality of life. Packham and Holly (2018) recommended this mechanism-specific rehabilitation approach to guide CRPS treatment. Chronic pain psychosocial treatments focus on decreasing pain-related fear, catastrophizing, depression, and disability while increasing quality of life, wellness, and social participation. Evidence-based chronic pain, psychosocial interventions include pain neuroscience education, cognitive-behavioral training, graded occupation-based exposure treatments, and mindfulness (den Hollander, 2016; H van, 2011; Rider & Tay, 2020; Zoffness, 2020). Additionally, teaching self-management skills encourages people with CRPS to become increasingly independent with managing their own treatment and condition.

Individualized Treatment

Considering the OT Domain and Process, each person with CRPS should be considered individually for appropriate treatment. In other words, not all available treatments should be used for all people with CRPS. Packham and Holly (2018) reported no single-treatment approach should be used in treating CRPS, nor should all treatment approaches be applied. Instead, they advocated for evidence-informed treatment interventions based on assessment findings (Packham & Holly, 2018).

Goals of Treatment

Additionally, understanding the purpose of CRPS OT interventions is essential prior to evaluation and treatment. The Occupational Therapy Practice Framework: Domain and Process Fourth Edition (OTPF-4) (2020) says OT treatments provide habilitation, rehabilitation, and promotion of health and wellness. Many clients with CRPS will not recover fully and will continue with deficits. Therefore, elimination of all deficits and return to a pre-CRPS state should not be the goal of OT interventions. Health and Human Services (2019) recommended pain treatments focused on outcomes directed at improving quality of life, function, and activities of daily living. Therefore, OT interventions should focus on physical rehabilitation to regain realistic return of physical abilities such as range of motion, decreased edema and pain, and increased use of an affected body part. Additionally, treatments should focus on habilitation to gain function and skills through methods such as adaptation, compensation, energy conservation, and self-management. Lastly, interventions should focus on health and wellness promotion to increase quality of life.

Conclusion

Using the new IASP parent classification of CRPS as chronic primary pain provides a bridge for the gap in the current literature for psychosocial CRPS interventions. By understanding CRPS is a primary chronic pain syndrome and not an autonomic disorder, OTs can confidently incorporate the biopsychosocial model of treatment. Combining evidence-based OT treatments of physical signs and symptoms of CRPS with research based, psychosocial interventions for chronic pain allows OTs to treat all aspects of a person. Need continues for further research using psychosocial methods of treatment specifically with the CRPS

population. This literature review and following manuscript can serve as a guide for OTs incorporating a biopsychosocial approach to CRPS assessments and treatments.

Section Three: Theoretical Framework

Biopsychosocial Model

Complex Regional Pain Syndrome (CRPS) is a multifaceted and complex constellation of symptoms but remains under the umbrella of a pain syndrome. As stated prior, the IASP's revision changed the CRPS parent classification from "focal or segmental autonomic disorder" to "chronic primary pain" under the International Classification of Diseases (ICD-11) (Goebel et al., 2021; Treede et al., 2019). Breeden et al. (2022) reported the biopsychosocial model is most widely used and recommended for treatment of pain. "The biopsychosocial model focuses on both disease and illness, with illness being viewed as the complex interaction of biological, psychological and social factors" (Gatchel et al., 2007, p. 582).

Newer research in treating chronic pain through biopsychosocial approaches yields promising results. The biopsychosocial model used for pain "evaluates the integrated 'whole person,' with both the mind and the body together as interconnected entities, recognizing biological, psychological, and social components of pain and illness" (Bevers et al., 2016, p. 99). These concepts can be utilized in treating CRPS. Additionally, new research regarding CRPS has led to more effective and directive physiological treatment approaches. CRPS-specific OT interventions focus on treating biological, mechanism-specific signs and symptoms to improve symptoms, function, and quality of life. Packham and Holly (2018) recommended this mechanism-specific rehabilitation approach to guide CRPS treatment. Chronic pain psychosocial treatments focus on decreasing pain-related fear, catastrophizing, depression, and disability while increasing quality of life, wellness, and social participation. Evidence-based chronic pain, psychosocial interventions include pain neuroscience education, cognitive-behavioral training,

graded occupation-based exposure treatments, and mindfulness (den Hollander, 2016; H van, 2011; Rider & Tay, 2020; Zoffness, 2020). Additionally, teaching self-management skills encourages people with CRPS to become increasingly independent with managing their own treatment and condition.

Cognitive Behavioral Frame of Reference

The cognitive behavioral frame of reference (FOR) complements the biopsychosocial model. It helps further explain the psychosocial aspect of the model. Gatchel et al. (2007) stated, “The psychosocial factors involve both emotion and cognition” (p. 582). Furthermore, Duncan (2011) reported the cognitive behavioral frame of reference highlights five characteristics of life experience: thought, behaviors, emotion/mood, physiological responses, and the environment. Pain is directly influenced by all five of these characteristics. Gatchel et al. (2007) explained nociception conveys information about possible tissue damage, while pain is the subjective experience felt by a person when nociception occurs. However, the subjective experience of pain is filtered through all aspects of a person including their environment. They further concluded people feel an immediate emotional reaction to nociception. “Cognitions then attach meaning to the emotional experience and can then trigger additional emotional reactions and thereby amplify the experience of pain, thus perpetuating a vicious circle of nociception, pain, distress, and disability” (Gatchel et al., 2007, p. 582)

Pain-related fear, fear of movement, and catastrophizing are common in persons with CRPS. These cognitions can lead to non-use behaviors of a limb. “Avoidance behaviors may be adaptive in the short run, but paradoxically increase dysfunction and decrease quality of

life later on, resulting in withdrawal from valued daily life activities" (den Hollander, 2016, p. 2318). Due to the plasticity of the brain, misguided cognitions can lead to detrimental behaviors of nonuse creating more disability and dysfunction. By implementing a cognitive behavioral frame of reference focused on valued occupations, OTs can focus their interventions on pain-related fears and catastrophizing tendencies. Current evidence shows exposure-based treatments, targeting pain-related fears by performing graded valued occupations can reduce disability and increase quality of life (den Hollander, 2016).

Theory of Occupation Adaptation

Schkade and Schultz (1992) described occupation adaptation in context of a person (consisting of sensorimotor, cognitive, and psychosocial systems) interacting with their occupational environment (physical, social, and cultural). Occupational adaptation theory focuses on a person's ability to adapt to internal and environmental changes to achieve or maintain competence in occupation.

Occupational adaptation is a usual and life-long experience. "However, a significant health event may cause a sudden and significant change in occupational ability which can overwhelm adaptive capacity" (Walder & Molineux, 2017, p. 226). OTs can facilitate achievable occupational challenges for a person to allow adaptation and self-mastery (Schkade & Schultz, 1992). They can focus interventions on enhancing clients' capabilities through remedial and compensatory strategies. Grading activities providing a "just right challenge" can allow a client to gain skill, mastery, and adaptation.

