DELIVERY OF PAIN COPING SKILLS TRAINING PROGRAM TO MANAGE CHRONIC PAIN RELATED TO OSTEOARTHRITIS: THE PRIMARY CARE PROVIDER ROLE

by

Patricia Obasi

BScN., University of Northern British Columbia, 2016

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Abstract

Osteoarthritis (OA) is the primary form of arthritis that affects a large portion of the Canadian population. With expected increases in OA prevalence over time, the magnitude of outcomes related to inadequate pain control will place further burdens on society and healthcare resources. Pain Coping Skills Training (PCST) is an intervention protocol derived from cognitive behavioural therapy and has traditionally been delivered by clinical psychologists to manage chronic pain related to OA. However, few providers in the primary care setting are trained in PCST. The lack of trained primary care providers creates a barrier to patient access in the community setting, which should be addressed. An integrative literature review has been conducted to identify if primary care providers, who work in primary care settings, can deliver PCST interventions to decrease pain interference and improve quality of life outcomes in adult patients diagnosed with OA. The results are discussed within the context of Canada's primary care practice. Eleven articles were reviewed using Whittemore and Knafl's approach to the integrative literature review. The results suggest that PCST interventions are both practical and possible among providers that do not possess a background in mental health specialization. Thus, primary care providers are encouraged to obtain educational competency to deliver this effective therapy to manage the adverse psychological effects on chronic pain related to OA. This way, providers can offer a biopsychosocial approach in managing OA while also playing an essential role in improving access to PCST interventions in the primary care setting. Recommendations for facilitating the uptake of PCST interventions are discussed, and specific strategies for its use in primary care are presented.

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Glossary of Terms

Apoptosis: the death of cells that occurs as a regular and controlled part of an organism's growth or development.

Arthroplasty: an orthopedic surgical procedure where the articular surface of a musculoskeletal joint is replaced, remodelled, or realigned.

Articular cartilage: the thin white layer of connective tissue that provides a lubricated surface for low friction joint articulation.

Chondrocytes: cells found in healthy cartilage to maintain tissue homeostasis and integrity of the cartilage matrix.

Cognitive Behavioural Therapy: an approach to psychotherapy that allows patients to engage in an active coping process to change maladaptive thoughts and behaviours.

Collagenase: enzymes that break the peptide bonds in collagen.

Collagen fibres: the most common fibrous protein in the extracellular framework essential to maintain tensile strength.

Cytokine: cell signalling molecules that aid cell to cell communication in immune responses and stimulate cells' movement towards sites of inflammation, infection, and trauma.

Cytokine interleukin-1β (IL-1β): is a crucial mediator of the inflammatory response essential for the host-response and pathogens' resistance. It also exacerbates damage during chronic disease and acute tissue injury.

Intra-articular injections: injections administered into the joint space to provide pain relief in mild to severe osteoarthritis. Includes corticosteroids, local anesthetics, and hyaluronic acid.

Joint effusion: the abnormal accumulation of fluid in or around a joint resulting from trauma.

Lipid metabolism: the synthesis and degradation of lipids in cells, involving the breakdown or storage of fats for energy and the synthesis of structural and functional lipids, such as those involved in constructing cell membranes.

Lumbosacral spine: the spine comprises five vertebral bodies (L1-L5) that extend from the lower thoracic spine to the sacrum.

Nitric oxide: an essential endogenous mediator of vasodilatation, platelet function, inflammation, and pain perception.

Nurse Practitioner: an Advanced Practice Nurse trained at the Masters level who integrate clinical skills including the diagnosis and management of disease and chronic illness, prescribing medications, ordering and interpreting diagnostic tests and labs, and initiating specialist referrals.

Osteophyte: cartilage-capped bony proliferations or bone spurs that most commonly develop at the margins of a synovial joint as a response to articular cartilage damage, seen in osteoarthritis.

Pain Coping Skills Training: an intervention protocol derived from cognitive behavioural therapy and has traditionally been delivered by clinical psychologists to manage chronic pain. PCST includes four interventions: 1) relaxation response; 2) attention diversion techniques; 3) altering activity and rest patterns; and 4) cognitive restructuring.

Pain interference: the impact that pain has on the patient's daily life activities. Higher pain interference is associated with more depressive or anxiety symptoms, which elicit negative emotional states that may intensify the unpleasantness of pain and reduce the patient's coping capabilities.

Periarticular muscles: the surrounding muscles across a joint that play a significant role in ensuring joint stability.

Primary Care Providers: often, a patient's first point of contact with the health system usually a family physician or nurse practitioner.

Proteoglycans: protein molecules containing many bound glycosaminoglycans chains. They regulate many cellular processes, such as adhesion, proliferation, migration, differentiation, survival, and death.

Quality of Life: incorporates people's emotional, social, and physical well-being and ability to function in ordinary living tasks.

Sciatica: pain radiating along the sciatic nerve, which branches from the lower back through the hips and buttocks and down each leg.

Sclerosis: an unusual hardening or thickening of bone that occurs in joints affected by osteoarthritis. The changes appear as bright, dense areas of bone on radiographs.

Selective serotonin reuptake inhibitors: a type of antidepressant drug that inhibits serotonin's reabsorption by neurons, which increases the availability of serotonin as a neurotransmitter.

Stromelysin: a member of the matrix metalloproteinase family that degrades non-collagen connective tissue components, including proteoglycans, fibronectin, and laminin

Subchondral bone: the layer of bone below the cartilage joint that absorbers shock.

Subchondral cyst: a fluid-filled space that forms inside a joint, caused by stress-induced microfractures of the subchondral bone noted in osteoarthritis.

Synovial membrane: a specialized connective tissue that lines the inner surface of capsules of synovial joints and tendon sheath. It has a lubricating function.

Synovitis: inflammation of the joint-lining membrane resulting in pain and swelling due to fluid collection in the synovial sac.

Tricyclic antidepressants: a class of antidepressants also used in the treatment of anxiety, bipolar disorder, insomnia, fibromyalgia and the control of chronic pain.

Tumour necrosis factor-α (TNF-α) pathways: an inflammatory cytokine produced by macrophages or monocytes during acute inflammation. It is responsible for a diverse range of signalling events within cells, leading to necrosis or apoptosis.

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Abbreviations

CBT: Cognitive Behavioural Therapy

HRQOL: Health Related Quality of Life

NP: Nurse Practitioner

OA: Osteoarthritis

PCST: Pain Coping Skills Training

PCP: Primary Care Provider

PHC: Primary Health Care

PMR: Progressive Muscle Relaxation

QOL: Quality of Life

Chapter One: Introduction

Osteoarthritis (OA) is the most common musculoskeletal disorder worldwide (Kean et al., 2020; McCance & Huether, 2019). It impacts various joints, with hip and knee OA ranked as the eleventh-highest contributors to global disability (Kean et al., 2020; McCance & Huether, 2019). Osteoarthritis does not result from a single cause but is multifactorial in origin. A wide range of systemic, genetic, biomechanical, and environmental factors can contribute to OA development (Fu et al., 2018; Kean et al., 2020; McCance & Huether, 2019). In Canada, approximately 3.9 million adults over 20 years and older are diagnosed with OA (Government of Canada, 2020). The genesis of OA involves contributions from both joint- and person-level risk factors such as joint injuries, occupation, obesity (Kean et al., 2020; McCance & Huether, 2019). Old age and female gender are thought to be systemic risk factors of OA (Kean et al., 2020; McCance & Huether, 2019). Reduced range of motion, joint instability, swelling, crepitus, muscle weakness, and pain-related psychological distress are commonly seen in patients with OA. Among these symptoms, pain is the most dominant and significant driver for clinical decision-making (Fu et al., 2018; Turk et al., 2016).

The traditional management of OA involves a combination of self-management strategies such as exercise, weight management, coupled with medications to assist with joint pain and inflammation and joint replacement surgery in severe cases (Kean et al., 2020; McCance & Huether, 2019). However, OA is also associated with negative mental and social consequences such as depression, anxiety, catastrophizing, isolation, and avoidance behaviors, which are not addressed by the current management options (Fontaine, n.d; Miettinen et al., 2019; Turk et al., 2016). Thus, approaching OA management from a biopsychosocial perspective would be a holistic way to address the psychological effects suffered by patients with OA. The purpose of

this paper is to conduct an integrative literature review to answer the following question: "Does the delivery of Pain Coping Skills Training (PCST) by primary care providers improve pain interference and quality of life for adult patients with chronic pain related to OA?"

Pain Coping Skills Training is an intervention protocol derived from cognitive behavioral therapy (CBT) for managing chronic pain related to OA (Broderick et al., 2014; Riddle et al., 2011). Pain Coping Skills Training teaches attention diversion methods such as relaxation, imagery, and distraction; activity-rest cycling; cognitive-restructuring; and behavioral rehearsal, to allow long term application of pain coping skills (Broderick et al., 2014; Riddle et al., 2011). Few primary care practitioners (PCPs) are trained to deliver PCST, as a clinical psychologist has traditionally delivered it (Broderick et al., 2014; Riddle et al., 2011). However, the delivery of PCST by PCPs, such as family physicians and nurse practitioners (NPs), could address gaps in patient access.

By employing an integrative literature approach, I will analyze the pertinent literature related to PCP delivery of PCST to patients with OA. A theoretical framework will not be included to permit flexibility to explore the concepts. However, the biopsychological model and the cognitive-behavioral therapy model will describe the importance of PCST in the care of patients with OA. Chapter 3 will outline the methods used for this integrative literature search, including tables summarizing the search process. Chapter 4 presents the findings of the literature search and analyzed based on the recurrent themes. This will then be followed by a discussion of the significance and relevance to PCPs in Chapter 5. Additionally, the limitations of this paper will be discussed, as well as future practice recommendations and areas requiring further research.

Chapter Two: Background and Context

In this chapter, OA's incidence and prevalence in Canada are reviewed, followed by an overview of OA pathogenesis, the clinical manifestations and psychological impact, which entails the cognitive and psychological responses to pain. The pathological mechanisms associated with chronic non-cancer pain will be explored. Relevant associated concepts such as pain interference, quality of life, pain catastrophizing, and self-efficacy will be defined. The traditional management options will also be discussed, and PCST rooted in cognitive behavioural therapy will be discussed as a biopsychosocial treatment option. Theoretical models that support PCST include *The Biopsychosocial Model* and *The Cognitive-Behavioral Model Theory,* which will be discussed. Finally, the context of primary health care and primary care providers focusing on the PCP role in Canada will be discussed.

Incidence and Prevalence of Osteoarthritis

Approximately 3.9 million (13.6%) Canadians aged 20 years and older live with diagnosed OA, and 219,000 were newly diagnosed from 2016 to 2017 (Government of Canada, 2020). The prevalence and incidence of diagnosed OA increase with age and are higher among females (16.1%) compared to males (11.1%) (Government of Canada, 2020). A study by Sharif et al. (2015) performed projections on OA burden and estimate an increase in OA prevalence from 13.8% in 2010 to 18.6% by 2031. With the projected increase of OA prevalence, the productivity costs of work loss are estimated to increase from $12 billion in 2010 to $17.5 by 2031 (Sharif et al., 2015). Direct health care costs include the annual costs for drugs, visits to health professionals, tests, hospitalizations, community services, and management of comorbidities (Sharif et al., 2015). Developing effective and accessible pain management

interventions will result in substantial savings in direct health care costs and reduce cumulative productivity losses (Sharif et al., 2017).

Pathophysiology of Osteoarthritis

Osteoarthritis is the most common form of joint disease and is the leading cause of disability in middle-aged and older adults (McCance & Huether, 2019). The primary pathogenesis is characterized by the degradation of cartilage and bone remodeling due to an active response of chondrocytes in the articular cartilage and the inflammatory cells in the surrounding tissues (Hsu & Siwiec, 2020; Fu et al., 2017; McCance & Huether, 2019). There are localized areas of progressive loss and damage of articular cartilage, the subchondral bone, ligaments, capsule, synovial membrane, and periarticular muscles (Fu et al., 2017; McCance & Huether, 2019). These changes lead to increased remodeling of the articular cartilage and a loss of smooth, frictionless joint, which is visualized as a yellow-gray or brownish-gray appearance on radiography (Fu et al., 2017; McCance & Huether, 2019). With the disease's progression, areas of the articular cartilage begin to flake off and develop longitudinal fissures; this causes the cartilage to thin out and permits areas of unprotected subchondral bone (Fu et al., 2017; McCance & Huether, 2019). The unprotected subchondral bone becomes sclerotic and may develop cysts that communicate with the cartilage's longitudinal fissures (Fu et al., 2017; McCance & Huether, 2019). The articular cartilage eventually erodes and causes joint deformity due to the cysts' pressure within the synovial cavity (McCance & Huether, 2019). Additionally, osteophyte fragments contribute to synovial membrane irritation, which results in synovitis and joint effusion (McCance & Huether, 2019). Next, the joint capsule becomes thickened and may adhere to the deformed underlying bone, contributing to the range of motion limitations (Hsu & Siwiec, 2020; Fu et al., 2017; McCance & Huether, 2019).

As described by McCance and Huether (2019), the articular cartilage is also lost through a cascade of cytokine, biochemical, and growth factor pathways. The first step of the enzymatic processes involves the collagenase breakdown the macromolecules of proteoglycans, glycosaminoglycans, and collagen into large diffusible fragments. These fragments are taken up by the chondrocytes and digested by the cells own lysosomal enzymes. The loss of proteoglycans from articular cartilage is a hallmark of the osteoarthritic process. Enzymatic destruction of articular cartilage begins in the matrix by destroying proteoglycans and collagen fibers. Next, stromelysin and collagenase enzymes affect proteoglycans by interfering with the proteoglycan subunit's assembly or the proteoglycan aggregate, which are markedly elevated in OA. Changes in the conformation of proteoglycans disrupt water and synovial fluid movement regulation into and out of the cartilage. The distribution and active redistribution of the water and synovial fluid evenly disperse the joint load across the cartilage. Thus, without the proteoglycan pump's regulatory action, cartilage absorbs too much fluid and becomes unable to withstand weight-bearing (Hsu & Siwiec, 2020; McCance & Huether, 2019). The proteoglycan content is also decreased with aging by up to 8%, which affects the cartilage's strength (McCance & Huether, 2019).

Current research has demonstrated that inflammation is one of the critical factors leading to the destruction of OA cartilage. Inflammatory cytokines IL-1β, IL-6, and TNF-α, apoptotic molecules (COX – 2, nitric oxide [NO], prostaglandin E2, [PGE2], and prostaglandins play a significant role in cartilage degradation partly due to induction on NO synthase and increased NO generation (Barnett, 2018; Hsu & Siwiec, 2020; McCance & Huether, 2019). Furthermore, Mehana et al. (2019) reports that enzyme matrix metalloproteinase-13 is a major contributor to the degenerative process in OA. These chemical mediators release and activate proteolytic and

collagenolytic enzymes, causing an imbalance of cell responses to growth factor activity (Barnett, 2018; Hsu & Siwiec, 2020; McCance & Huether, 2019). These deposits cause disequilibrium between inorganic phosphates and mineralization inhibitors while the NO stimulates apoptosis in chondrocytes, with the resultant cartilage destruction initiates the IL-1β and TNF-α pathways of inflammation (Barnett, 2018; Hsu & Siwiec, 2020; McCance & Huether, 2019).

Clinical Manifestations

Pain and stiffness are the predominant symptoms of OA. Additional symptoms include swelling, tenderness, or enlargement/deformity of joints (Buttaro et al., 2021; McCance & Huether, 2019). The symptoms are usually exaggerated by weight-bearing or use of the joint and relieved through resting, supporting, bracing, or splinting the joint (Buttaro et al., 2021; McCance & Huether, 2019). Referred pain may also be experienced. For example, OA of the lumbosacral spine may mimic sciatica, causing severe pain in the back of the thigh along the course of the sciatic nerve (Buttaro et al., 2021; McCance & Huether, 2019). Another example is OA of the hip may cause pain referred to the lower thigh and knee area (Buttaro et al., 2021; McCance & Huether, 2019). The mechanism of joint pain perception is complex, cartilage lacks innervation; therefore, the sensation of pain is not experienced from cartilaginous damage alone (Buttaro et al., 2021; McCance & Huether, 2019).

Psychological Impact of Osteoarthritis

Osteoarthritis often has a profound impact on an individual's health and well-being since it is associated with increased pain, decreased function, and elevated disability, with the concomitant difficulties experienced in maintaining activities of daily living and subsequent reductions in quality of life (QOL) (Stubbs et al., 2016; Turk et al., 2016). Thus, it is

unsurprising that people with OA are at greater risk of experiencing mental health problems. Psychological comorbidities like anxiety and depression are highly prevalent among patients with OA (Iijima et al., 2018; Sharma et al., 2016; Turk et al., 2016). These comorbidities are frequently associated with higher pain and physical limitation, poor outcomes to conservative and surgical interventions, and increased pharmacotherapy and health care utilization (Iijima et al., 2018; Sharma et al., 2016; Turk et al., 2016).

