

# CHRONIC PAIN CLINICAL PRACTICE GUIDELINE

Lauren Tiemeier, PT, DPT

Sean Meers, PT, DPT

## Background

- Chronic pain is ongoing or recurrent pain, lasting beyond the usual course of acute illness or injury, or more than 3-6 months (Ratter, 2014). Chronic pain adversely affects an individual's well-being. Chronic pain can also contribute to disability, anxiety, depression; sleep disturbances, poor quality of life, and high healthcare costs (Cochrane, 2014).
- Chronic pain persists and is often a self-limiting problem. Pain signals fire continuously in the nervous system for weeks, months, and even years. Chronic pain can be due to an initial injury or, an ongoing cause of pain such as arthritis, cancer, or infection. However, some people suffer from chronic pain in the absence of any past injury or evidence of body damage. Common chronic pain complaints can include headache, low back pain, cancer pain, arthritis pain, neurogenic pain, and/or psychogenic pain (American Chronic Pain Association, 2019).
- Pain categories are variably defined based on the perceived location (headache), etiology (cancer pain), or the primarily affected anatomical system (neuropathic pain). Some diagnoses of pain defy these classification principles (i.e. fibromyalgia). Pain severity can be graded based on pain intensity, pain-related distress, and functional impairment. (Treede, 2015.)

## Prevalence and Cost

- Approximately 20 percent of U.S. adults have chronic pain and 8 percent have high-impact chronic pain—meaning pain that limits at least one major life activity (2018).
- Higher prevalence of chronic pain and high-impact chronic pain were observed among women, older adults, previously but not currently employed adults, adults living in poverty, adults with public health insurance, and rural residents. (Dahlhamer, 2018.)
- Chronic pain has been linked to restricted mobility, opioid dependency, anxiety, depression, and reduced quality of life, and it contributes to an estimated \$560 billion annually in direct medical costs, lost productivity, and disability programs in the United States (NIH 2016).

## Population

- Chronic pain is defined as persistent pain that extends beyond normal tissue healing time greater than three to six months (Ratter, 2014). Patients with persistent pain can have reduced or complete disability in normal daily activities including self-care activities, household chores, cooking, grocery shopping, driving, and sexual dysfunction (Ratter, 2014). Patients included in this clinical practice guideline are any patients with persistent pain including but not limited to the musculoskeletal, neuromuscular, inflammatory, or visceral/genitourinary tract systems. Common diagnoses seen in patients with persistent pain include fibromyalgia, complex regional pain syndrome (CRPS), migraines, headaches, peripheral pain including osteoarthritis, rheumatoid arthritis and the vast array of spine pain disorders including cervical, thoracic and lumbar spine pain (Nijs, 2015).
- Chronic pain is associated with a host of medical and mental health co-morbidities such as cardiovascular disease, depression, and anxiety; substance use problems, including opioid dependence and abuse; and over-utilization of health care resources, including excessive use of emergency room services and frequent office visits.



**THE OHIO STATE UNIVERSITY**

WEXNER MEDICAL CENTER

For OSUWMC USE ONLY. To license, please contact the OSU Technology Commercialization Office at <https://tco.osu.edu>.

## Risk Factors

- Can include, but are not limited to the following:
  - Previous history of pain
  - Previous injury
  - Psychological distress
  - Dissatisfaction with work
  - Lack of exercise
  - Overuse/Heavy lifting
  - Smoking
  - Increased Age
  - Family concerns/stress
  - Obesity
  - Persistent post-surgical pain
  - Persistent post trauma pain
  - Frequency of seeing medical providers

## Diagnosis/Classification

- **Neuropathic Pain-** pain caused by damage or disease affecting the somatosensory nervous system. Neuropathic pain may be associated with abnormal sensations called dysesthesia or pain from normally non-painful stimuli (allodynia). It may have continuous and/or episodic components.
  - **Peripheral-** nerve pain that is a symptom of damage or dysfunction of the peripheral nervous system, which is the vast network of nerves that send messages to and from the central nervous system. Examples include complex regional pain syndrome (CRPS), metabolic disorders, and phantom limb. Symptoms may include abnormal sensations or pain from normally non-painful stimuli, swelling, change in skin temperature and color, joint stiffness, and muscle spasms.
  - **Central-** nerve pain or symptoms which are neurological and caused by a dysfunction that specifically affects the central nervous system, which includes the brain, brainstem and spinal cord. Examples include Parkinson's disease, multiple sclerosis, post-stroke pain, fibromyalgia, and myelopathies. Symptoms may include abnormal sensations, heightened pain response.
- **Musculoskeletal Pain-** pain that can affect bones, muscles, ligaments, tendons, and nerves. Musculoskeletal pain can be localized in one area, or widespread. Pain can be caused from injury, overuse, poor posture, and/or prolonged immobilization. Examples can include low back pain, myalgia, Myofascial Pain Syndrome, stress fractures, and tendinitis. Symptoms may include muscle aches and/or spasms, tenderness to palpation, joint stiffness, pain with movement or rest.
- **Inflammatory Pain-** localized reaction that produces redness, warmth, swelling, and pain as a result of infection, irritation, or injury. Inflammation can be external or internal. Examples can include arthropathies, infection, post-operative pain, and tissue injuries.



## Suggested Outcome Measures to Utilize:

- **Fear Avoidance Beliefs Questionnaire (FABQ)**

[https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/Fear%20Avoidance%20Behavior%20Questionnaire%20\(FABQ\).pdf](https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/Fear%20Avoidance%20Behavior%20Questionnaire%20(FABQ).pdf)

- Fear is a distressing negative experience induced by a perceived threat. The most commonly used outcome measure for fear is the **Fear Avoidance Beliefs Questionnaire (FABQ)**. The FABQ is designed to quantify fear and avoidance beliefs in individuals with chronic pain. The FABQ has two subscales to measure fear-avoidance beliefs about work and physical activity. The higher the score represents an increase in fear-avoidance beliefs. (Burton, W et al., 1999) (Fritz, et al. 2002)

- **The Brief Pain Inventory**

<https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/Brief%20Pain%20Inventory.pdf>

- Chronic pain is one of the most common disabling and persistent pain diagnoses (Baird, Sheffield, 2016). Beliefs about one's pain and ability to cope with pain determine physical and mental health outcomes in patients with chronic pain (Baird, Sheffield, 2016). **The Brief Pain Inventory** has been found to be responsive to detecting and reflecting improvement in pain over time for chronic nonmalignant pain. The Brief Pain Inventory maintains consistency and validity of measuring pain intensity and pain interference within chronic pain patients. The measure is also considerably sensitive to detecting and measuring changes in pain, such as demonstrating improvement (Tan, 2004).