The theory of occupation adaptation provides a backdrop for my capstone research and project. People with CRPS experience a sudden change in their occupational abilities.

The trauma they experience, along with the development of CRPS directly impacts their roles and performance of valued occupations. Furthermore, it impacts their psychosocial well-being.

Facilitating occupation adaptation can address the psychosocial consequences of CRPS. Adapting internally and to the environment can improve CRPS recovery and quality of life. CRPS rehabilitation can be a lengthy process and many people are left with permanent changes. Occupational adaptation can enhance quality of life during and after formal occupational therapy interventions. Walder and Molineux (2017) profoundly said, "Reconstructing one's occupational identity and re-establishing purpose and meaning are central to adjustment after chronic disease, sudden illness or injury" (p. 243).

Section Four: Implementing the Capstone Project

Implementation Planning

As an occupational therapist and certified hand therapist (CHT) working in outpatient orthopedic rehabilitation, I have treated many patients with CRPS through my years of practice. My special interest in this group led to numerous hours of research regarding their condition and effective occupational therapy treatment approaches prior to pursuing my Post-Professional Occupational Therapy Doctorate (PP-OTD). Naturally, when I entered the PP-OTD program at University of Nevada Las Vegas (UNLV), I wanted to focus my capstone project on the topic of CRPS.

I began formal research on CRPS and chronic pain management during the early semesters of the PP-OTD program. During this process, I noticed a gap in the literature for CRPS occupational therapy interventions incorporating the biopsychosocial model commonly used in chronic pain management. Additionally, I discovered the IASP revision of CRPS classification from “focal or segmental autonomic disorder” to “chronic primary pain” (Goebel et al., 2021). Out of this process and discovery, my capstone project idea was born.

I developed my capstone proposal and presented it to my committee in December of 2023. My proposal was to develop and implement a client-centered, evidence-based, 8-week OT intervention for a person with CRPS based on a biopsychosocial model in an outpatient orthopedic clinic. My committee members guided me toward developing a pilot manuscript instead of implementing an actual intervention with a patient as I would need an Institutional Review Board (IRB) to do this. UNLV does not recommend this in the capstone project due to time constraints.

Creating the Document

My focus turned to developing an evidence-based pilot manuscript for OTs to use for treating CRPS incorporating a biopsychosocial approach. This pilot manuscript emerged from hours of researching hundreds of evidence-based articles for the background, need, theoretical frameworks, OT processes and roles, CRPS interventions and assessments, and chronic pain interventions and assessments. However, three key articles guided the development of my pilot manuscript.

The first article was the American Occupational Therapy (AOTA) position statement "*Role of Occupational Therapy in Pain Management*" (Breeden et al., 2022). This provided valuable information on significant OT pain interventions using the biopsychosocial model. Next was the article, "*Mechanism-Specific Rehabilitation Management of Complex Regional Pain Syndrome: Proposed Recommendations from Evidence Synthesis"* (Packham & Holly, 2018). This article inspired dividing intervention methods into peripheral and central nervous system approaches based on signs and symptoms therapists are intending to treat, linked to CRPS-appropriate assessments administered at evaluation. Additionally, Packham and Holly (2018) provided a quality synthesis of current CRPS evidence-based treatments with mention of the gap in psychosocial treatments. Lastly, I was motivated by the article "*The Effectiveness of Rehabilitation Interventions on Pain and Disability for Complex Regional Pain Syndrome: A Systematic Review and Meta-analysis*" (Shafiee et al., 2023). These authors provided a quality systematic review and analysis of the most current CRPS interventions providing efficacy ratings. This article simplified my process of intervention inclusion and exclusion for my manuscript based on level-of-evidence ratings.

As I researched literature and discussed with committee members regarding psychosocial interventions in chronic pain management, I developed a list of effective interventions to include in my manuscript. Two techniques, exposure therapy and pain exposure therapy, emerged from the literature as cognitive behavioral techniques specific to CRPS. Both have high levels of evidence supporting their use.

Other effective psychosocial interventions I gleaned from literature were pain neuroscience education (PNE), other cognitive behavioral techniques, mindfulness, deep breathing with relaxation, and self-management. I reviewed and included references for evidence-based articles, books, and workbooks for these techniques in my manuscript. I discovered a comprehensive and effective workbook titled *The Pain Management Workbook: Powerful CBT and Mindfulness Skills to Take Control of Pain and Reclaim Your Life* (Zoffness, 2020). Since this workbook included PNE, cognitive behavioral techniques, mindfulness, and self-management education and exercises, I incorporated each chapter into the weekly treatments included in my manuscript.

Goals and Assessments

To measure the effectiveness of the 8-week intervention program, I needed to clarify the goals of therapy and gather appropriate assessments and measurements. These goals and assessments are provided for OTs utilizing this manuscript to guide their practice (Appendix A). I encourage OTs to employ these assessments according to their clinical judgment to determine the effectiveness of the interventions.

As with any condition, goals of therapy should be determined at initial evaluation and checked periodically throughout treatment. Many clients with CRPS will not recover fully and

will continue with deficits. Therefore, elimination of all deficits and return to a pre-CRPS state should not be the goal of OT interventions. Health and Human Services (2019) recommended pain treatments should focus on outcomes directed at improving quality of life, function, and activities of daily living. Goals of therapy for CRPS can include decreasing signs and symptoms of CRPS, including pain. However, decreasing disability and increasing function, occupation, and quality of life should be the therapist's primary focus. Reported reductions in pain naturally occur with increasing engagement in meaningful and enjoyable occupations (Fisher et al., 2007).

The suggested assessments were thoughtfully chosen for their quality, reliability, validity, and function. Assessments associated with the CRPS Budapest Criteria quantify severity of signs and symptoms of the syndrome. The other suggested assessments help the therapist understand how CRPS-specific changes are impacting their patient. They are organized under the headings of occupational performance, pain, disability, quality of life, and central nervous system changes including neuroplasticity, body perception disturbances, kineseophobia/disuse, and psychological distress/coping.

Intervention Methods Document

To assist therapists in their decision-making skills for treatment interventions, I created an intervention methods table (Appendix B). Inspired by Packham and Holly (2018), these intervention methods are divided into peripheral and central nervous system approaches based on signs and symptoms therapists intend to treat. These evidence-informed interventions should be linked to CRPS- appropriate assessments administered at evaluation (Appendix A). Furthermore, interventions are labeled as biological or psychosocial approaches based on the

biopsychosocial model of treatment for chronic pain and CRPS. Some interventions have evidence supporting multiple improvements and are labeled appropriately. Lastly, treatment interventions were carefully selected based on statistically significant results from the most current evidence-based literature at the time of this writing. Interventions yielding poor results were omitted as viable CRPS treatments. Citations are included for reference. I encourage therapists to read the evidence-based articles associated with the treatments they employ.