A systematic review conducted by Sharma et al. (2016) evaluated the concordance between OA, anxiety, and depression. The researchers found considerable overlap in reporting the impact of these psychological conditions on patients with OA, with pain being the critical central element. The prevalence of anxiety and depression was interrelated to index joint pain, pain at multiple sites, pain intensity, and OA severity (Sharma et al., 2016). Osteoarthritis pain was, in turn, associated with depression and its recurrence and predicted future fatigue, disability, and depressed mood (Sharma et al., 2016). In addition to its impact on OA pain, concurrent depression was also interrelated to significant participation restriction and physical limitation (Sharma et al., 2016). This systematic review's findings coincided with a cross-sectional study conducted by Iijima et al. (2018), which also indicated an association with increased joint pain intensity and functional limitations in patients with knee OA.

The findings from both studies indicate the importance of incorporating self-care management programs to manage these comorbidities. The current management interventions being used revealed varied results, and this variability in patient care highlights the complicated relationship between OA, anxiety, and depression (Iijima et al., 2018; Sharma et al., 2016). However, these comorbidities are commonly overlooked by many PCPs who either solely focus on the physical aspects of OA or fail to assess patients' psychological states altogether (Sharma

et al., 2016). It is imperative to recognize these comorbidities influence disease course and management, ultimately affecting functional outcomes. Anxiety and depression can significantly impair the QOL of patients by altering pain perception and functional capacity. The next section will explore the pathological mechanisms of chronic non-cancer pain (CNCP).

Chronic Non-cancer Pain

Chronic non-cancer pain is moderate or severe pain that lasts for six or more months, often attributed to neuropathic pain, rheumatoid arthritis, lower back pain, osteoarthritis, or fibromyalgia (Genova et al., 2020; Yasaei et al., 2020). Additionally, CNCP can arise from various stressors such as physical or psychological trauma, an infectious process such as the Ebstein Barr virus, underlying chronic diseases such as sickle cell anemia, or in the setting of multiple episodes of acute pain (Yasaei et al., 2020). Chronic pain can be classified as nociceptive, neuropathic, and central sensitization (Tauben & Stacey, 2020; Yasaei et al., 2020).

Nociceptive pain is caused by stimuli that result from bodily tissue damage (Tauben & Stacey, 2020). Nociceptive pain is expected after surgical or acute traumatic injury affecting a range of musculoskeletal and visceral conditions that involve inflammatory, ischemic, infectious, or mechanical/compressive injury (Tauben & Stacey, 2020). Additionally, chronic pain may occur with persisting nociceptive signalling from medical disorders despite aggressive treatment for the underlying cause, such as degenerative, inflammatory, and neoplastic diseases (Tauben & Stacey, 2020). Pain sensation is due to pronociceptive changes evident when afferent nociceptive signals are amplified with a lack of descending modulation in the dorsal horn pathway by serotonin's action norepinephrine (Tauben & Stacey, 2020). Chronic non-cancer pain can occur from prolonged nociceptive stimulation, nerve injury, inflammation that can sensitize the pain

transmission fibres, the death of inhibitory cells, or neuroplastic structural changes (Yasaei et al., 2020).

Neuropathic pain results from a maladaptive response to the somatosensory nervous system's damage or pathology and consists of a central and peripheral disorder of pain modulation (Tauben & Stacey, 2020). Often, damage to the nervous system results in only a loss of function, such as numbness or weakness; however, with neuropathic pain, there is a gain of function, which is pain (Tauben & Stacey, 2020). Neuropathic pain can occur in the absence of an active noxious stimulus or as an exaggerated response to a minor or moderate nociceptive stimulus (Tauben & Stacey, 2020). Examples of neuropathic pain include diabetic neuropathy, postherpetic neuralgia, CNS sites of initial injury or disease such as stroke, spinal cord injury, multiple sclerosis, phantom limb pain, and trigeminal neuralgia (Tauben & Stacey, 2020).

Central sensitization may also play a role in transforming acute pain into chronic pain resulting in hyperalgesia or allodynia (Tauben & Stacey, 2020; Yasaei et al., 2020). Cortical processes like alertness activate pain-facilitatory cells in the medulla, while various single-nucleotide-polymorphisms generate more or less pain sensitivity (Tauben & Stacey, 2020). Pathophysiologic changes in functional MRI studies demonstrated that patients reported different pain levels for standard stimuli with varied activation of the anterior cingulate gyrus, frontal cortex, and somatosensory cortex (Tauben & Stacey, 2020). Central sensitization explains clinical syndromes like fibromyalgia, rheumatic and common musculoskeletal disorders (Tauben & Stacey, 2020; Yasaei et al., 2020). Visceral hyperalgesia also demonstrates central sensitization, responsible for obscure pain present with chronic pancreatitis, chronic pelvic pain, interstitial cystitis, and sickle cell disease (Tauben & Stacey, 2020; Yasaei et al., 2020).

As OA falls within CNCP, it is no surprise that it affects its sufferers' quality of life and socio-economic activities and requires careful attention to management. There is no definitive cure for chronic non-cancer pain; approximately 20% of patients with CNCP receive an opioid prescription, however, the use of opioids for long-term treatment of CNCP does not show a positive effect or improvement in the quality of life for patients and poses risks of dependency and overdose (Yasaei et al., 2020). Studies suggest a multidisciplinary pain program developed within a biopsychosocial model as a better approach to managing pain in this population (Genova et al., 2020; Lachance & McCormack, 2019; Tauben & Stacey, 2020; Yasaei et al., 2020). Pain Coping Skills Training falls within such a pain program, and although it is geared towards OA sufferers in this project, it may be beneficial to other chronic pain conditions.

Associated Concepts and Definitions

Pain Interference

Pain interference is defined as the impact that pain has on the patient's daily life activities (Miettinen et al., 2019). Studies show that patients with higher pain interference are associated with more depressive or anxiety symptoms (Miettinen et al., 2019). Depression and anxiety bring forth negative emotional states that may intensify the unpleasantness of pain, reduce the patient's psychological resources, and diminish treatment results (Miettinen et al., 2019). The pain interference subscale of the Brief Pain Inventory (BPI) is among the most commonly used measures of this construct. The original BPI Pain Interference Subscale asks patients to indicate the extent to which pain interferes with seven quality of life domains (general activity, mood, walking ability, routine work [including housework], relations with other people, sleep, and enjoyment of life) on 0 to 10 numerical rating scales (Jensen, 2011; Kean et al., 2016).

Quality of Life

Quality of life incorporates people's emotional, social, and physical well-being and ability to function in ordinary living tasks (WHO, 2012). It is an individuals' perception of their position in life in the context of their culture and value systems concerning their goals, expectations, standards, and concerns (WHO, 2012). It is a broad-ranging concept affected in a complex way by the persons' physical health, psychological state, level of independence, social relationships, and their relationship to their environment's salient features (WHO, 2012). Measurement of QOL for individuals with OA offers a way to assess disease effects on daily living, treatment value, and willingness to adhere to a given therapy (Fontaine, n.d.). This broad conceptualization of QOL has led to the development of many QOL instruments. Among the instruments are Health-Related Quality of Life (HRQOL) measures that address symptoms specific to a disease or health condition (Baird & Sands, 2006; Fontaine, n.d.).

The persistent symptoms of OA can lead to a reduction in HRQOL. The primary physical symptoms of OA that affect HRQOL are pain and mobility problems (Baird & Sands, 2006; Fontaine, n.d.; Turk et al., 2016). These symptoms, in turn, can lead to problems with the ability to perform activities of daily living (ADL) and to carry out instrumental activities of daily living (IADL), such as shopping and home maintenance (Baird & Sands, 2006; Fontaine, n.d.; Turk et al., 2016). Other significant components of HRQOL in patients with OA, such as social support and social activity, are also affected by OA-associated pain and mobility problems (Baird & Sands, 2006; Fontaine, n.d.; Turk et al., 2016).

Health-Related Quality of Life can be measured by using generic or specific instruments. Generic instruments are not designed to assess HRQOL relative to a particular medical condition but rather to provide a general sense of an illness's effects (Baird & Sands, 2006; Fontaine, n.d.).

One commonly used instrument is the Medical Outcomes Study Short-Form Health Survey (SF-36), which measures HRQOL along with eight different domains: physical functioning, role limitations due to physical problems, bodily pain, general health perception, vitality, social functioning, role limitations due to emotional problems, and mental health (Baird & Sands, 2006; Fontaine, n.d.). Other generic instruments used with arthritis patients include the Satisfaction with Life Scale, the Extended Satisfaction with Life Scale, and the Quality of Life Inventory/Scale (Baird & Sands, 2006; Broderick et al., 2016; Fontaine, n.d.). The second approach to measuring HRQOL involves using instruments specific to a disease, population, or clinical problem (Baird & Sands, 2006; Fontaine, n.d.). Measures geared toward specific diseases or populations are likely to be more sensitive and have greater relevance to PCPs. The Arthritis Impact Measurement Scale (AIMS) is a prime example of an arthritis-specific HRQOL instrument (Baird & Sands, 2006; Broderick et al., 2016; Fontaine, n.d.). The AIMS measures pain, mobility, walking and bending, extremity functioning, self-care, household tasks, social activities and support, work, tension, and mood (Broderick et al., 2016; Fontaine, n.d.).

The major limitation of generic HRQL instruments is that they do not assess potential condition-specific domains of HRQL (Fontaine, n.d.). Because of this, they may not be sensitive enough to detect subtle treatment effects (Fontaine, n.d.). For example, an SF-36 assessment of an arthritis patient will not provide a great deal of information on essential aspects of the illness, such as joint pain, stiffness, and related symptoms on function, attitude, and mood (Fontaine, n.d.). Although disease-specific instruments provide more focused assessments of HRQOL, there is some consensus among QOL researchers that both generic and disease-specific instruments should be used to provide the most comprehensive assessment of HRQL possible (Fontaine, n.d.). For this integrative literature review, ‘QOL’ will be used to refer to HRQOL specifically.

Additionally, the QOL measures reviewed will include both generic and specific instruments to ensure a comprehensive assessment.

Catastrophizing and Self- Efficacy

Depression can be exacerbated by other traits, such as catastrophizing and self-efficacy. Catastrophizing tends to focus on the negative aspects of an experience such as feeling helpless, ruminating, or exaggerating the threat of a situation (Swift, 2012; Turk et al., 2016). People who score highly for both catastrophizing and depression tend to experience a synergistic increase in pain and disability (Swift, 2012; Turk et al., 2016); This demonstrates the relationship between negative emotion and pain perception. Catastrophizing can deleteriously bias perceptions, expectations, memories, and experiences (Swift, 2012; Turk et al., 2016). Consequently, such individuals may develop passive coping styles like rumination and helplessness that further exacerbate their situation (Swift, 2012; Turk et al., 2016). A large volume of evidence suggests that catastrophizing about pain plays a significant role in defining the actual pain experience. For example, in a cross-sectional study on patients with OA of the knee, pain-related fear explained a large proportion of variance in measures of psychological disability and walking speed (Somers et al., 2009). This validates the importance of evaluating or assessing pain catastrophizing in patients suffering from OA.

Catastrophizing is also linked to pain and depression via self-efficacy and the coping strategies employed by people with OA (Swift, 2012; Turk et al., 2016). Self-efficacy is a belief in one's competence or a personal conviction that one can successfully execute a course of action to produce the desired outcome in a given situation (Swift, 2012; Turk et al., 2016). Examples of this in OA include a patient's belief about their ability to ambulate prolonged distances or climb up a flight of stairs. Patients with a high sense of self-efficacy would likely feel capable and

confident in accomplishing these tasks; however, a patient with low self-efficacy may be unable to. Efficacy beliefs are task- and situation-specific. Particularly for assessing chronic pain, they include self-efficacy beliefs to manage pain, pain-related symptoms, and physical functioning (Swift, 2012; Turk et al., 2016). Self-efficacy beliefs for people experiencing chronic pain incorporate the expectation that they can perform a particular activity and their confidence in accomplishing them despite pain (Swift, 2012; Turk et al., 2016).

Management Options

Standard pharmacological OA management involves a stepwise approach consisting of initial use of topical analgesics, followed by oral analgesics and injectable agents (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). Topical medications, including over-the-counter rubs, patches, and topical NSAID gel (diclofenac), may also be of some benefit (Buttaro et al., 2021; Kean et al., 2020). Analgesics such as Acetaminophen used within the recommended dosing reduces discomfort without the additional risks of anti-inflammatory medications (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). Tramadol is a non-opioid pain reliever indicated in those who report moderate to moderately severe pain (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). NSAIDs have long been part of OA's treatment regimen and are believed to be most beneficial for their analgesic rather than their anti-inflammatory properties (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). Intra-articular injections of exogenous hyaluronan can also help reduce the pain of OA of the knees (Buttaro et al., 2021; Kean et al., 2020). However, it seems to be most effective in mild to moderate OA and acts as a lubricant as it improves fluid viscosity within the joint (Buttaro et al., 2021). Intra-articular corticosteroid injections such as Triamcinolone acetonide (Kenalog) and methylprednisolone acetate (Depo-Medrol) can also provide significant

pain relief for mild to severe disease (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). However, these injections are not recommended more often than every 3 to 4 months (Buttaro et al., 2021). Low-dose, long-acting opioids, gabapentin, selective serotonin reuptake inhibitors, and tricyclic antidepressants have also been used adjunctively to manage chronic pain associated with OA (Buttaro et al., 2021; Kean et al., 2020).

Obesity is the most important modifiable risk factor for knee OA; each pound of weight increases loading across the knee threefold to sixfold (Buttaro et al., 2021; Kean et al., 2020). The cartilage damage is related to mechanical problems and metabolic factors related to abnormal lipid metabolism (Buttaro et al., 2021; Kean et al., 2020). Aerobic exercise can help with cardiovascular conditioning and weight reduction (Buttaro et al., 2021; Kean et al., 2020). Physical and occupational therapy can improve muscle strength and maintain range of motion and functional capacity (Buttaro et al., 2021; Kean et al., 2020). Stretching programs can help reduce contractures that lead to excessive joint wear (Buttaro et al., 2021). Assistive devices, such as canes, walkers, and orthotics, can help reduce the load from lower extremity joints (Buttaro et al., 2021; Kean et al., 2020). Heat and ice application may also provide symptomatic relief and improve exercise tolerance (Buttaro et al., 2021; Kean et al., 2020). Ultimately, when patients have ongoing symptomatology despite adherence to conservative medical management, total joint replacement (called arthroplasty) may be recommended (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). Hip and knee arthroplasty are not without risks but are reported to be highly successful operations that relieve pain and functional status (Buttaro et al., 2021; Kean et al., 2020; McCance & Huether, 2019). The next section explores PCST interventions as another potential option in the management of chronic pain related to OA.

Pain Coping Skills Training

Pain Coping Skills Training is an intervention protocol derived from cognitive behavioral therapy and has traditionally been delivered by clinical psychologists to manage chronic pain related to OA (Broderick et al., 2014; Riddle et al., 2011). On average, patients are taught four broad coping skills across ten 30 to 45-minute sessions (Broderick et al., 2014; Riddle et al., 2011). Pain Coping Skills Training includes four interventions: 1) relaxation response; 2) attention diversion techniques; 3) altering activity and rest patterns; and 4) cognitive restructuring (Broderick et al., 2014; Riddle et al., 2011). The first applied skill is relaxation training, which involves concentrating on muscle tension signals and using them as cues to relax (Broderick et al., 2014; Riddle et al., 2011). In addition to this relaxation exercise, pleasant imagery is another skill to aid in relaxation and distraction; this requires patients to visualize various pleasant images to create a mental escape (Riddle et al., 2011). The second applied skill is activity-rest cycling and pleasant activity scheduling, enabling patients to reduce pain and pace their activity level (Broderick et al., 2014; Riddle et al., 2011).

In the third skill, activity-rest cycling, patients identify activities that cause overexertion. This may include activities of daily living, such as housework or grocery shopping (Broderick et al., 2014; Riddle et al., 2011). After the activities have been identified, the patients are then led into scheduling sufficient periods of rest and are guided on how to gradually increase their activity level as they decrease rest periods (Broderick et al., 2014; Riddle et al., 2011). An essential aspect of this third intervention involves the patients identifying activities or hobbies they enjoy and scheduling weekly goals (Broderick et al., 2014; Riddle et al., 2011). The fourth skill is cognitive restructuring, which helps patients recognize the relationships between thoughts, feelings, and behavior (Broderick et al., 2014; Riddle et al., 2011).

These techniques teach patients to identify irrational, maladaptive thoughts and replace them with alternative, rational coping thoughts such as calming self-statements when in severe pain (Broderick et al., 2014; Riddle et al., 2011). Also, necessary problem-solving skills involving problem identification, generation of coping alternatives, evaluation of coping alternatives, and selecting and implementing a problem solution are presented and practiced (Broderick et al., 2014; Riddle et al., 2011). After all four interventions are completed, the goal is for patients to develop a written maintenance plan and apply these learned skills to manage their pain and enhance their perception of pain control (Broderick et al., 2014; Riddle et al., 2011).