- **The Pain Catastrophizing Scale**

<https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/Pain%20Catastrophizing%20Scale.pdf>

- **The Pain Catastrophizing Scale** is multi-dimensional and considers rumination, magnification, and helplessness as important components of catastrophizing. The Pain Catastrophizing Scale is a robust tool that has clinical and non-clinical applications and seems to generalize across populations and cultures (Van Damme, 2002). The Pain Catastrophizing Scale is a useful measure for predicting pain intensity (Sullivan, 1995).

- **Chronic Pain Acceptance Questionnaire**

<https://www.div12.org/wp-content/uploads/2015/06/Chronic-Pain-Acceptance-Questionnaire-Revised.pdf>

- **The Chronic Pain Acceptance Questionnaire** is designed to measure acceptance of pain. The acceptance of chronic pain is thought to reduce unsuccessful attempts to avoid or control pain and thus focus on engaging in valued activities and pursuing meaningful goals. The questionnaire shows moderate to high correlations with measures of avoidance, distress, and daily functioning. The questionnaire has also been found to significantly predict pain-related disability and distress, thus demonstrating predictive validity (McCracken, 2005).

- **Patient Reported Outcome (PRO) Measures- body specific**

- Specific Patient-Reported Outcome (PRO) measurements play an increasingly important role in healthcare and understanding health outcomes. PROs are the report of a patient's health status that comes directly from the patient, and can measure patient symptoms, patient function, and quality-of-life. PROs have been used successfully to assess impairment in a clinical setting. The most commonly used PROs for the chronic pain population include Oswestry Disability



Questionnaire, Neck Disability Index, Quick DASH, and Lower Extremity Functional Scale to address body specific components of the low back, neck, upper extremity, and legs.

- **Oswestry Disability Questionnaire**  
[https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/ODI-\(Back\).pdf](https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/ODI-(Back).pdf)
  - **Neck Disability Index**  
[https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/NDI-\(Neck\).pdf](https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/NDI-(Neck).pdf)
  - **Quick DASH**  
[https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/quickDASH-Upper%20Extremity\).pdf](https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/quickDASH-Upper%20Extremity).pdf)
  - **Lower Extremity Functional Scale (LEFS)**  
[https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/LEFS\(leg.ankle.foot.hip\).pdf](https://collaborate.osumc.edu/sites/RehabilitationSvcs/ebp/Clinical%20Practice%20Guidelines/Chronic%20Pain%20Outcome%20Measures/LEFS(leg.ankle.foot.hip).pdf)
- **2 Minute and 6 Minute Walk Tests**
    - Based on completion rates, distances walked, reliability and the high correlation between the distance walked in 2 and 6 minutes, the distance walked over 2 minutes can be considered to be a legitimate alternative to the distance walked over 6 minutes for indicating functional endurance among relatively healthy community-dwelling individuals. Even if the 6 minute walk test is used, it may be useful to document 2 minute walk test distance so that useful information is still obtained from individuals unable to complete the full 6MWT (Bohannon, R, et al, 2014).
  - **5x Sit to Stand Test**
    - The ability to go from a sitting position to a standing position is an important skill; the inability to perform this basic skill can lead to institutionalization, impaired functioning and mobility in activities of daily living (ADL), and even death. The test provides a method to quantify functional lower extremity strength and/or identify movement strategies a patient uses to complete transitional movements (Janssen, 2002).

## Chronic Pain Program Interventions

- **Interdisciplinary Chronic Pain Rehabilitation Program** uses the biopsychosocial approach of the integration of physical rehabilitation, clinical psychology, and medical interventions combined to create the most cost-effective and clinically-effective long term care (Gatchel, 2014). The care team will consist of providers from medicine, psychology, physical therapy, occupational therapy, social work, nursing, nutrition, and pharmacy. The team will provide coordinated, multi-modal, interdisciplinary care that effectively and safely addresses the biological, psychological, and social aspects of pain. Treatment components will include pain education, self-management/lifestyle modification skills, evidence based psychotherapy (ACT), mindfulness training, values-based goal setting, and PT group exercise. A systematic review found intensive (>100) hours of multidisciplinary biopsychosocial rehabilitation with functional restoration resulted in greater pain reduction and function for patients with chronic, disabling



**THE OHIO STATE UNIVERSITY**

WEXNER MEDICAL CENTER

For OSUWMC USE ONLY. To license, please contact the OSU Technology Commercialization Office at <https://tco.osu.edu>.

low back pain (Guzman, 2001). Self-management interventions to reduce pain limitations and improve physical activity have strong evidence for treatment of chronic musculoskeletal pain conditions (Smith, 2016). Interventions should be focused on disrupting the vicious cycle of fear avoidance behavior, pain, and disability (Bunzil, et al., 2017). See flyers included on OSU specific Chronic Pain Rehab Program.

- **Pain Neuroscience Education** is used to treat patients with pain by changing cognitions, beliefs, and fear before engaging a movement based approach of therapeutic exercise, graded exposure and pacing, guided motor imagery, cognitive behavioral therapy, acceptance and commitment therapies (Louw, Diehere, et al., 2011). The goal is to decrease fear and catastrophization. Pain neuroscience education is an educational intervention which aims to reduce pain and disability by explaining the biology of the pain experience to a patient (Moseley, 2005. Ryan, G et al., 2010). There is compelling evidence that an educational strategy addressing neurophysiology and neurobiology of pain can have a positive effect on pain, disability, catastrophization, and physical performance (Louw, 2017).
  - **Educational Delivery Methods:**
    - Verbal instruction (1:1 is most effective)
    - Duration & Frequency: 10-15 minutes; 1-2x/week; 1x/week when interspersed with homework
    - Group Sessions can be performed but should not exceed 12 patients, patients need to be like-minded and can be seen 1x/week for 6-8 week
    - Educational Tools include prepared pictures, drawings, metaphors, stories, examples, and/or workbook with homework
    - Content may include neurophysiology of pain, nociception and nociceptive pathways, neurons, synapses, action potential, spinal inhibition and facilitation, peripheral sensitization, central sensitization, plasticity of the nervous system. There should be no reference to anatomical or patho-anatomical models and no discussion of emotional or behavioral aspects of pain.
- **Physical Activity and Exercise Therapy** includes aerobic conditioning, strengthening and flexibility exercises that can be performed on land or in water that has been shown to inhibit nociceptor mechanisms, reactivate endogenous pain modulating systems and decrease chronic musculoskeletal pain (Arribas-Romano, 2020). Exercise is also helpful in improving depression and anxiety, improving fatigue, reducing kinesiophobia and improving overall physical fitness to perform daily activities (Polaski, 2019). This systematic review found chronic musculoskeletal pain had the greatest changes when incorporating aerobic activity, strengthening, and coordination exercises for one hour, three times per week for 12 weeks (Arribas-Romano, 2020). A randomized controlled trial found sensorimotor training to be superior to other forms of exercising when focused on deep trunk muscle activation, spine control and muscle performance for chronic low back pain (Wipert, 2020). Aquatic water exercising has been recommended for treatment of chronic pain due to the hydrodynamic properties of water (buoyancy, viscosity, hydrostatic pressure) leading to muscle strengthening, muscle relaxation, low joint impact and better venous return (Araújo, 2019) When prescribing physical activity and exercise, it is recommended that an exercise program be individualized, dosed and progressed at a “low and slow” pace (Polaski, 2019) in order to improve quality of life and overall well-being.