Intervention Document

I created an 8-week intervention outline that includes an evaluation, 14 therapy sessions, and a discharge session (Appendix C). I also included sections for psychosocial interventions, biological interventions, and a home exercise program (HEP). The program is quite intensive and extensive and can be modified easily to a 16-week or 32-week program by duplicating each week's treatment sessions.

The program is based on an outpatient therapy setting with the person attending 2x/week for 45 min – 1-hour sessions. This scenario is also based on a "typical" person presenting with CRPS I or II in the upper extremity with the following list of symptoms upon evaluation discovered using the suggested assessments in Appendix A: diminished occupational engagement, high pain levels at rest and with movement, allodynia/hyperalgesia, edema, stiffness in joints, diminished strength, temperature asymmetry, hyperhidrosis, kineseophobia and learned nonuse, body perception disturbances, catastrophizing, central sensitization, diminished enjoyment and quality of life, reported disability, and poor coping strategies. The person's health history presents with no precautions nor limitations for aerobic exercise or use of the upper extremity bike. Therapists should use clinical judgement to adapt this outline to

specific presentations overall and for daily treatments. During each session, the therapist should check for indications and precautions for fluidotherapy, modalities, and other interventions.

The sequence and progression of interventions are purposeful based on the evidence I gathered. For example, aerobic exercise exhibited strong evidence for decreasing hyperalgesia, allodynia, and several types of pain. Fluidotherapy produced similar results. Therefore, I incorporated both immediately in the program in preparation for subsequent treatments. Additionally, I included PNE immediately in the program to support decreasing symptom severity, pain intensity, catastrophizing, depression, and anxiety (H van, 2011; Louw, 2016; Rider & Tay, 2022; Rufa et al., 2019; Saracoglu, 2022; Zoffness, 2020).

Each treatment session, with the associated homework and HEP, builds upon and works in concert with previous interventions. Although each intervention targets a specific sign or symptom, it has multiple effects (Appendix B). I built the program sequentially based on evidence and logic. For example, I incorporated exposure therapy after introducing and utilizing PNE and cognitive behavioral techniques to ensure acceptance and approval of this intervention. Additionally, when I applied the second sequence of graded motor imagery (GMI), imagined movements, I integrated feared and valued movements, sensations, and activities used in exposure therapy. Subsequently, I implemented mindfulness training and relaxation with breathing techniques prior to incorporating pain exposure therapy. Moreover, I placed the third sequence of GMI, mirror therapy, prior to adding in tactile discrimination training within the mirror as evidence showed this is most effective.

Conclusion

This 8-week intervention pilot manuscript is a valuable tool and guide for OTs treating persons with CRPS. Using the OT process, clinical reasoning skills, and this manuscript as a guide will support a more holistic treatment of CRPS than current guidelines provide. Additionally, using this guide can promote improvements in a person's occupational function and quality of life. My goal is to educate other OTs in a comprehensive and evidence-based intervention program with my capstone project. The American Occupational Therapy Vision 2025 is to maximize health, well-being, and quality of life for all people (AOTA, 2021). This organization's aspirations support my intent to alleviate suffering caused from CRPS and help people return to their maximum function and quality of life.

Section Five: Evaluation and Results

My capstone project has focused on developing a pilot manuscript created for OTs to implement with their own patients with upper extremity CRPS in an outpatient setting. My initial plan was to implement the program I created with two CRPS patients I have been treating over the past year. However, my capstone committee felt this would require an Institutional Review Board (IRB) which is not approved for the PP-OTD program currently. Additionally, I considered asking OTs implementing my program to submit data on their patients' results. Upon further reflection, I realized this would also require an IRB. Therefore, due to the nature of my project and the rules in place, I did not gather project data to analyze and evaluate effectiveness.

Evaluation and Assessment Process

Although my project does not permit gathering and analyzing data on patients, it is heavily grounded in the evaluation and assessment process outlined by the *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2020). Within this framework, OTs are encouraged to use reliable, valid, and sensitive standardized outcome performance measures and tools to establish a baseline for occupational performance, goals for treatment, and determine improvements made throughout the course of treatment (AOTA, 2020). Additionally, these outcome measures can determine progress during the treatment process and guide therapists to adjust goals and interventions appropriately.

Packham and Holly (2018) also advocated for evidence-informed treatment interventions for CRPS based on assessment findings. My program utilizes quality, reliable, and valid assessments and outcome measures to determine performance deficits. Assessments

associated with the CRPS Budapest Criteria quantify the severity of signs and symptoms of the syndrome. Other suggested assessments provide insight into common CRPS-specific changes. In my document, assessments are organized under the headings of occupational performance, pain, disability, quality of life, and central nervous system changes including neuroplasticity, body perception disturbances, kineseophobia/disuse, and psychological distress/coping.

Utilizing Outcomes Measures

Within the program outline (Appendix C), I created a session for evaluation with the comprehensive use of outcome measures to guide goal and treatment plan development. Additionally, mid-way through the program the therapist is prompted to take measurements and use the outcome measures to adjust goals and interventions appropriately. Then at the end of the program, this process is repeated with an emphasis on overall progress and implementing goals for home exercises and activities. Since the number of relevant outcome measures can be time consuming, I prompted therapists to have patients complete them at home where appropriate. This will save the therapist time and allow for more efficient use of therapy time within sessions.

Selecting Outcome Measures

The outcome measures I recommend in my document (Appendix A) were thoughtfully chosen based on their relevance with CRPS for the OT profession. I gathered these pertinent assessments throughout my research and capstone process. Some were used within clinical trials for CRPS-specific symptoms, some were recommended in chronic pain literature, some in OT-specific literature focused on chronic pain, some by my committee members, and others were selected for their overall picture of occupational performance. My committee members

and I agreed not to use the pain analog scale, as this provides no relevant information on its own. I selected five pain assessments, but each was associated with pertinent psychosocial components. For example, the *Pain Catastrophizing Scale* (Sullivan et al., 1995) provides relevant data regarding the degree of pain catastrophizing. Then, the OT can use this information to implement cognitive behavioral therapy techniques specific to pain catastrophizing.

Outcome Measures Availability

The suggested outcome measures are available online and many are free to the user. Others require payment for use. I did not include specific websites in my document, as websites change frequently. However, I included each assessment's original publication reference (Appendix B). Each therapist can research the assessments online and download them according to their own access.

Keeping Track of Scores

OTs using my manuscript should determine appropriate assessments and measurements based on the individual they are treating and their clinical judgement. Then, therapists should record each assessment score in their own electronic medical record (EMR) within their facility. Comparing scores during progress reporting can determine the effectiveness of interventions and guide changes in treatment or discontinuation of certain treatments. Additionally, comparing scores at the end of treatment can determine the effectiveness of the interventions overall. OTs should make personal notes (keeping HIPPA in mind) for future reference regarding their own success with this CRPS intervention manuscript.