Theoretical Models Supporting PCST

PCST originates from cognitive behavioral therapy, which is the most widely accepted biopsychosocial treatment for chronic pain (Keefe & Somers, 2010). Pain has traditionally been evaluated from a biomedical perspective that views pain as a symptom of underlying disease activity (Keefe & Somers, 2010). This perspective draws attention to the changes in inflammation and joint damage that can cause arthritis pain, and the medical treatments are geared towards this underlying pathology (Keefe & Somers, 2010; McCance & Huether, 2019). Clinical observations, however, reveal several weaknesses of the biomedical model, including the discrepancies between patients with similar degrees of joint damage, the difference in treatment response, and the fact that this model does not address the role of psychological factors in the pain experience (Keefe & Somers, 2010). Chronic pain is viewed as an illness that cannot be cured but only managed. Therefore, the biopsychosocial perspective is directed at the illness rather than the disease, and this approach focuses on the diversity and the individual differences in the overall pain experience (Gatchel & Howard, 2020).

The Biopsychosocial Model

The biopsychosocial model was first introduced in medicine by George L. Engel (1977), tailored towards a holistic approach to addressing medical illness (Gatchel & Howard, 2020; Turk et al., 2016). Subsequently, Loeser applied this model to pain. From this perspective, there were four dimensions related to the idea of pain: nociception, pain, suffering, and pain behavior (Gatchel & Howard, 2020; Turk et al., 2016). Nociception refers to the physiological components associated with sensory input, such as nerve receptors and fibers, while pain is described as a subjective perception resulting from sensory input (Gatchel & Howard, 2020). While nociception and pain provide methods of communication to the central nervous system, suffering and pain behavior, on the other hand, are described as reactions to those signals that can be influenced by both previous experiences and anticipation of potential consequences (Gatchel & Howard, 2020; Turk et al., 2016). Suffering can be seen as a negative affective response to nociception or pain (Gatchel & Howard, 2020). Often, individuals who experience a painful encounter will exhibit various emotional responses such as depression, anxiety, and fear (Gatchel & Howard, 2020; Turk et al., 2016). Pain behavior is described in one's actions while suffering from pain. For example, fear of recurrence of pain or injury often leads to inactivity, social isolation, and avoidance behaviors, which, in turn, can delay the progression of recovery (Gatchel & Howard, 2020; Turk et al., 2016).

The biopsychosocial model shifts the emphasis from exclusive reliance on the pathophysiology involved in the initiation of nociception to the involvement of the patient's cognitive and emotional state and conditioned responses that influence an individual's pain experiences and subsequent behavior (Gatchel & Howard, 2020; Turk et al., 2016). From this perspective, assessment, diagnosis, prognosis, and consequently treatment of the patient with

persistent pain requires a broad strategy that not only examines the biomedical factors but also incorporates a wide range of psychosocial and behavioral factors (Gatchel & Howard, 2020; Turk et al., 2016).

The Cognitive-Behavioral Model Therapy Model

A psychiatrist invented the cognitive-behavioral therapy model, Aaron Beck, in the 1960s from his observations from patient psychoanalysis (Martin, 2019; McLeod, 2019). He noted that patients experienced an internal dialogue during these sessions and realized an essential link between thoughts and feelings (Martin, 2019; McLeod, 2019). He invented *automatic thoughts* to describe emotion-filled thoughts that happen without awareness and the need to identify and manage negative thoughts (Martin, 2019; McLeod, 2019). Beck found that identifying these thoughts would allow patients to understand and overcome their difficulties (Cosio & Lin, 2017; Martin, 2019; McLeod, 2019). Cognitive Behavioral Therapy has traditionally been efficacious in a wide range of conditions like insomnia, anxiety, substance use disorders, and depression (Centre for Addiction and Mental Health, n.d; Martin, 2019; McLeod, 2019). However, this approach to psychotherapy also allows patients to engage in an active coping process to change maladaptive thoughts and behaviors that can reduce chronic pain exacerbation (Cosio & Lin, 2017; Martin, 2019; McLeod, 2019).

Cognitive Behavioral Therapy protocols introduce two aspects: the cognitive aspect and the behavioral aspect (Cosio & Lin, 2017). The cognitive aspect includes automatic thinking and cognitive restructuring, while the automatic thinking involves spontaneous “negative” thoughts that come to mind when a particular situation occurs (Cosio & Lin, 2017). Cognitive distortions are unconscious operations of the mind that people often act on, causing negative implications (Cosio & Lin, 2017). This form of negative thinking causes an increase in pain perception (Cosio

& Lin, 2017). The first step to changing cognitive distortions is to recognize them. Negative cognitive distortions fall into overgeneralization, applying mental filters by focusing solely on negative aspects of an event, making decisions from minimal evidence, or rooted in emotions (Cosio & Lin, 2017). After recognition of these negative thoughts and responses, cognitive restructuring begins.

Cognitive restructuring is a useful tool for understanding and changing negative thinking. It involves observing negative thoughts closely, challenging them, and re-scripting the negative thinking behind them (Cosio & Lin, 2017). By engaging in this active process, the patient learns to approach situations in a positive frame of mind (Cosio & Lin, 2017). The key idea behind cognitive restructuring is the A-B-C model, which claims that the environment (activating Event-A) affects cognitions (beliefs about the Event-B), which in turn drives our emotions and bodily sensations (Consequences-C) (See Figure 1) (McLeod, 2019).

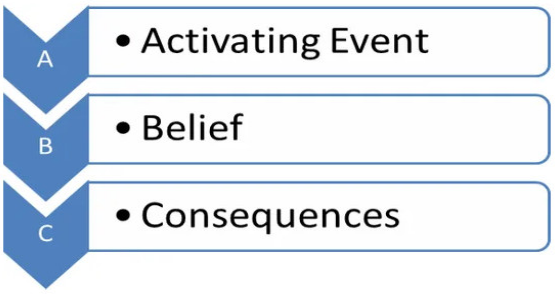

Figure 1. The ABC Model. From "Cognitive Behavioral Therapy," by S. A. McLeod, 2019 (https://www.simplypsychology.org/cognitive-therapy.html). In the public domain.

Furthermore, CBT protocols introduce behavioral strategies, such as relaxation techniques, time-based activity pacing, and pleasant activity scheduling, adopted in PCST interventions (Broderick et al., 2014; Cosio & Lin, 2017; Riddle et al., 2011). Some relaxation techniques employed in CBT include diaphragmatic breathing, progressive muscle relaxation, and visual imagery (Cosio & Lin, 2017). Diaphragmatic breathing is the act of performing deep

inhalations by flexing the diaphragm, rather than shallow breathing by flexing the rib cage or raising the shoulders (Cosio & Lin, 2017). This deep breathing optimizes oxygen consumption and is often used as a therapy for pain management. Progressive muscle relaxation is a technique for reducing muscle tension and entails both physical and mental components. Progressive muscle relaxation is initiated by a physical component, in which patients are instructed to keep their eyes closed and tense and relax different muscle groups in a sequential pattern (Cosio & Lin, 2017). The mental component focuses on the difference between the feelings of tension and relaxation. Closing of the eyes allows for focus and concentration on the sensation of tension and relaxation (Cosio & Lin, 2017). In visual imagery, patients are guided through visualization to create images that serve as messages from the unconscious to consciousness (Cosio & Lin, 2017). Time-based pacing or activity-rest cycling requires patients to list activities that cause overexertion, limit the amount of time for the activity, and schedule rest periods (Cosio & Lin, 2017). Pleasant activity scheduling is another way to increase positive emotions by listing pleasurable activities and scheduling them weekly (Cosio & Lin, 2017). Next, the role of PCPs will be discussed with regard to OA management in the primary care practice model.

The Primary Care Provider Role in Canada

Patient access to PCST interventions is scarce because it is a therapy that has solely been delivered by clinical psychologists in hospital settings (Broderick et al., 2014). Few PCPs are trained to deliver PCST, limiting patient access in the community setting (Broderick et al., 2014). Despite the lack of trained PCPs available to administer PCST interventions, access to general health practitioners continues to be an issue in Canada. Many Canadian communities, particularly those in rural and remote areas, face challenges accessing primary care and retaining health care providers (Peckham et al., 2018). However, health access is problematic not only in

rural and remote areas but also in urban communities. Shah et al.'s (2016) study examined potential access to care across 14 Canadian urban areas, representing all ten provinces, and found considerable intra-urban variations in potential geographical accessibility to family physicians.

Furthermore, in 2019, 14.5% of Canadians aged 12 and older (roughly 4.6 million people) reported that they had no regular HCP when requiring care or advice on their health (Statistics Canada, 2019). The population most affected was identified as males and females aged 18 to 34, and those aged 65 and older (Statistics Canada, 2019). The lack of PCPs and unattached patients raises concerns about adequate and timely access to care for those diagnosed with OA. This is particularly important to consider because OA's prevalence and incidence generally increase with age and has been shown to affect Canadian adults from age 20 (Government of Canada, 2020).

Primary Care Providers are considered a patient's first point of contact with the health system and are expected to provide continuous care (Peckham et al., 2018). In Canada, the key PCPs are family physicians and NPs (Peckham et al., 2018). Nurse Practitioners are Advanced Practice Nurses (APNs) that complete Master's-level education and are authorized to diagnose illnesses autonomously, treat conditions, and provide evidence-based health education to their patients with a population span that encompasses infancy to older adults (British Columbia College of Nurses and Midwives [BCCNM], n.d.). In Canada, NPs have been proven to improve access to health care by reducing wait times and alleviating pressures on the health-care system achieved by providing patients with early diagnosis, preventive and curative interventions, wellness strategies, and continuity of care in both primary health care settings and acute care populations (BCCNM, n.d.; Canadian Nurses Association [CNA], 2016). Furthermore, the NP role explicitly emphasizes implementing self-management and patient education counselling to

improve health outcomes in patients suffering from chronic illness and boost interprofessional collaboration (BCCNM, n.d.; Writers, 2020).

Attaining patient-centred outcomes requires developing a supportive relationship and ultimately takes time (Heale et al., 2018; Judge-Ellis & Wilson, 2017). Additionally, the amount of time that providers spend with patients may affect the quality of care provided, especially for preventive services and education (Judge-Ellis & Wilson, 2017). Interprofessional collaboration with the primary care practice model may permit the delivery of PCST interventions. If in-person delivery becomes problematic, PCPs can explore alternative delivery methods with proven benefits, such as telephone delivery (Allen et al., 2019; Broderick et al., 2014), internet-based delivery (Bennell et al., 2018; Giacobbi et al., 2015; Lawford et al., 2019), or potentially in a group setting (Helminen et al., 2015). This time investment is necessary to develop long-term coping benefits for the patients, which will lead to eventual health care cost savings. Additionally, the implementation of PCST interventions would be valuable in rural and urban primary care settings to bridge accessibility.

A comprehensive literature search was conducted to obtain relevant studies for review, analysis, and synthesis. The search methodology for this process will be described in the next chapter.

Chapter Three: Methods

A comprehensive literature search was performed by adapting Whittemore and Knafl's (2005) methodological approach to obtain a wholesome account of evidence salient to my research question: Does the delivery of Pain Coping Skills Training (PCST) by primary care providers improve pain interference and quality of life for adult patients with chronic pain related to OA? The research question was constructed using the Population, Intervention, Comparison, and Outcome (PICO) framework to guide the search (Gray et al., 2017). The stages included the rationale for database selection, identification of key search terms, database search, inclusion and exclusion criteria, a review of the search results, and a critical appraisal of the final selected articles.

Selection of Databases

This literature search began by searching the University of Northern British Columbia online library databases: PubMed (Ovid), Cumulative Index to Nursing and Allied Health Literature (CINAHL EBSCOhost), PsychINFO (EBSCOhost) and the Web of Science (Clarivate) in November, 2020. The PubMed database was selected as it served as a credible search interface for biomedical literature (Williamson & Minter, 2019). The CINAHL database was selected as it provided indexing for more than 3,000 English language journals and publications in the field nursing, biomedicine, alternative/complementary medicine, consumer health, and other allied health disciplines (EBSCO Health, n.d.). The PsychINFO database was selected for its psychological research and applications (EBSCOhost, n.d.-a). The Web of Science database was selected to review the curated collection of peer-reviewed literature and resources regarding pain coping skills training (Web of Science, n.d.).

Search Terms

The Medical Subject Headings (MeSH) used by the National Library of Medicine allowed me to utilize the same established search terms in each database. However, there were slight variations due to the functionality of each program used. Relevant keywords and MeSH terms were used to create a thorough search strategy which was then applied to the PubMed, CINAHL, PsycINFO, and Web of Science database. The university librarian was also consulted to ensure that all applicable MeSH terms and keyword combinations were optimized for this integrative review. A concept table was created to illustrate the primary search strategy (see Table1).

Table 1

Concept Table for Search Strategy

Concept	**Keyword**	**MeSH**	**CINAHL Heading(s)**
Primary Care providers	primary care provider(s) OR nurse practitioner(s) OR family nurse practitioner(s) OR general practitioner(s)	"Nurse Practitioners"[Mesh] OR "Family Nurse Practitioners"[Mesh] OR "General Practitioners"[Mesh]	Physicians, Family Nurse Practitioners, Nurse Practitioners
Pain Coping Skills	pain coping OR pain coping skills training OR pain management OR PCST	"Pain Management"[Mesh]	Pain Management
Osteoarthritis	osteoarthritis OR OA OR arthritis	"Osteoarthritis"[Mesh] OR "Arthritis"[Mesh]	Osteoarthritis, Arthritis
Quality of Life	quality of life OR QOL	"Quality of Life"[Mesh]	Quality of Life

Search of Databases

The Boolean operators “AND” and “OR” were used to combine keywords, and truncation was utilized when applicable to establish focused comprehensive results. Although

"Primary Care providers" is a key concept relevant to this integrative literature review, I discovered that including this concept and the associated key words resulted in no results in the CINAHL and PsychINFO database. Thus, this concept was exempted at this stage. Each database search and results are presented in tables in the appendix section (see Appendix A, B, C, D).

Inclusion and Exclusion Criteria

Eligibility was based on inclusion and exclusion criteria to identify relevant sources for the integrative literature review. The English language was selected to ensure readability. I included randomized controlled studies, qualitative studies, mixed methods studies, systematic reviews, meta-analysis and reviews in peer-reviewed journals as integrative literature reviews focus on analyzing original research and peer-reviewed journals. I excluded books, documents, reviews, meeting briefs, commentaries and updates based on the same rationale.

Study populations of adults aged 19 and older were included to capture adults with chronic pain related to OA. To ensure the generalizability of results, studies incorporating a variety of ethnic populations were selected. Studies evaluating pediatric and adolescent patients were excluded as this was not the population focus on this review.

It was important to include all primary care provider delivery of PCST to address the research question. Studies that involved nurses, nurse practitioners, physicians, and physiotherapists were included. Studies were excluded if PCST was solely delivered online, over the phone, by psychologists or by the patient's spouse. I excluded any results that focused on acupuncture, dry needling, aquatic exercise, cod liver oil application, joint massage with oils, pharmacological management or joint replacement surgery to avoid straying from the research question.

To maintain a focus on OA, studies that focused on other causes of chronic pain or solely on rheumatoid arthritis management were excluded. I included all results that had a focus on pain coping skills, training, teaching, education, and management to explore other therapies that may be grouped into the PCST. All results from the year 1976 to 2020 were included as there was limited literature specifically addressing primary care provider delivery of PCST thus limiting the time of publication would limit the search results even further. Table 2 depicts the eligibility criteria utilized in the search.

Table 2

Inclusion and Exclusion Criteria

Inclusion	Exclusion
Publications from 1976 to 2020 were included as there was limited literature specifically addressing primary care provider delivery of PCST	None
Adults aged 19 and older were chosen to capture adults with chronic pain related to OA	Literature focusing on individuals <19 years of age
English language publications to ensure readability	Non-English language publications
RCTs, qualitative, meta-analyses, systematic reviews, literature review or mixed design peer-reviewed journals to ensure the highest level of evidence	Unpublished dissertation, editorial, news article, opinion statement, books, documents, reviews, meeting briefs, commentaries, and updates
Interventions delivered by nurses, nurse practitioners, physicians, and physiotherapists in primary care settings	Interventions solely delivered online, over the phone, by clinical psychologists or by the patient's spouse
Studies that included a diverse patient sample	None
Studies focused on pain coping skills, training, teaching, education, or management to explore other therapies that may be grouped into the PCST	Studies focused on acupuncture, dry needling, aquatic exercise, moxibustion, cryotherapy, cod liver oil application, laser therapy, joint massage with oils, pharmacological management, or joint replacement surgery
Studies focused on OA management of the hip, knee, and hand	Studies focused on other causes of chronic pain or solely on rheumatoid arthritis, juvenile idiopathic arthritis, AIDs, postoperative pain following arthroplasty, and fibromyalgia

Search Results

Following the application of exclusion criteria, the cumulative search yielded 650 articles. The articles were imported into the Zotero citation manager application to detect any duplicates. The

removal of duplicates resulted in 560 sources. Next, screening was performed by reviewing titles and abstracts with the application of all eligibility criteria; 32 sources remained. The full-text screening was then performed, and the eligibility criteria were reapplied to improve the relevancy of the results to the research question. The full-text screening yielded 11 articles. Additionally, reference lists were searched for relevant citations, however no additional articles were found to be relevant to the research question. Lastly, to find relevant grey literature, a Google search was conducted with the keyword's *osteoarthritis* and *pain management guidelines*. With this search, the American College of Rheumatology (ACR) website was discovered and a link to their 2019 guidelines for the management of OA of the hand, hip, and knee was reviewed. The ACR 2019 guideline will be included to aid discussion on psychosocial, and mind- body approaches. A summary of the full search process with results is illustrated in Appendix E.

