Group Psychotherapy for Pain: A Meta-Analysis

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ABSTRACT

Group Psychotherapy for Pain: A Meta-Analysis

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Chronic pain is common and frequently interferes with people’s regular functioning and reduces quality of life. Though pharmacological approaches are used most frequently to treat pain-related issues, the side effects of these medications often lead to other problems. Group therapy has been used and studied for decades in treating pain though it’s general efficacy for addressing pain is not clear. Objectives: to determine group therapy’s efficacy for patients with pain-related issues and whether the effects are moderated by study, patient, leader, or group characteristics. Method: potential articles were selected from searches completed in major databases based on a set of inclusion criteria. A random effects meta-analysis was conducted, and potential moderators were analyzed. Results: we analyzed 57 studies representing 8,933 patients receiving group therapy for pain which produced a significant, small effect (g = 0.28) for reducing pain intensity. Various secondary outcomes such as pain frequency, interference with activities of daily living, physical functioning, catastrophizing, self-efficacy, anxiety, depression, and quality of life were also found to improve significantly. Four significant moderating variables were found to include pain measure used, gender composition, number of sessions, and presence of pain diagnosis. Discussion: results are discussed and compared to those of past meta-analyses regarding both chronic pain and group therapy. Implications for practice and research are provided.

Keywords: chronic pain, fibromyalgia, group psychotherapy, meta-analysis
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Group Psychotherapy for Pain: A Meta-Analysis

Need for the Study

Over the past decade, the literature has seen an increase in randomized clinical trials (RCTs) being conducted to examine the effects of psychotherapy for individuals experiencing physical pain (Williams et al., 2012; Kerns et al., 2011; Sturgeon, 2014). Reasons for this emphasis include concerns with the high risk of addiction to medication which has contributed to the current opioid epidemic and the high cost of treatment (Nelson et al., 2015). A recent meta-analysis (Niknejad et al., 2018) examining the effectiveness of psychological treatments for chronic pain in older adults found treatment format as the only significant moderator among the 22 studies included. In this case, the authors found that group treatment was the key factor responsible for producing better outcomes. Thus, given the increased interest in and high volume of RCTs examining nonpharmacologic group approaches to treating pain, a meta-analysis would be useful to investigate the general effectiveness of group intervention in order to provide a robust interpretation of its association with improved outcomes regarding pain.

Problem to be Addressed

Chronic pain is one of the most common reasons individuals seek medical services in the United States and impacts nearly 50 million Americans (Dahlhamer et al., 2018; Nahin, 2015). Individuals who suffer from chronic pain often experience low quality of life due to their limited physical functioning which tends to impact recreational activities and occupational responsibilities (Smith et al., 2001). Traditionally, the medical community has turned to prescribing opioid analgesics in order to minimize these consequences. Research has suggested that overprescription of opioids by physicians was the key factor in the origin of the opioid epidemic in the United States (Rose, 2018). This is problematic because the long-term use of
prescription opioids has been shown to increase the risk of misuse, abuse, and opioid-related overdoses (Dowell et al., 2016; Volkow & McLellan, 2016). In 2016 alone, 66.4% of the 63,632 overdose deaths in the United States involved an opioid (Seth et al., 2018). Additionally, the estimated costs of prescription opioid addiction are over $78 billion annually in the U.S. Because of this, nonpharmacological treatments have been heavily investigated in order to better utilize adjunctive interventions aimed at improving physical functioning and general well-being among chronic pain populations.

Although past studies have yielded results suggesting group therapy as a superior treatment for pain-related issues (e.g., Niknejad et al., 2018), a meta-analysis has not been conducted specifically for group therapy and for all types of pain in any population. Past systematic reviews and meta-analyses have been conducted regarding the treatment of pain irrespective of treatment format and/or only focused on one specific type of pain or population (e.g., fibromyalgia in older adults; Hoffman et al., 2007; Zhang et al., 2019).

**Purpose of the Study**

The purpose of this study is to outline the current practices within group therapy for treating pain and to assess the relationship between group treatment and outcomes for individuals being treated for pain-related symptoms. In other words, the present study fills the gap in the literature concerning the overall effectiveness of group therapy in treating patients experiencing pain by synthesizing the findings from RCTs conducted within the past 30 years.

**Justification**

Currently, there are 10 other meta-analyses dedicated to specific disorders (e.g., schizophrenia, panic disorder, borderline personality disorder) and group therapy’s effectiveness in treating them (Burlingame & Strauss, 2021). The current study is an essential addition to these
meta-analyses in continuing to build the evidence-base for group therapy in treating various disorders. Because a meta-analysis for group therapy treating pain has not been conducted previously, this study is necessary as it would answer the call put forth by Burlingame and Strauss (2021) “the large number of recent [pain] studies justify a meta analytic review to test alternative combinations and define new research and treatment directions” (p. 654).

**Literature Review**

The following literature review will cover topics relevant to the present study with the assumption that the reader has little-to-no previous knowledge. The sections are organized to provide a foundational understanding of the histories, theories, and practices associated with each core component. First, meta-analysis as an investigative method will be discussed which will be followed by an overview of group therapy, pain, treatment of pain, and end with group therapy for pain. Within the discussion of meta-analysis, a basic definition will be provided and topics such as effect sizes, heterogeneity, publication bias, coding, and strengths/weaknesses will be discussed. For group therapy, a historical foundation will be set with a review of its evidence base, subtypes, dynamics, and models. The pain section begins with a core definition followed by biological explanations, theories, and specific medical indications such as fibromyalgia and chronic pain. Next, I present an overview of pain treatment and cover research involving pharmacological and nonpharmacological approaches. Finally, group therapy for pain is presented with an overview of relevant research studies categorized according to orientation.

**Meta-Analysis as an Investigative Method**

Meta-analysis is a technique used in the statistical synthesis of multiple, independent studies and is an analytical solution to the problem of underpowered studies (Hedges & Pigott, 2001). It is especially useful in detecting and identifying potential moderators which can explain
differences in effects between similar research objectives. Additionally, a meta-analysis can act as a quasi-replication from which generalizations about an effect of interest can be synthesized across studies (Hunter & Schmidt, 1990; Lipsey & Wilson, 2001). Because the probability of detecting a specific effect is different than the probability of detecting an overall population effect size, single studies with multiple tests tend to attenuate the true effect size (Cohn & Becker, 2003). Single studies are typically incapable of resolving contradictions in social science research; thus, meta-analyses are imperative in order to reveal confounding factors that suppress real impacts on substantive variables (Yang, 2002).

In meta-analyses, calculations are made to determine effect sizes describing the direction and strength of a particular study’s findings. These effect sizes are typically converted into a $d$, $g$, or $r$ statistic and provide a common metric used to make comparisons between studies and are (Berkeljon & Baldwin, 2009). The combination of statistical results from empirical studies allows for drawing conclusions based on more robust, generalized patterns found in aggregated data. If the included studies in a meta-analysis share a common underlying true effect size, they are classified as homogeneous; otherwise, they are referred to as heterogeneous. For studies deemed to be homogeneous, a fixed-effect model is typically used (Borenstein et al., 2009). When the studies are heterogeneous, a random-effects model is used (Riley et al., 2011). Because of this, assessing heterogeneity is essential in meta-analysis as different models may lead to different estimates of overall effect size and different standard errors. Additionally, the indications of heterogeneity or homogeneity can help researchers and practitioners make important decisions. For example, it adds clarity concerning whether the collected studies are similar enough to integrate results and whether a treatment is generalizable across all patients (Ioannidis et al., 2007).
Ideally, when heterogeneity exists in a meta-analysis, it should affect all included studies rather than being isolated to a smaller number of outlying studies. Outlying studies can have great impact on conventional heterogeneity measures which can threaten the validity and generalizability of the conclusions. Because of this, heterogeneity measures are expected to be robust, meaning, they should be minimally affected by outliers and accurately describe heterogeneity.

In meta-analysis, publication bias stands as an additional concern for validly coming to appropriate, generalizable conclusions. The idea behind publication bias is that studies with statistically significant findings are much more likely to be published than those reporting statistically non-significant findings (Begg & Berlin, 1988; Stern & Simes, 1997; Sutton et al., 2000; Thornton & Lee, 2000; Rosenberg, 2005; Kicinski et al., 2015). The result of this can often be an overestimation of the overall treatment effect. Because of this potential overestimation, examining publication bias is a critical step in meta-analysis. A traditional method for assessing publication bias is to examine the asymmetry of the funnel plot. Funnel plots depict the studies’ effect sizes vs. their corresponding precisions or standard errors (Light & Pillemer, 1984). When publication bias is present, the funnel plot is expected to be asymmetric. Because the visual examination is vulnerable to researcher subjectivity, Egger’s regression test and the trim-and-fill method are widely used to statistically test publication bias (Begg & Mazumdar, 1994; Duval & Tweedie, 2000). The trim-and-fill analysis is favorable because it both detects and adjusts for publication bias. It is important to note that trim-and-fill analyses make fairly strong assumptions about the treatment effects of potentially suppressed studies (Peters et al., 2007). Because of this, the adjusted overall effect estimate is considered as a type of sensitivity analysis.
It is important to note that the goal of a meta-analytical framework consists of more than just producing a common standardized effect size while accounting for publication bias and outliers. Specifically, meta-analyses also provide a clearer context for the common effect and synthesized results (Borenstein et al., 2009). This is typically accomplished via a process commonly referred to as coding. Coding is the detailed process of identifying specific variables of a study which may potentially moderate the studied relationship. A coding manual is comprised using the variables of interest which relate to the study aims along with a list of possible options usually associated with in past research with treatment outcomes. Examples of coding domains include study characteristics, group characteristics, client characteristics, and therapist characteristics. Within each of these domains, specific variables such as number of sessions, client age, disorder treated, therapeutic orientation, and measures used are coded.

Despite receiving criticism in the past concerning issues commonly referred to as, “the file drawer problem,” “garbage in, garbage out,” or “mixing apples and oranges” (Borenstein et al., 2009), meta-analysis remains a prominent research method for synthesizing results from studies examining similar topics. Though imperfect, meta-analytic techniques can lead to helpful, generalized conclusions which can be relied on more than those coming from a single study. In the present study, meta-analysis will be used to succinctly and effectively assess the relationship between group therapy and pain.

**Group Therapy**

The purpose of this section is to provide a basic background regarding group therapy and present the evidence supporting its efficacy for treating a variety of issues. Group therapy’s history will be outlined which will be followed by a brief review of research supporting group and its status as a specialty practice within the American Psychological Association (APA).
Following, a review will be provided regarding past group-specific meta-analyses and how it compares to outcomes of individual therapy. Finally, the various dynamics, models, and types of groups will be explored.

The history of group therapy paints a complex picture regarding its initial use, and it is difficult to determine who should be credited for its inception. For example, around the time Alfred Adler and Jacob Moreno began writing about group therapy, Sigmund Freud was already holding weekly meetings with his students in a therapeutic group setting (Barlow et al., 2004). Additionally, Joseph Pratt held group treatment classes for Tuberculin patients and emphasized recovery as a group dynamic within a homogenous population. During this same time period, Carl Jung encouraged Bill Wilson to start Alcoholics Anonymous (AA) meetings. Foulkes and Bion also used groups during World War II to work with army personnel struggling with neurotic disorders and combat fatigue (Harrison & Clarke, 1992). In perspective, multi-person treatment was occurring long before influential figures such as Irvin Yalom or Rollo May began to popularize group therapy. Taken together, group treatment’s long-standing presence in society creates a narrative suggesting that it is more than a modality created by a single individual and is not a fleeting fad.