Conclusion

Utilizing outcome measures and evaluating the effectiveness of treatment is an essential part of the OT process. Outcome performance measures are the tangible and measurable verification of improved occupational performance (AOTA, 2020). Additionally, they provide feedback and justification for the therapeutic process in a way all stakeholders can appreciate. This includes the insurance companies who often pay for services. Although I was not able to gather data on the effectiveness of the implementation of my CRPS intervention manuscript, I have provided the opportunity for each OT to appropriately collect and utilize their own pertinent and reliable data to guide their own practice.

Section Six: Discussion, Impact, and Conclusion

Professional and Personal Development

While attending my entry-level occupational therapy program at Texas Woman's University in Dallas, I wanted to stay and complete my doctorate degree. However, at that time I was unable to as I needed immediate income to support myself and three school-aged children. I promised myself I would fulfill my goal and complete my OTD in the future if I was able. When the opportunity presented itself to complete the PP-OTD at UNLV, I was very excited. My goals were to give back to and advance the field of occupational therapy and progress my professional development. After 7 years of working as an OT specializing in hand therapy, I wanted to add value and advance a topic in the field of hand therapy. For my professional development, I wanted to gain more knowledge in my field and qualify myself to teach OT at the university level as an adjunct professor.

The stories of my professional and personal development coincide. In 2008, I was bitten by a tick and contracted Lyme disease, along with many coinfections. I was treated immediately but developed Post-Treatment Lyme Syndrome and have been impacted ever since. My journey ultimately led to the realization I could not manage my syndrome and illness symptoms purely through a biological approach. Since one of the harshest symptoms was chronic pain, I sought help with this specifically. I found amazing help through a wonderful pain psychologist who opened my eyes to a new world of healing. He taught me, and I implemented, psychosocial interventions such as pain neuroscience education (PNE), cognitive behavioral techniques for pain catastrophizing, meditation, deep breathing techniques, nervous system calming exercises, and self-management skills. I also completed the workbook encompassing these techniques

titled *The Pain Management Workbook: Powerful CBT and Mindfulness Skills to Take Control of Pain and Reclaim Your Life* (Zoffness, 2020). I was honestly quite surprised when my pain levels decreased dramatically and became virtually nonexistent on some days.

I was attending pain psychology and completing the pain workbook when I started the PP-OTD program at UNLV in 2021. As I progressed through the curriculum, I began formulating ideas and researching for the capstone project. Naturally, I explored OT interventions in chronic pain management. I was excited to read the American Occupational Therapy (AOTA) position paper "*Role of Occupational Therapy in Pain Management*" (Breeden et al., 2022). Additionally, I had a meeting with one of the OTs who co-authored this document. She works in a mental health setting helping people with chronic pain in the city I live in. She and the AOTA document confirmed the psychosocial interventions I had learned and incorporated for my own chronic pain management were within the OT scope of practice.

Near the time I needed to choose my capstone project topic and PICO question, I had an influx of people with Complex Regional Pain Syndrome (CRPS) in my outpatient therapy clinic. I had been treating them using OT intervention techniques I had learned through various avenues such as my entry-level OT program, my study literature for the Certified Hand Therapy (CHT) exam, and during my own research on CRPS. I suddenly found it odd CRPS contains the words "pain syndrome" within it, yet I had never read or been taught to treat it through a biopsychosocial approach. Naturally, I began implementing psychosocial interventions with my CRPS patients that fell within the OT scope of practice. Additionally, I formulated and submitted my topic for my capstone project to develop a comprehensive biopsychosocial OT intervention program for people with CRPS.

I have thoroughly enjoyed the process of developing my capstone project. It has been surprising to discover a true gap in the literature regarding OT interventions incorporating a biopsychosocial model. Additionally, the process of my professional and personal journeys merging to create a manuscript to help other OTs and people with CRPS has been special for me. I feel happy my personal experiences with suffering and pain, along with finding helpful solutions, can ultimately benefit others.

Two Special People

Although I cannot officially include the two individuals with upper extremity CRPS I have been treating over the past year in my capstone project, I would be remiss if I did not acknowledge the impact they have had on me personally and my overall project. I have modified my treatments with these individuals with each new, relevant evidence-based discovery. Then, in real time, I have received feedback from them regarding the interventions. They have provided me with up-close insight into how CRPS and certain interventions impact them. For example, now when a person tells me their arm does not feel like it "belongs to them," I know they likely have cortical reorganization that can be helped through mirror therapy. I also know to be ready when mirror therapy works and the person perceives their affected hand as their "old, normal hand," as it can be an emotional experience. Additionally, I have heard these individuals' struggles with how CRPS has impacted their roles, daily performances of occupations, quality of life, energy levels, and mental health. Moreover, I have seen their determination to persevere and do "whatever it takes" to continue to heal and improve to be participants in their own lives, family, social circles, and community. It has truly been inspiring.

Empowerment

The capstone process has helped me feel more empowered as a therapist to implement psychosocial-based treatments and recommendations focused on the biopsychosocial model of care for chronic pain. The outpatient therapy setting often leads to a medical model-based culture. I have felt more justified and confident within the outpatient therapy setting to implement a more whole-person, biopsychosocial approach to my interventions. Finding appropriate spaces and creating an environment for the introspection required for psychosocial treatments and can be difficult in a busy outpatient clinic. I have become more determined to create these spaces for my patients.

Preparation for Adjunct Professor

Besides the capstone process, the UNLV PP-OTD program has prepared me to become an adjunct professor. Although I have not yet pursued this route, the classes I have completed have prepared me for this role. I have completed coursework in leadership skills, teaching adult learners, distance education, evidence-based practice, and social determinants of health. These classes, along with my experiences while being an OT adult distance learner, have prepared me to teach in an adjunct professor role for an OT program when I am ready.

Sustainability

My pilot manuscript is an important start to my goal to advance the field of occupational therapy. I will have the opportunity to present my pilot manuscript and program in a professional arena, such as a poster presentation. Additionally, I plan to create a clinical manual and continuing education class to help disseminate the information. Moreover, I would like to prepare a publication with my research for an occupational therapy journal. As new

information continues to develop, it will be important to stay current and continuously update information with this topic. These ideas are ways to create sustainability for my capstone project.

Conclusion

The culmination of merging my personal and professional life's journeys becomes tangible with two documents that signify the process of completing the PP-OTD program. The first document is my capstone project, "*A Pilot Manuscript for Occupational Therapy Biopsychosocial Interventions for Complex Regional Pain Syndrome*." This document synthesizes effective psychosocial solutions I discovered in managing my own chronic pain with my years of experience as a hand therapist and opportunity as a doctoral student to develop a whole-person, evidence-based OT treatment approach for people with CRPS. The second document will be my UNLV OTD diploma symbolizing my love and dedication to life-long learning and emphasis I place on advancing the field of OT through my research and plans for teaching at the university level. I am entirely grateful for the experience and process this program has provided.