Approach to Analysis

The initial analysis is presented in a literature review matrix that describes the *Author(s), Title, Journal, Year; Purpose/Aim; Methods; Sample; Findings; Strengths; and Limitations* (see Appendix F). A critical analysis of the eleven selected sources was undertaken using the Critical Appraisal Skills Program (CASP) (2013) checklists to evaluate the strengths, limitations rigor, validity, and strength of evidence in the included systematic reviews, randomized control trials (RCTs), and qualitative study. By utilizing the CASP tool, each study's rating is outlined in the literature matrix found in Appendix F. Four themes emerged from my analysis: 1) Pain Interference and Quality of Life Outcomes, 2) Education, 3) Delivery Modality, and 4) Multidisciplinary management. The thematic analysis of the evidence is discussed in the next chapter.

Chapter Four: Findings

The purpose of this integrative literature review was to explore the current evidence surrounding the following research question: "Does the delivery of Pain Coping Skills Training (PCST) by primary care providers improve pain interference and quality of life for adult patients with chronic pain related to OA?" By following a comprehensive literature search, eleven articles were selected and included in this review. In this section, the findings of the integrated literature review will be presented by comparing the data and identifying accurate and meaningful themes abstracted from the chosen literature.

The existing body of literature related to PCST interventions in the treatment of chronic pain related to OA was mainly composed of systematic reviews (n=4) (Dixon et al., 2007; Giacobbi et al., 2015; Ismail et al., 2017; Wang et al., 2020), quantitative studies (n=6) (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Helminen et al., 2015; Riddle et al., 2019) as well as a qualitative study (n=1) (Lawford et al., 2019).

Overall, the participants included in the studies were a mix of Caucasian, Hispanic, Asian, and African American, low to middle class, and comprised of adult men and women. Limitations to use PCST were identified within this body of literature and will be discussed in the next chapter. An in-depth description pertaining to each study's purpose/aim, methods, sample, findings, strengths, limitations, and CASP scores can be found in the literature matrix in Appendix F and referred to while reading this section.

Through a critical analysis of the findings from each study, the following themes emerged: 1) Pain Interference and Quality of Life Outcomes, 2) Education, 3) Delivery Modality, and 4) Multidisciplinary management. These themes organize the presentation of finding and guide the discussion of this review.

Pain Interference and Quality of Life Outcomes

The findings regarding the effects of PCST interventions on pain interference and QOL outcomes were synthesized from two high-quality systematic reviews with meta-analyses (Dixon et al., 2007; Wang et al., 2020), two systematic reviews (Ismail et al., 2017; Giacobbi et al., 2015), and six individual studies (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Lawford et al., 2019; Riddle et al., 2019). Decreased pain interference and improved QOL in these studies were reported using effect size, standardized mean difference (SMD), estimated treatment difference (ETD), and repeated measures analysis of variance (ANOVA). It is also important to note that there is a significant overlap between pain interference and QOL outcome measures utilized within this body of literature; however, efforts have been made to highlight the differences distinctively.

Pain Interference

In the high-quality quantitative RCT by Allen et al. (2019), a comprehensive list of validated primary and secondary outcomes was measured. Focusing on pain interference, Allen et al. (2019) utilized the Western Ontario and McMasters Universities Osteoarthritis Index (WOMAC) pain subscale to measure the severity of pain during the past two weeks for different activities such as walking, climbing stairs, sitting or lying, and standing. Additionally, the PROMIS Pain Interference Instrument (Short-Form 6a) was used to report on the consequences of pain over the past seven days across aspects of life, including social, cognitive, emotional, physical, and recreational activities (Allen et al., 2019). The PROMIS Pain Interference score did not differ significantly between both groups at either the 3- or 9-month follow-up (Allen et al., 2019). At the 3-month follow-up, WOMAC pain scores did not differ significantly between the PCST group and the waitlist group (ETD 0.63, 95% CI 1.45, 0.18; P 0.128) (Allen et al., 2019).

At the 9-month follow-up, WOMAC pain scores in the PCST group decreased from 3 months but were not statistically different from the waitlist group (ETD 0.84, 95% CI 1.73, 0.06; P 0.068) (Allen et al., 2019). The Complier average causal effect (CACE) methods showed that receipt of at least seven PCST sessions resulted in more significant and clinically meaningful improvements (Allen et al., 2019). However, it was not statistically different from the control group at either 3 or 9 months (difference in CACE estimated mean change 1.2,95% CI 2.4, 0.2 for three months and 1.4, 95% CI 2.8,0.1 for nine months) (Allen et al., 2019).

Baird and Sand (2004) studied tools to measure pain and physical activity, focusing on mobility. The Arthritis Impact Measures (AIMS2) was used to measure Perceived pain. The AIMS2 is a seven-item scale that measured current and usual pain, frequency of severe pain, frequency of pain in more than two joints, persistent morning stiffness, pain interfering with sleep, and fatigue (Baird & Sand, 2004). Mobility difficulties were assessed through seven items; four items measured walking ability, and three items measured bending ability (Baird & Sand, 2004). A scaled score was obtained by summing responses across the seven items (Baird & Sand, 2004). Repeated-measures ANOVA revealed a significant difference between the two groups in how much change in pain the participants experienced over the 12 weeks (F = 4.406, df = 26; P = 0.046) (Baird & Sand, 2004). The 17 participants in the intervention group reported a significant reduction in pain ($P < 0.001$) at week 12 compared to the control group, whose members reported no change in pain (Baird & Sand, 2004). Repeated-measures ANOVA revealed a significant difference between the two groups in how much change in mobility the women experienced over the 12 weeks (F = 9.619, df = 22; P = 0.005) (Baird & Sand, 2004). The participants in the intervention group reported a significant reduction in mobility difficulty

at week 12 ($P < 0.001$), while those in the control group had increases in mobility difficulty at week 12 (Baird & Sand, 2004).

In the meta-analysis of twenty-seven RCTs by Dixon et al. (2007), fifteen studies assessed the pain of arthritis patients post treatment using a visual analog scale (VAS) or other pain measures. The overall effect size was 0.177 (95% CI0.259–0.094), indicating that patients who received PCST type interventions reported significantly lower pain posttreatment than patients in control conditions (combined $p < 0.01$) (Dixon et al., 2007). The authors also conducted a meta-analysis restricted to studies that used the VAS to assess pain (n=9) and found a combined effect size of 0.162 (95% CI0.257–0.067; p0.001), favouring the psychosocial interventions.

Bennell et al. (2018) also utilized the WOMAC pain subscale measured at 8, 24, and 52 weeks. Results from this quantitative RCT by Bennell et al. (2017) showed that at three months, the intervention group reported significantly greater improvement in pain (mean difference, 1.6 units [CI, 0.9 to2.3 units]) and WOMAC physical function (mean difference, 9.3 units [CI, 5.9 to 12.7 units]) compared to the control group. These results were further sustained at nine months (mean differences, 1.1 units [CI, 0.4 to 1.8 units] and 7.0units [CI, 3.4 to 10.5 units], respectively) (Bennell et al., 2017). Both groups showed significant improvements from baseline at 3 and 9 months, with a significantly greater proportion of participants in the intervention group exceeding minimum clinically significant differences (MCIDs) at both time points (Bennell et al., 2017). All secondary outcomes except coping attempts at three months and self-efficacy at nine months showed significant between-group differences favouring the intervention (Bennell et al., 2017). The intervention group had significant improvements in all secondary outcomes at both time points. In contrast, the control group improved only on WOMAC pain at three months

and WOMAC pain and self-efficacy at nine months (Bennell et al., 2017). At both time points, significantly more participants in the intervention group reported global improvements (Bennell et al., 2017). The overall benefits in this study were attributed to a combination of exercise and PCST intervention which emphasizes the benefits of addressing the biological and psychosocial factors to optimize health outcomes.

This was further described in the results from the systematic review by Ismail et al. (2017), which included four RCTs to compare the effect of CBT and PCST with usual care, placebo and the combination with usual care. The selected pain interference outcome measure used was the WOMAC pain subscale (Ismail et al., 2017). The studies that provided PCST combined with Behavioural Weight Management (BWM) interventions had attained a moderate to large effect size (0.77) (Ismail et al., 2017). The researchers determined that patients diagnosed with knee OA who receive PCST with BWM for pain management are 69% more likely to reduce pain than patients who solely received standard (Ismail et al., 2017). The other intervention groups in the review had small effect sizes (ranged from 0.06 to 0.25) compared to control groups (Ismail et al., 2017).

In the quantitative RCT by Broderick et al. (2014), the researchers utilized the AIMS2 questionnaire to measure the impact of pain, mobility, walking and bending, extremity functioning, self-care, household tasks, social activities and support, work, tension, and mood. The BPI and the WOMAC pain subscale were also utilized (Broderick et al., 2014). Broderick et al. (2014) performed omnibus tests across all follow-up assessments which yielded significant group differences, indicating improvement with treatment on: pain intensity ($F(3, 233) = 2.75$, $P= 0.044$), and physical functioning ($F(3, 233) = 3.11$, $P= 0.027$). Two of the 4 secondary outcomes yielded significant treatment effects: fatigue ($F(3, 233) = 5.14$, $P= 0.002$) and AIMS

satisfaction with health (F(3, 232) = 3.12, P= 0.027); AIMS2 family/friend support showed a trend (F(3, 232) = 2.54, P= 0.057), and the effect for AIMS2 social activities was not significant (F(3, 232) = 0.58, P= 0.631) (Broderick et al., 2014). The patients in the PCST group reported less pain (F(3, 231) = 9.22, P <0 .001), less activity interference due to pain (F(3, 231) = 5.68, P=0 .001), and reduced use of pain medication (F(3,231) = 3.09, P=0 .028) across the 3 follow-up assessments compared with the usual care control group (Broderick et al., 2014). Changes in daily ratings of life satisfaction (F(3, 231) = 0.43, P=0 .728) and need to cancel activities (F(3, 230) = 1.19, P= 0.315) did not differ between the groups (Broderick et al., 2014). Overall, NP delivery of PCST interventions produced improvements in various pain-related outcomes: pain intensity, coping with pain, self-efficacy for controlling pain, activity interference due to pain, and decreased use of pain medication when compared with usual care. Additionally, these improvements were sustained 12 months after the intervention.

In the meta-analysis of ten RCTs by Wang et al. (2020), pain interference was measured using the WOMAC pain subscale, the AIMS and AIMS2. The intervention group had significant differences in pain (SMD = −0.18; 95% CI −0.29 to −0.06) compared to the control group (Wang et al., 2020). Between-group differences measured by the WOMAC subscales of pain (MD = −0.62; −1.48 to 0.24) were not statistically significant and did not reach the minimal clinically important differences that have been established (Wang et al., 2020).

In the quantitative RCT by Riddle et al. (2019), pain interference outcomes included the highly reliable and valid WOMAC Pain Scale, a 4-item knee pain intensity scale, and a global rating-of-change scale. Performance-based outcome measures were the Short Physical Performance Battery (SPPB) to gauge physical performance and the 6-minute walk test to assess walking endurance and speed (Riddle et al., 2019). There was no effective treatment (p=0.60) or

group-by-time interaction (p=0.73), indicating no significant difference between groups (collapsed over time) or in the trajectories of the WOMAC pain score (Riddle et al., 2019). No significant group or group-by-time interactions ($p > 0.05$) were found among composite pain or SPPB scores (Riddle et al., 2019). Additionally, there was a significant group effect on 6-minute walk scores (p=0.04) but no significant interaction (p=0.96) (Riddle et al., 2019). Overall, among adults with pain catastrophizing undergoing knee arthroplasty, PCST did not confer pain or functional benefit beyond the extensive improvements achieved with usual surgical and postoperative care. Thus, patients awaiting knee arthroplasty are likely not appropriate candidates for PCST interventions except if they experience persistent function-limiting pain postoperatively (Riddle et al., 2019).

Furthermore, in the systematic review of seven RCTs by Giacobbi et al. (2015), four RCTs relied on self-report surveys to measure pain using the AIMS2, McGill Pain Questionnaire, WOMAC pain subscale, or VAS. All seven included RCTs reported results that support the use of guided imagery as a therapeutic tool for the treatment of pain (Giacobbi et al., 2015).

Quality of Life

Various valid and reliable tools were utilized within the literature to measure QOL outcomes focusing on the five main QOL dimensions: Physical activities, Mental health, Pain, Social support, and Social functioning (Goetz et al., 2011; Mahmoud et al., 2019).

To examine the effects of physical activity, pain, mental health and functioning, Allen et al. (2019) utilized various surveys. The Western Ontario and McMasters Universities Osteoarthritis Index (WOMAC) function subscale was used to measure pain, stiffness and functionality. All items are listed rated on a Likert scale of 0 (no symptoms) to 4 (extreme

symptoms), with ranges of 0 to 96 for the total score and 0 to 68 for the function subscale (Allen et al., 2019). The Short-Form 12 Health Survey (SF-12) was used to cover domains of general health, physical health, work and activity limitations (Allen et al., 2019). The Patient Health Questionnaire-8 (PHQ-8) was used to calculate depressive symptoms. The Yale physical activity survey was used to assess activities such as housework, yard work, leisure activity, moderate-intensity physical activity, caretaking, and recreational activity performed during a typical week. The Pain Catastrophizing Scale was used to measure participant's thoughts and feelings when in pain, assess domains of rumination, magnification, and helplessness, which coincided with the degree of pain interference (Allen et al., 2019). Other outcome measures included the Coping Strategies Questionnaire, Arthritis Self-Efficacy, Yale Physical Activity Survey, and Patient Global Impression of Arthritis Symptom Change (Allen et al., 2019). There were no significant differences noted in any of the listed scores between the PCST and control groups either at three or nine months (Allen et al., 2019).

The WOMAC total and function scores, and the SF-12 Mental and Physical Health Component Scores did not differ significantly between PCST and waitlist groups at either 3 or 9 months (Allen et al., 2019). The CSQ Pain Coping Attempts score increased more in the PCST group than in the waitlist control group at both three months (ETD 15.31,95% CI 9.09, 21.53; P 0.001) and nine months (estimated treatment difference 11.67, 95% CI 5.08, 18.27; P 0.001) (Allen et al., 2019). Pain Catastrophizing Scale scores (PCS) decreased more in the PCST group than in the waitlist group at three months (ETD 3.03, 95% CI 5.25, 0.80; P 0.008) (Allen et al., 2019). At nine months, PCS scores continued to decline in the PCST group, but the difference compared with the usual care waitlist control group was smaller and no longer statistically significant (P 0.273) (Allen et al., 2019). The PHQ-8 scores did not differ between PCST and

waitlist control groups at either time point (Allen et al., 2019). The Arthritis Self-Efficacy scores improved more in the PCST group than in the waitlist control group at both 3 months (ETD 1.01,95% CI 0.61, 1.41; P 0.001) and 9 months (ETD 0.67, 95% CI 0.24, 1.09; P 0.02) (Allen et al., 2019). The Yale Physical Activity Survey scores did not differ between groups at either 3 or 9 months (Allen et al., 2019). The Patient Global Impression of Arthritis Symptom Change scores were lower, indicating more improvement since baseline in the PCST group than in the waitlist control group at both 3 months (ETD 1.27, 95% CI 1.60, 0.95; P,0.001) and 9 months (ETD 0.87, 95% CI 1.24, 0.51; P,0.001) (Allen et al., 2019). Overall, although there was no significant effect of PCST on the primary outcome of pain severity in this study, the participants experienced an improvement in key measures of pain coping and perceived ability to manage pain.

In Bennell et al. (2018), secondary outcomes included measures of QOL using the Assessment of Quality-of-Life instrument. Psychological health was measured using the Depression, Anxiety, and Stress Scale (DASS-21) (Bennell et al., 2018). The Physical Activity Scale coupled with the WOMAC function subscale was used to measure the level of physical activity of the participants (Bennell et al., 2018). At week 24, there was also no between-group difference in change in WOMAC function (−0.9 units; 95% CI, −4.8 to 2.9), which remained the same when dichotomized on MCID (PCST 64% vs comparison 57%, odds ratio 0.70, 95% CI 0.34-1.42) (Bennell et al., 2018). The frequency of use of pain coping skills was significantly higher for the PCST group than the comparison group at every time point (mean [95% CI] between-group difference: week 8, 11.5 [5.3-19.7]; week 24, 11.7 [2.9-20.5]; and week 52, 15.3 [4.4-26.2]) (Bennell et al., 2018). There was a significant between-group difference for change in WOMAC function (−3.2 units; 95% CI, −6.2 to −0.1) at week 8 favouring PCST, and more

participants in this group reported improvement overall and in pain and function at week 8 (Bennell et al., 2018).