Over the past three decades, an increasing number of studies have been published which examine group’s efficacy in treating various psychological disorders (Corey, 2012; Hopper et al., 2008). In 2018, the American Psychological Association (APA) recognized group treatment as a specialty practice that “requires advanced knowledge and skills acquired through an organized sequence of education and training” (American Psychological Association, 2019). This indicates that, through extensive evaluation, independent scholars have deemed group therapy to be sufficiently mature based on the empirical, theoretical, and clinical literature on small group
treatments. Thus, group has joined other evidence-based specialties such as neuropsychology, clinical psychology, and forensic psychology.

Contributing to this strong foundation of empirical evidence is 10 published, group-specific meta-analyses that collectively summarize 329 randomized clinical trials (RCTs) involving nearly 27,000 patients. The majority are also disorder-specific summarizing group’s efficacy for social anxiety disorder (Barkowski et al., 2016), panic disorder (Schwartze et al., 2017), obsessive-compulsive disorder (Schwartze et al., 2016), eating disorders (Grenon et al., 2018), substance use disorder (Lo Coco et al., 2019), mood disorders (e.g., major depressive disorder, bipolar disorder; Janis et al., 2021), schizophrenia (Burlingame et al., 2020), borderline personality disorder (McLaughlin et al., 2019), and post-traumatic stress disorder (Schwartze, et al., 2019). These meta-analyses are compelling and offer strong support for a wider acceptance and use of group treatment. Specifically, the analyses including waitlist control and active treatment comparisons provide the strongest evidence for group’s efficacy. Additionally, the effect sizes correspond with clinical practice demonstrating small improvement for chronic and difficult disorders (e.g., schizophrenia, substance use, borderline personality disorder) and larger effects for common anxiety and mood disorders.

Prior to the recognition as a specialty, Burlingame and colleagues (2016) conducted an important meta-analysis involving 67 controlled trials contrasting the group and individual therapy formats. Their main finding was clear that, “when identical treatments, patients and doses are compared, individual and group formats produce statistically indistinguishable outcomes” (Burlingame et al., 2016, p. 457). More specifically, rates of acceptance, attrition, improvement, and recovery were found to be equivalent between the formats. These findings support earlier statements that group psychotherapy is a practical and cost-effective mode of
treatment (Burlingame et al., 2003; Corey, 2012). It is important to note that this meta-analysis also contributed to a greater understanding of mixed findings that have historically complicated format outcome conclusions. Specifically, allegiance effects were found to lend explanation as to why some studies find differences between formats which may favor either individual or group treatment. Interestingly, only in nonidentical treatment studies was allegiance found to be a significant moderator. This suggests that findings from identical treatment RCTs will be the best resource for practice guidelines in clinical work because these types of studies have shown to be less affected by allegiance.

In their most recent chapter on efficacy of small group treatments, Burlingame and Strauss (2021) outline the three major type of therapeutic groups: leaderless, psycho-educational, and psychotherapy. Figure 1 depicts these three types of groups and the various subtypes or examples associated with them. In leaderless groups, the primary goal is to support individuals dealing with a common challenge. Although these types of groups are fairly popular in the U.S., their prevalence in the literature is sparse. The most well-known example in this category, however, is 12-step groups which tend to follow a more structured format and have been empirically examined and found to be a helpful stand-alone treatment for addictive disorders (Bekkering et al., 2016).

For psychoeducation groups, the primary goal revolves around providing information and teaching skills to help group members manage their illness. This type of group is commonly found in medical settings and inpatient treatment centers. The structure of this group type usually involves lecture-style instruction to provide members with a better understanding of the physiological properties associated with their illness. Behavioral changes are also emphasized and presented to the group members with a rationale of how following the implementation of
these changes may lead to an improvement in their quality of life. In short, their purpose is to disseminate disease management and lifestyle information as well as provide training in behavioral strategies.

**Figure 1**

*Major types of therapeutic groups and their subtypes*

Finally, psychotherapy groups can be categorized into two different subtypes: *manualized* and *model-based* groups. Manualized groups are usually conducted within a certain amount of sessions and rely on a specific theoretical orientation such as cognitive behavioral therapy (CBT). These types of groups usually operate under goals that stem from the whole group as well as from specific sessions. Because there are clear session goals and interventions, treatment fidelity ratings are easier to obtain with these groups. In contrast, model-based groups are based
on individual members in addition to the developmental stage of the group-as-whole and are thus less structured than manualized protocols as they rely more on principle-based intervention.

Given the nature of multi-person treatment and the inherent variety of dynamics associated with treating more than one person simultaneously, researchers have examined role of these dynamics in therapy and how they relate to outcomes. Traditionally, researchers and practitioners have referred to a five-factor model (see Figure 2) which was proposed in an effort to best explain factors which have been associated with positive outcomes of group (Burlingame, et al., 2004). Although these factors are discussed as distinct elements, each describes different aspects of group therapy change process and are mutually dependent and interact with each other. These factors include patient characteristics, leader characteristics, structural factors, formal change theory, and small group processes. As seen in past meta-analyses, these factors usually make up the overarching categories for potential moderating variables and will provide the theoretical foundation for the categories that will be coded in the present study.

The first factor, patient characteristics, includes internal and external factors which have been associated with successful outcomes in group therapy. These are factors unique to each group member and can be accounted for via typical intake processes. Examples of internal factors include patient motivation, diagnosis, presenting problem, or interpersonal skill level. External factors include life changes such as moving, scheduling conflicts, or lack of transportation, which can prevent them from regularly attending group (Burlingame et al., 2004; Yalom & Leszcz, 2005).

The second factor is group leader characteristics. Past research has suggested that group leaders who show traits such as empathy, acceptance, openness, and warmth, and who model appropriate self-disclosure and feedback, create a positive therapeutic group culture which often
leads to favorable outcomes (Braaten, 1989; Yalom & Leszcz, 2005). In addition, experience level and leadership style are also important contributors to this factor.

Third, structural factors within group treatment, include aspects of the group such as frequency and duration of sessions, location, setting, whether the group is led by a single leader or co-leaders, and group size. Each of these has been found to interact with specific group processes (e.g., member-to-member interactions) and/or member outcome (Burlingame et al., 2004; Yalom & Leszcz, 2005).

**Figure 2**

*Therapeutic outcomes of group treatment*
The fourth factor, formal change theory, involves specific models or therapeutic orientations (e.g., cognitive behavioral, psychodynamic, interpersonal, or humanistic). Interestingly, cognitive behavioral approaches are the most frequently used in the group therapy literature and meta-analyses have found this factor to be a significant moderator (Burlingame et al., 2018). This factor is important to consider because it has the potential of measuring the effectiveness of particular orientations within group treatment which can lead to a clearer picture regarding the most effective approaches to be used in a group setting.

Finally, the fifth factor is small group processes. These are empirically supported features unique to multi-person treatment and are frequently associated with client outcome. Examples of small group processes include development of socializing techniques, imparting information, instillation of hope, interpersonal learning, family reenactment, group cohesiveness, and universality (Yalom & Leszcz, 2005). Over the past decade, meta-analyses have been conducted regarding small group processes such as cohesion which yielded a moderate effect ($d = .56$; Burlingame et al., 2018), and alliance which yielded a small effect ($d = .38$; Alldredge et al., 2021).

Among these group properties, group cohesion stands out as a salient factor across the majority of models including Burlingame et al.’s (2008) group anatomy and physiology model. This model places the emphasis of change in group psychotherapy on both form (which they term “anatomy”) and function (“physiology”) of the group. In this, they illustrate that a group facilitator’s knowledge of group dynamics is similar to a physician’s knowledge of physiology. Just as living organisms are composed of anatomical forms and physiological functions, groups (and their outcomes) are shaped by their structure and processes. Cohesion, for example, is included within the “physiology,” or function, of a group as a result of direct member and leader
interactions. Examples of these interactions include interpersonal feedback, self-disclosure, and leader interventions which have all been shown to positively impact outcome (Burlingame et al., 2008).

Similar to the anatomy and physiology model, Yalom and Leszcz (2005) proposed a series of eleven factors explaining change in group treatment. These therapeutic factors highlight various processes and experiences of the group as a whole and for individual members which impact treatment outcome. These included factors such as feelings of being similar to others (Universality), an increase in hope that issues will be successfully addressed (Instillation of Hope), a relief from tension (Catharsis), and a sense of group togetherness (Group Cohesiveness).

Taken together, the previous paragraphs have highlighted the complexity found in group therapy and how group dynamics affect its process and outcomes. They have also illustrated that despite this apparent disadvantage, group is consistently found to be a viable treatment option for a variety of disorders and is simply more cost effective. Yalom and Leszcz (2020) concisely summarize group’s status as a mode of therapy by describing it as a “triple E treatment” when delivered by trained therapists. More specifically, they state that group is effective when compared to no-treatment, it is equivalent to other empirically based treatments including individual therapy, and it is more efficient in terms of therapist time and cost when compared to individual therapy. Indeed, it appears that group has “come of age” and should rely on its strong foundation of empirical evidence to support the wide use of empirically supported group treatments (ESGTs; Burlingame & Strauss, 2021).
Pain

An early definition of pain in modern medicine describes pain as an aversive, personal, subjective experience, influenced by cultural learning, situational context, and attention which interferes with regular behavior and drives to stop the pain (Melzack & Wall, 1965). The International Association of the Study of Pain (IASP) describes pain as an “unpleasant sensory and emotional experience that is linked to either actual or potential tissue damage” (Merskey & Bogduk, 1994, p. 210). Both definitions highlight the presence of an unpleasant sensation with a strong emphasis on the psychological features of pain to highlight its highly subjective nature.

In understanding pain, it is important to consider the biological processes involved in the sensation of pain. Regarding these biological processes, two categories have been described in past research: nociceptive pain and neuropathic pain. The first, nociceptive pain, involves either external stimulation or tissue damage (Flor & Turk, 2015). Receptors known as nociceptors are responsible for the sensation of nociceptive pain when activated. Nociceptors can be activated and/or damaged through three different means: thermal stimulation (e.g., excessive heat or cold), chemical stimulation (e.g., contact with hazardous substances), or mechanical stimulation (e.g., excessive pressure or breaks in the tissue). The spinal cord acts as a channel for various signals to be transmitted which activate inflammation at the site of the injury. Simultaneously, messages are sent immediately from the spinal cord to activate muscular spasms in order to avoid additional injury. During this process, the cortex is bypassed in order to ensure that the body can respond to the injury quickly. The sensation of pain is typically isolated to the injury site and does not result in multiple sensations of pain.