Appendix A: Suggested Goals and Assessments for OTs Treating CRPS

Therapy Goals

Increase

- Occupational performance
- Quality of life
- Participation
- Pain coping strategies
- Functional use of limb
- Self-regulation and self-management

Decrease

- Budapest Criteria signs/symptoms, including pain
- Disability
- Catastrophizing
- Fear-avoidance behaviors

Assessments

- Occupational Performance
    - Canadian Occupational Performance Measure (COPM) (Law, Baptiste, et al., 2019)
- Pain
    - Pain Self-Efficacy Questionnaire (Nicholas, 2007)
- Disability
    - Disabilities of the Arm, Shoulder, and Hand (DASH) (Hudak et al., 1996)

    - Pain Disability Questionnaire (Anagnostis et al., 2004)
- Quality of Life
    - Health-Related Quality of Life (HRQOL) (Yin et al., 2016)
- Central Nervous System Changes
    - Neuroplasticity
        - Central Sensitization Inventory (Mayer et al., 2012)
    - Body Perception Disturbances
        - Bath CRPS Body Perception Disturbance Scale (Lewis et al., 2007, Ten Brink et al, 2021)
    - Kineseophobia/Disuse
        - Fear-Avoidance Beliefs Questionnaire (Waddell et al., 1993)
    - Psychological Distress /Coping
        - Pain Catastrophizing Scale (Sullivan et al., 1995)
        - Pain Coping Questionnaire (Reid et al., 1998)
        - Pain Enjoyment of Life and General Activity (Krebs et al., 2009)
- Assess CRPS Budapest Criteria Signs and Symptoms (Harden et al., 2022)
    - Sensory
        - Quantify and record allodynia and/or hyperalgesia- test and record pain level with touch, temperature, pressure or joint movement. May use Semmes Weinstein monofilament or 2-point discriminator with the pain number scale of 0-10

- Vasomotor
    - Temperature Asymmetry
        - Quantify and record temperature asymmetry of affected body part and contralateral side with thermometer.
    - Skin Color
        - Record description of skin color changes or asymmetry or photo record
- Sudomotor/edema
    - Sudomotor
        - Record description of sweating changes or asymmetry between affected part and contralateral side or photo record
    - Edema
        - Record circumferential measurement of affected body part and contralateral side
- Motor/trophic
    - Motor
        - Record Range of Motion (ROM) of affected body part with comparison of contralateral side using standard goniometry
        - Record strength measurements of affected body part with comparison of contralateral side using standard manual muscle testing and dynamometer testing

        - Record description of any tremor or dystonia. May use standardized motor function testing such as the 9 Hole Peg Test (9HPT)
- Trophic Changes
    - Record description of hair, nails, and/or skin changes of affected body part with comparison of contralateral side

Appendix B: Intervention Methods

Inspired by Packham and Holly (2018), intervention methods are divided into peripheral and central nervous system approaches based on signs and symptoms therapists are intending to treat. These evidence-informed interventions should be linked to CRPS-appropriate assessments administered at evaluation. See "Suggested Assessments for OTs Treating CRPS" section of this document. Furthermore, interventions are labeled as biological or psychosocial approaches based on the biopsychosocial model of treatment for chronic pain and CRPS. Some interventions have evidence supporting multiple improvements and will be labeled as such. Lastly, treatment interventions were carefully selected based on statistically significant results from the most current evidence-based literature at the time of this writing. Interventions yielding poor results were omitted as viable CRPS treatments. Citations are included for reference.

Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
Peripheral Nervous System					
Allodynia/hyperalgesia (Part of Budapest Criteria)	Fluidotherapy	10 min sessions; 5 days/week	Biological	Allodynia, Pain, pain intensity, edema, function, pain-related disability	Sethy et al., 2017; Ozcan et al., 2019
	Tactile Discrimination Training	Use 2PD for assessments; most effective with combining with mirror therapy	Biological	Dysesthesia, pain reduction	Mosley et al., 2008; Mosley and Wiech, 2009

	Aerobic Exercise	Study with mice using high-intensity 30-min full body interval sessions 5 days/week and humans with UE bike 30 min sessions 5 days/week	Biological and Psychosocial	Hyperalgesia, sweating, MCP joint tenderness, movement pain, allodynia, neuropathic pain	Martins et al., 2013; Topcuoglue et al., 2015
Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
	Manual Therapy	3 min series of 30 second intervals in between for total of 9 min	Biological and Psychosocial	Hyperalgesia, pain behavior, oxidative stress,	Salgado et al., 2019
	Sensory Reeducation	Self-stimulation of skin adjacent to painful/sensitive skin	Biological	2PD and body perception	Lewis et al., 2011
Inflammation (Part of Budapest Criteria)	Manual Lymph Drainage	Taught and performed as HEP	Biological	Short term benefits of edema reduction with long term benefits on pain	Duman et al., 2009
	Fluidotherapy	10 min sessions; 5 days/week	Biological	Edema, allodynia, Pain, pain intensity, function, pain-related disability	Sethy et al., 2017; Ozcan et al., 2019

	Graded Motor Imagery	Sequential GMI consisting of Laterality training daily 2 weeks, imagined movements matching picture 2 weeks, then mirror therapy 2 weeks	Biological	Swelling, Neuropathic pain, disability	Moseley, 2004; Moseley 2005; Moseley 2006
Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
	Mirror Therapy	2-week HEP with Mirror Therapy in 2 min on-off schedule for 20 min, 2x/day for 7 days a week	Biological	Edema, pain at rest, ROM	Goswami, et al., 2016
Central Nervous System					
Body Perception Disturbances	Sensory Reeducation	Self-stimulation of skin adjacent to painful/sensitive skin	Biological	Improved body perception and 2PD	Lewis et al., 2011
	Mirror Therapy	10 min, 2x/day with simultaneous movement with non-affected hand as HEP	Biological	Body perception, pain, with increased movement capacity and muscle strength	Kotiuk et al., 2019

Learned Nonuse/Kineseophobia	Exposure Therapy (EXP)	Repeated exposure to feared movements, sensations, and activities valued by subject for 1 hour per week over 17 weeks	Biological and Psychosocial	Perceived harmfulness of activities, pain catastrophizing, pain, disability, and increased quality of life	den Hollander et al., 2016
Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
	Pain Exposure Therapy	Loading exercises and desensitization beyond pain limits with HEP of A/PROM with pain education to assure pain not causing damage	Biological and Psychosocial	Kineseophobia, disability, pain disability with improvements in perceived health and strength. No harmful side effects	H van,de M. (2011)
	Manual Therapy	3 min series of 3 min with 30 sec intervals between for total of 9 min	Biological and Psychosocial	Pain movement behavior, hyperalgesia, oxidative stress,	Salgado et al., 2019