The meta-analysis of ten RCTs by Wang et al. (2020) supported the effectiveness and safety of PCST for managing OA in pain, function, and psychological aspects. Outcome measurement tools included the WOMAC function subscale. Psychological outcomes were measured using the PCS, CSQ, and the Arthritis Self-Efficacy Scale (Wang et al., 2020). The intervention group had significant differences in function (SMD = −0.19; −0.30 to −0.07), coping attempts (SMD = 0.37; 0.24 to 0.49), pain catastrophizing (SMD = −0.16; −0.29 to −0.02), and self-efficacy (SMD = 0.27; 0.07 to 0.46) compared to the control group (Wang et al., 2020). Between-group differences measured by the WOMAC subscales of function (MD = −3.01; −6.26 to 0.24) were not statistically significant and did not reach the minimal clinically important differences that have been established (Wang et al., 2020). Overall, findings from this study supported the effectiveness and safety of PCST for managing OA in pain, function, and psychological aspects (Wang et al., 2020). Interestingly, the researchers also discovered that exercise did not add any benefits when combined with PCST interventions (Wang et al., 2020).

In the study by Broderick et al. (2014) QOL scale, a 16-item instrument was used to measure QOL across different life domains. Other outcome measures relevant to QOL included the CSQ, Beck Depression Inventory (BDI), Arthritis Self-Efficacy Scale, Brief Fatigue Inventory (BFI) and the End-of-day symptom diaries recorded on interactive voice recording (Broderick et al., 2014). Omnibus tests across all follow-up assessments were performed and yielded significant group differences, indicating improvement with treatment on: psychological distress ($F(3,233) = 2.83$, $P= 0.039$), use of pain coping strategies ($F(3, 233) =4.97$, $P= 0.002$), self-efficacy ($F(3, 232) = 10.59$, $P < 0.001$), catastrophizing ($F(3, 233) = 2.47$, $P= 0.063$), and the

effect on QOL was not significant (F(3, 233) = 1.97, P=0 .119). However, the patients in the PCST group reported less fatigue (F(3,231) = 2.95, P=0 .033) across the three follow-up assessments compared with the usual care control group (Broderick et al., 2014).

In the meta-analysis of twenty-seven RCTs by Dixon et al. (2007), the specific measurement scales for QOL outcomes were not mentioned; however, five studies assessed anxiety pre-and postintervention resulting in the overall effect size of 0.282 (95% CI0.455–0.110), indicating significantly lower posttreatment anxiety in the intervention group compared to patients in control conditions (combined p 0.01) (Dixon et al., 2007). Seven studies assessed depression pre-and post-intervention resulting in an overall effect size of 0.208 (95% CI0.363–0.052), indicating that patients receiving psychosocial interventions reported significantly lower posttreatment depression than patients in control conditions (combined p 0.01) (Dixon et al., 2007). Additionally, patients reported significantly lower posttreatment psychological disability than patients in control conditions (combined p 0.01) (Dixon et al., 2007). Five studies assessed active coping pre-and post-intervention resulting in an overall effect size of 0.716 (95% CI0.490–0.941), indicating higher levels of active coping following in the intervention group compared to patients in control conditions (combined p 0.01) (Dixon et al., 2007). Four studies assessed the pain self-efficacy pre-and post-intervention resulting in an overall effect size of 0.184 (95% CI0.031–0.336), indicating that patients receiving psychosocial interventions reported significantly higher posttreatment pain self-efficacy than patients in control conditions (combined p 0.05) (Dixon et al., 2007). Eleven studies assessed the physical disability of arthritis patients pre-and post-intervention, resulting in an overall effect size of 0.152 (95% CI0.242–0.062), indicating significantly lower posttreatment physical disability compared to patients in control conditions (combined p 0.01) (Dixon et al., 2007).

In the high-quality qualitative study by Lawford et al. (2019), five themes arose: 1) easy to understand and follow, 2) better able to cope with pain, 3) anonymity and flexibility, 4) not always relatable or engaging, and 5) support from clinician desirable. Focusing on the second theme, most participants believed the pain coping techniques they learned helped them better control their pain and no longer felt overwhelmed by it, ultimately improving their QOL (Lawford et al., 2019). Participants had different perceptions about which techniques were most beneficial for them, and many found that the relaxation techniques helped alleviate muscle tension and reduce stress (Lawford et al., 2019). Participants valued the activity-pacing technique, finding that it helped them avoid flares in pain and break activities into smaller, more manageable segments (Lawford et al., 2019). One participant stated:

> I have, I think, learnt from [the PCST program] that you can actually ride the pain out as it where, you can actually deal with it, whereas, before that it was always you were scared of pain because you thought you couldn't deal with it but now I know you can actually deal with it in some way, you have some control. I mean you can't get rid of it but you can deal with it. (Lawford et al., 2019, p. 1742)

These findings suggest that individuals with knee OA generally had positive experiences using the PCST program, suggesting that virtual delivery is a broadly acceptable and accessible way to help individuals with OA manage their pain and improve their QOL.

In the quantitative RCT by Riddle et al. (2019), QOL outcomes included the WOMAC Physical Function Scale and the Pain Catastrophizing Scale. There were no significant group or group-by-time interactions ($p > 0.05$) found among WOMAC physical function or pain catastrophizing scores (Riddle et al., 2019). However, there were substantial improvements over

12 months for WOMAC physical function scores (pooled effect size, 1.8) and pain catastrophizing (pooled effect size,2.0) (Riddle et al., 2019).

In the systematic review by Giacobbi et al. (2015), measurement of QOL, psychological well-being, anxiety, and depression was noted in five of the included RCTs. Tools utilized included the HRQOL scale, Anxiety (STAI-T), depression (BDI), and automatic negative thoughts (ATQ-30) (Giacobbi et al., 2015). Other outcomes relating to QOL included the arthritis self-efficacy scale and assessment to measure medication usage (Giacobbi et al., 2015). All seven included RCTs reported results that support the use of guided imagery as a therapeutic tool for improved psychological well-being, improved mobility, reduced anxiety, and increased self-efficacy in managing pain (Giacobbi et al., 2015). The findings provide evidence that guided imagery with progressive muscle relaxation, a part of PCST protocol, may be an effective self-management technique for coping with daily pain and mobility limitations associated with OA.

Overall, although psychosocial interventions appear to have some effects on pain, PCST interventions are most likely to enhance patient's QOL by producing improvements in coping, anxiety, pain self-efficacy, depression, and physical disability (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Giacobbi et al., 2015; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020).

Education

Traditionally, PCST interventions usually consist of three phases: (1) an education segment in which patients are taught about the biopsychosocial model of pain; (2) a skills-training component in which participants are trained in a variety of cognitive-behavioural pain coping skills (relaxation training, activity pacing, pleasant activity scheduling, imagery techniques, distraction strategies, cognitive restructuring, problem-solving, or goal setting); and

(3) an application phase in which patients practice and apply their skills in real-life situations (Dixon et al., 2007). The second theme outlines the importance of patient and provider education, which was a thread in all selected articles and was achieved using various approaches.

Patient Education

Patients received education on various cognitive-behavioral pain coping skills such as relaxation training, activity pacing, pleasant activity scheduling, guided imagery techniques, distraction strategies, cognitive restructuring, problem-solving, or goal setting, and behavioural rehearsal to enable lasting results. The various tools and mediums used to aid in PCST patient education were described in ten studies (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020).

In the systematic review by Giacobbi et al. (2015), all seven included RCTs employed patient education on guided imagery interventions in patients with arthritis and other rheumatic diseases (AORD), often beginning with breathing or progressive muscle relaxation exercises and then images of movement and physical activity free of pain and stiffness. All patients were given an instructional audio player, which they listened to once or twice daily. To expand on how guided imagery interventions were delivered, the pilot study by Baird and Sand (2004) describes composing guided imagery with progressive muscle relaxation scripts often beginning with describing a relaxing scene, then urging patients to smell aromas, hear sounds and feel the warmth of the air and breeze, then finally verbally guiding patients to visualize moving extremities in the scene without stiffness, hesitancy, or pain (Baird & Sands, 2004). The participants were asked to complete a journal three times a week with information about symptoms and the number of times a day they used guided imagery. Additionally, participants

were called biweekly to navigate any difficulties that arose using guided imagery with progressive muscle relaxation (Baird & Sands, 2004).

In the study by Helminen et al. (2015), the CBT group interventions were based on Linton's Model. Each session lasted two hours with a 15−20-minute break to enhance peer support and social bonding. The outline of the sessions included an introduction (15 minutes), lecture (knowledge and insight, max 15 minutes), problem-solving (in pairs/teams, 15−20 minutes), skills training (15−20 minutes), homework assignments (15 minutes), and a résumé (feedback) of the session (15 minutes) (Helminen et al., 2015). Similarly, the study by Broderick et al. (2014) taught four broad coping skills across the ten 30 - 45-minute sessions, which were outlined in detail in a treatment manual and followed a format of a review of home practice assigned at the last session, instruction in a new coping skill, guided practice in that skill, and a home practice assignment. Patients were provided with a treatment binder divided into sections for each session, handouts and logs to record the home practice of the skill, and were reviewed at each session by the NP (Helminen et al., 2015).

In the study by Allen et al. (2019), the PCST program involved 11 weekly sessions, approximately 30-45 minutes each, delivered through telephone by a trained counsellor. The counsellor provided instructions on cognitive and behavioural pain coping skills and led participants in guided rehearsals of these skills (Allen et al., 2019). Participants were encouraged to engage in the home-based practice of the skills to enhance their application in pain-related situations (Allen et al., 2019). Additionally, the counsellor reviewed participants' home practice, including successes and barriers, encouraged problem-solving, and set goals for applying skills (Allen et al., 2019). Participants were given handouts to facilitate each session, along with an audio recording to guide progressive muscle relaxation.

In the multisite randomized clinical trial conducted by Riddle et al. (2019), the participants randomized to either PCST or arthritis education received eight 50-minute individual sessions over an approximately 2-month period beginning two weeks preoperatively and ending six weeks postoperatively. The physical therapists were provided with a detailed manual to guide treatment delivery (Riddle et al., 2019). However, it was not clear if participants were provided with any resources or tools to facilitate learning.

The systematic review by Ismail et al. (2017) included four RCTs with slightly different protocols in providing PCST. On average, the sessions lasted for 62 minutes and were delivered weekly or biweekly (Ismail et al., 2017). Also, two studies had examined the effect of PCST independently and PCST combined with behavioural weight management and exercise (Ismail et al., 2017). This was similar to the systematic review by Wang et al. (2020), which included ten RCTs that provided PCST patient education with some combination of exercise guidance and educational materials.

In the studies by Bennell et al. (2017) and Lawford et al. (2019), the participants received educational material about exercise and physical activity, pain management, emotions, healthy eating, complementary therapies, and medications. Participants were asked to complete eight 35- to 45-minute modules (1 per week commencing in week 1) and practice pain-coping skills daily (Bennell et al., 2017; Lawford et al., 2019). The participants were also given an instructional manual and workbook that included information on each session and password access to the program (Bennell et al., 2017; Lawford et al., 2019).

Provider Education

The importance of provider education was discussed in three studies (Allen et al., 2019; Broderick et al., 2014; Riddle et al., 2019). Broderick et al. (2014) clearly described how

provider education and competence were attained. In this study, NPs received a two-day training workshop in PCST and additional training to ensure satisfactory competency levels with the treatment delivery (Broderick et al., 2014). Eligibility for these positions required a registered nurse license and working or engaged in the study as adult health or family practice NP (Broderick et al., 2014). Although not specializing in mental health, the nurses' training systematically addressed pain's emotional underpinnings (Broderick et al., 2014). After the initial training, NPs continued training with the instructors at their site to reach competency with the delivery of the treatment (Broderick et al., 2014). Next, each NP delivered PCST treatment to 2 to 3 OA pilot patients, and NPs did not begin to see patients in the clinical trial until adherence and therapist competence were confirmed (Broderick et al., 2014). Competence was defined as the NP consistently achieving a score of 3 (satisfactory) to 5 (excellent) on a rating of therapist performance (1 = poor, 5 = excellent) (Broderick et al., 2014). Using audiotapes of the sessions, ratings were made on specific items including: (1) establishing and maintaining rapport, (2) showing professionalism and clinical judgment, (3) covering the protocol in a way that meets patient needs, (4) encouraging active patient engagement in the session, (5) applying the protocol to the patient's unique challenges and needs, (6) using time efficiently and appropriately pacing the session, and (7) overall performance (Broderick et al., 2014).

The study by Allen et al. (2019) discusses how PCST counsellors received training that included role-play sessions from experienced clinical psychologists, therapist certification achieved upon delivery of 11 study sessions to mock participants audio-recorded and rated by a trained counsellor. The therapists were required to receive a rating of at least a 4 out of 5 for both qualities of intervention delivery and adherence to the study protocol (Allen et al., 2019).

Additionally, the training also included cultural sensitivity issues (Allen et al., 2019), an essential component not discussed in other studies.

In the study by Riddle et al. (2019), PCST interventions were delivered by physical therapists who completed a 2-day training session conducted by clinical psychologists highly experienced in the delivery of PCST. Additionally, physical therapists received a detailed training manual to guide treatment delivery, and all treatment sessions were audio-recorded (Riddle et al., 2019). The local clinical psychologists held monthly conference calls with physical therapists and monitored treatment delivery by listening to audiotapes throughout the study (Riddle et al., 2019). For the participant group receiving arthritis education solely, registered nurses with at least two years of experience in the care of patients with OA were trained by one author using a detailed manual (Riddle et al., 2019).

Also noted in Bennell et al. (2017), although PCST was delivered using an automated program, the physiotherapists attended a 1-day training course conducted by the researchers and were given an exercise manual. They also were provided with an overview of the PainCOACH program and were asked to encourage participants to complete modules and practice skills; however, the physiotherapist did not achieve competency in PCST training, nor were they expected to deliver this intervention to the participants. Additionally, the four RCTs included in the systematic review by Ismail et al. (2017) discuss PCST and CBT interventions, which health professionals delivered, but it is unclear how provider competence was determined.

Delivery Modality

The third theme was the delivery modality of PCST programs, which was often related to the traditional in-person, telephone or web-based delivery format (Allen et al., 2019; Lawford et

al., 2019), while some studies utilized a combination of settings (Bennell et al., 2017; Broderick et al., 2014; Giacobbi et al., 2015; Riddle et al., 2019).

The study by Broderick et al. (2014) utilized an in-person delivery format consisting of ten PCST sessions with up to four sessions conducted over the phone. In the systematic review by Giacobbi et al. (2015), one study delivered guided imagery interventions in a clinic setting while the remaining six studies were home-based imagery practice. Similarly, in the study by Allen et al. (2019), the PCST program involved eleven weekly sessions, approximately 30-45 minutes each, delivered through telephone by a trained counsellor. In the study by Riddle et al. (2019), the first session was an in-person appointment, and the remaining seven sessions occurred over the telephone.

Bennell et al. (2017) conducted an innovative online intervention combining an interactive PCST program and physiotherapist-prescribed home exercises in patients with OA, which resulted in substantial clinical benefits. Another study using web-based delivery of PCST was conducted by Lawford et al. (2019); participants from this qualitative study reported favourable outcomes due to flexibility, accessibility, and anonymity. Although online PCST programs can be a low-cost and more accessible way to manage osteoarthritic pain, several limitations to this delivery format have been reported. First, computer-illiterate individuals may struggle with accessing this therapy (Bennell et al., 2017). Secondly, clinician guidance during PCST interventions may improve adherence and boost treatment effectiveness, as suggested by participants (Lawford et al., 2019).

Although the body of literature demonstrated that overall, PCST interventions embedded within primary care practice settings are reasonable, there is evidence also to consider web or telephone-based delivery formats in addition to in-person sessions. However, to ensure success,

there must be a partnership with IT support and training providers to guide patients. This approach will mitigate accessibility issues for patients residing in rural or remote areas and lack computer literacy.

Multidisciplinary Management

Although PCPs have been defined as GPs and NPs within this review, various providers supply healthcare within the primary care setting and warrant further evaluation. Pain Coping Skills Training were delivered by primary healthcare therapists, which included counsellors and therapists (Allen et al., 2019; Giacobbi et al., 2015; Ismail et al., 2017); NPs (Broderick et al., 2014); and physiotherapists (Helminen et al., 2015; Riddle et al., 2019). In the systematic review by Wang et al. (2020), a mix of trained counsellors, physical therapists, NPs, therapist teams, and clinical psychologists were included as teachers of PCST.

In the study by Riddle et al. (2019), PCST was delivered by psychologist-trained physical therapists with at least two years of clinical experience treating patients with knee arthroplasty. To ensure intervention fidelity, upon study completion, an external pain psychologist reviewed a random set of 5% of PCST audiotapes and rated proficiency of care delivery based on the treatment manual, on a 5-point scale (1=poor to 5=excellent) (Riddle et al., 2019). A joint arthroplasty nurse not affiliated with the study used a similar rating for arthritis education audiotapes. The mean quality rating was 4.0 (range, 3.5 to 4.5) for PCST and 3.8 (range, 2.0 to 5.0) for arthritis education training (Riddle et al., 2019).