The second category of pain, neuropathic pain, is experienced following damage to the somatosensory system (Geber et al., 2008). The initial physiological response is similar to the
nociceptive pain. However, neuropathic pain involves nerve damage and results in different pain-related sensations. For example, this type of pain has been described as tingling, shooting, burning, and electrical type sensations. Research has described neuropathic pain to be more severe than nociceptive pain and, as a result, is more difficult to treat (Schmidt et al., 2009).

The general prevalence of nociceptive pain is greater than neuropathic pain and past research has indicated that it ranges between 7-8% (Bouhassira et al., 2008). Neuropathic pain, however, accounts for greater use of healthcare services (Breivik et al., 2006; NICE, 2013). It is important to note that neuropathic and nociceptive pain can co-occur in conditions such as back pain and cancer pain which can go on to become chronic. The main difference between acute and chronic pain (which will later be discussed in depth) is duration. In cases of chronic pain, stimulation of pain-related nerves and spasms continue as if the body is still reacting to an injury in the absence of external stimulation.

**Theories of Pain**

The following are the most prevalent and influential models of pain as outlined in the literature. The first three models: biopsychosocial, gate control theory, and behavioral are important to understand in order to gain a sufficient background of pain models. Because the fear-avoidance model has been the subject of the most investigation and is commonly used as the theoretical base for cognitive-behavioral approaches aimed at treating pain, it will be given the most attention. While there may be other models of pain beyond the ones presented here, they are outside the scope of the present study.

**Biopsychosocial model.** First introduced by Engel (1977), the biopsychosocial perspective is complex as it proposes that the experience of pain is determined by the interaction of biological, psychological, and social factors. The psychological factor is made up of cognitive,
affective, and behavioral processes. The social factor involves the social and cultural contexts which influence the perception and response to physical symptoms. Compared to earlier theories, this model includes a multidimensional understanding of pain. The following theories and models have stemmed from the biopsychosocial model which acts as an overarching theory of pain. The biopsychosocial model has helped lay the foundation to current conceptualizations regarding how acute pain can become chronic (Lumley et al., 2011).

**Gate control theory.** When first introduced, the gate control theory was revolutionary as it went against the idea of a “hard-wired system” that results in chronic pain (Melzack & Wall, 1965). Specifically, the authors suggested an approach which combined both biological and psychological elements involved in sensations of pain. Dating back to Descartes in the 1600s, pain was previously thought of as a reflex in response to direct, external stimulation and viewed as an association between a noxious stimulus and the pain or injury (DeLeo, 2006). The gate control theory provided an explanation as to how sensations of pain are not directly linked to the extent of tissue damage or external stimulation. This theory proposes that signals from injury sites are sent to the brain through nerve fibers to the dorsal horn in the spinal cord. At this point, a gating mechanism is either opened or closed depending on the type of nerve that is excited. The gating mechanism is thought to be vulnerable to the influences of emotional reactions. Accordingly, high levels of expressed emotion lead to a wider opening of the gate which leads to greater signals and experience of pain. The link between emotional and biological processes has been demonstrated and the theory has received support based on findings from neuro-imaging research (Main, 2013). Although this theory is oversimplified and does not accurately describe the neuronal structure within the spinal cord, there is evidence to suggest that brain stem plays a critical role in sending modulated pain messages (Nathan & Rudge, 1974).
Behavioral model. In the behavioral model, operant conditioning stands as the key principle regarding the maintenance of pain behaviors (Fordyce et al., 1973). Pain behaviors are conceptualized as any behavior that occurs in response to pain such as verbal agitation, altered gait, avoidance of activities, and requesting/taking medication. The main idea is that receiving sympathetic responses (e.g., providing comfort or reassurance) from others to these pain behaviors leads to reinforcement through operant conditioning. Once reinforced, individuals then demonstrate pain behaviors as signals to others regardless of whether pain was actually experienced. It is thought that when pain behaviors are not reinforced then the frequency of these behaviors decreases as a form of extinction.

Fear-avoidance model. The fear-avoidance model is based off of the early work of Lethem et al. (1983), Philips (1987), and Waddell et al. (1993) which was proposed by Vlaeyen, Kole-Snijders, Boeren, and van Eek (1995) and Vlaeyen and Linton (2000). The model is consistent with the notion that pain perception is a multifaceted experience consisting of sensory and emotional responses and provides a theoretical explanation regarding why some individuals develop chronic, exaggerated pain beyond what would be expected based on physiological abnormalities alone (Crombez et al., 2012). The basis of the fear-avoidance model is that an individual may avoid tasks such as movement, leisure activities, and social interactions due to the fear that it will lead to increased levels of pain. The fear is underpinned by catastrophic thinking whereby individuals make predictions about the nature and consequences of the pain. Catastrophizing was first introduced by Ellis (1962) to describe the anxious process of ruminating about extreme negative consequences of a threatening stimulus and pain catastrophizing can be described as the cognitive interpretation of pain as being highly threatening (Leeuw et al., 2007). Another common fear is that pain is an indication of injury and
damage that will inevitably lead to disability and the pain can only be treated with medications (Crombez et al., 2012). These catastrophic thoughts typically lead to a fear of experiencing pain, hyper vigilance to pain sensations, and avoidant behaviors in anticipation of experiencing pain. When pain is perceived as an indication of injury or sign of pathology that is outside of one’s realm of control, pain-related fear has been observed to increase in severity (Crombez et al., 2012; Vlaeyen & Linton, 2012). Figure 3 depicts Vlaeyen and Linton’s (2000) conceptualization of how catastrophizing leads to pain-related fear, which leads to avoidance and/or hypervigilance, which then leads to disuse, depression, and/or disability.

**Figure 3**

*The fear-avoidance model*

Because behavioral avoidance is the most common behavior observed in response to pain (Hasenbring & Verbunt, 2010), the cycle of fear and avoidance can exacerbate an individual’s functional impairment through disuse as well as emotional distress. Specifically, Thieme and Turk (2012) found that anticipation of pain related to a physical activity can act as a trigger for the avoidance of that activity which often leads to the extinction of that physical activity altogether. Additionally, avoidance may lead to disability through the development of disuse syndrome, in which inactivity actually weakens the musculoskeletal and cardiovascular systems.
(Leeuw et al., 2008; Wideman et al., 2013). This, in turn, increases the likelihood that an individual will develop a persistent physical problem and eventual disability (Pincus et al., 2010; Verbunt et al., 2010).

Regarding emotional distress, avoidance often leads to the inability of engaging in normal social roles which is associated with individuals’ overall sense of wellbeing. The less one engages in valued activities, the less likely they are to have positive emotional experiences and the more likely they are to experience isolation and distress (Crombez et al., 2012). Because of this, inactivity has been observed to negatively impact psychological functioning. Additionally, one’s exposure to positive social reinforcers is reduced through isolation which also negatively impacts mood. As a result, depression and physical disuse have been observed to decrease one’s pain tolerance which perpetuates the vicious cycle that defines the fear-avoidance model.

Since its introduction, the fear-avoidance model has become the dominant framework used to explain the development and maintenance of pain-related disability among individuals with musculoskeletal pain even though past research findings have been mixed (Wideman et al., 2013). For example, past studies have found evidence that pain-related fear is associated with impaired physical performance and increased self-reported disability (Klenerman et al., 1995; Heuts et al., 2004; Nederhand et al., 2004). Other studies have found that approximately 40% of individuals with fibromyalgia have high levels of fear of pain and movement (Nijs et al., 2013; Turk et al., 2004; van Kouilil et al., 2008). These findings have been supported by recent studies finding evidence of neurobiological mechanisms at play in the fear and anticipation of pain (Ellingsen et al., 2018) and outcomes being significantly associated with pain catastrophizing and activity engagement (Miró et al., 2018). Cognitive-behavioral interventions among pain populations targeting fear-avoidance have demonstrated decreased pain catastrophizing, pain-
related fear, and disability (de Jong et al., 2011; den Hollander et al., 2010). On the other hand, some studies have found that catastrophic thoughts did not occur prior to the development of pain-related fear, and that changes in fear did not precede changes in depression (e.g., Bergbom et al., 2012).

Despite mixed findings concerning the directional pathways within the fear-avoidance model, it has been found to be fairly well-accepted by patients (Crombez et al., 2012). More specifically, patients report that it is easy to understand and reflects their perceived experience. The fear-avoidance model has also guided the development of treatment interventions as CBT treatment studies with chronic pain patients have shown that managing catastrophizing beliefs reduces the likelihood of disability and depression (Smeets, Vlaeyen, Kester, et al., 2006; Spinhoven et al., 2004).

**Types of Pain-Related Chronic Conditions**

**Fibromyalgia (FM).** Fibromyalgia (FM) is a chronic condition that is estimated to affect between 1 and 11% of the general population, with the prevalence observed to increase with age (Giacomelli et al., 2014; McBeth & Mulvey, 2012; Wolfe et al., 1995; Häuser et al. 2015). Approximately 10 million people are estimated to suffer from FM in the United States (which is 2% of the adult population) along with an estimated 3-6% of the world population. FM is more prevalent in women than men in a ratio of 9:1 (Yunus, 2001). One potential explanation of this differential prevalence is that women have lower thresholds for pain and typically experience more fibromyalgia-related symptoms (Wolfe et al., 1995). FM is also the second most common rheumatologic disorder, behind osteoarthritis (Clauw & Chrousos, 1997).

Despite widespread prevalence, FM is considered to be under-diagnosed and under-treated. Diagnosis time in the U.S. is 5 years on average after onset. (Arnold et al., 2011; Clark et
al., 2013). On a more global scale, a survey study involving 800 patients with FM and 1622 physicians in 6 European countries, Mexico, and South Korea found that patients waited an average of nearly one year after experiencing an onset of symptoms before presenting to a physician (Choy et al., 2010). Additionally, it took an average of 2.3 years and meeting with 3.7 different physicians before being diagnosed with FM. Another issue is that many patients are misdiagnosed and treated for other medical problems prior to receiving an FM diagnosis (Berger et al., 2007).

FM consists of various symptoms with the primary symptom being widespread musculoskeletal pain (Wolfe et al., 1990). More specifically, individuals with FM report experiencing allodynia (pain perceived in the absence of noxious stimuli) and hyperalgesia (exaggerated pain response in the presence of noxious stimuli). Additionally, most individuals with FM report experiencing chronic fatigue and various forms of sleep disturbance, including poor overall sleep, frequent awakenings, difficulty falling asleep, morning stiffness, and exhaustion after awakening (Bennett, 2009; Wolfe et al., 2010; Hawkins, 2013; Moldofsky, 2009). Interestingly, sleep studies have shown that FM-type symptoms can be induced in healthy individuals through sleep deprivation (Yunus, 2007).

Other common FM symptoms include cognitive and bowel dysfunction (Okifuji & Hare, 2013). The cognitive dysfunction observed in FM patients has been coined “fibro-fog” and typically includes episodes of short-term memory loss and concentration difficulties. In addition to the physical symptoms, individuals diagnosed with FM are more likely to experience almost all forms of mental illness compared to the general population and the relationship between FM and psychological issues is bi-directional (Fietta et al., 2007; Wolfe et al., 2013; Hawkins, 2013). Most notable among these psychological issues is depression, anxiety, and general difficulties in
coping with stressors (Hawkins, 2013). It is important to note that nearly half of FM patients present with depression and anxiety (Yunus, 2007).