- **Pilates** exercise is a low impact program that focuses on improving motor control, core stability, flexibility, strength and posture (Amarol, 2020). Pilates can significantly improve functional movement, improve pain and range of motion (Lim, 2019), and can also improve cardiorespiratory fitness regardless of the patient's health status (Fernández-Rodríguez, 2019).
- **Yoga** exercise is a mind-body intervention that aims to improve the individual's emotional response to movement (emotional regulation) by improving body awareness, motor coordination and reducing muscle spasms, tension and pain (Schmid, 2019). Yoga has been shown by several studies to offer significantly better pain reduction than usual care (Posadzki, 2011) and can help to reduce anxiety, functional disability and depression (Dunleavy, 2016). Yoga can be incorporated with several pain-associated disorders (Bussing, 2012) and among the many yoga styles, Iyengar yoga has been found to be feasible for several pain syndromes (Michalsen, 2012).
- **Tai Chi** exercise is a Chinese mindfulness technique that involves slow, controlled movements with regulated breathing, weight shifting and balance postures (Pergolizzi, 2020) and research shows it to help reduce falls, improve physical fitness and improve psychological well-being (reduced stress, depression, anxiety and pain) (Qi, 2020). A meta-analysis found significant positive benefits including exercise capacity, gait, mental health, mobility, blood pressure, pain, stiffness, etc. were found for patients including chronic obstructive pulmonary disease, cancers, low back pain, osteoporosis and osteoarthritis, depression (Easwaran, 2020).
- **Dry Needling** is a minimally invasive technique by which an acupuncture needle is inserted directly into myofascial trigger points (Unverzagt, 2015). Research has shown in cases such as fibromyalgia syndrome the number of myofascial trigger points are directly related to pain intensity (Alonso-Blanco, 2011) and dry needling can reduce the local and referred pain produced by myofascial trigger points, the number of myofascial trigger points and improve the muscle activation of the muscle group (Hsieh, 2007). In addition, when incorporated as a multidisciplinary approach, dry needling can improve anxiety, depression, fatigue, sleep and can improve quality of life (Adelaida, 2019).
- **Graded Motor Imagery (GMI)** is an intervention that may be effective for patients with persistent pain by treating their cortical disruption (Bowering, 2013). The goal of GMI is to target cortical disruption and normalize sensory stimulation without triggering the pain response (Bowering, 2013). GMI increases cortical and spinal motor excitability. Visual input enhances tactile sensitivity. There is currently limited evidence to support GMI and mirror therapy for treatment of chronic pain; however, early research does support improvement in pain compared to traditional physical therapy interventions (Bowering, 2012). Evidence demonstrates an increased analgesic benefit for individuals with Complex Regional Pain Syndrome presenting with symptoms for 1 year or less (McCabe, 2008).
  - **Delivery Methods:**
    - **Left-Right Discrimination-** retraining the accuracy and speed of identifying whether a picture or body part is a right or left. Loss of laterality is known to occur in patients with CRPS and phantom limb pain (Moseley, 2004).
    - **Motor Imagery-** by imagining or watching positions of a body part, the maps can be sharpened without actually moving the painful body part.



- **Mirror Therapy**- used to “trick” the brain and represent the body part as normal, reduces the threat to the CNS/brain and pain is reduced. Mirror therapy can be a very emotional experience and exposure should be graded. Be sure to remove jewelry and cover tattoos and scars as much as possible. If a patient has bilateral pain, the most affected one is placed behind the mirror.
  
- **Virtual Reality (VR)** is a technology that lets you figuratively step inside a computer-generated 3D world. You can explore and sometimes even manipulate objects in that world. VR is now being incorporated into the treatment of some chronic pain conditions. Research suggests that VR can decrease chronic pain, especially in patients with chronic neck pain (Ahern, 2020). VR can improve global perceived effect, satisfaction, and general health in the short term; and pain intensity, disability, general health and balance in the long term. VR has also been shown to improve pain, disability, and fear of movement when compared to lumbar stabilization exercises. (Ahern, 2020). Evidence based practice suggests to achieve significant reduction in pain and disability included four to six- thirty minute sessions over a five week period. (Mallairi, 2019).
  
- **Cognitive Behavioral Therapy (CBT)** is the prevailing psychological treatment for individuals with chronic pain (Edhe, 2014). CBT focuses on the development of personal coping strategies that target solving current problems and changing unhelpful patterns in cognitions (e.g. thoughts, beliefs, and attitudes), behaviors, and emotional regulation. Depression and physical disability are found to be directly linked to self-efficacy beliefs (Asghari, 2008). CBT focuses on reducing maladaptive behaviors, improving thoughts and beliefs, and increasing self-efficacy for pain management (Turner and Romano, 2001). CBT is effective in reducing pain and distress, and reducing disability in systematic and meta-analysis reviews (Edhe, 2014). Multiple trials have shown that CBT is more effective for pain, functional status, and behavioral outcomes than placebo or no treatment (Airaksinen, 2006).
  
- **Acceptance and Commitment Therapy (ACT)** is a type of behavior therapy that is used to treat chronic pain and conditions that often go along with pain, such as anxiety, depression, and substance use problems. ACT is an evidence-based treatment for chronic pain. ACT does not aim to reduce pain intensity, but rather increase pain acceptance and reduce avoidance due to pain (Veehof, 2011). ACT is a promising alternative to CBT, particularly in older populations. Mindfulness training can be a particularly useful tool in restructuring patients’ avoidance cognitions, so that they can return to activities of value despite pain (Okifuji, 2015). The literature is limited, but there is an indication that cognitive reconstruction and acceptance allow for a greater pain tolerance, both in acute and chronic pain settings. Acceptance seems to be effective in both settings (Kohl, 2014). ACT focuses on helping patient’s to behave more consistently with their own values and apply mindfulness and acceptance skills to their responses to uncontrollable experiences (Smout, 2012).