Neuroplasticity	Mirror Therapy	Observe unaffected hand moving 5-10 min, bilateral movement 5-10 min, observe touch stimulation of unaffected hand. HEP 3-5x/day 15 min sessions	Biological	Pain relief, reduced stiffness	McCabe et al., 2003; Selles et al., 2008
	Mirror Therapy	2-week HEP with Mirror Therapy in 2 min on-off schedule for 20 min, 2x/day for 7 days a week	Biological	Pain at rest, ROM, and edema	Goswami, et al., 2016
Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
	Graded Motor Imagery	Sequential GMI consisting of Laterality training daily 2 weeks, imagined movements matching picture 2 weeks, then mirror therapy 2 weeks	Biological	Swelling, Neuropathic pain, disability	Moseley, 2004; Moseley 2005; Moseley 2006
Sudomotor Changes-Hyperhidrosis (Part of Budapest Criteria)	Aerobic Exercise	Study with mice using high-intensity 30-min full body interval sessions 5 days/week and	Biological and Psychosocial	Sweating, hyperalgesia, MCP joint tenderness, movement pain,	Martins et al., 2013; Topcuoglue et al., 2015

		humans with UE bike 30 min sessions 5 days/week		allodynia, neuropathic pain	
Sudomotor Changes- Temperature Asymmetry (Part of Budapest Criteria)	Temperature Regulation	Shifting affected limb to unaffected side of the body to warm	Biological	Temperature regulation	Moseley et al., 2013
Motor Changes- Decreased Range of Motion (Part of Budapest Criteria)	Mirror Therapy	Exercises with affected arm in mirror	Biological	Stiffness, pain	McCabe et al., 2003
Mechanism	**Treatment**	**Recommendations**	**Model of Treatment**	**Noted Improvements**	**References**
	Mirror Therapy	2-week HEP with Mirror Therapy in 2 min on-off schedule for 20 min, 2x/day for 7 days a week	Biological	ROM, Pain at rest, and edema	Goswami, et al., 2016
Psychological Distress/Disability/ Diminished Quality of Life	Exposure Therapy (EXP)	Repeated exposure to feared movements, sensations, and activities valued by subject for 1 hour per week over 17 weeks	Biological and Psychosocial	Perceived harmfulness of activities, pain catastrophizing, pain, disability, and increased quality of life	den Hollander et al., 2016
	Pain Exposure Therapy	Loading exercises and desensitization	Biological and Psychosocial	Kineseophobia, disability, pain	H van,de M. (2011)

		beyond pain limits with HEP of A/PROM with pain education to assure pain not causing damage		disability with improvements in perceived health and strength. No harmful side effects	
	Pain Neuroscience Education	Evidence-based articles, systematic review, and workbooks on pain neuroscience education	Psychosocial	Severity of symptoms, pain intensity, catastrophizing, depression, and anxiety	H van, 2011; Louw, 2016; Rider & Tay, 2022; Rufa et al., 2019; Saracoglu, 2022; Zoffness, 2020
	Cognitive Behavioral Techniques	Cognitive behavioral strategies for managing pain involving thoughts/beliefs, emotions, behaviors, and bodily responses	Psychosocial	Pain, depression, distress, catastrophizing, quality of life	Duncan, 2011; Wetering et al., 2010; Zoffness, 2020
	Mindfulness	Strategies for managing pain through mindfulness	Psychosocial	Pain, suffering, quality of life	Gardner-Nix & Costin-Hall, 2009; Zoffness, 2020
	Deep Breathing with Relaxation	Constant, slow, deep diaphragmic breathing rhythm with 7 cycles per minute (half of	Psychosocial	Pain, tension, anger, depressive feelings	Busch et al., 2012

		normal rate) 20 min session			
	Self-Management	Techniques for self and lifestyle management for pain	Psychosocial	Pain intensity, pain catastrophizing, pain disability	Breeden et al., 2022; Scholz, 2023; Zoffness, 2020

Appendix C: 8 Week Biopsychosocial CRPS OT Intervention

This outline is based on an outpatient therapy setting with the person attending 2x/week for 8 weeks for 45 min – 1-hour sessions. This scenario is also based on a "typical" person presenting with CRPS I or II in the upper extremity with the following list of symptoms upon evaluation discovered using the suggested assessments: diminished occupational engagement, high pain levels at rest and with movement, allodynia/hyperalgesia, edema, stiffness in joints, diminished strength, temperature asymmetry, hyperhidrosis, kineseophobia and learned nonuse, body perception disturbances, catastrophizing, central sensitization, diminished enjoyment and quality of life, reported disability, and poor coping strategies. Health history presents with no precautions or limitations for aerobic exercise or use of the upper extremity bike. Therapists should use clinical judgement for adapting this outline to specific presentations overall and for daily treatments. Each session, check for indications and precautions for fluidotherapy, modalities, and other interventions.

Week	Session	Type	Psychosocial Intervention	Biological Intervention	HEP
1	1	Eval	Full OT Evaluation using the suggested assessments. May issue some questionnaires to be taken home or provide as intake prior to evaluation.		
	2	Treatment	• Pain Neuroscience Education (PNE) (see resources)	• 30 min UE bike before session • 10 min fluidotherapy • 10 min manual therapy	• Pain Neuroscience Education; Zoffness (2020) Workbook Chapter 1 • Aerobic Exercise 30 min/day

2	3	Treatment	• Brief review of PNE, Chapter 1 of workbook • Cognitive Behavioral Techniques and Pain Education (see resources) • May use time during manual therapy and/or fluidotherapy for education	• 30 min UE bike before session • 10 min fluidotherapy • 10 min lymph drainage/manual therapy • 10 min sensory reeducation techniques	• Cognitive Behavioral Techniques; Zoffness (2020) Workbook Chapter 2 • Aerobic Exercise 30 min/day
	4	Treatment	• Brief review Chapter 2 in workbook • Cognitive Behavioral Techniques and Pain Education cont. (see resources) • May use time during manual therapy and/or fluidotherapy for education	• 30 min UE bike before session • 10 min fluidotherapy • 10 min lymph drainage/manual therapy • Introduction to Graded Motor Imagery (GMI) and laterality exercises	• Cognitive Behavioral Techniques; Zoffness (2020) Continue Workbook Chapter 2 • Aerobic Exercise 30 min/day • GMI laterality exercises using phone apps (OrientateFree or Recognise from the Noi group or flash cards of right and left hands) 10 min, 2x/day for 2 weeks
3	5	Treatment	• Brief review Chapter 2 in workbook	• 30 min UE bike before session • 10 min fluidotherapy	• Cognitive Behavioral Techniques; Zoffness (2020) Workbook Chapter 3 • Aerobic Exercise 30 min/day