Although the etiology of FM is unknown, past research has found links to genetic and environmental risk factors. For example, findings from multiple studies have suggested that there is a strong familial occurrence of FM (Chakrabarty & Zoorob, 2007; Clauw, 2009; Mease, 2005; Park et al., 2001) Specifically, first-degree family relatives of individuals with FM are eight times more likely to develop FM compared to the general population (Clauw, 2009). In genetic studies, the catechol-O-methyltransferase gene and the dopamine D4 receptor gene have been shown to play a role in FM (Bellato et al., 2012) although there are no agreed-upon biomarkers for reliable use in clinical practice (Giacomelli et al., 2014). Past research has also identified various environmental triggers associated with the development of FM which include trauma (Jones et al., 2011), psychological distress (Robinson et al., 2004), genetic predisposition, and dysfunctional pain processing (Staud et al., 2009).

The cost of FM is high for individual patients as well as for society in general as patients with FM are high utilizers of the healthcare system (Turk & Okifuji, 2002). Berger and colleagues (2007) found that FM patients visited the doctor 4 times more frequently than a typical adult and were 4 times more likely to seek emergency room services. Additionally, 34% of FM patients spend between $100 - $1000 out-of-pocket per month to receive treatment (Berger et al., 2007).

Approximately 30% of FM patients work shorter hours and exert less physical effort to maintain employment. In addition, approximately 15% receive disability funding because of their symptoms. As a result, the direct cost to the U.S. economy is over $16 billion annually, which is 1-2% of the nation’s overall productivity. Past studies have found that employees with
FM have an average, annual cost of $10,199 to their employers which is double the cost of matched controls (White et al., 2008). Similar financial burdens have been found in Canada and France (Lacasse et al., 2016; Perrot et al., 2012).

**Chronic pain.** Chronic pain not classified as fibromyalgia is one of the most common reasons individuals seek medical services in the United States and impacts between 50 – 100 million Americans (Institute of Medicine, 2011; Dahlhamer et al., 2018; Nahin, 2015). Chronic pain is more prevalent in women and the elderly affecting approximately 45 - 80% of older adults (Maxwell et al., 2008; van Hecke et al., 2013). Being retired, out of work, or living on low wages has also been linked with increased risk of experiencing chronic pain (Flor & Turk, 2015).

According to ICD-11’s criteria, chronic pain is classified as pain lasting longer than three months or past the time of normal tissue healing (Treede et al., 2015) with some studies finding that 78% of patients continue to experience the pain after a four-year follow-up (e.g., Smith et al., 2001). Consistent with the literature, chronic pain can be viewed as an overarching classification for a number of different musculoskeletal issues variably defined based on the perceived location, etiology, or the primary affected anatomical system (e.g., arthritis, myofascial pain, nonspecific low back pain, neck pain, headaches, joint pain, stomach pain, etc.; Treede et al., 2015). Although arthritis, herniated/deteriorating discs, low back pain, and neck pain have been reported to make up the majority of chronic pain (National Center for Health Statistics, 2017), approximately one-third of patients do not have a formal diagnosis nor an obvious injury which has caused them to experience pain (Breivik et al., 2006).

The subjective experience of chronic pain differs greatly based on a number of variables which can be unique to individuals such as cause, location, and physical sensations. Although primary symptoms in chronic pain include the subjective experience of pain, there is a range of
secondary symptoms that may arise which are linked to pain. Chronic pain is often accompanied by limited physical functioning which severely reduces quality of life due to the impacts it has on recreational activities and occupational responsibilities (Smith et al., 2001; Naylor et al., 2012). Individuals experiencing chronic pain are more likely to report greater emotional distress, poorer physical functioning, poorer sleep, diminished social interactions, and greater use of health care services (Dahlhamer et al., 2018; McCarberg et al., 2008; Nahin, 2015; Vowles et al., 2015). Breivik and colleagues (2006) conducted a large community-based survey and found that 47% of chronic pain suffers felt that it limited their social life, 54% struggled with household chores, 65% had trouble sleeping, 48% had to change jobs or were unable to work, 73% struggled with exercise, 27% struggled to maintain relationships with family or friends and 21% received a diagnosis of depression. These findings highlight the heavy burden of chronic pain which includes psychosocial issues in addition to physical discomfort.

In research specifically investigating the link between mental health difficulties and chronic pain, prevalence rates have been well established in both community and clinical samples (Gormsen et al., 2010; Kroenke et al., 2013; Lerman et al., 2015). For example, the prevalence of comorbid chronic pain and psychological distress has been estimated as 35% for anxiety and 40-50% for depressive symptoms (McWilliams et al., 2003; Tunks et al., 2008). When depression is comorbidly present, future episodes of pain are predictable and patients experience greater pain complaints, amplification of symptoms, and longer durations of pain (Bair et al., 2003). Rudy and colleagues (1988) argued that depression and chronic pain results from a “perceived reduction in instrumental activities along with a decline in perception of control and personal mastery” (p. 129). Other researchers have suggested a diathesis-stress framework to highlight possible genetic explanations (Banks & Kerns, 1996). Specifically, their
argument is that certain genes can lead to the expression of both mental health and chronic pain difficulties based on an interaction between genetics and environmental influences.

The annual cost of chronic pain in the U.S. has been estimated to be between $560 to $635 billion which is greater than the annual cost of heart disease, cancer, and diabetes (Gaskin & Richard, 2012). Because chronic pain frequently results in high rates of sick leave, the value of lost productivity due to pain is estimated to be between $299 to $335 billion. Chronic low back pain is one of the leading causes of all physician office visits and is the second most common cause of long-term disability in adults causing pain and restricting physical activity (Meucci et al., 2015; Freburger et al., 2009).

Overview of Pain Treatment

Although there is currently no consensus on a standard of treatment, accepted treatments for chronic pain and fibromyalgia have typically included pharmacotherapy, behavioral interventions (e.g., exercise), and psychological treatments (McBeth & Mulvey, 2012). Given the complex nature of these chronic health conditions, the primary aims of intervention include reducing the speed of deterioration, improving the management of symptoms, and increasing quality of life (QoL; Naylor et al., 2012; Nolte & McKee, 2008; Arnold et al., 2004; Snyder & Handrup, 2018). Because of this, a greater emphasis has been placed on psychological-based interventions in recent years to mitigate comorbid emotional distress and improve QoL.

In an early meta-analysis, the efficacy of 49 pharmacological and non-pharmacological treatments of FM was evaluated and compared by looking across four different outcome domains: physical status, self-report of FM symptoms, psychological status, and daily functioning (Rossy et al., 1999). Results indicated that non-pharmacological treatments demonstrated significant improvement in all four areas and had significantly larger effect sizes
for FM symptoms and daily functioning. Non-pharmacological treatments were also shown to be significantly better than pharmacological on self-report symptoms. Although use of antidepressants was shown to improve physical status and self-report of FM symptoms, none of the pharmacological treatments significantly improved daily functioning.

A common struggle among both pharmacological and nonpharmacological interventions for pain has been the issue of heterogeneity. Specifically, pain is heavily heterogeneous regarding symptom presentation and treatment response. Some researchers have concluded that heterogeneity is largely responsible for high attrition rates and the small to moderate effect sizes generally observed in RCTs examining pain treatments (e.g., van Kouil et al., 2008). This adds merit to the idea of taking a patient-centered and a customized approach to treatment when working with pain (Ablin et al., 2013). To address this, past research has suggested that it is essential to tailor efficacious treatments for pain in order to fit the individual’s unique presentation (McCarberg, 2012; Pincus et al., 2010).

The following sections will highlight three main approaches to pain treatment: traditional medical approaches, alternative approaches, and psychosocial approaches. Because nonpharmacological, psychosocial approaches are the focus of the present study, the most relevant orientations will be reviewed more extensively. Specifically, I will focus on behavioral, cognitive-behavioral, graded in-vivo exposure, and self-management therapies.

**Traditional Approaches**

Patients presenting with pain-related symptoms at primary care services have typically been treated under a biomedical approach in attempt to relieve the pain symptoms (Okifuji & Hare, 2013; Ehde et al., 2014). Historically, medical treatments for pain have relied on opioids although the long-term use of prescription opioids has been shown to increase the risk of misuse,
abuse, and opioid-related overdoses (Dowell et al., 2016; Volkow & McLellan, 2016; Rose, 2018). In Seth and colleagues’ (2018) report, they indicate that 66.4% of the 63,632 overdose deaths in 2016 in the U.S. involved an opioid. Other common medical treatments include surgical interventions, physiotherapy, and spinal stimulation-induced analgesia (Ehde et al., 2014).

Goldenberg, Burckhardt, and Crofford (2004) ranked and reviewed commonly used pharmacological treatments in controlled studies on fibromyalgia. They found strong evidence regarding the benefit of Tricyclics (amitriptyline and cyclobenzapine) in overall well-being and improved sleep. They also found and modest evidence of improved well-being for Tramadol, and selective serotonin reuptake inhibitors (SSRIs). Of note, opioids, benzodiazepine, corticosteroids, and non-steroidal anti-inflammatory drugs (NSAIDS) were shown not to be effective.

Sarzi-Puttini and colleagues (2008) also examined the efficacy of a variety of pharmacological and non-pharmacological interventions. In their review, few drugs showed any benefit and there were limitations with the ones that did. More specifically, opioids helped with pain but were accompanied by a number of side effects and introduced tolerance. Pregabalin (Lyrica), an antiepileptic drug, was shown to be superior to placebo when the side effects could be tolerated. Antidepressants such as amitriptyline and cyclobenzaprine were found to improve sleep but could not be tolerated by a majority of patients. This is consistent with a more recent systematic review in which Häuser and colleagues (2012) found that antidepressants were shown to provide substantial relief for only a small number of individuals while the majority dropped out of studies due to small benefits and intolerable side effects.

Past and recent meta-analysis create a complex picture regarding the efficacy and safety of opioid use for pain management. An earlier meta-analysis looking at changes in the intensity
of noncancer chronic pain using opioids found medium effects for pain relief and small effects for functional outcomes (Furlan et al., 2006). It is important to note that the authors found statistically significant side-effects to include constipation, nausea, dizziness, drowsiness, dry skin, vomiting, and pruritus.

In a more recent meta-analysis involving 15 enriched enrollment randomized withdrawal studies and reported only a small effect on pain intensity (Meske et al., 2018). The authors also indicated that no significant effects were found for mental function while only “minor benefits” were found for physical functioning. According to the authors’ conclusions, their results demonstrate a general effectiveness because the majority of patients had a clinically meaningful response but their review does not support the use of opioids alone to improve physical function.

**Alternative Approaches**

It is important to note that chronic pain patients have been found to be more likely to use alternative medicine when compare to the general population (Lind et al., 2007). Although international clinical guidelines for chronic pain recommend the use of multidisciplinary holistic approaches, specific recommendations are sparse (Pillastrini et al., 2012). Alternative intervention strategies have included meditation, injection-based treatments, lifestyle modifications, massage, laser therapy, and physical therapy (Ekici et al., 2017).