Recommendation	Best Practice
<b>Biopsychosocial Approach</b>	<ul style="list-style-type: none"> <li>Chronic pain is best conceptualized and treated within a biopsychosocial framework in which pain is viewed as a complex problem that is influenced by the dynamic interplay among biological, psychological, and social factors.</li> <li>Clinicians should provide education about the biopsychosocial model of pain and collaborate with patients on developing an integrated plan of care that incorporates multiple modalities and types of interventions (e.g., medication, physical therapy, pain psychology, nutrition counseling, etc.).</li> </ul>
<b>Self-Management, Adaptive Coping, Lifestyle Modification</b>	<ul style="list-style-type: none"> <li>Best approaches to chronic pain empowers patients to take personal responsibility for their health and to self-manage their condition, rather than relying on others (including medical providers) to do so. Patients learn self-management, adaptive coping strategies and healthy lifestyle skills, which can be practiced at any time- even when pain is at its worst.</li> <li>Educate patients that flare-ups are part of the chronic pain condition. Patients are encouraged to use self-management and adaptive coping skills when flare-ups occur, rather than seeking additional medication and medical care in the emergency department or in office visits.</li> </ul>
<b>Shared Decision Making</b>	<ul style="list-style-type: none"> <li>Clinicians and patients work together to establish care plans. When patients participate in decision making and have a clear understanding of next steps, they are more likely to follow through.</li> <li>It is important to have a conversation surrounding goal setting and expectations with the patient. For most chronic pain conditions, there is no “cure” or “fix”, which means that absolute pain, but that tends to be temporary. This means it will be useful for patients to learn how to cope with pain in the long-term. Clinicians can educate patients about the nature of chronic pain and best treatments, which focus primarily on improved function and quality of life and secondarily on partial and/or temporary pain reduction.</li> </ul>
<b>Goal Setting</b>	<ul style="list-style-type: none"> <li>Regardless of the chosen intervention, set a SMART goal with the patient. The goal should be specific, measurable, attainable, relevant, and timely.</li> <li>Generally there are three focus areas for chronic pain management: <ul style="list-style-type: none"> <li><b>Improve function</b> (physical, emotional, social) and quality of life</li> <li><b>Decrease pain</b></li> <li><b>Correct secondary consequences of pain</b> (postural deficits, maladaptive behavior)</li> </ul> </li> </ul>





CarePoint East  
Family Practice Center  
543 Taylor Avenue (2<sup>nd</sup> r)  
Columbus, Ohio 43203  
Phone: (614) 688-6490

---

## Chronic Pain Rehabilitation Program

**Description:** The Comprehensive Pain Rehabilitation Program (CPRP) is a 9-week program for adults living with chronic pain conditions. This program teaches healthy lifestyle and specialized skills for living a full life with pain. The focus is on learning to pursue personal values and meaningful life goals in spite of physical and emotional pain. CPRP uses an interdisciplinary team approach and includes staff from psychology, physical therapy, nutrition, pharmacy, and medicine.

**Schedule: Tuesday, 1:00 to 4:30 PM**

- Group education & behavior therapy (1:00-3:00 PM)
- Group physical therapy (3:15-4:30 PM)

**Check-in: CarePoint East Family Practice Center**

**543 Taylor Avenue (2<sup>nd</sup> floor), Columbus, OH 43203**

On the first and last days of the program, please check in by 12:30 pm to complete paperwork.

**Attendance Policy:** If you miss more than 2 appointments, you may be asked to participate at a later date. If for whatever reason you are unable to attend, **please contact Dr. Laurie Greco at (614) 366-8358.**

**Treatment Format:**

- Group sessions led by a clinical-health psychologist, physical therapist, and other members of the treatment team, including: resident physician, clinical pharmacist, registered dietitian, and social worker
- Individual counseling, nutrition and pharmacy consultation, and case management services are available as-needed

For more information about the OSU Family Medicine Chronic Pain Rehabilitation Program, please speak with your provider or contact Dr. Laurie Greco at (614) 366-8358.



**THE OHIO STATE UNIVERSITY**  
WEXNER MEDICAL CENTER

For OSUWMC USE ONLY. To license, please contact the OSU Technology Commercialization Office at <https://tco.osu.edu>.

## Education & ACT Topics

## STAFF

<b>Week 1</b>	<ul style="list-style-type: none"> <li>– <b>Education:</b> Bio-psycho-social model of pain, active vs. passive treatment, hurt vs. harm</li> <li>– <b>ACT:</b> Nature of human suffering, Mindfulness</li> </ul>	Clinical Health Psychologist Resident Physician
<b>Week 2</b>	<ul style="list-style-type: none"> <li>• <b>Education:</b> Spine health, posture, body mechanics</li> <li>• <b>ACT:</b> Let's get clear about what's NOT working; Control as the problem, <i>not</i> the solution</li> </ul>	Physical Therapist Clinical Health Psychologist Resident Physician
<b>Week 3</b>	<ul style="list-style-type: none"> <li>• <b>Education:</b> Healthy sleep habits</li> <li>• <b>ACT:</b> Let's get clear about what's NOT working; Control as the problem, <i>not</i> the solution</li> </ul>	Social Worker Clinical Health Psychologist Resident Physician
<b>Week 4</b>	<ul style="list-style-type: none"> <li>• <b>Education:</b> Activity management, pacing skills, and SELF-managing flare-ups</li> <li>• <b>ACT:</b> Methods for cultivating willingness</li> </ul>	Physical Therapist Clinical Health Psychologist Resident Physician
<b>Week 5</b>	<ul style="list-style-type: none"> <li>• <b>Education:</b> Pain medications</li> <li>• <b>ACT:</b> Methods for cultivating willingness</li> </ul>	Pharmacist Clinical Health Psychologist Resident Physician
<b>Week 6</b>	<ul style="list-style-type: none"> <li>• <b>Education:</b> Mindfulness, nutrition &amp; wellness</li> <li>• <b>ACT:</b> Methods for cultivating willingness</li> </ul>	Dietitian Clinical Health Psychologist Resident Physician
<b>Week 7</b>	<ul style="list-style-type: none"> <li>• <b>ACT:</b> Values identification &amp; clarification; Willingness in the service of values</li> </ul>	Clinical Health Psychologist Resident Physician
<b>Week 8</b>	<ul style="list-style-type: none"> <li>• <b>ACT:</b> Barriers to living out values Making &amp; keeping commitments Follow up / booster session(s)</li> </ul>	Clinical Health Psychologist Resident Physician

### Group Education / Acceptance & Commitment Therapy (ACT)

Acceptance and Commitment Therapy (“ACT”) is the treatment approach used in the CPRP program. ACT is a type of behavior therapy or “talk therapy” that is used to treat chronic pain and conditions that often go along with pain, such as anxiety, depression, and substance use problems. ACT is considered an evidence-based treatment for chronic pain. Research has shown that ACT is an effective approach for people living with chronic pain and related conditions. For more ACT, please visit the website: [www.contextualscience.org](http://www.contextualscience.org).