In the study by Broderick et al. (2014), PCST was delivered by trained NPs. Across the five years of the clinical trial and the clinical sites, 6 NPs provided PCST to the study patients. Two clinicians reviewed 18% of the audiotaped treatment sessions and rated proficiency on a 5-point scale (1 = poor, 3 = satisfactory, 5 = excellent) in delivering the PCST intervention for that

session per the PCST manual (Broderick et al., 2014). The ratings of NPs across each session was averaged, and none of the NPs received ratings less than satisfactory (Broderick et al., 2014). Among the 129 PCST patients, 45% received treatment from a NP with a rating of 3 (satisfactory), 21% a rating of 4, and 34% a rating of 5 (excellent) (Broderick et al., 2014). Using an ANCOVA model, the researchers also examined whether NP level of proficiency in delivering PCST was associated with the level of improvement that patients achieved (Broderick et al., 2014). Consistent with the main analyses, across seven primary, four secondary, and six daily outcome measures, there were no significant differences in outcome by nurse proficiency at the post-treatment assessment (Broderick et al., 2014). Overall, the NP-delivered PCST protocol produced substantial improvements in a range of pain-related variables, including pain intensity, coping with pain, self-efficacy for controlling pain, activity interference due to pain, and the use of pain medication when compared with usual care (Broderick et al., 2014).

Interestingly the study by Baird and Sand (2004) focused on guided imagery with progressive muscle relaxation as an easy-to-use self-management intervention eliminating the need for the primary care provider. This was done to mitigate class attendance or one-on-one sessions that may not be feasible for some patients due to pain and mobility difficulties. The 17 participants in the intervention group reported a significant reduction in pain ($P<.001$) and a substantial reduction in mobility difficulty at week 12 ($P<.001$) compared to the control group, who had no change in pain but increases in mobility difficulty at week 12. However, this study had a Low CASP score related to several limitations such as the uneven distribution of participants, small sample size, and the sole inclusion of participants over 65 who were highly educated.

In the study by Helminen et al. (2015), a psychologist and physiotherapist worked collaboratively to deliver a group-based CBT pain program. The psychologist was the principal leader of the cognitive–behavioural intervention while the physiotherapist's tasks were to lead the relaxation exercises, provide information on osteoarthritis pain mechanisms, offer advice about suitable exercises, and facilitate the group when needed (Helminen et al., 2015). Although this single-blinded RCT could not confirm the hypothesized advantage of a group-based CBT programme over ordinary GP care in knee OA pain patients, it poses the question of the benefits of a multidisciplinary approach in delivering PCST interventions as opposed to limiting this to GPs and NPs.

In the study by Riddle et al. (2019), PCST was delivered by local physical therapists with at least two years of clinical experience treating patients with knee arthroplasty who also received training by clinical psychologists. Additionally, arthritis education was taught by registered nurses with at least two years of experience in the care of patients with OA (Riddle et al., 2019). After study completion, a pain psychologist not involved with the study reviewed a random set of 5% of PCST audiotapes and rated care delivery proficiency, based on the treatment manual, on a 5-point scale (1=poor to 5=excellent) (Riddle et al., 2019). A joint arthroplasty nurse not affiliated with the study used a similar rating for arthritis education audiotapes (Riddle et al., 2019). The mean quality rating was 4.0 (range, 3.5 to 4.5) for PCST and 3.8 (range, 2.0 to 5.0) for arthritis education training (Riddle et al., 2019). The quality ratings support intervention treatment fidelity and the benefit of including a multidisciplinary approach to managing chronic pain related to OA.

In the systematic review by Wang et al. (2020), an interactive automated program and trained physical therapists were used to teach PCST interventions to patients. Therefore, it is

vitally important to determine the role of physiotherapists in PCST delivery. Similarly, in Bennell et al. (2017), PCST and education materials were provided to the participants; the participants also received seven skype sessions with a physiotherapist over 12 weeks which lasted between 12 - 45 minutes. The physiotherapist performed a brief assessment, prescribed an individualized lower-limb–strengthening home exercise program, instructions, video demonstrations, and equipment (Bennell et al., 2017). Additionally, the fifth theme that arose in the qualitative study by Lawford et al. (2019) emphasized the provision of support from a clinician as important. It was clear that the program worked effectively in tandem with the physical therapist–prescribed exercise program (Lawford et al., 2019).

This body of literature supports the overall effectiveness of NPs, physical therapist, and nurses not explicitly trained in mental health interventions can effectively deliver PCST interventions in the primary care setting. However, it is essential to evaluate potential barriers for PCPs integrating PCST interventions into their primary care practices and strategies to mitigate them. Exploration of the roles of registered nurses, counsellors and physiotherapists should also be considered. The strategies needed to facilitate delivery of PCST interventions in the primary care setting will be explored further in the discussion section and help develop appropriate practice recommendations.

In summary, this analysis has provided a critical review of common themes within the literature gathered on the delivery of Pain Coping Skills Training by Primary Care Providers to patients suffering chronic pain related to OA. In consideration of the research question, this analysis explores pain interference and QOL outcomes, patient and provider education, primary care providers, appropriate delivery modalities, and the importance of multidisciplinary

management. The next chapter discusses these findings and includes recommendations for clinical practice, practice implications, limitations, and recommendations for future research.

Chapter Five: Discussion

The purpose of this integrative literature review is guided by the following question "Does the delivery of Pain Coping Skills Training (PCST) by primary care providers improve pain interference and quality of life for adult patients with chronic pain related to OA?" A literature search was completed to answer the posed research question and identified 11 relevant articles for inclusion in this review. The findings from the 11 articles were analyzed in the previous chapter and provide PCPs with the current evidence for the integration of PCST interventions in their respective primary care practices.

Four key findings were identified within the literature analysis to answer the research question. They included: 1) Pain Interference and Quality of Life Outcomes, 2) Patient and Provider Education, 3) Delivery Modality, and 4) Multidisciplinary management. This section aims to illustrate how the synthesis of the findings led to the development of practice recommendations for PCPs. Furthermore, the limitations to this integrative literature review will be discussed and the direction for future research.

Pain Interference and Quality of Life Outcomes

Osteoarthritis is related to various psychosocial and functional consequences, exacerbating the patient's pain experience, decreasing responsiveness and participation to treatment, increasing disability, and negatively affecting health-related quality of life (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Lawford et al., 2019; Riddle et al., 2019). Pain interference was reported as a significant contributor affecting activities of daily living. One commonly used tool utilized within the articles to measure pain interference is the Brief Pain Inventory (BPI). The BPI measures the extent to which pain interferes with seven quality of life domains (general activity, mood,

walking ability, routine work [including housework], relations with other people, sleep, and enjoyment of life) (Jensen, 2011; Kean et al., 2016).

Measurement of QOL outcomes was a deliberate choice by the author as I believe it is essential to assess disease effects on daily living in relation to critical aspects of each patient's life. This assessment can then lead to a discussion of treatment value and the patient's willingness to adhere to therapies. Quality of life is a broad complex concept that incorporates a persons' physical health, psychological state, level of independence, social relationships, personal beliefs, and relationships to the environment's salient features (WHO, 2012). It is difficult to capture these factors using one tool, and this perhaps explains why researchers did not use one specific tool to capture the measure of QOL within the selected studies. One QOL instrument utilized within the selected articles includes the AIMS, an arthritis-specific QOL instrument (Baird & Sands, 2006; Broderick et al., 2016). The AIMS tool was used to measure pain, mobility, walking and bending, extremity functioning, self-care, household tasks, social activities and support, work, tension, and mood. Additionally, the Short-Form Health Survey (SF-36) was also utilized and measures physical functioning, role limitations due to physical problems, bodily pain, general health perception, vitality, social functioning, role limitations due to emotional problems, and mental health (Baird & Sands, 2006).

There remains uncertainty about whether generic or disease-specific instruments should be used to attain the most comprehensive assessment of health-related quality of life (Fontaine, n.d.). For example, the SF-36 on an OA patient will not provide information on joint pain, related symptoms of function, attitude and mood. In this case, the AIMs or WOMAC function subscale tool would be more beneficial for OA patients. The major domains of QOL: Physical activities, Mental health, Pain, Social support, and Social functioning, were all reported in the

studies and were found to have overlapping results to pain interference. Analysis of this body of literature has demonstrated that overall PCST interventions had a positive impact of reducing pain interference and improving reports of QOL outcomes which was primarily influenced by the patient's ability to cope and their self-efficacy (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Giacobbi et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Wang et al., 2020). Riddle et al. (2019) found that patients awaiting knee arthroplasty are likely not appropriate candidates for PCST interventions except if they experience persistent function-limiting pain postoperatively. This is valuable information to consider during the baseline patient assessment; however, it prompts further questions regarding the effects on patients with varying OA severity levels. Further research is needed to determine if there are favourable advantages to PCST interventions in patients with advanced severity of OA who may not necessarily require arthroplasty.

Primary Care Provider Role

The PCP role would be essential here to administer baseline surveys to assess what effect OA has on each patient's QOL and the extent of pain interference on their activities of daily living. Once this information is gathered, the advanced knowledge possessed by PCPs will enable them to aid patients in developing an appropriate plan. Utilizing tools such as the BPI for measurement of pain interference and the WOMAC function subscale for measurement of QOL can be used as an introduction to discuss the impact of OA, which is a valuable addition to the health assessment. Based on this information and the severity of OA, decisions can be made if PCST is an appropriate intervention. If not, PCPs are well suited to provide any required medications and referrals to appropriate specialists.

Education

The second finding that emerged from the literature analysis is centred on patient and provider education. Providing education that addresses OA expands the knowledge of adult patients and enables them to understand the associated risks and consequences of delayed intervention and the impact of OA. A personalized education approach was suggested by Dixon et al. (2007) to aid in the self-management of OA. Through the explorations of patient's knowledge and perception of their risk, tailored education and specific PCST components can be provided to support the patient. Additionally, reinforcement with repeated education and follow-up at subsequent visits encourages sustainable coping strategies. It will be necessary to set up standardized PCST manuals, adapt therapy based on individual patient needs, and implement home practice/assignments to foster patient education. However, before patient education can occur, PCPs must have the required knowledge around PCST interventions to manage OA's physical and psychological effects.

Provider Education

Provider education was only discussed in three studies (Allen et al., 2019; Broderick et al., 2014; Riddle et al., 2019). The three studies that discussed provider education included NPs, nurses, and physical therapists who did not possess mental health specialization but achieved competency in delivering PCST interventions. In these articles, the providers took a training workshop that was taught and monitored by trained clinical psychologists highly experienced in delivering PCST. Developing a standardized provider education workshop or program will be an essential aspect that will facilitate the delivery of PCST interventions, especially for providers who have a large number of patients diagnosed with OA in their panel. This may be achieved by partnering with Pain BC who currently offers a virtual chronic pain program. This finding

illustrates that delivering PCST interventions depends not on the provider's background but mainly on obtaining the required training.

Additionally, having a specialized psychologist available during the training and afterwards likely increased the provider's confidence with PCST delivery. However, I acknowledge that support from a clinical psychologist may not be readily available to PCPs, which warrants the need for other resources and tools such as a standardized PCST manual. Additionally, for PCPs who cannot integrate PCST interventions into their current practice, initiating a referral to a specialized psychologist remains an appropriate option.

PCST Manual.

The use of a PCST manual or treatment protocol was described in the literature as a consistent strategy that facilitated the uptake of PCST interventions by each provider (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020). An example of a PCST manual available to primary care providers is the Cognitive Behavioural Therapy for Chronic Pain (CBT-CP) therapist manual (Murphy et al., 2020). Similar to the goal of PCST interventions, the CBT-CP approach encourages patients to adopt an active, problem-solving approach to cope with the various challenges associated with chronic pain (Murphy et al., 2020). This manual is divided into two parts; the first part focuses on foundational information regarding pain, especially chronic pain, including common conditions and treatments (Murphy et al., 2020). It further provides education on CBT, its application in managing chronic pain, and an introduction to case conceptualization and the therapeutic alliance (Murphy et al., 2020). The second part of the manual focuses on understanding and implementing each session (Murphy et al., 2020).

The CBT-CP manual was developed specifically for veterans; however, it is approved in the management of various pain conditions such as low back pain, middle and upper back pain, neck pain, osteoarthritis, rheumatoid arthritis, tendonitis/bursitis, pelvic floor disorders, gout, peripheral neuropathic pain, radicular pain, phantom limb pain, fibromyalgia, complex regional pain syndrome, and headaches (Murphy et al., 2020). Within the CBT-CP manual, there are twelve sessions. The first three sessions are called the initial treatment phase, comprised of assessment and interview, rapport building, preparing for treatment, orientation to CBT and goal setting (Murphy et al., 2020). Sessions four to ten involve cognitive and behavioural skill-building, including physical activation, relaxation techniques, pleasant activities, cognitive strategies, and sleep (Murphy et al., 2020). The final discharge phase is from sessions eleven to twelve and includes strategies to maintain treatment gains, anticipating obstacles, discharge plan, and follow-up session (Murphy et al., 2020).

Although this is a USA-developed therapist manual for veterans, adopting a standard PCST manual similar to the CBT-CP will provide PCPs with a resource that can be referred to when questions concerning delivery arise. The CBT-CP manual provides a standardized approach to delivering PCST interventions based on the key components (Murphy et al., 2020). Thus, utilizing a standardized PCST treatment manual will allow for a stepped approach in educating, planning, and supporting patients through PCST interventions.

Individualized Plans/Adapting Therapy.

The benefit of utilizing a standardized PCST therapist manual has been discussed in the previous section as a facilitator to the uptake by PCPs. Another important facilitator is the ability for providers to adopt PCST interventions based on each patients' specific needs (Allen et al., 2019; Baird & Sands, 2004; Broderick et al., 2014; Helminen et al., 2015). It is important to note

that every patient's experience of chronic pain related to OA differs, and each patient may find various PCST skills more beneficial than the other. This was evident in the study by Broderick et al. (2014), where the participants reported progressive muscular relaxation, mini practices of relaxation, and activity pacing to be most beneficial, and only 40% found pleasant imagery and distraction techniques to be helpful.

Furthermore, Helminen et al. (2015) report that a predisposition to treating all chronic pain patients with the same methods leads to inaccurate conclusions regarding the treatment efficacy. Variables such as the point of time for intervention, the duration of symptoms, psychological stress, low levels of physical activity, and reduced self-rated health may affect the treatment effect (Helminen et al., 2015).

In the study by Allen et al. (2019), the providers were encouraged to use active listening to identify opportunities to demonstrate that pain coping skills are compatible with the participant's cultural, spiritual, religious, or other values. In the context of cognitive restructuring, if a participant described religious beliefs or values, the provider would explore how those beliefs could be integrated into new, more adaptive thoughts about pain coping (Allen et al., 2019). Another adaptive approach was noted in the study by Baird and Sands (2004), in which the movement exercises were tailored based on the types of joint pain or mobility concerns reported by the participants. These studies highlight the importance of adapting PCST interventions based on patient's needs, which leads to better patient adherence and efficacy of the tailored interventions.

PCST Home Practice/Assignment.

One facilitator to PCST interventions noted in the articles was the importance of home activities. The homework assignments are an integral component of PCST, followed by review

and problem-solving in the subsequent session (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Helminen et al., 2015; Lawford et al., 2019). Although participants are taught new skills at each PCST session, the most significant change occurs between sessions and when the patients are in their home setting or performing regular activities that require them to implement PCST skills. This is a crucial aspect of PCST and aids in building coping and self-efficacy (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014). Participants in Giacobbi et al. (2015) were provided with an instructional audio player to guide their home activities which they played once or twice daily. Other studies report having assigned homework assignments or home practice to the participants after each PCST session (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Helminen et al., 2015; Lawford et al., 2019). The importance of these home activities must be discussed at the start of PCST treatment. Adherence to these activities is an indicator of if patients will have long-lasting, sustainable coping skills.

Delivery Modality

The studies utilized traditional in-clinic delivery, virtual/telephone delivery, and a combination of both. Virtual delivery was proven to be an effective method to deliver PSCT interventions and was also utilized to accommodate patients' illness, physical functioning, and scheduling challenges (Allen et al., 2019; Baird & Sands, 2004; Bennell et al., 2017; Broderick et al., 2014; Giacobbi et al., 2015; Lawford et al., 2019; Riddle et al., 2019).

Additionally, during the writing of this review, the world was hit with the coronavirus disease 2019 (COVID-19) pandemic. Thus, in shifting towards a virtualized care approach in response to the COVID-19 pandemic, health care planners worldwide have employed various telehealth technologies to meet the needs of patients without compromising their safety (Webster, 2020; Zulman & Verghese, 2021). Some noted benefits of virtual care include

improved access and convenience for individuals residing in remote locations, those with severe mobility limitations, and those with intense work or caregiving demands (Allen et al., 2019; Riddle et al., 2019; Zulman & Verghese, 2021).

Overall, the body of literature supports all delivery modalities as reasonable options and poses no harm; however, addressing other barriers such as computer literacy level and cell or internet connectivity issues pose barriers to virtual and telephone delivery formats. However, knowing that there are beneficial outcomes regardless of what delivery modality is employed, PCPs should allow patients to choose based on their needs and preferences.