**Psychosocial Approaches**

In response to the growing concern around the tolerability, abuse, and misuse of opioids (Miller-Matero et al., 2019; Dowell et al., 2016; Volkow & McLellan, 2016; Eccleston et al., 2013), the Centers for Disease Control and Prevention’s (CDC) guidelines recommend that the treatment of chronic pain move away from the use of opioid medications. This shift in guidelines
has been met with an increase in research on psychological interventions that target both pain and psychological issues (Dowell et al., 2016).

The following subsections will highlight the various empirically based treatments commonly used in treating pain. These treatments are used as both stand-alone treatments as well as supplementary treatments to pharmacological interventions. Although there are many different treatment orientations that could be covered, only those that are most prevalent in the literature will be reviewed here.

**Behavioral therapy.** The aim of behavioral therapy is to reduce “pain behaviors” with the use of operant conditioning while simultaneously attempting to increase “well behaviors.” In their meta-analysis, Morley and colleagues (1999) found that behavioral therapy led to decreases in the frequency and intensity of pain behaviors, reduced anxiety, and increased social functioning when compared to waitlist controls. Mazzucchelli and Da Silva (2016) conducted an exploratory review concerning behavioral activation as an approach to treating pain. They indicated that based on conditioned underpinnings contributing to the maintenance of pain, behavioral activation stood as a strong theoretical match for chronic pain treatment. They also presented the findings from past studies which used behavioral therapy to reduce pain behaviors and increase well behaviors (Nicholas et al., 1991; Kole-Snijders et al. 1999).

Specific research examining behavioral-based treatments has focused on operant-behavioral therapy (OBT; Thieme et al., 2003; Thieme & Turk, 2012). The primary aims of OBT include the extinction of pain behaviors, reduction of medication use, increased physical activity, reduction of interference by pain, and training in assertive pain-incompatible behaviors. Thieme and colleagues (2003) compared OBT to treatment-as-usual in a group of fibromyalgia participants and found that participants who received OBT showed a significant reduction in pain
intensity and interference, pain behavior, medication use, and improved sleep at posttreatment and at 6- and 15-months follow-ups.

Despite promising results in past research, studies have also found high rates of relapse following behavioral treatment programs which may suggest that the target of treatment does not fully address the underlying factors maintaining pain symptoms (Sharp, 2001). This is consistent with Henschke and colleage’s (2010) Cochrane review of 30 articles examining efficacy of behavioral treatments for chronic low back pain which found that although behavioral treatments were more effective than usual care for pain at post-treatment, these differences disappear at intermediate- to long-term follow up on pain and functional status outcomes. A major gap in the literature shows that the idea of “pain behaviors” is ill-defined and the notion that they are dysfunctional is not substantiated. Additionally, the aim to extinguish behaviors is not often shared by patients and can lead to complexity in interpreting outcome data.

Cognitive-behavioral therapy. While there is no standard CBT protocol for pain nor consensus concerning treatment length and utilization of specific techniques, the primary points of intervention tend to include cognitive restructuring and behavior change (Tang, 2018). Cognitive restructuring is the process of an individual actively changing the thoughts and beliefs they have concerning their pain. Techniques typically include pacing, setting and working toward goals, activity scheduling, behavioral activation, psychoeducation, problem solving, and relaxation strategies (Thorn, 2004). CBT subscribes to the fear-avoidance model as a valid explanation of where therapy can intervene. Focusing on catastrophic thinking, pain beliefs, and self-efficacy has been shown to result in physical functioning improvement (Jensen et al. 2001; Jensen et al., 2007; Vowles et al., 2007). CBT also usually includes between-session activities to
practice and apply new skills (e.g., completion of thought records, relaxation practice, work toward behavioral goals).

Over the past three decades, CBT has been investigated in a variety of pain-related populations such as fibromyalgia, chronic back pain, headaches, orofacial pain, and arthritis-related pain which has led to its wide use as the primary psychotherapy intervention for pain management (Morley et al., 2008; Williams et al., 2012; Ehde et al., 2014; Yoshino et al., 2019). Multiple studies have historically found strong effects for CBT in improving mood and reducing pain intensity and disability (Eccleston et al., 2013; Glombiewski, Hartwich-Tersek, et al., 2010; Williams et al., 2012). Although effect sizes are typically small to moderate, CBT does not leave patients vulnerable to the risks associated with medications and surgeries. Benefits of CBT have also been supported through neuroimaging studies, where enhanced functioning linking frontal brain region function with therapeutic improvements (Jensen et al., 2008). Additionally, third wave approaches related to CBT such as acceptance and commitment therapy (ACT) have produced positive effects on attentional bias, increasing acceptance of pain, life satisfaction, and decreasing pain intensity, depression, and anxiety for chronic pain (Thorsell et al., 2011; Zgierska et al., 2016).

In their recent meta-analysis, Bernardy and colleagues (2018) evaluated the efficacy, acceptability, and safety of CBT-based treatments for pain. Using 29 RCTS, they found that CBT-based treatments were superior to controls in pain relief of 50% or greater, improvement of health-related QoL of 20% or greater, and in reducing negative mood, disability, and fatigue. No differences were observed between CBT-based treatments and controls regarding acceptability and safety. In sum, they found that CBT was effective in reducing key symptoms and disability in FM patients in the short- and long-term when compared to all other control conditions.
(waitlist, TAU, attention controls, active pharmacological therapies). The same authors published another meta-analysis a year later (Bernardy et al., 2019) evaluating the efficacy, acceptability, and safety of internet-based psychological therapies. Drawing from six RCTs, they found that these internet-delivered treatments were associated with a reduction of negative mood and disability when compared to control conditions.

Similar, favorable findings have been presented in other past meta-analyses. Specifically, others have found a significant but small effect for pain reduction in the short-term and a small to medium effect for long-term pain reduction (Glombiewski, Sawyer, et al., 2010), efficacy of in-person formats were equal to those of an online format (Knoerl et al., 2016), reduced arthritis pain (Astin et al., 2002; Knittle et al., 2010), and reductions in pain intensity, depression, and pain-related activity interference (Aggarwal et al., 2011).

In a more recent study, Zabihiyeganeh et al. (2019) sought to evaluate the effect of CBT on fibromyalgia (FM) patients by assessing circulating proinflammatory cytokines. This study is important because evaluating the efficacy of CBT in FM patients has mainly relied on self-report and the researchers were able to rely on biomarkers instead in order to evaluate its effects. To accomplish this, they measured the circulating level of proinflammatory cytokines which have been found to be enhanced in FM patients compared to healthy controls. Their results indicated significant reductions in proinflammatory cytokines after CBT when compared to waitlist controls which suggests that CBT should be considered a safe and effective nonpharmacological treatment for FM.

Another recent RCT demonstrated that CBT was able to maintain positive effects on depression and anxiety within a chronic pain population at a 3-year follow-up while the comparison treatments did not (Ólason et al., 2018). This is important as many other treatments
have struggled with maintaining long-term effects. The researchers concluded that CBT should be integrated into pain management programs for long-term benefits in addressing anxiety and depression commonly comorbid in chronic pain patients.

Despite CBT’s strong presence in the literature, some of the researching findings have been mixed regarding its efficacy. In a recent Cochrane review, Williams et al. (2020) analyzed the results across 59 studies using over 5,000 participants and concluded that CBT has small or very small effects in reducing pain intensity, disability, and distress in chronic pain patients. Issues contributing to this have included small RCTs, methodological weaknesses, and CBT’s limited impact on primary pain-related symptoms (Okifuji & Hare, 2013; Gilpin et al., 2017). CBT’s mixed and/or modest effects has also been attributed to the heterogeneity of the population and CBT’s tendency to treat them as though they are homogeneous (van Koulil et al., 2010). Another issue is that improvement in psychological outcome has been found to occur in the absence of cognitive restructuring, a major component of CBT for pain, which brings into question whether it is an essential element for change (Longmore & Worrell, 2007). These mixed findings contribute to the complexity of an old issue concerning treatment fidelity and how the “ingredients” of CBT are linked with changes in functionality and levels of pain and whether these are similar in all patients (Morley & Keefe, 2007; Morley, 2011).

Hypnosis. For many years, hypnosis has been used as a viable method of helping individuals manage their pain (Jensen & Patterson, 2014). It involves physical relaxation, heightened focus, and verbal suggestions that instruct an altered perception of experiences. Past research has identified changes in the activity of important pain-related brain regions that may lend explanation to its pain-relieving effects (Del Casale et al., 2015). Research on hypnosis for
pain has been variable regarding methodological quality but has been shown to be generally effective for chronic pain depending on patients’ hypnotic ability (Moss & Willmarth, 2019).

In their recent meta-analysis, Thompson and colleagues (2019) synthesized the results of 85 studies looking at the effectiveness of hypnosis on reducing pain. They found a significant and medium effect that was moderated by level of hypnotic suggestibility and the use of direct analgesic suggestion. Overall, they found evidence to suggest that hypnosis can intervene in pain severity with some level of relief for most people. While these results are limited by the research quality of the included studies, they lend evidence to viability of hypnosis as a primary approach to treating chronic pain.

**Graded in-vivo exposure therapy.** The theoretical foundation for graded in-vivo exposure is based on the principles of classical conditioning used in the fear-avoidance model (Vlaeyen & Linton, 2012). More specifically, repeated exposure to avoided activities is proposed to weaken the association between the conditioned stimulus (the movement/activity) and the conditioned response (the avoidance and escape behaviors). Thus, graded in-vivo exposure therapy operates under the fear-avoidance model in the sense that an individual’s fear is the target of treatment (Wideman et al., 2013). Having fear as the target of intervention is thought to improve chronic pain outcomes as past studies using treatments that do not target fear have shown to have limited success and lack a solid, theoretical foundation (Pincus et al., 2010).

For treatment of pain-related fear-avoidance, this approach typically relies on the following activities: psychoeducation regarding the fear-avoidance model and chronic pain, developing of a hierarchy of fear-inducing movements and activities, graded exposure to these activities through behavioral experiments, and evaluation and assessment of catastrophic interpretations before and after activity engagement (Leeuw et al., 2007). The ability to challenge
catastrophic mispredictions concerning chronic pain is made possible via exposure to the avoided activities (Crombez et al., 2012; Leeuw et al., 2008). This, in turn, reduces fear and increased approach-oriented behaviors.

In their recent RCT, Hedman-Lagerlöf and colleagues (2019) used 140 patients to investigate mediators of treatment outcome in exposure therapy for FM. Their results suggested that changes in avoidance behavior mediates the outcome of exposure therapy on FM symptoms (e.g., pain severity). Additionally, past single-subject experiments using participants with chronic pain have shown that graded in-vivo exposure led to improvements in fear, catastrophizing, activity engagement, and functioning (Vlaeyen & Linton, 2012; Woods & Asmundson, 2008). In Vlaeyen and Linton’s (2012) RCT, this approach yielded moderate effect sizes when used with chronic low back pain. Among more recent studies (Schemer et al., 2018), researchers have found moderate-to-large effects for using graded in-vivo exposure therapy for chronic low back pain compared to CBT which had small-to-moderate effects.