Type of Pain	Evaluation	Treatment Recommendations
<b>Peripheral Neuropathic Pain</b> (ex. Complex Regional Pain Syndrome, Metabolic disorders, Phantom limb)	<ul style="list-style-type: none"> <li>– Symptoms: abnormal sensations or pain from normally non-painful stimuli, swelling, change in skin temperature and skin color, joint stiffness, muscle spasms</li> <li>– Exam: weakness, decrease in functional mobility/ROM, decrease in sensation</li> <li>– Imaging: X-ray, MRI, bone scan</li> </ul>	<ul style="list-style-type: none"> <li>● Physical therapy including appropriate exercise, aquatic therapy, GMI, desensitization, CBT, ACT, TENS, biofeedback, pain neuroscience education</li> <li>● Interdisciplinary Chronic Pain Program</li> </ul>
<b>Central Neuropathic Pain</b> (ex. Fibromyalgia, Parkinson's Disease, Multiple Sclerosis, Post-stroke Pain, Myelopathies)	<ul style="list-style-type: none"> <li>● Symptoms: abnormal sensations, heightened pain response</li> <li>● Exam: decrease in functional mobility/ROM, weakness, spasticity</li> <li>● Imaging: X-ray, MRI, CT Scan</li> </ul>	<ul style="list-style-type: none"> <li>● Physical therapy including appropriate exercise, GMI, CBT, ACT, bracing, pain neuroscience education</li> <li>● Interdisciplinary Chronic Pain Program if meets all inclusion criteria</li> </ul>
<b>Musculoskeletal Pain</b> (ex. Arthritic joint pain, Myofascial Pain Syndrome)	<ul style="list-style-type: none"> <li>● Symptoms: muscle aches, muscle spasms, tender to palpation, joint stiffness, pain with movement or rest</li> <li>● Exam: decrease in functional mobility/ROM, weakness, palpable trigger points</li> <li>● Imaging: X-ray, MRI</li> </ul>	<ul style="list-style-type: none"> <li>● Physical therapy including appropriate exercise, aquatic therapy, yoga, Pilates, GMI, CBT, ACT TENS, biofeedback, pain neuroscience education, dry needling</li> <li>● Interdisciplinary Chronic Pain Program</li> </ul>
<b>Inflammatory Pain</b> (ex. Rheumatoid Arthritis, Infection, Post-op Pain, Tissue Injury)	<ul style="list-style-type: none"> <li>● Symptoms: increased redness, warmth, swelling, and pain</li> <li>● Exam: decrease in functional mobility/ROM, weakness</li> <li>● Imaging: X-ray, bone scan</li> </ul>	<ul style="list-style-type: none"> <li>● Physical therapy including appropriate exercise, aquatic therapy, GMI, CBT, ACT, pain neuroscience education, dry needling</li> <li>● Interdisciplinary Chronic Pain Program</li> </ul>



<b><u>LOCATION</u></b>	<b><u>ADDRESS</u></b>	<b><u>PHONE NUMBER</u></b>	<b><u>WEBSITE</u></b>
<b><u>ABS Pilates (Pilates)</u></b>	238 South State Route 605 Sunbury, OH 43230	(614) 499-6770	<a href="http://www.a-b-spilates.com">www.a-b-spilates.com</a>
<b><u>Arthritis Foundation</u></b>			<a href="http://www.arthritis.org">www.arthritis.org</a>
<b><u>Columbus Aquatic Center</u></b>	1160 Hunter Ave, Columbus, OH 43201	(614) 645-3129	<a href="http://www.columbus.gov">www.columbus.gov</a>
<b><u>Columbus Tai Chi (Tai Chi)</u></b>	3436 Heritage Club Dr. South, Hilliard, OH 43026	(614) 517-6404	<a href="http://www.taichicolumbus.com">www.taichicolumbus.com</a>
<b><u>Exercise Is Medicine</u></b>	OSU Sports Medicine Healthy New Albany 150 W. Main Street New Albany, OH 43054	(614) 685-4348	<a href="http://www.wexnermedical.osu.edu/fitness/health">www.wexnermedical.osu.edu/fitness/health</a>
<b><u>Local Fitness Centers</u></b>	Located throughout Columbus and surrounding suburbs		*Ex. Lifetime Fitness, YMCA's, Planet Fitness, L.A. Fitness, Community Recreation Centers, Jewish Community Center, etc.
<b><u>Ohio State Center for Wellness and Prevention</u></b>	2050 Kenny Rd # 1010, Columbus, OH 43221	(614) 293-2800	<a href="https://wexnermedical.osu.edu/locations-and-parking/center-for-wellness-and-prevention">https://wexnermedical.osu.edu/locations-and-parking/center-for-wellness-and-prevention</a>
<b><u>Pilates Innovations (Pilates)</u></b>	4245 N. High Street Columbus, OH 43214	(614) 388-8939	<a href="http://www.pilatesinnovations.org">www.pilatesinnovations.org</a>
<b><u>Silver Sneakers</u></b>	Located throughout Columbus and surrounding suburbs		*Available through most Medicare Advantage plans at various gyms/fitness centers (Ex. YMCA's, Lifetime Fitness)
<b><u>Shift Grandview (Tai Chi)</u></b>	1520 West 1 <sup>st</sup> Ave Grandview Heights, Columbus, OH 43212	(614) 407-4668	<a href="http://www.shiftgrandview.com">www.shiftgrandview.com</a>
<b><u>The Pilates Studio</u></b>	1700 W. Lane Ave, Columbus, OH 43221	(614) 485-9145	<a href="http://www.thepilatesstud.io/upper-arlington">www.thepilatesstud.io/upper-arlington</a>
<b><u>Turning Point Fitness (Pilates)</u></b>	5890 Chandler Ct. Westerville, OH 43082	(614) 895-1433	<a href="http://www.turningpointfit.com">www.turningpointfit.com</a>
<b><u>Wesley Ridge Aquatic Center</u></b>	2225 Taylor Park Dr. Reynoldsburg, OH 43068	(614) 902-3820	<a href="http://www.wesleyridge.com/harcum-fitness-and-aquatic-center">www.wesleyridge.com/harcum-fitness-and-aquatic-center</a>
<b><u>Yoga Physical Therapist- Stephanie Carter Kelley, PhD</u></b>		(614)-949-9930	<a href="http://stephaniecarterkelley.com/contact">http://stephaniecarterkelley.com/contact</a>



**THE OHIO STATE UNIVERSITY**

WEXNER MEDICAL CENTER

For OSUWMC USE ONLY. To license, please contact the OSU Technology Commercialization Office at <https://tco.osu.edu>.