			• Cognitive Behavioral Techniques and Pain Education cont. (see resources) • May use time during manual therapy and/or fluidotherapy for education	• 10 min lymph drainage/manual therapy • Exposure Therapy in session feared valued movements, sensations, and activities introduction/reinforcing PNE	• GMI laterality exercises using phone apps (OrientateFree or Recognise from the Noi group or flash cards of right and left hands) 10 min, 2x/day for 2 weeks
	6	Treatment	• Brief review Chapter 3 in workbook • Cognitive Behavioral Techniques and Pain Education cont. (see resources) • May use time during manual therapy and/or fluidotherapy for education	• 30 min UE bike before session • 10 min fluidotherapy • 10 min lymph drainage/manual therapy • Exposure Therapy in session feared valued movements, sensations, and activities introduction/reinforcing PNE	• Cognitive Behavioral Techniques; Zoffness (2020) Continue Workbook Chapter 3 • Aerobic Exercise 30 min/day • GMI laterality exercises using phone apps (OrientateFree or Recognise from the Noi group or flash cards of right and left hands) 10 min, 2x/day for 2 weeks
4	7	Treatment	• Brief review Chapter 3 in workbook • Cognitive Behavioral Techniques and	• 30 min UE bike before session • 10 min lymph drainage/manual therapy • Exposure Therapy in session with feared, but	• Mindfulness; Zofness (2020) Workbook Chapter 4 • Aerobic Exercise 30 min/day • GMI laterality exercises using phone apps (OrientateFree or Recognise from the Noi group

			Pain Education cont. (see resources) • May use time during manual therapy and/or fluidotherapy for education	valued movements, sensations, and activities introduction/reinforcing PNE • Introduce 2nd sequence of GMI using imagined movements based on the feared and valued movements, sensations, and activities in exposure therapy	or flash cards of right and left hands) 10 min, 2x/day for two weeks • List 20 feared, but valued movements, sensations, and activities in order from least feared to greatest feared. Find photos of self doing these activities previously if possible.
	8	Treatment, Measurements, and Assessments	• Brief review Chapter 4 in workbook • Mindfulness and Pain Education (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • Take measurements, assessments, and review/revise goals • 10 min lymph drainage/manual therapy • Exposure Therapy in session with feared, but valued movements, sensations, and activities graded from list	• Mindfulness; Zofness (2020) Workbook Chapter 4 • Aerobic Exercise 30 min/day • GMI imagined movements from list and photos for 2 weeks • Take home and fill out assessments assigned
5	9	Treatment	• Brief review Chapter 4 in workbook • Relaxation and Deep Breathing Techniques	• 30 min UE bike before session • 15 min Relaxation and Deep Breathing Techniques in session with constant, slow, deep diaphragmic breathing	• Cognitive Behavioral Techniques; Zofness (2020) Workbook Chapter 5 • Aerobic Exercise 30 min/day • GMI imagined movements from list and photos for 2 weeks while practicing deep

			education (see resources)	rhythm of 7 cycles per minute (half of normal rate) • Exposure Therapy in session with feared, but valued movements, sensations, and activities graded from list • Review any revised goals	breathing techniques for 20 min/day for 2 weeks
	10	Treatment	• Brief review Chapter 5 in workbook • Relaxation and Deep Breathing Techniques education (see resources) • May use time during fluidotherapy for education	• 30 min UE bike before session • Pain Exposure Therapy (see resources). Begin loading and PROM exercises and desensitization beyond pain limits with PNE and implementing deep breathing techniques. Use clinical reasoning skills. • 10 min Fluidotherapy	• Cognitive Behavioral Techniques; Zofness (2020) Workbook Chapter 5 • Aerobic Exercise 30 min/day • GMI imagined movements from list and photos for 2 weeks while practicing deep breathing techniques for 20 min/day for 2 weeks
6	11	Treatment	• Brief review Chapter 5 in workbook • Cognitive Strategies and PNE to reinforce acceptance of Pain Exposure and Exposure Therapy (see resources)	• 30 min UE bike before session • Pain Exposure Therapy (see resources). Loading and PROM exercises and desensitization beyond pain limits with PNE and implementing deep breathing techniques. Use clinical reasoning skills.	• Cognitive Behavioral Techniques; Zofness (2020) Workbook Chapter 6 • Aerobic Exercise 30 min/day • GMI imagined movements from list and photos for 2 weeks while practicing deep breathing techniques for 20 min/day for 2 weeks

				• Introduce 3rd sequence of GMI with Mirror Therapy in session for 15 min in quiet room. Teach HEP	• Begin loading and PROM activities at home for 10 min, 2x/day
	12	Treatment	• Brief review Chapter 6 in workbook • Cognitive Strategies and PNE to reinforce acceptance of Pain Exposure and Exposure Therapy (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • 10 min manual therapy • 10 min Pain Exposure Therapy (see resources). Loading and PROM exercises and desensitization beyond pain limits with PNE and implementing deep breathing techniques. Use clinical reasoning skills. • Exposure Therapy in session with feared, but valued movements, sensations, and activities graded from list	• Cognitive Behavioral Techniques; Zofness (2020) Workbook Chapter 6 • Aerobic Exercise 30 min/day • GMI Mirror Therapy with observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Perform 2x/day for 2 weeks • Loading and PROM activities 10 min, 2x/day
7	13	Treatment	• Brief review Chapter 6 in workbook • Self-Management Education (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • 10 min manual therapy • 10 min Pain Exposure Therapy (see resources). Loading and PROM exercises and desensitization beyond pain limits with PNE and implementing deep	• Self-Management Techniques; Zofness (2020) Workbook Chapter 7 • Aerobic Exercise 30 min/day • GMI Mirror Therapy with observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Perform 2x/day

				breathing techniques. Use clinical reasoning skills. • Exposure Therapy in session with feared, but valued movements, sensations, and activities graded from list	• Loading and PROM activities 10 min, 2x/day
	14	Treatment	• Brief review Chapter 7 in workbook • Self-Management Education (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • 10 min manual therapy • 10 min Pain Exposure Therapy (see resources). Loading and PROM exercises and desensitization beyond pain limits with PNE and implementing deep breathing techniques. Use clinical reasoning skills. • Progress GMI Mirror Therapy with Tactile Discrimination Training. Perform observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Add in observing touch stimulation of unaffected hand in mirror for 5 min	• Self-Management Techniques; Zofness (2020) Workbook Chapter 7 • Aerobic Exercise 30 min/day • GMI Mirror Therapy with Progress GMI Mirror Therapy with Tactile Discrimination Training with observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Add in observing touch stimulation of unaffected hand in mirror for 5 min. Perform 2x/day • Loading and PROM activities 10 min, 2x/day

8	15	Treatment	• Brief review Chapter 7 in workbook • Review and questions (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • 10 min manual therapy • Measurements and Assessments	• Bringing It All Together; Zofness (2020) Workbook Chapter 8 • Aerobic Exercise 30 min/day • GMI Mirror Therapy with Progress GMI Mirror Therapy with Tactile Discrimination Training with observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Add in observing touch stimulation of unaffected hand in mirror for 5 min. Perform 2x/day • Loading and PROM activities 10 min, 2x/day • Issue Assessments to bring back next session
	16	Treatment and Discharge or Reevaluation	• Brief review Chapter 8 in workbook • Overview and questions (see resources) • May use time during manual therapy for education	• 30 min UE bike before session • 10 min manual therapy • Measurements and Assessments • Review goals and HEP	• Bringing It All Together; Zofness (2020) Workbook Chapter 8 • Aerobic Exercise 30 min/day • GMI Mirror Therapy with observation of unaffected hand moving 5-10 min, then bilateral movement 5-10 min. Add in observing touch stimulation of unaffected hand in mirror for 5 min. Perform 2x/day

					• Loading and PROM activities 10 min, 2x/day

Appendix D: Budapest Criteria

New IASP diagnostic criteria for complex regional pain syndrome ("Budapest criteria" 2) (A–D must apply).