Glombiewski and colleagues (2018) found similar results in their RCT examining exposure treatments compared to CBT using patients with high levels of fear avoidance. Specifically, they found that although exposure-type interventions are more challenging to patients, it is an effective, short-term treatment and outperformed CBT regarding improvements in psychological flexibility. Interestingly, they also found that five sessions of exposure-based therapy were equally effective as ten sessions.

**Patient self-management strategies.** The primary aim of self-management strategies includes training patients to become actively involved in managing their pain (Iversen et al., 2010). Self-management refers to “the individual’s ability to manage the symptoms, treatment, physical, and psychosocial consequences and lifestyle changes inherent in living with a chronic
condition” (Barlow et al., 2002, p. 178). The idea of offering psychoeducation to patients regarding pathogenesis and symptom management specific to their illness has long-standing support in the literature (e.g., Hassett & Gevirtz, 2009).

Self-management approaches typically encourage patients to engage in stress-reducing activities (e.g., physical exercise or stretching, meditative practice, or deep breathing techniques) to manage pain. A recent meta-analysis of 20 RCTs testing self-management interventions for chronic pain found moderate effects in its efficacy and significant effects favoring self-management strategies for physical function and pain intensity compared to control groups (Elbers et al., 2018). Other core components of self-management intervention studied in the literature include exercise and sleep improvement.

Kelley and colleagues (2011) conducted a meta-analysis examining the effects of aerobic and strength training exercise and found it to be associated with the reduction of pain and tender points in patients with fibromyalgia. In another meta-analysis, aerobic-only exercise studies for FM patients were reviewed and the most optimal outcomes were observed when patients exercised 2 to 3 times a week for at least 4 to 6 weeks (Häuser et al., 2010). Significant improvements were observed regarding pain level, fatigue, and fitness level. Depressive symptoms were also significantly reduced and health related QoL was significantly improved. The maintenance of these improvements was more likely to occur if the patients continued participation in aerobic exercise activities.

Because sleep quality is important in modulating emotional and physical symptoms and sleep disturbances are common within pain populations, practicing good sleep hygiene is viewed as an essential self-management tool. Good sleep hygiene practices include behaviors such as retiring to bed at the same time every night, wearing earplugs, soaking in a warm bath before
bed, refraining from eating before sleep, and refraining from daytime napping. In a study of 101 FM patients, Theadom and colleagues (2007) found that 99% reported poor sleep quality with problems such as waking up frequently throughout the night and waking up feeling unrefreshed. In their study, poor sleep quality was significantly associated with increased pain and fatigue as well as with poorer social functioning. A consistent finding was reported in another study looking at 2,196 FM patients who reported significantly more trouble with sleep quality than matched control participants (Wagner et al., 2012).

**Group Therapy for Pain**

In a recent meta-analysis looking at studies involving CBT-based approaches for the treatment of chronic pain in older adults, Niknejad and colleagues (2018) found evidence for small but statistically significant reduction of pain and catastrophizing beliefs as well as increased self-efficacy for managing pain. Interestingly, a moderator analysis yielded only one significant moderator: treatment format. More specifically, group-based therapy moderated the efficacy of CBT-based treatment for chronic pain. This is consistent with studies which have found that groups out-performed control conditions on variables such as functioning, anxiety and depression, self-efficacy, and pain-related disability (Boschen et al., 2016; Bourgault et al., 2015; Martins et al., 2014; Thieme et al., 2016; Wicksell et al., 2013; Torres et al., 2018). Recent evidence has suggested that group size and member characteristics (e.g., sex, age) are related to patient outcomes (Wilson et al., 2018).

It is important to highlight two studies that have conducted long-term follow-up assessments. In the first study (Gustavsson et al., 2009), the researchers compared a pain and stress self-management group intervention (PASS) to individually administered physiotherapy (IAPT) for patients with persistent tension-type neck pain and found that the PASS group
produced a better effect on pain-related disability, self-efficacy, catastrophizing, and perceived pain control. In their nine-year follow-up, Gustavsson and Koch (2017) found that these favorable effects for the PASS group were maintained. In the second study (Lamb et al., 2010), researchers examined the effects of CBGT treating low back chronic pain and found that the positive effects on pain and disability were maintained for an average of 34 months after treatment (Lamb et al., 2012).

**Cognitive behavioral group therapy.** Past research has found cognitive behavioral group therapy (CBGT) in primary care to be cost-effective (Lamb et al., 2010). The pattern of mixed results for CBT is also prevalent within recent group therapy literature as Burlingame and Strauss (2021) indicate that CBGT studies have produced more mixed findings in recent studies compared to those included in earlier iterations of their review. CBGT was observed to outperform control conditions (e.g., physical therapy and health education) in multiple studies (Knox et al., 2014; Linden et al., 2014; Inoue et al., 2014; Morone et al., 2016; Thorn et al., 2018). Interestingly, CBGT demonstrated superiority in pain-related outcomes, but yielded no significant improvement regarding general psychopathology (e.g., Linden et al., 2014). In contrast, other studies found equal effects between CBGT and controls in pain reduction but favored CBGT on secondary outcomes such as anxiety and depression (e.g., Taylor et al., 2016; Helminen et al., 2015). Additionally, five studies found equivalence among CBGT, active groups, and control conditions (Kjeldgaard et al. 2014, Harris et al., 2017; Mehlisen et al., 2017; Marques et al., 2014; Sleptsova et al., 2013).

In regard to specific pain, past research has examined CBGT’s efficacy with myofascial pain (Bogart et al., 2007) and low-back pain (Lamb et al., 2010) finding positive effects on pain intensity, functional impairment, depression and anxiety. Additionally, CBGT has been
compared with medication and waitlist conditions for treating intercourse pain (dyspareunia) and was found to be more effective than medication but equivalent to the waitlist control (Bergeron et al., 2016; Brotto et al., 2015). Studies examining CBGT for arthritis pain have also yielded mixed results. While positive effects were observed for CBGT treating adolescents with juvenile arthritis (Lomholt et al., 2015), two studies examining CBGT for adults suffering from knee arthritis pain showed no difference with a psychoeducational intervention (Vitiello et al., 2013; Helminen et al., 2015).

**Mindfulness-based stress reduction.** Mindfulness-based stress reduction (MBSR) is a manualized, group-based intervention integrating mindfulness meditation with Western clinical and psychological practices (Kabat-Zinn, 2003). Interestingly, this approach was initially developed for patients with chronic pain during the 1970s (Kabat-Zinn, 1990). Since then, general, mindfulness-based interventions have demonstrated efficacy in decreasing pain, increasing capacity to perform daily activities, and improving mood in patients with chronic pain (Cassidy et al., 2012; Majeed et al., 2018; Rod, 2015; Ussher et al., 2014; Garland et al., 2014). For MBSR specifically, the primary aims include increased ability for patients to bring their focus to the present moment and to change their attitude to be consistent with acceptance and openness without self-judgement. The intervention consists of eight weekly group sessions and focuses on three core strategies: awareness of breathing, body scan (sequentially attending to different parts of the body), and “hatha yoga” which involves breathing, stretches, and postural exercises.

Promising results have been found among a number of studies conducted to examine the efficacy MBSR for chronic pain. For example, an RCT found that when used in a chronic pain sample and compared to progressive muscle relaxation, MBSR yielded significant improvements
in areas such as QoL, coping with pain, anxiety, depression and somatic complaints (Grossman et al., 2007). Additionally, Morone and colleagues (2008) found that, within a lower back pain population, MBSR led to significant reductions in self-reported pain and increased chronic pain acceptance.

In working with FM patients specifically, MBSR has yielded mixed results although it has been found to be beneficial more often than not. Specifically, an early study reported improvements in pain, disability, and depression post-MBSR and that these improvements were maintained at a six-month follow-up (Astin et al., 2003). In another study examining the effects of MBSR on symptoms of depression in FM patients, Sephton and colleagues’ (2007) randomly assigned participants to either an MBSR group or to a waitlist control group. Depressive symptoms were measured at baseline, post-treatment, and again at a two-months follow-up and the MBSR group reported significant improvement in depression ratings compared to those in the control group with improvements maintained at the two-month follow-up.

In a more recent study, Cash and colleagues (2015) also found positive outcomes for the use of mindfulness meditation within an FM population. Participants were assessed on several measures: stress, pain, fatigue, quality of sleep, physical functioning, symptom severity, and salivary cortisol. Participants randomized to either an MBSR group (n = 51) or a waitlist control group (n = 40) were assessed at baseline, at the end of the study (8 weeks), and again at a two-months follow-up. Although no significant differences were observed between the groups regarding pain, cortisol levels, fatigue, or in physical functioning, the MBSR group produced significant improvements regarding perceived stress, sleep quality, and severity of symptoms and these improvements were maintained at the two-month follow-up.
Another important study using a larger sample size is Cherkin and colleagues’ (2016) RCT that compared MBSR to CBT and a treatment-as-usual (TAU) condition. They included 342 patients experiencing chronic low back pain who were randomized to the three different treatment conditions: MBSR, CBT, and TAU. Adults treated in either the MBSR or CBT conditions reported greater improvement in back pain and functional limitations at 26 weeks when compared with TAU. Interestingly, no significant differences were observed in outcomes between MBSR and CBT.

In contrast, Schmidt and colleague’s (2011) study of MBSR for FM patients did not find the same support. In their study, 177 FM patients were randomized to either an MBSR group, an alternative control intervention such as relaxation exercises and stretching, or to a waitlist control group. All three groups demonstrated significant improvement in health related QoL at the conclusion of the study with no significant differences between the groups; MBSR had no observable advantage. In secondary analyses, the authors found that those in the MBSR group reported themselves higher in mindfulness than the other two groups and that anxiety decreased significantly in both active treatment groups compared to the waitlist group.

**Psychoeducation and support groups.** Psychoeducation in group has been found to be helpful to patients for a variety of disorders (Burlingame & Strauss, 2021). Specifically, these groups educate patients about their condition so that they can become more proactive in their treatment and are able to more easily explain their condition to others. They also provide a space for members to feel supported and understood by others in the group. In a study examining support groups for individuals with FM and chronic fatigue syndrome (CFS), 80.4% of participants reported that attending group meetings was helpful regarding illness-related issues (Friedberg et al., 2005). The researchers concluded that these groups were successful because
they acted as a vehicle for validating FM as a true medical condition. Other studies have found similar effects for FM patients posting on a popular fibromyalgia electronic support group helping participants to feel empowered enough to be more assertive with their physicians (Barker, 2008).

Statement of the Problem

To date, a meta-analysis has not been conducted specifically for group therapy in treating all types of pain among any population. This meta-analysis will answer the call proposed by Burlingame and Strauss (2021) indicating that “the large number of recent studies justify a meta-analytic review to test alternative combinations and define new research and treatment directions” (p. 654). The purpose of this study is to define pain and its various presentations, highlight the current evidence for pain-related interventions, outline the current practices within group therapy for treating pain, and to assess the relationship between group treatment and outcomes for individuals being treated for pain-related symptoms. In other words, the present study will synthesize the literature by including published studies of pain-related issues treated in a group format to examine the overall effectiveness of group. Due to the nature of meta-analytic studies, the hypothesis operated under will be the null hypothesis.