**Authors:** Lauren Tiemeier, PT, DPT; Sean Meers, PT, DPT  
**Reviewers:** John Dewitt, PT, DPT; Jordan Hudson, PT, DPT  
**Completion date:** April 2020

## References

- Ahem M, Dean L, Stoddard C, Agrawal A, Kim K, Cook C, Garcia A. The effectiveness of virtual reality in patients with spinal pain: A systematic review and meta-analysis. *Pain Practice*. 2020; 10: 1111.
- Alonso-Blanco C, Fernández-de-las-Peñas C, Morales-Cabezas M, et al. Multiple active myofascial trigger points reproduce the overall spontaneous pain pattern in women with fibromyalgia and are related to widespread mechanical hypersensitivity. *Clin J Pain*. 2011;27:405–413.
- Amaral DDV, Miyamoto GC, Franco KFM, Dos Santos Franco YR, Bastos De Oliveira NT, Hancock MJ, Van Tulder MW and Nunes Cabral CM. Examination of a Subgroup of Patients with Chronic Low Back Pain Likely to Benefit More From Pilates-Based Exercises Compared to an Educational Booklet. *J Orthop Sports Phys Ther*. April 2020; 50(4):189-197.
- Anna Lucia Barker, PhD, Jason Talevski, BHealth Sci (Public Health), Renata Teresa Morello, MPH, Caroline Anne Brand, MPH, Ann Elizabeth Rahmann, PhD, Donna Michelle Urquhart, PhD. Effectiveness of Aquatic Exercise for Musculoskeletal Conditions: A Meta-Analysis. *Archives of Physical Medicine and Rehabilitation*. 2014; 95: 1776-86.
- Araújo FM, DeSantana JM. Physical therapy modalities for treating fibromyalgia. *F1000Res*. 2019;8:F1000 Faculty Rev-2030.
- Arribas-Romano A, Fernandez-Carnero J, Molina-Rueda F, Angulo-Diaz-Parreno S and Navarro-Santana MJ. Efficacy of Physical Therapy on Nociceptive Pain Processing Alterations in Patients with Chronic Musculoskeletal Pain: A Systematic Review and Meta-analysis. *Pain Med*. February 25, 2020: pnz366.
- Asghari A, Julaeiha S and Godarsi M. Disability and depression in patients with chronic pain: pain or pain-related beliefs? *Arch Iran Med*. 2008; 11(3): 263-269.
- Baird A and Sheffield D. The Relationship between Pain Beliefs and Physical and Mental Health Outcome Measures in Chronic Low Back Pain: Direct and Indirect Effects. *Healthcare (Basel)*. 2016; 14(3).
- Bowering KJ, O'Connell NE, Tabor A, et al. The Effects of Graded Motor Imagery and Its Components of Chronic Pain: A Systematic Review and Meta Analysis. *The Journal of Pain*. November 19, 2012.
- Bunzil S, Smith A, Schutze R, et al. Making Sense of Low Back Pain and Pain-Related Fear. *JOSPT*. September 2017. 47 (9): 628-636.
- Bussing, A, Ostermann, T, Ludke, R, Michalsen, A. Effects of Yoga Interventions of Pain and Pain-Associated Disability: A Meta-Analysis. *J of Pain*. 2012; 13(1):1-4.
- Butland RJ, Pang J, Gross ER, Woodcock AA, Geddes DM. Two-, six-, and 12-minute walking tests in respiratory disease. *Br Med J (Clin Res Ed)*. 1982; 284(6329):1607-1608.
- Cox, H, Tilbrook, H, Aplin, J, Semlyen, A, Togerson, D, Trehwela, A, Watt, I. A randomised controlled trial of yoga for the treatment of chronic low back pain: Results of a pilot study. *Complementary Therapies in Clin Prac*. 2010; 16: 187-193.
- Dahlhamer J, Lucas J, Zelaya C, Nahin R, Mackey S, DeBar L, Kerns R, Von Korff M, Porter L, Helmick C. [Prevalence of chronic pain and high impact chronic pain among adults – United States, 2016](#). *MMWR*. September 14, 2018.



Deyo, RA, Walsh NE, et al. A Controlled Trial of Transcutaneous Nerve Stimulation (TENS) and Exercise for Chronic Low Back Pain. *The New England Journal of Medicine*. 1990; 322: 1627-1634.

<http://www.nejm.org/doi/full/10.1056/NEJM199006073222303#t=article>

Dunleavy, K, Kava, K, Goldberg, A, Malek, M, Talley, A, Tutag-Lehr, V, Hildreth, J. Comparative effectiveness of Pilates and yoga group exercise interventions for chronic mechanical neck pain: quasi-randomized parallel controlled study. *Physiotherapy*. 2016; 102:236-42.

Easwaran K, Gopalasingam Y, Green D, Lach V, Melnyk J, Wan C and Bartlett D. Effectiveness of Tai Chi for health promotion for adults with health conditions: a scoping review of Meta-analyses. *Disability and Rehabilitation*. 2020; 1-12.

Edhe DM, Dilworth TM and Turner JA. Cognitive-Behavioral Therapy for Individuals with Chronic Pain-Efficacy, Innovations and Directions for Research. *American Psychologist*. 2014; 69(2): 153-166.

Fernández-Rodríguez R, Álvarez-Bueno C, Ferri-Morales A, Torres-Costoso AI, Cavero-Redondo I, Martínez-Vizcaíno V. Pilates Method Improves Cardiorespiratory Fitness: A Systematic Review and Meta-Analysis. *J Clin Med*. 2019;8(11):1761.

Fransen, Marlene, Nairn Lillias, Winstanley Julie, Lam Paul, Edmond John. Physical Activity for Osteoarthritis Management: A Randomized Controlled Clinical Trial Evaluating Hydrotherapy or Tai Chi Classes. *Arthritis and Rheumatism*. 2007; 57(3): 407-414.

Gatchel, McGeary DD, McGeary CA and Lippe B. Interdisciplinary Chronic Pain Management: Past, Present and Future. *American Psychologist*. 2014; 69(2): 119-130.

Geytenbeek Jenny. Evidence for Effective Hydrotherapy. *Physiotherapy*. 2002; 88(9): 514-528.

Gusi N, Tomas-Carus P, Kkinen A, Kkinen K, Ortega-Alonso A. Exercise in Waist-High Warm Water Decreases Pain and Improves Health-Related Quality of Life and Strength in the Lower Extremities in Women With Fibromyalgia. *Arthritis & Rheumatism*. 2006; 55(1): 66-73.

Guzman, J, Rosmin E, Karjalainen K, et al. Multidisciplinary rehabilitation for chronic low back pain: systematic review. *BMJ*. 2001; 322: 1511.

Hall AM, Maher CG, Lam P, Ferreira M, Latimer J. Tai chi exercise for treatment of pain and disability in people with persistent low back pain: A randomized controlled trial. *Arthritis Care Res*. 2011; 63(11): 1576-1583.