Multidisciplinary Management

Various providers such as physiotherapists, physical therapists, registered nurses, counsellors, and NPs, were able to deliver PCST interventions within the primary care setting (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020). Successful provider competency and training were also highlighted in the studies by Riddle et al. (2019) and Broderick et al. (2014), further supporting the benefit of PCST delivery by providers other than a clinical psychologist. Thus, it is likely that with the required educational training, PCPs can successfully deliver PCST interventions to adult patients suffering chronic pain related to OA. This is likely because the providers that delivered PCST interventions in the studies did not have background training in mental health. Thus, it is not a prerequisite for the successful delivery of the intervention. However, the delivery of PCST interventions is dependent on the application of appropriate education and support (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Riddle et al., 2019).

The management of chronic pain related to OA is complex and is best managed with a multidisciplinary team. For example, in the study by Helminen et al. (2015), the physiotherapists taught components of pain coping skills and recommended individualized adjunct exercises to the participants. The psychotherapists' role in managing OA is of high importance; according to the Centre for Effective Practice (CEP, 2017), incorporating exercises, joint protection, and assistive devices is part of the non-pharmacological management for OA affecting the hip, knee or hand. Additionally, the 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee, support self-management programs that utilize a multidisciplinary approach coupled with exercises as strong recommendations for patients with knee, hip, or hand OA (Kolasinski et al., 2020).

In the study by Riddle et al. (2019), registered nurses performed the arthritis education component to the participants while the therapists delivered PCST interventions. This type of collaborative effort will be necessary and permits health professionals to administer components of PCST that fall within their scope of practice. This approach would also likely reduce the provider burden. The PCP role is uniquely set to not only deliver PCST interventions but also to address other needs such as prescribing medications, making referrals to physiotherapists, occupational therapists, orthopedic surgeon, rheumatologist or pain specialist (Egerton et al., 2018; Peckham et al., 2018; Sasek, 2015).

Although only two studies (Broderick et al., 2014; Wang et al., 2020) utilized trained NPs to deliver PCST interventions, the success of physiotherapists, counsellors, registered nurses and physical therapists indicates that the delivery of PCST interventions is feasible and effective in the primary care setting. Offering PCST interventions to manage chronic pain related to OA

permits using a biopsychosocial approach to care. The recommendations for clinical practice are summarized in Table 3.

Recommendations

Based on the findings, six recommendations have been made to assist PCPs in the delivery of PCST. The purpose of these recommendations is to facilitate the PCPs ability to integrate components of PCST into routine primary care visits.

Table 3. *Summary of Recommendations for Primary Care Practice*

Recommendations	Implementation within PCP Practice	Evidence
PCPs to undertake educational competency in delivering PCST interventions	• Partnership with clinical psychologists, Pain BC and CEP • Attend PCST training course • Maintain competency by completing continual recertification and educational opportunities	• Allen et al., 2019; Broderick et al., 2014; Dixon et al., 2007; Riddle et al., 2019.
Assess and implement PCST interventions during primary care visits	• Provide counseling, education, and assessments to patients suffering chronic pain related to OA • Identify patient goals, and effect of chronic pain (BPI and WOMAC function subscale) • Develop and sustain therapeutic relationships • Provide biomedical treatments (i.e., Steroids, Analgesics) • Provide non-pharmacotherapeutics treatment options (PCST)	• Allen et al., 2019; Baird & Sands, 2004; Broderick et al., 2014; CEP, 2017, 2020; Helminen et al., 2015.
Utilize a Standardized PCST Manual	• Utilize manuals with clear and concise approach • Attend PCST training course • Focus first on PCST interventions best suited to manage patients' chief complaints	• Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Murphy et al., 2020; Riddle et al., 2019; Wang et al., 2020.

Educate on and administer PCST Home Activities/Assignments /Practice	• Provide clear guidance on activities to practice at home • Detailed description of each activity in patient manuals • Provide opportunity to follow up on completion status	• Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Helminen et al., 2015; Lawford et al., 2019.
Tailor delivery modality based on patients' needs and preference	• Inform patients of efficacy with all delivery modality types • Consider mobility concerns, rural/remote area, and computer literacy level • Obtain support from IT services to set up virtual delivery	• Allen et al., 2019; Baird & Sands, 2004; Broderick et al., 2014; Helminen et al., 2015; Webster, 2020; Zulman, & Verghese, 2021.
Adopt a multi-disciplinary approach	• Consider aspects of PCST that fall within each team members scope (i.e., Nurses may complete initial arthritis education) • Involve PT, OT, pain specialist, orthopedic surgeon, rheumatologists, and mental health clinicians in patients care	• Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; CEP, 2017; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Kolasinski et al., 2020; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020.

Limitations and Recommendations for Future Research

A review of limitations allows planners to identify and improve aspects when introducing new interventions such as those within primary care practice (Ross & Bibler Zaidi, 2019). By addressing the identified limitations, appropriate next steps can be established to initiate PCST delivery to eligible patients in the community setting.

The included studies displayed a diverse range of participants, including Caucasians, Hispanics, African Americans, and Asians, similar to the ethnically diverse population in Canada. However, only studies written in the English language were included in the integrative review. Thus, it is likely that applicable studies not available in the English language were excluded in this review. Furthermore, as one author conducted the literature search, the

possibility of publication bias or unintended omissions of relevant studies may have been introduced.

Additionally, of the eleven studies included in this review, seven were conducted in the USA, one in Finland, two in Australia, and one in West China. Although these settings represent the diverse population in Canada, it is relevant to acknowledge the sociopolitical and healthcare system differences, which may affect the generalizability of findings between each country. Thus, my first recommendation is to further research PCP delivery of PCST for adult patients suffering chronic pain related to OA that applies to the Canadian context.

As evidenced by this review's findings, there remains uncertainty regarding the benefit of using generic or disease-specific measurement instruments to attain the most comprehensive assessment of pain interference and QOL. It is essential to utilize appropriate screening tools that capture the extent of pain interference and effects on QOL for each patient suffering OA. With the administration of screening instruments such as the BPI for pain interference and the AIMS for QOL, future research needs to investigate the appropriateness of each instrument balanced by respondent and provider burden. By establishing appropriate and standardized screening instruments tailored to patients affected by OA, the impact of PCST interventions can be monitored at various time points and compared to treatment effects using other interventions.

While education was revealed to be an essential aspect of facilitating PCST uptake, limited studies described how provider competency was attained. Further research is needed to develop appropriate PCP competency/educational training on PCST delivery interventions. Training centres could teach skills for delivering PCST, provide monitoring of intervention competence, and offer certification of competency. This may be achieved by partnering with organizations such as the Pain BC society who currently offer free educational webinars to health

professionals on topics such as the biopsychosocial model of pain and pain foundations for PCPs to build provider competency.

Additionally, although the studies support the utility of PCST treatment manuals, there was no clear direction on what manual or treatment protocol would be best utilized. The development of a treatment manual to assist PCPs may be achieved by the partnership with the Centre for Effective Practice (CEP), an organization responsible for knowledge translation for primary care in Canada. The CEP currently has a tool for managing chronic non-cancer pain but no specific guidance on how to implement PCST interventions in practice other than referring patients to a psychotherapist (CEP, 2020). With the example of the CBT-CP therapist manual, further research will be needed to develop a standardized manual or treatment protocol that can facilitate PCST delivery in the primary care setting.

Although the findings from the literature provide insight into the results of PCST interventions on pain interference and QOL outcomes, a significant limitation was the lack of literature specific to the PCP role. The research results can be discussed within the context of a primary care setting; however, further research is needed to examine the outcomes of NP and physician delivery of PCST interventions. This research would provide valuable insight into the PCP's role in delivering PCST interventions.

Finally, the number of PCST sessions and the timing of each session ranged from 15-90 minutes per session and 6-12 sessions. However, the optimal dose of PCST or the minimum required sessions needed to achieve treatment effects is uncertain. To optimize dissemination in primary care practice, treatment will need to be brief and streamlined. Thus, future studies are needed to explore shorter (under six sessions) effects compared to the currently reported (6-12 sessions) PCST protocols.

Conclusion

It is estimated that the incidence of OA is projected to affect 9 million people by 2040 (Arthritis Society, 2019). Pain Coping Skills Training is an intervention protocol derived from CBT to address patients' psychological and physical effects with OA. However, access to PCST interventions is scarce, as clinical psychologists solely deliver it in hospital settings. By offering PCST interventions within the primary care setting delivered by PCPs is a proposed strategy to mitigate gaps in PCST service access. The current guidelines for arthritis care are limited in the support they provide for delivering PCST in primary care and only advise on referral to mental health specialists. However, without adequate resources, guidelines and treatment manuals, such as the CBT-CP utilized in the USA, PCPs will experience difficulties when offering PCST interventions.

The integrative literature review synthesized evidence to answer the following question "Does the delivery of Pain Coping Skills Training (PCST) by primary care providers improve pain interference and quality of life for adult patients with chronic pain related to OA?" A comprehensive search of the literature was undertaken, and eleven studies were selected for this review. The evidence from these eleven articles was critically appraised using the CASP (2013) checklist to evaluate the strengths, limitations, rigor, validity, and strength of evidence in the included studies. Key findings from this integrative review included: 1) Pain Interference and Quality of Life Outcomes, 2) Education, 3) Delivery Modality, and 4) Multidisciplinary management.

Based on this review, PCST interventions can be successfully delivered within the primary care setting by physiotherapists, physical therapists, registered nurses, counsellors, and NPs (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Giacobbi et al., 2015;

Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020). Additionally, successful delivery and competency were achieved by providers who did not have specific mental health background (Allen et al., 2019; Bennell et al., 2017; Broderick et al., 2014; Riddle et al., 2019).

To address the psychological effects of OA, management plans should include safe, accessible, and cost-effective interventions. With the introduction of PCST interventions, patients reported improvement in self-efficacy for controlling pain, decreased activity interference due to pain, increased physical functioning, and decreased psychological distress (Allen et al., 2019; Baird & Sand, 2004; Bennell et al., 2017; Broderick et al., 2014; Dixon et al., 2007; Giacobbi et al., 2015; Helminen et al., 2015; Ismail et al., 2017; Lawford et al., 2019; Riddle et al., 2019; Wang et al., 2020). This body of evidence provides a substantial rationale for the benefit of PCP delivery of PCST interventions to patients suffering chronic pain related to OA.

Finally, in keeping with the integrative review process, limitations and recommendations for future research were highlighted. The recommendations for future research will be essential to provide further rationale for GPs and NPs to adopt strategies that will allow integration of PCST interventions within their management plans for adult patients who suffer from chronic pain related to OA.

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Appendix A

PubMed Search and Results (November 25, 2020)

#1	"Pain Management"[Mesh] OR “pain coping” OR “pain coping skills training” OR “pain management” OR “PCST”	62,595
#2	"Osteoarthritis"[Mesh] OR "Arthritis"[Mesh] OR “osteoarthritis” OR “OA” OR “arthritis”	381,813
#3	"Quality of Life"[Mesh] OR “quality of life” OR “QOL”	346,496
#4	#1 AND #2 AND #3 AND #4 AND #5	**TOTAL = 420**

Appendix B

CINAHL Search and Results (November 25, 2020)

#1	(MM "Pain Management") OR “pain coping” OR "pain coping skills training" OR "PCST"	4,932
#2	(MH "Osteoarthritis+") OR (MH "Arthritis+") OR “OA”	80,037
#3	(MH "Quality of Life+") OR “quality of life” OR “QOL”	198,033
#4	#1 AND #2 AND #3	**TOTAL = 53**

Appendix C

PsychINFO Search and Results (November 25, 2020)

#1	MM “Pain Management” OR PCST OR pain coping OR pain coping skills training OR pain management	24,958
#2	DE “Arthritis” OR DE "Rheumatoid Arthritis" OR Osteoarthritis	5,454
#3	DE "Quality of Life" OR DE "Health Related Quality of Life" OR DE "Quality of Work Life" OR QOL OR quality of life	98,410
#4	#1 AND #2 AND #3	**Total = 106**

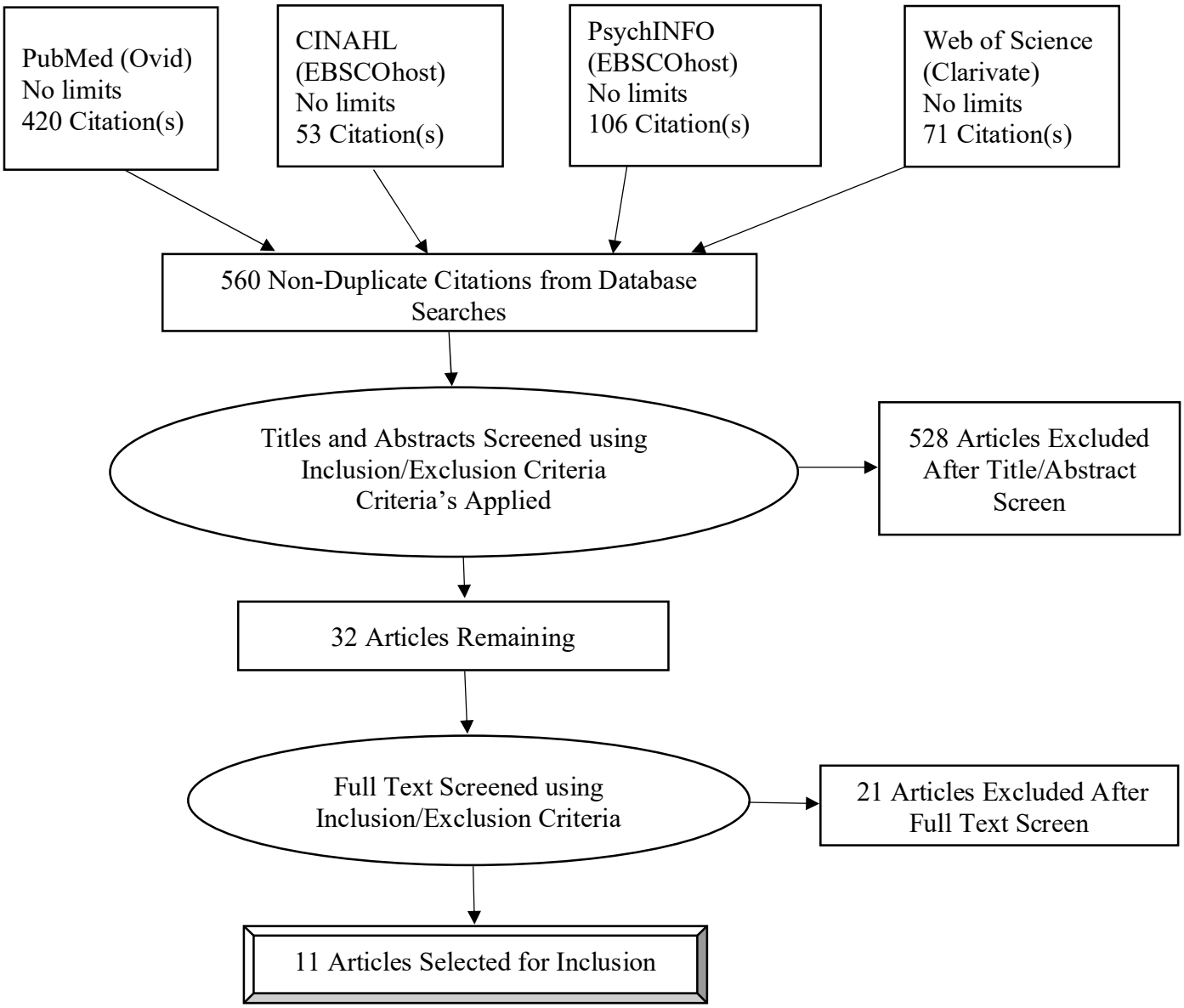
Appendix D

Web of Science Search and Results (November 25, 2020)

#1	**TITLE:** "pain coping" OR "pain coping skills training" OR "pain management" OR "PCST"	8.410
#2	**TOPIC:** "osteoarthritis" OR "OA" OR "arthritis"	361,886
#3	**TOPIC:** "quality of life" OR "QOL"	407,709
#4	#1 AND #2 AND #3	**Total = 71**

Appendix E

Literature Search Strategy



Appendix F
Literature Matrix

Systematic Reviews

Author(s), Title, Journal, Year	Purpose/ Aim	Method	Sample	Findings	Strengths	Limitations
Dixon, Keefe, Scipio, Perri, & Abernethy. (2007). Psychological interventions for arthritis pain management in adults: A meta-analysis. *Health Psychology: American Psychological Association.*	-To examine empirical studies investigating the efficacy of psychosocial interventions for OA and RA. - To explore the effects of psychosocial interventions on psychological, physical, and biological functioning	- Meta-analysis of quantitative literature (RCTs). - Databases: Cochrane Controlled Trials, EMBASE, Ovid MEDLINE, and Ovid PsycINFO. - Inclusion criteria: adults >18 years, diagnosis of OA and/or RA, reported pain as an outcome, and tested one psychosocial intervention. - English language publications. Dates:1985-2006.	Results=233 Initial screen=63 Full text screen=37 Eligibility re-applied=27, N=27 studies included.	- Intervention group reported significantly lower levels of pain, lower post-treatment anxiety, depression, and psychological disability. - Psychosocial interventions were associated with higher levels of active coping and significantly lower post-treatment physical disability.	- Internal validity was assessed according to an adapted Jadad scale. - External validity was assessed based on clear description of population; description of provider training; standardisation of treatment; clear description of study methods; and adequately reported outcome data. - Studies were of high quality. **CASP High**	- Majority (18) of the studies included were carried out in RA patients. - The methods were not fully stated. - Differences in patient characteristics, outcome measures and interventions which may affect the reliability of the pooled effect sizes. - Findings are limited by publish date.
Giacobbi, Stabler, Stewart, Jaeschke, Siebert, & Kelley. (2015). Guided imagery for arthritis and other rheumatic diseases: A systematic review of randomized controlled trials.	- To conduct a systematic review of RCTs that examined the effects of guided imagery in adults with AORD in order to determine whether this intervention approach is	- Systematic review of qualitative literature. - Databases: Academic Search Complete, Medline, PsycInfo, Scopus, SPORTDis- cus, Cochrane Central Register of	Results= 1935, Duplicates removed=1313, Title and abstract screen=441, Full-text screen=322, Eligibility re-applied=7, N=7 studies included.	- All seven studies support the use of guided imagery as a therapeutic tool for the treatment of pain, improved psychological well-being improved mobility reduced anxiety and increased self-	- Researchers followed the Cochrane Collaboration guidelines for coding risk of bias. - Six RCTs were rated to have low	- Findings are limited by publish date. - Breakdown by gender was disproportionate because only two of the seven studies included men.