Objectives:

- To assess the efficacy of group therapy for individuals experiencing pain-related issues on relevant outcomes in comparison to (a) treatment-as-usual (TAU) control groups, (b) waitlist control groups, and (c) active treatments.
- To examine the impact of patient, leader, study, and/or group characteristics as well as risk of bias as moderators on effect sizes.
To tailor the coding process in order to capture potential, pain-specific explanations of moderators.

**Hypotheses**

- There will be no difference between group therapy and treatment-as-usual (TAU) control groups, waitlist control groups, and/or active treatments.
- Effect sizes will not be moderated by patient, leader, study, and/or group characteristics nor by risk of bias.
- The coded variables uniquely associated with pain will not moderate the overall effect sizes.

**Method**

**Protocol and Registration**

This review was registered in the international prospective register of systematic reviews (PROSPERO) under the registration number CRD42020191413.

**Eligibility Criteria**

For the present study, we relied upon recent group therapy related meta-analyses to develop inclusion criteria (Burlingame et al., 2016; Burlingame et al., 2018; Burlingame et al., 2020; Janis et al., 2021; Alldredge et al., 2021). Studies were eligible for inclusion if they (a) were a randomized clinical trials (RCTs) published in 1990 or later, (b) involved individuals diagnosed with or treated for fibromyalgia, chronic pain, and/or specific pain, (c) measured pain intensity, (d) investigated group treatment’s efficacy in treating symptoms associated with a pain-related issues, (e) included at least one comparison condition of waitlist control (WLC), treatment-as-usual (TAU), an unspecific treatment control, and/or medication, (f) included at least 20 participants in each trial arm at the first post-assessment, (g) included groups that met at
least three times face-to-face, and (h) were reported in the English language. Unpublished studies, theses, and dissertations were excluded from eligibility given the focus on high-quality RCTs. A cutoff date of 1990 was chosen to maintain consistency with previous disorder-specific group therapy meta-analyses that use the same codebook and methodology. Pain intensity was defined as the primary outcome. Secondary outcomes included pain interference, beliefs about pain, catastrophizing, physical functioning, self-efficacy, quality of life, pain frequency, pain duration, anxiety, and depression.

**Information Sources and Search**

Potential articles were identified by searching PsycINFO, MEDLINE (Ovid), Web of Science, and CENTRAL for articles published between January 1990 and January 2020. Search terms (see Supplementary Tables 1-4) included pain-related keywords such as pain disorder, chronic pain, back pain, PSOCQ, fibromyalgia, and somatoform pain. The group treatment-related keywords included group treatment, group intervention, group setting, group therapy, group counseling, and group format. When possible, the design-related keywords included random sampling, random assignment, control, comparison, and experimental design.

**Study Selection**

Upon completing the search through each major platform, titles and abstracts were exported and loaded onto Endnote. From there, duplicate articles were removed and each remaining unique title and abstract were reviewed according to the inclusion criteria at which point the original articles were retrieved and underwent a full-text review if deemed promising.

**Data Extraction**

Studies meeting inclusion criteria and used in the meta-analysis were coded according to 38 different variables stemming from four main categories: study characteristics, leader
characteristics, member characteristics, and group characteristics. Some of these variables have been found to moderate outcome in previous group therapy meta-analyses (Burlingame et al., 2016) and are based upon the empirical and theoretical foundations outlined in the literature review. Additionally, certain variables previously found as significant moderators in past studies investigating group therapy’s effectiveness for specific disorders were coded and examined. Emphasis was placed on understanding the structure of the groups, how they were conducted, and demographic information of the individuals in them. The categories and variables were as follows:

- Thirteen study characteristics: year of publication, country of study, pain type, the pain intensity measures used, outcome measures used, other pain measures used, rater perspective, comparison, how frequently the measures were administered, when the measures were administered, whether there was a follow-up assessment and how long after treatment it was administered, and whether treatment integrity was monitored via fidelity checks.

- Five leader characteristics: number of therapists, therapist gender, clinical experience, therapists’ professional degree, and single leader versus co-led groups.

- Seven member characteristics as follows: sample size, gender, age, race, diagnosis, whether they were concurrently in other treatments (e.g., individual therapy), and attrition.

- Seventeen group characteristics: orientation, whether a manual or model was used, format, type, open or closed membership, composition, size, number of different groups included, session length, session frequency, number of sessions, average number of sessions attended by members, entrance into treatment, setting, and location.
The present study relied upon ten raters (one graduate student and nine undergraduate students) trained on using the codebook for the meta-analysis. After achieving an 85% level of consistent rating, raters were grouped into pairs to independently code identical articles included in the analysis so that each article was double-coded. Complete agreement was required, and discrepancies were resolved by the graduate student and mentor.

Outcome data for the pre-treatment time point and all assessment points after completion of the treatment were extracted, leading to post-treatment (first assessment after the last session and within one week of program termination), short-term follow-up (≤ 6 months after the intervention), mid-term follow-up (6–12 months after the intervention) and long-term follow-up (≥ 12 months after the intervention) effect size estimates. To ensure the validity of effect size parameters, outcome data were pre-selected by one coder (CA) and finally extracted by another coder (JR). Raw population data (M, SD, N) were preferred over test results (p-value, F-value, etc.) and, where possible, pre-test data were used in the effect size calculation. If available, intention-to-treat (ITT) data were chosen over completer data. Effect sizes were calculated using Comprehensive Meta-Analysis software (CMA; Biostat. Inc., Version 3).

**Risk of Bias in Individual Studies**

We evaluated various indicators of bias according to assignment to intervention (the 'intention-to-treat' effect) by using the current version of the Cochrane Risk of Bias Tool for Randomized Trials (ROB2 – revised version from August 2019; Sterne et al., 2019). Trained raters assessed the following five broad domains of bias: randomization process, deviations from intended treatments, missing outcome data, measurement of the outcome, and selection of the reported result. Each article was assessed independently by two raters and these ratings were synthesized and checked by two authors. In order to achieve risk of bias ratings within each
domain, one or more signaling questions were answered. For each domain, judgments of ‘low risk of bias’, ‘some concerns’, or ‘high risk of bias’ were proposed based on defined algorithms. Finally, the judgments within each domain resulted in an overall risk-of-bias judgment per study. Studies judged as “low risk of bias” were compared to studies evaluated with “some concerns” or as “high risk of bias” in the single domains and in the overall judgment were compared in subgroup analyses.

**Summary Measures and Data Synthesis**

We computed standardized mean differences (Hedges’ $g$) and 95% confidence intervals for the between-group differences of group therapy and the control group for all outcomes and assessment time-points of interest. A small sample bias correction was applied to all effect sizes (Hedges & Olkin, 1985).

Because we expected a heterogeneous effect size distribution, a random-effects model was used for data aggregation. In cases of multiple comparisons within one study (e.g., two intervention groups were compared against one shared control group), we combined groups to create a single pair-wise comparison (Higgins et al., 2021). Effect sizes were interpreted according to Cohen (1988) with 0.2, 0.5, and 0.8 as small, medium, and large effect sizes, respectively. Positive effect sizes indicate a superiority of the group treatment, while negative effect sizes indicate effects in favor of the control treatment.

Between-study heterogeneity was tested with the $\chi^2$-test (Cochrane’s Q) and quantified using $I^2$, which provides the amount of between-study variability that cannot be explained by chance alone. $I^2$ values of 25%, 50% and 75% are commonly interpreted as low, moderate, and high levels of heterogeneity, respectively (Higgins et al., 2003). We further calculated prediction
intervals representing the possible underlying effect in a new study that is similar to the studies in the meta-analysis (Deeks et al., 2019; Riley et al., 2011).

**Risk of Bias Across Studies**

Publication bias was assessed via visual examination of the funnel plot, looking for asymmetry that might suggest specific omission of non-significant results. Egger’s regression test for funnel plot asymmetry was also run (Egger, 1997). Additionally, we used Duval and Tweedie’s trim and fill procedure to determine whether small studies with non-significant effects were underrepresented in the meta-analysis (Duval & Tweedie, 2000). Possible missing studies were imputed, and the effect size estimate was recalculated. Finally, we computed Rosenthal’s Fail Safe N (Rosenthal, 1979), indicating the number of additional ‘negative’ studies (studies in which the intervention effect is zero) that would be needed to increase the p value for the meta-analysis to be above 0.05.

**Additional Analyses**

Sensitivity analyses were conducted in order to test the robustness of findings, examining if meta-analytic results change when excluding outliers (defined as effect sizes with confidence intervals not over-lapping with the confidence interval of the pooled effect; Cuijpers et al., 2014). Exploratory subgroup analyses and meta-regression analyses were run to explain statistical heterogeneity (Thompson & Higgins, 2002). The impact of the following moderator variables on pain intensity effect size was analyzed: publication year, country of study, pain type, pain intensity measure used, other pain measures used, non-pain outcome measures used, number of administrations for measures, administration time points, whether fidelity checks were implemented, group leadership method, sample size, attrition rate, participant age, participant gender, participant race, whether a diagnosis was given and reported, theoretical orientation,
treatment structure (i.e., manual or model-based), group format (i.e., psychoeducation, therapy, support), group size, session length, number of sessions, frequency of meetings, treatment setting, and treatment location. Differences between subgroups were tested only if \( n \geq 5 \). In cases of smaller subgroups, those groups were either merged or excluded in order to compare them against the largest subgroup, or otherwise excluded from analysis. All analyses were performed using Comprehensive Meta-Analysis software (CMA; Biostat. Inc., Version 3).

Results

Study Selection

Our search yielded 5,725 records and an additional 172 records were identified from references sections of relevant articles. A total of 4,467 unique titles and abstracts were vetted for inclusion. A full-text review was performed for 110 articles which led to a final inclusion of 57 studies in the meta-analysis (Figure 4). Reasons for exclusion were articles not having a sufficient \( n \) at post assessment \(( n = 30 \)), not meeting the criteria of an RCT \(( n = 10 \)), absence of a pain intensity measure \(( n = 7 \)), insufficient data to compute effect sizes \(( n = 3 \)), same data being reported in more than one article \(( n = 2 \)), and the treatment groups failed to meet more than three times face-to-face \(( n = 1 \)).

Study Characteristics

Studies included in this meta-analysis were published between 1990 and 2019. Sixteen studies came from the USA; six from the UK, Germany, and Sweden; five from Spain; two from Canada, Norway, and Denmark; and one from Australia, Finland, Switzerland, Iran, Hong Kong, Brazil, Italy, and France. The type of pain studied varied with 15 studies looking at chronic back pain; 13 for unspecified musculoskeletal pain; 12 for fibromyalgia; seven for arthritis; two for
migraine/headache, mixed back and neck pain, pain from irritable bowel syndrome, and cancer-related pain; and one for both neck pain and chest pain (Table 1).

The majority of studies used only self-report measures while 10 studies used an observer (e.g., spouse, therapist, physician) report in addition to self-report. Treatment-as-usual or waitlists were used as control groups in the majority of studies while 10 studies compared two intervention groups against one shared control group, and two more studies used three intervention groups in their comparisons against one shared control group.