Hall Jane, PhD, MPhil, MCSP, Swinkels Annette, PhD, MCSP, Briddon Jason, MA, MCLIP, McCabe Candida S., PhD, RGN. Does Aquatic Exercise Relieve Pain in Adults With Neurologic or Musculoskeletal Disease? A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Archives of Physical Medicine and Rehabilitation*. 2008; 89: 873-883.

Harding, V, Williams, A, Richardson, P, Nicholas, M, Jackson, J, Richardson, I, Pither, C. The development of a battery of measures for assessing physical functioning of chronic pain patients. *Pain*. 1994; 58: 367-75.

Hsieh YL, Kao MJ, Kuan TS, et al. Dry needling to a key myofascial trigger point may reduce the irritability of satellite MTrPs. *Am J Phys Med Rehabil*. 2007;86:397-403.

Jae-Young Lim, MD, PhD, Esther Tchai, PhD, Soong-Nang Jang, RN, MPH, PhD. Effectiveness of Aquatic Exercise for Obese Patients with Knee Osteoarthritis: A Randomized Controlled Trial. *Cleveland Clinic Journal of Medicine*. 2010; 2: 723-731.

Janssen, W, Bussmann, H, Stam, H. Determinants of the Sit-to-Stand Movement: A Review. *Phys Ther*. 2002; 82(9): 866-79.

Kohl, A, Rief, W, Glombiewski, J. Do fibromyalgia patients benefit from cognitive restructuring and acceptance? An experimental study *Journal of Behavior and Experimental Psychiatry*. 2014; 45: 467-474.

Kong LJ, Lauche R, Klose P, et al. Tai Chi for Chronic Pain Conditions: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Sci Rep*. 2016; 6(April): 1-9.



**THE OHIO STATE UNIVERSITY**

WEXNER MEDICAL CENTER

For OSUWMC USE ONLY. To license, please contact the OSU Technology Commercialization Office at <https://tco.osu.edu>.

- Kosak M, Smith T. Comparison of the 2-, 6-, and 12-minute walk tests in patients with stroke. *J Rehabil Res Dev.* 2004; 41(1): 103.
- Lee H-J, Park H-J, Chae Y, et al. Tai Chi Qigong for the quality of life of patients with knee osteoarthritis: a pilot, randomized, waiting list controlled trial. *Clin Rehabil.* 2009; 23(6): 504-511.
- Lim EJ, Park JE. The effects of Pilates and yoga participant's on engagement in functional movement and individual health level. *J Exerc Rehabil.* 2019;15(4):553–559.
- Lunde, L, Nordhus, I. Combining Acceptance and Commitment Therapy and Cognitive Behavioral Therapy for the Treatment of Chronic Pain in Older Adults. *Clinical Case Studies.* August 2009; 8(4): 296-308.
- Mallari B, Spaeth E, Goh H, Boyd B. Virtual reality as an analgesic for acute and chronic pain in adults: a systematic review and meta-analysis. *J Pain Res.* 2019; 12: 2053-2085.
- Marcos Renato Assis, Luciana Eduardo Silva, Adriana Martins Barros Alves, Ana Paula Pessanha, Vale'ria Valim, Daniel Feldman, Turi'bio Leite de Barros Neto, Jamil Natour. A Randomized Controlled Trial of Deep Water Running: Clinical Effectiveness of Aquatic Exercise to Treat Fibromyalgia. *Arthritis and Rheumatism.* February 2006; 55(1): 57-65.
- McCabe, Candida S., Haigh, Richard C., Blake, David R. Mirror Visual Feedback for the Treatment of Complex Regional Pain Syndrome (Type I). *Current Pain and Headache Reports.* 2008; 12: 103-107.
- McCracken, L, Sato, A, Taylor, G. A Trial of a Brief Group-Based Form of Acceptance and Commitment Therapy (ACT) for Chronic Pain in General Practice: Pilot Outcome and Process Results. *The Journal of Pain.* November 2013; 14(11): 1398-1406.
- McCracken, L. M., Vowles, K. E., & Eccleston, C. (2005). Acceptance-based treatment for persons with complex, long standing chronic pain: a preliminary analysis of treatment outcome in comparison to a waiting phase. *Behavior Research and Therapy,* 43, 1335-1346.
- Michalsen, A, Traiteur, H, Ludtke, R, Brunnhuber, S, Meier, L, Jeitler, M, Bussing, A, Kessler, C. Yoga for Chronic Neck Pain: A Pilot Randomized Controlled Clinical Trial. *J of Pain.* 2012; 13(11): 1122-1130.
- Mosely GL, Butler DS, Beames TB, Giles TJ. *The graded motor imagery handbook.* NOIgroup Publications. Adelaide, Australia, 2012.
- Nijs JO, Girbes EL, Lundberg M, Malfliet A and Sterling M. Exercise therapy for chronic musculoskeletal pain: Innovation by altering pain memories. *Manual Therapy.* 2015; 20: 216-220.
- Nnoaham KE, Kumbang J. Transcutaneous electrical nerve stimulation (TENS) for chronic pain (Review). *The Cochrane Collaboration.* 2010.
- Okifuji, A, Turk, D. Behavioral and Cognitive-Behavioral Approaches to Treating Patients with Chronic Pain: Thinking Outside the Pill Box. *Journal of Rational-Emotive & Cognitive Behavioral Therapy.* 2015; 33: 218-38.
- Pergolizzi, J.V., LeQuang, J.A. Rehabilitation for Low Back Pain: A Narrative Review for Managing Pain and Improving Function in Acute and Chronic Conditions. *Pain Ther.* 2020. <https://doi.org/10.1007/s40122-020-00149-5>.
- Peterson, T, Kryger P, Ekdahl C, Olsen S and Jacobsen S. The Effect of McKenzie Therapy as Compared With That of Intensive Strengthening Training for the Treatment of Patients with Subacute or Chronic Low Back Pain: A Randomized Controlled Trial. *Spine.* 2002; 27(16): 1702-1709.
- Polaski AM, Phelps AL, Kostek MC, Szucs KA, Kolber BJ. Exercise-Induced Hypoalgesia: A Meta-Analysis of Exercise Dosing For the Treatment Of Chronic Pain. *PLoS One.* 2019;14(1):e0210418.
- Posadzki P, Ernst E. Yoga for low back pain; a systematic review of randomized clinical trials. *Clin Rheumatol.* 2011;30 (9):1257-1262.