A. The patient has continuing pain which is disproportionate to any inciting eventB. The patient reports at least one symptom in 3 or more of the categoriesC. The patient displays at least one sign in 2 or more of the categoriesD. No other diagnosis can better explain the signs and symptoms □□□□

Category		Symptom (the patient reports a problem)	Sign (you can see or feel a problem on examination)
1 "Sensory"	Allodynia (to light touch/brush stoke and/or temperature sensation and/or deep somatic pressure and/or joint movement), and/or hyperalgesia (to pinprick)	Reported hyperesthesia also qualifies as a symptom□	□
2 "Vasomotor"	Temperature asymmetry and/or skin colour changes and/or skin colour asymmetry	□	□
3 "Sudomotor/oedema"	Oedema and/or sweating changes and/or sweating asymmetry	□	□
4 "Motor/trophic"	Decreased range of motion and/or motor dysfunction (weakness, tremor, dystonia) and/or trophic changes (hair/nail/skin)	□	□

(Taken from Goebel, A., Birklein, F., Brunner, F., Clark, J. D., Gierthmühlen, J., Harden, N., Huygen, F., Knudsen, L., McCabe, C., Lewis, J., Maihöfner, C., Magerl, W., Moseley, G. L., Terkelsen, A., Thomassen, I., & Bruehl, S. (2021). The Valencia consensus-based adaptation of the IASP complex regional pain syndrome diagnostic criteria. *Pain (Amsterdam)*, *162*(9), 2 346–2348. https://doi.org/10.1097/j.pain.0000000000002245)

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Curriculum Vitae

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Contact Information

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Education

University of Nevada, Las Vegas
Post-Professional Occupational Therapy Doctorate Candidate
University of Nevada, Las Vegas
May 2024

Texas Woman's University, Dallas
Master of Occupational Therapy
December 2014

Brigham Young University, Provo
Bachelor of Independent Study - Business Management
July 2007

Academic Research

Doctoral Capstone Research and Project
University of Nevada, Las Vegas
Biopsychosocial Occupational Therapy Interventions for Complex Regional Pain Syndrome- A Pilot Manuscript

Clinical Experience

Great Basin Orthopaedics
Reno, Nv
February 2018 – Present
Outpatient Orthopedic Clinic
Hand Therapist

- Recruited by hand surgeon to establish Occupational Therapy program from its inception
- Collaborate directly with hand and orthopedic surgeons in clinic to ensure exceptional patient care
- Observe relevant surgeries for educational purposes
- Administer skilled occupational and hand therapy services including evaluations, assessments, interventions, custom orthotic fabrication, and discharges for patients in busy outpatient orthopedic setting

- Caseload consists of pediatrics and adults with upper extremity orthopedic traumas from broad mechanisms of injury, repetitive use injuries, neurological impairments, pain syndromes, and medical conditions

Tahoe Forest Health Systems
Truckee, Ca and Incline Village, Nv
April 2015- July 2019, March 2024- Present
Outpatient, Inpatient, & Extended Care Settings
Occupational and Hand Therapist

- Provide quality therapy services to clients in rural settings in outpatient, inpatient, and extended care settings
- Collaborate closely with physicians and multidisciplinary team members to coordinate best care
- Outpatient
    - Provide interventions for upper extremity injuries pre and post operatively in an outpatient setting with a caseload focused on outdoor sports-related injuries
    - Provide skilled OT services in outpatient setting focused on chronic pain management and neurorehabilitation
- Inpatient and Extended Care
    - Perform all aspects of Occupational Therapy in ICU, med surge, and extended care on one campus
    - Participate in discharge planning and family/caregiver training to allow patients greatest independence with safety as priority

Carson Tahoe Hospital
Carson City, Nv
March 2024 – Present
Inpatient Level II Trauma Center
Inpatient Occupational Therapist

- Perform all aspects of Occupational Therapy in ICU, med oncology, telemetry, behavioral health, surgical orthopedics, and emergency department
- Participate in discharge planning and family/caregiver training to allow patients greatest independence with safety as priority
- Collaborate with interdisciplinary team to provide best care

Nevada Hand Therapy
Reno, Nv
August 2015 – February 2018
Outpatient Hand Therapy
Hand Therapist

- Facilitated patient rehabilitation primarily for work-related upper extremity injuries. Treated post-operative trauma cases from UCSF, Stanford, and various local plastic and orthopedic surgeons
- Educated patients in conservative management and ergonomic principles for injury prevention in the workplace and home office
- Utilized best practices in treatment techniques and progressed patients through return-to-work simulated activities
- Fabricated customized orthoses as part of treatments and for daily functional activities

HCR Manor Care
Reno, Nv
January 2015 – April 2015
Skilled Nursing Facility
Occupational Therapist

- Created plans of care and implemented skilled occupational therapy based on assessments and evaluations
- Assessed needs and educated patient/caregivers on adaptive equipment and home modifications needs
- Communicated with physicians and interdisciplinary team for discharge planning to reintegrate patients to least restrictive environments

Clinical Fieldwork Experience

Level 2

Renown Regional Medical Center
Reno, Nv
Fall 2014
Completion of 12-week rotation providing quality therapy services in med surg, cancer, orthopedic, neurology, ICU, and cardiac units of Level I Trauma Center

Renown Rehabilitation Hospital
Reno, NV
Summer 2014
Completion of 12-week fieldwork in integrated inpatient rehabilitation program with conditions including CVA, TBI, spinal cord injuries, orthopedic injuries and

surgeries, multiple sclerosis, Parkinson's, and deconditioning from complicating medical conditions

Level 1

Baylor Center for Pain Management
Dallas, Tx
Summer 2013
Integrative pain management day program

North Texas Hand Center
Denton, Tx
Summer 2012
Outpatient hand therapy clinic

Certifications

National Certification: NBCOT - 2015
California State Occupational Therapy Licensure: CBOT Licensure - 2015
Nevada State Occupational Therapy Licensure: NBOT Licensure - 2015
Certified Hand Therapist: HTCC - 2019

Clinical Instructor Experience

Clinical Instructor for two Level I and two Level II students in outpatient orthopedic hand clinics 2018 – 2022

Guest Lecturer

University of Nevada, Las Vegas - 2021
Occupational Therapy 724: Mental Health Practice – Adults/Older Adults
Lecture Title: All Settings are Mental Health Settings

California State University, Dominguez Hills - 2024
Occupational Therapy 563, Case Seminar III – Adults
Lecture Title: Interventions in Upper Extremity Injuries