Official Journal of the American Society of Pain Management Nurses.	effective at reducing pain, increasing function, or improving other outcomes such as anxiety, depression, and quality of life.	Controlled Clinical Trials, CINAHL, Physiotherapy Evidence Database, Web of Science, and ERIC. - Clear description of inclusion criteria. - All English language publications Dates: January 1, 1960 - June 1, 2013.		efficacy managing pain. - None of the seven studies performed a cost-benefit analysis.	risk of bias; one RCT was unclear. - Results reported for pain, physical function, anxiety, depression, or quality of life. **CASP Moderate**	
Ismail, Moore, Alshishani, Yaseen, & Alshehri. (2017). Cognitive behavioural therapy and pain coping skills training for osteoarthritis knee pain management: A systematic review. *Journal of Physical Therapy Science*.	To investigate the effectiveness of CBT and PCST on perceived pain level in adults with knee osteoarthritis (KOA) in comparison with usual care.	- Systematic review of quantitative literature (RCTs). - Databases: MEDLINE, PsychINFO, EMBASE, CINAHL, and JBI. - Search terms: "pain", "osteoarthritis", "knee", "psychological therapy", "cognitive therapy" and "pain coping". - English language only. - Dates: 2012-2016.	Results=29, Duplicates removed=18, Full-text screen=6, Eligibility re-applied=4, N=4 studies included	- CBT and PCST were not recommended as sole interventions for managing KOA pain. - No statistically significant evidence and lack of improvement in the WOMAC pain index in treatment groups. -Improvement noted when delivered with adjunct rehabilitation intervention.	- Clear outline of the methods and sample selection process. - The WOMAC index was used as outcome measure. -Methodological quality determined by the Physiotherapy Evidence Database scale which assessed selection bias, performance bias & detection bias. **CASP Moderate**	- Low evidence based on the Grading of Recommendations Assessment, Development and Evaluation. - Possible selection bias as one researcher conducted the primary database search. - Lacks pain-related functional and psychological outcome measures. - Lack of participant and assessor blinding in 3 RCTs.

Wang, Zhang, Yang, & Cheng-Qi. (2020). Effectiveness of pain coping skills training on pain, physical function, and psychological outcomes in patients with osteoarthritis: A systemic review and meta-analysis. *Clinical Rehabilitation.*	- To investigate the effectiveness of PCST in pain, function, and psychological outcomes for patients with OA, compared to the control group. - To compare the effectiveness of PCST between the intervention involving exercise.	- Meta-analysis of quantitative literature (RCTs). - Databases: PubMed, Embase, the Cochrane Library, PEDro, Clinical Trials, and the WHO Clinical Trials Registry Platform (to 30 September 2020). - Clear description of eligibility criteria.	- Results=199, Duplicates removed=84, Full-text screen=28Eligibility re-applied=10, N= 10 studies included.	- PCST group had significant improvement in pain, function, coping attempts, pain catastrophizing, and self-efficacy compared to the control group. - Group differences measured by the McMaster Universities Osteoarthritis Index subscales of pain were not statistically significant.	- Clear outline of the methods and sample selection process. - Risk of bias assessed by two independent reviewers based on the Cochrane Handbook for Systematic Reviews of Interventions. - Most recent systematic review on PCST and OA. -Outcomes: WOMAC, PCS , CSQ Arthritis Self-Efficacy Scale. **CASP High**	- Likely biased results as trials were conducted by the same researchers at different times. - Varying follow-up time frames between included RCTs. - Exclusion of relevant studies (i.e., Somers et al., 2012).

Individual Research Studies

Author(s), Title, Journal, Year	**Purpose/ Aim**	**Method**	**Sample**	**Findings**	**Strengths**	**Limitations**
Allen, Somers, Campbell, Arbeeva, Coffman, Cené, Oddone, & Keefe. (2019). Pain coping skills training for African Americans with osteoarthritis: results of a randomized controlled trial. *Pain*.	To examine the effectiveness of this pain CST program among African Americans with OA, relative to usual OA care.	- A parallel-group design, randomized controlled trial. - 11 weekly PCST sessions, each 30 - 45 minutes, delivered via telephone by a trained counselor. - Coping skills training counselors received training in the PCST protocol, from experienced coinvestigators prior to study. - Sessions were audio-recorded. - Follow-up assessment at 3 and 9 months.	- Recruitment of patients with evidence of knee or hip OA in Durham Veterans Affairs Medical Center and East Carolina University medical records; advertisements at study sites and surrounding communities; and referrals from HCPs. - Screening based on described inclusion and exclusion criteria. - 248 participants, randomized into pain CST group (N=124) and a usual care, wait list control group (N=124).	- No statistically significant changes in WOMAC pain score compared with control group. - Complier average causal effect analyses showed that intervention effects on WOMAC pain were more robust for participants who received >7 visits. - Improvement in pain coping and perceived ability to manage pain in PSCT group. - PROMIS Pain Interference, SF-12, PHQ-8, and Yale Physical Activity Survey showed favorable changes in the PCST group. - Decreased pain catastrophizing, and increased self-efficacy, relative to the WL group.	- Adequate diverse sample size and randomization of participants. - Thoroughly described how counsellors' competency was achieved. - Ensured quality assurance as PSCT sessions were reviewed weekly by experienced investigators. - Valid and reliable measures (WOMAC, Pain Interference Instrument, Short-Form 12 Health Survey, Coping Strategies Questionnaire, PCS). **CASP High**	- The study co-ordinator and PCST counselor were not blinded to treatment assignment. - Likely biased reporting as participants were paid $50 for completing baseline and 3-month assessments and $25 for completing 9-month assessments. - Only 35% of participants (43 of 124) completed less than 7/11 sessions in the PCST group. - Lack of de novo radiographs to confirm OA status.

Baird, & Sands. (2004). Pilot study of the effectiveness of guided imagery with progressive muscle relaxation to reduce chronic pain and mobility difficulties of osteoarthritis. *Pain Management Nursing.*	To determine whether Guided Imagery (GI) with Progressive Muscle Relaxation (PMR) would reduce chronic pain and mobility difficulties in patients with OA.	- Quantitative longitudinal, randomized clinical trial. -Personalized audiotaped instructions on using GI and PMR with journaling three times a week. -Perceived pain measured using the AIMS2. - Repeated-measures (ANOVA) used to examine treatment effect.	- Recruited via Central Midwestern senior citizen centers, fitness centers, churches, wellness fairs, newspapers and wellness newsletters. - Screening based on described inclusion and exclusion criteria. - 28 selected women randomized into treatment (N=18) and control groups (N=10).	- Significant difference between the two groups in pain experienced over the 12 weeks ($F = 4.406$, $df = 26$; $P = 0.046$). - Intervention group reported a significant reduction in pain ($P<0.001$) and mobility difficulties ($P<0.001$) at week 12 compared to the control group who experienced increased mobility difficulties.	- Grouping of participants from the same location to limit contamination. - Reliable and valid outcome measurement using the AIMS2. - The researchers clearly identified limitations. - Clear description of methods, and analysis. **CASP Low-Moderate**	- Uneven distribution of participants. - Small sample size. - All participants were over 65 and were highly educated creating a threat to the external validity.
Broderick, Keefe, Bruckenthal, Junghaenel, Schneider, Schwartz, Kaell, Caldwell, McKee, Reed, & Gould. (2014). Nurse practitioners can effectively deliver pain coping skills training to osteoarthritis patients with chronic pain: A	To evaluate the effectiveness of a health care delivery model that trains nurse practitioners (NP) to deliver PCST to OA patients in community practices.	- Quantitative multisite, RCT. - 10 PCST sessions delivered by trained NPs in community primary care offices. - Audiotaped treatment sessions. - Analyses conducted with the intention-to-treat principle.	- Recruited from community primary care and rheumatology practices in three states. - Screening based on described inclusion and exclusion criteria. - 256 selected patients randomized into treatment (N=129) and	- NP delivery of psychosocial interventions produced improvements in various pain-related outcomes: 1) Pain intensity 2) Coping with pain, self-efficacy for controlling pain	- Adequate randomization of participants. - Sample size ensured adequate power to detect an intervention effect. - Ethical rigour based on the confidential handling of data and confirmation of consent.	- Assessor blinding may have been compromised as patients sometimes revealed their experimental condition. - Threat to external and internal validity due to attrition rate of 29% at the 12 month follow up.

randomized, controlled trial. *Pain*.		- Repeated-measures ANCOVA models used to examine treatment effects. - Follow-up assessment completed at 6 and 12 months.	control groups (N=127).	3) activity interference due to pain 4) decreased use of pain medication when compared with usual care. - There were beneficial effects lasting at least 12 months beyond the intervention.	- All outcome measures used showed adequate validity and sensitivity; the researchers indicated the internal consistency for each outcome measure. **CASP High**	
Bennell, Nelligan, Dobson, Rini, Keefe, Kasza, French, Bryant, Dalwood, Abbott, & Hinman. (2017). Effectiveness of an internet-delivered exercise and pain-coping skills training intervention for persons with chronic knee pain: A randomized trial. *Annals of Internal Medicine*.	To investigate whether a 12-week physical therapist–delivered combined pain coping skills training (PCST) and exercise (PCST/exercise) is more efficacious and cost effective than either treatment alone for KOA.	- Quantitative parallel pragmatic RCT. - Educational materials, 7 physiotherapist led Skype sessions, and eight 35-45-minute PCST modules (PainCOACH). - Analyses conducted with the intention-to-treat principle.	- Recruited via print, radio, and social media advertisements and the researcher's database. - Screening based on described inclusion and exclusion criteria. - 148 selected patients randomized into treatment (N=74) and control groups (N=74).	- At 3 months, intervention group showed significant improvement in pain (mean difference, 1.6 units [CI, 0.9 to 2.3 units]) and physical function (mean difference, 9.3 units [CI, 5.9 to 12.7 units]) compared with the control group. - Pain improvement effects were sustained at 9 months.	- Various PCST interventions were included. - Reliable and valid outcome measurements used. - Researchers report strengths: 1) Treatment delivery by practicing physiotherapists. 2) Cost effective accessible technology not requiring clinician input 3) Diverse participants.	- Possible performance bias as participants and physiotherapists were unblinded. - Likely biased reporting as $50AUD gift vouchers was used as an incentive to complete questionnaires. - No clinical examination or radiography confirmed OA diagnosis in participants; posing threats to external validity.

					4) Longer follow-up, retention and adherence. **CASP Moderate**	
Helminen, Sinikallio, Valjakka, Väisänen-Rouvali, & Arokoski. (2015). Effectiveness of a cognitive-behavioural group intervention for knee osteoarthritis pain: a randomized controlled trial. *Clinical Rehabilitation*.	- To assess the effectiveness of a six week cognitive–behavioural group intervention in patients with knee osteoarthritis pain compared to routine GP care.	- Single-blinded RCT. - 3- and 12-month follow-up assessments. - Six group based weekly sessions supervised by an experienced psychologist and a physiotherapist. - Two-hour sessions, with clear outline of each session.	- Recruited from PCPs in Kuopio area by advertisements in surrounding clinics and mailed out recruitment letters. - Screening based on described inclusion and exclusion criteria. - 111 participants randomized into treatment (N=55), and control groups (N=56).	- No significant difference between intervention and control group for any outcome measures of pain or function. - Among health-related quality of life instruments, no significant differences were found between the study groups. - In the RAND-36 a significant difference was detected in the emotional well-being multi-item subscale in favour of the intervention group (Pr =0.038). - Significant difference between groups was found in the Pain Self-Efficacy Questionnaire (Pr =	- Valid and reliable outcome measures including WOMAC, health-related quality of life, and self-reports of pain and physical function. - Appropriate participant and accessor blinding until after 12-month follow-up. - Great participant retention for duration of study. - Radiographic x-rays to confirm the OA diagnosis, and the use of intent-to-treat. - Adequate sample size based on power calculation.	- Mean age of participants was 63 years old likely affecting generalizability of findings. - Participants had an average of 5 comorbidities that may have affected study results.

				0.022) in favour of the control group. - No significant differences between the groups in the use of pain medication, number of doctor appointments, physiotherapist appointments, or sick-leave days owing to OA.	**CASP High**	
Lawford, Hinman, Nelligan, Keefe, Rini, & Bennell. (2019). "I could do it in my own time and when I really needed it": Perceptions of online pain coping skills training for people with knee osteoarthritis. *Arthritis Care & Research*.	To explore the perceptions and experiences of people with OA who completed an online PCST program.	- Qualitative design based on the interpretivism paradigm embedded within a randomised controlled trial. - One 35-45-minute online module per week for 8 weeks. - Audio recorded semi-structured interviews. - Thematic analysis of the interviews.	- Purposive sampling via media campaigns, advertisements, and the use of a research volunteer database. - Sample size dictated by theoretical saturation. - (N=12).	- Five themes: 1) "easy to understand and follow," 2) "better able to cope with pain," 3) "anonymity and flexibility," 4) "not always relatable or engaging," and 5) "support from clinician desirable"	These factors contribute to the trustworthiness and transferability of the results: - Diverse sample. - Achieving data saturation. - Findings are consistent with past studies (Broderick et al., 2014). **CASP High**	- Possible inclusive bias because participants volunteered to participate in the study. - Possible confirmation bias in data collection, as only one researcher performed initial analysis.

Riddle, Keefe, Ang, Slover, Jensen, Bair, Kroenke, Perera, Reed, McKee, & Dumenci. (2019). Pain Coping Skills Training for Patients Who Catastrophize About Pain Prior to Knee Arthroplasty: A Multisite Randomized Clinical Trial. *The Journal of bone and joint surgery. American volume*.	- To determine if PCST in OA patients with moderate to high pain catastrophizing undergoing knee arthroplasty improves postoperative outcomes compared with usual care or arthritis education.	- A 3-arm RCT conducted at: Duke University, New York University Medical Center, Virginia Commonwealth University, Wake Forest University, and Southern Illinois University. - Eight 50 minute audio recorded sessions over 2 months. - First session was in -person and rest was via telephone. - PCST was delivered by physical therapists (PTs) trained by clinical psychologist. - Arthritis education was taught by experienced registered nurses. - Follow-up at 2, 6 and 12 months.	- Screening based on described inclusion and exclusion criteria. - Recruited from academic medical centers. - 402 participants randomized into usual care (N=137), arthritis education (N=135), and PCST group (N=130).	- All 3 treatment groups had large improvements in 12-month WOMAC pain scores with no significant differences among the 3 treatment arms. - No differences between WOMAC pain scores at 12 months for the pain coping skills and arthritis education groups or between the pain coping and usual-care groups. - Secondary outcomes also showed no significant differences among the 3 groups. - PCST was not an effective perioperative treatment for patients who are undergoing knee arthroplasty and catastrophize about pain.	- Utilized the Research Electronic Data Capture (REDCap) web interface to reveal randomized group assignments. - Methods employed to provide intervention fidelity. -Blinded data collectors. - Valid and reliable measures (WOMAC, Pain Catastrophizing Scale, Short Physical Performance Battery [SPPB] and the 6-minutewalk test). - Diverse sample. - Adequate sample to detect meaningful differences between groups. - Intention-to-treat approach. **CASP Moderate**	- Participants were over 45 years of age. - Participants and interventionists were not blinded. - Possible reporting bias as participants were compensated $50 at baseline and $80 for completing all follow-up assessments. - Results may not generalize to individuals with low levels of pain catastrophizing.