- Posadzki, P, Ernst, E, Terry, R, Soo Lee, M. Is yoga effective for pain? A systematic review of randomized clinical trials. *Contemporary Therapies in Medicine*. 2011; 19: 281-87.
- Qi M, Moyle W, Jones C and Weeks B. Tai Chi Combined with Resistance Training for Adults Aged 50 Years and Older: A Systematic Review. *J Geriatr Phys Ther*. 2020; 43(1):32-41.
- Ramasamy A, Martin ML, Blum SI, Liedgens H, Argoff C, Freynhagen R, Wallace, M et al. Assessment of Patient-Reported Outcome Instruments to Assess Chronic Low Back Pain. *Pain Med*. 2017; 18(6): 1098-1110.
- Rolf-Detlef Treede, Winfried Rief, Antonia Barke, Qasim Aziz, et al. A classification of chronic pain for ICD-11. *Pain Med*. 2015; 156(6): 1003-1007.
- Rosario, J, Orcesi, L, Kobayashi, F, Aun A, Assumpcao, I, Blasioli, J, Hanada, E. The immediate effects of modified Yoga positions on musculoskeletal pain relief. *J of Bodywork & Movement Therapies*. 2013; 17: 469-74.
- Sánchez AMC, López HG, Sánchez MF, Mármol JMP, Aguilar-Ferrándiz ME, Suárez AL and Peñarrocha G. Improvement in clinical outcomes after dry needling versus myofascial release on pain pressure thresholds, quality of life, fatigue, pain intensity, quality of sleep, anxiety, and depression in patients with fibromyalgia syndrome. *Disability and Rehabilitation*. 2019;41(19): 2235-2246.
- Schmid AA, Fruhauf CA, Sharp JL, Van Puymbroeck M, Bair MJ, Portz JD. Yoga for People With Chronic Pain in a Community-Based Setting: A Feasibility and Pilot RCT. *J Evid Based Integr Med*. 2019 ;24-25.
- Simmonds, M, Olsen, S, Jones, S, Hussein, T, Lee, E, Novy, D, Radwan, H. Psychometric Characteristics and Clinical Usefulness of Physical Performance Tests in Patients with Low Back Pain. *Spine*. 1998; 23(22): 2412-21.
- Smeets, R, Hijdra, H, Kester, M, Hitters, M, Knottnerus, A. The usability of six physical performance tasks in a rehabilitation population with chronic low back pain. *Clinical Rehabilitation*. 2006; 20: 987-96.
- Smith, et al. Should exercises be painful in the management of chronic musculoskeletal pain? A systematic review and meta-analysis. *British Journal of Sports Medicine*.  
<http://bjsm.bmj.com/content/early/2017/07/12/bjsports-2016-097383>
- Smout, M. Acceptance and Commitment Therapy Pathways for General Practitioners. *Australian Family Physician*. 2012; 672-676.
- Song R, Lee EO, Lam P, Bae SC. Effects of tai chi exercise on pain, balance, muscle strength, and perceived difficulties in physical functioning in older women with osteoarthritis: A randomized clinical trial. *J Rheumatol*. 2003; 30(9): 2039-2044.
- Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and Validation. *Psychol Assess*. 1995; 7 (4): 524-532.
- Tan G, Jensen MP, Thornby JI, Shanti BF. Validation of the brief pain inventory for chronic nonmalignant pain. *The Journal of Pain*. 2004; 5(2): 133-137.
- Tekur, P, Nagarathna, R, Chametcha S, Hankey, A, Nagendra H. A comprehensive yoga program improves pain, anxiety and depression in chronic low back pain patients more than exercise: An RCT. *Complementary Therapies in Medicine*. 2012; 20: 107-118.
- Pilates article 2014. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0100402>
- Lumbar stabilization greater than Pilates and dynamic strengthening for chronic LBP. <https://www.e-sciencecentral.org/articles/SC000026761>
- Umit Dundar, MD, Ozlem Solak, MD, Ilknur Yigit, MD, Deniz Evcik, MD, and Vural Kavuncu, MD. Clinical Effectiveness of Aquatic Exercise to Treat Chronic Low Back Pain, A Randomized Controlled Trial. *Spine*. 2009; 34(14): 1436-40.





- Unverzagt C, Berglund K, Thomas JJ. Dry needling for myofascial trigger point pain: a clinical commentary. *Int J Sports Phys Ther.* 2015;10:402–418.
- Van Damme S, Crombez G, Bijttebier P, Goubert L, Van Houdenhove B. A confirmatory factor analysis of the Pain Catastrophizing Scale: Invariant factor structure across clinical and non-clinical population. *Pain.* 2002; 96(3): 319-342.
- vanMiddelkoop M, Rubinstein SM, Verhagen AP, Ostelo RW, Koes BW, vanTulder MW. Exercise therapy for chronic nonspecific low-back pain. *Best Prac Res Clin Rheumatol* 2010;24 (2):193-204.
- Veehof, M, Oskam, MJ, Schreurs, K, Bohlmeijer, E. Acceptance-based interventions for the treatment of chronic pain: A systematic review and meta-analysis. *Pain.* 2011; 152: 533-42.
- Vowles, K, Witkiewitz, K, Sowden, G. Acceptance and Commitment Therapy for Chronic Pain: Evidence of Mediation and Clinically Significant Change Following an Abbreviated Interdisciplinary Program of Rehabilitation. *The Journal of Pain.* January 2014; 15(1): 101-113.
- Waller, Benjamin, Lambeck Johan, Daly Daniel. *Clinical Rehabilitation.* Therapeutic aquatic exercise in the treatment of low back pain: a systematic review. 2009; 23: 3-14.
- Wetherell, J, Petkus, A, Alonso-Fernandez, M, Bower, E, Steiner, A, Afari, N. Age moderates response to acceptance and commitment therapy vs. cognitive behavioral therapy for chronic pain. *International Journal of Geriatric Psychiatry.* 2016; 31: 302-308.
- Whitney, S, Wrisley, D, Marchetti, G, Gee, M, Redfern, M, Furman, J. Clinical Measurement of Sit-to-Stand Performance in People with Balance Disorders: Validity of Data for the Five-Times-Sit-to-Stand Test. *Phys Ther.* 2005; 85(10): 1034-45.
- Williams, K, Abildso, C, Steinberg, L, Doyle E, Epstein, B, Smith, D, Hobbs, G, Gross, R, Kelley, G, Cooper, L. Evaluation of the Effectiveness and Efficacy of Iyengar Yoga Therapy on Chronic Low Back Pain. *Spine.* 2009; 34(19): 2066-76.
- Wippert, P.-M.; Drießlein, D.; Beck, H.; Schneider, C.; Puschmann, A.-K.; Banzer, W.; Schiltenswolf, M. The Feasibility and Effectiveness of a New Practical Multidisciplinary Treatment for Low-Back Pain: A Randomized Controlled Trial. *J. Clin. Med.* 2020; 9: 115.
- Zou L, Wang C, Chen K, et al. The effect of Tai chi practice on attenuating bone mineral density loss: A systematic review and meta-analysis of randomized controlled trials. *Int J Environ Res Public Health.* 2017; 14(9).