Of the articles that reported the type of leadership used, 24 groups were led by a single professional while 18 reported co-led groups. Cognitive Behavioral Therapy (CBT) was reported as the treatment orientation in 28 studies. Other approaches included mindfulness-based stress reduction (MBSR), acceptance and commitment (ACT), multidisciplinary, hypnosis, supportive, and behavioral. On average, group therapy sessions lasted 119 minutes and consisted of an average of 10 sessions. Nearly half of the articles \( n = 28 \) reported having group sizes of 5-10 members.

Pooled together, 9,694 participants were randomized across the studies and a remaining 8,933 participants completed sufficient post-measures. The average age among participants was 52.5 years, and 77% were female. Among the articles that reported on participant race, 16 articles indicated that Whites made up the majority and three articles reported that Blacks made up the majority. Forty-four articles reported that participants had an official pain diagnosis in the respective studies.
Figure 4

Flow chart of search and selection process

Records identified through database searching
(n = 5,725)

Records after duplicates removed
(n = 4,467)

Records screened
(n = 4,467)

Additional records identified through other sources
(n = 171)

Records excluded
(n = 4,351)

Full-text articles assessed for eligibility
(n = 110)

Studies included in qualitative synthesis
(n = 57)

Full-text articles excluded
(n = 53)

n = 30 did not have a large enough n in each arm at post assessment
n = 10 were not RCTs
n = 7 did not assess pain intensity
n = 3 data were insufficient to calculate effect sizes
n = 2 used the same data
n = 1 the group did not meet enough face-to-face

Studies included in quantitative synthesis (meta-analysis)
(n = 57)
### Table 1

**Descriptive characteristics of included studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Intervention</th>
<th>Control group</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Average Age</td>
<td>% Female</td>
<td>Pain Type</td>
<td>Theoretical Orientation</td>
</tr>
<tr>
<td>Alonso-Fernandez et al. (2016)</td>
<td>IG: 27</td>
<td>82.3</td>
<td>78.6</td>
<td>Unspecified chronic pain</td>
</tr>
<tr>
<td>Altmaier et al. (1992)</td>
<td>IG: 24, 21</td>
<td>39.9</td>
<td>26.7</td>
<td>Chronic low back pain</td>
</tr>
<tr>
<td>Basler et al. (1997)</td>
<td>IG: 36, 40</td>
<td>49.3</td>
<td>75.6</td>
<td>Chronic low back pain</td>
</tr>
<tr>
<td>Blanchard et al. (2007)</td>
<td>IG: 120, 90</td>
<td>44.0</td>
<td>84.5</td>
<td>Pain due to irritable bowel syndrome</td>
</tr>
<tr>
<td>Bourgault et al. (2015)</td>
<td>IG: 29, 29</td>
<td>48.4</td>
<td>92.9</td>
<td>Fibromyalgia</td>
</tr>
<tr>
<td>Butler et al. (2009)</td>
<td>IG: 63, 61</td>
<td>52.9</td>
<td>100</td>
<td>Breast cancer</td>
</tr>
<tr>
<td>Castel et al. (2012)</td>
<td>IG: 29, 30, 34</td>
<td>49.6</td>
<td>96.8</td>
<td>Fibromyalgia</td>
</tr>
<tr>
<td>Study</td>
<td>IG:</td>
<td>CG:</td>
<td>Condition</td>
<td>Intervention</td>
</tr>
<tr>
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<tr>
<td>Cherkin et al. (2016)</td>
<td>116, 113</td>
<td>113</td>
<td>Chronic low back pain</td>
<td>MBSR; CBT</td>
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<tr>
<td>Damush et al. (2003)</td>
<td>105</td>
<td>106</td>
<td>Chronic low back pain</td>
<td>Self-management n.r.</td>
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<td></td>
</tr>
<tr>
<td>Ersek et al. (2008)</td>
<td>133</td>
<td>123</td>
<td>Unspecified chronic pain</td>
<td>Self-management</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Falcao et al. (2008)</td>
<td>30</td>
<td>30</td>
<td>Fibromyalgia</td>
<td>CBT</td>
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<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Garland et al. (2019)</td>
<td>50</td>
<td>45</td>
<td>Unspecified chronic pain</td>
<td>MORE</td>
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</tr>
<tr>
<td>Gaylord et al. (2011)</td>
<td>36</td>
<td>39</td>
<td>Pain due to irritable bowel syndrome</td>
<td>Mindfulness-based</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Goodwin et al. (2001)</td>
<td>158</td>
<td>77</td>
<td>Breast cancer</td>
<td>Supportive-Expressive n.r.</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Gustavsson et al. (2009)</td>
<td>77</td>
<td>79</td>
<td>Neck pain</td>
<td>Self-management</td>
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<td></td>
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<tr>
<td>Haas et al. (2005)</td>
<td>54</td>
<td>47</td>
<td>Chronic low back pain</td>
<td>Self-management</td>
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<td></td>
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<td></td>
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<tr>
<td>Study Authors</td>
<td>IG Control</td>
<td>IG 1yr mean</td>
<td>Control mean</td>
<td>Condition</td>
</tr>
<tr>
<td>---------------</td>
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<tr>
<td>Hammond et al. (2004)</td>
<td>IG: 65 CG: 62</td>
<td>50.5 76.4</td>
<td>Arthritis Educational-behavioral</td>
<td>120 8</td>
</tr>
<tr>
<td>Hammond et al. (2008)</td>
<td>IG: 74 CG: 64</td>
<td>55.4 64.7</td>
<td>Arthritis Educational-behavioral</td>
<td>150 9</td>
</tr>
<tr>
<td>Harris et al. (2017)</td>
<td>IG: 55, 60 CG: 99</td>
<td>44.8 50.5</td>
<td>Chronic low back pain CBT; Physical group exercise</td>
<td>90 7</td>
</tr>
<tr>
<td>Haugli et al. (2001)</td>
<td>IG: 77 CG: 44</td>
<td>43.8 92.6</td>
<td>Chronic musculoskeletal pain Psycho-education</td>
<td>240 12</td>
</tr>
<tr>
<td>Helminen et al. (2015)</td>
<td>IG: 55 CG: 56</td>
<td>63.6 69.5</td>
<td>Arthritis CBT</td>
<td>120 6</td>
</tr>
<tr>
<td>Hsu et al. (2010)</td>
<td>IG: 24 CG: 21</td>
<td>50.1 100</td>
<td>Fibromyalgia ASA</td>
<td>120 3</td>
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<tr>
<td>Johansson et al. (1998)</td>
<td>IG: 21 CG: 21</td>
<td>43.5 68.0</td>
<td>Chronic musculoskeletal pain CBT n.r.</td>
<td>20</td>
</tr>
<tr>
<td>Johnson et al. (2007)</td>
<td>IG: 102 CG: 94</td>
<td>47.9 59.5</td>
<td>Chronic low back pain CBT</td>
<td>120 8</td>
</tr>
<tr>
<td>Karlsson et al. (2015)</td>
<td>IG: 24 CG: 24</td>
<td>48.6 100</td>
<td>Fibromyalgia CBT</td>
<td>180 20</td>
</tr>
<tr>
<td>Keefe et al. (1990)</td>
<td>IG: 32, 36 CG: 31</td>
<td>63.8 71.7</td>
<td>Arthritis Skills training; education</td>
<td>90 10</td>
</tr>
<tr>
<td>Study</td>
<td>IG</td>
<td>CG</td>
<td>Condition</td>
<td>Treatment</td>
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<tr>
<td>Keller et al. (1997)</td>
<td>36</td>
<td>29</td>
<td>Chronic low back pain</td>
<td>Multidisciplinary group tx</td>
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<td>Kjeldgaard et al. (2014)</td>
<td>35</td>
<td>37</td>
<td>Migraine/headache</td>
<td>CBT</td>
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<tr>
<td>Lamb et al. (2010)</td>
<td>468</td>
<td>233</td>
<td>Chronic low back pain</td>
<td>CBT</td>
</tr>
<tr>
<td>Lami et al. (2018)</td>
<td>24, 22</td>
<td>26</td>
<td>Fibromyalgia</td>
<td>CBT-IP &amp; CBT-P</td>
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<tr>
<td>Lemstra et al. (2002)</td>
<td>41</td>
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<td>Lemstra et al. (2005)</td>
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<td>36</td>
<td>Fibromyalgia</td>
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<td>Linden et al. (2014)</td>
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<td>Linton et al. (1997)</td>
<td>39, 39</td>
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<td>Chronic low back pain</td>
<td>Supportive groups</td>
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<td>84</td>
<td>91</td>
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<td>CBT</td>
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<td>Mixed neck and back pain</td>
<td>CBT &amp; CBT+PT</td>
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<td>Sex</td>
<td>Pain Type</td>
</tr>
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<td>Masiero et al. (2007)</td>
<td>46:39</td>
<td>53.2</td>
<td>81.4</td>
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<td>McCracken et al. (2013)</td>
<td>31:27</td>
<td>58.0</td>
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<td>Mehlsen et al. (2017)</td>
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<td>54.5</td>
<td>71.5</td>
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<td>Morone et al. (2016)</td>
<td>140:142</td>
<td>74.5</td>
<td>66.3</td>
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<td>Nicholas et al. (2013)</td>
<td>49, 53:39</td>
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<td>62.5</td>
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<td>Perez-Aranda et al. (2019)</td>
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<td>54.1</td>
<td>61.0</td>
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<td>43.9</td>
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<td>Group 2 (N)</td>
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<td>Taylor et al. (2016)</td>
<td>IG: 363</td>
<td>CG: 262</td>
<td>Chronic musculoskeletal pain</td>
<td>CBT-based psychoed n.r.</td>
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<td>Thieme et al. (2003)</td>
<td>IG: 40</td>
<td>CG: 21</td>
<td>Fibromyalgia</td>
<td>OBT n.r. n.r. &gt; Twice a week TAU</td>
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<tr>
<td>Thieme et al. (2006)</td>
<td>IG: 43, 42</td>
<td>CG: 40</td>
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<td>Thorn et al. (2011)</td>
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<td>Thorn et al. (2018)</td>
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<td>CG: 98</td>
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<td>Torres et al. (2018)</td>
<td>IG: 33</td>
<td>CG: 26</td>
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<td>GrpMI 120 12 Weekly No treatment</td>
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<td>Tse et al. (2013)</td>
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<td>CG: 26</td>
<td>Unspecified chronic pain</td>
<td>MIE 90 8 Weekly TAU</td>
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<td>Study, Year</td>
<td>Intervention</td>
<td>Condition</td>
<td>Baseline</td>
<td>Follow-up</td>
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<tr>
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<td>CBT-PI, CBT-P</td>
<td>CG: 120</td>
<td>73.1 74.5</td>
<td>Osteoarthritis</td>
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<td>Vitiello et al. (2013)</td>
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<td>Osteoarthritis</td>
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<td>Vlaeyen et al. (1996)</td>
<td>Educational-cognitive group</td>
<td>CG: 39, 43</td>
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<td>Fibromyalgia</td>
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<tr>
<td>Vlaeyen et al. (1996)</td>
<td>Educational-cognitive group</td>
<td>IG: 49, 39, 43</td>
<td>44.0 88.0</td>
<td>Fibromyalgia</td>
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* This time point is from the initial baseline assessment. n.r. = not reported; ACT = Acceptance and Commitment Therapy; CBT = Cognitive Behavioral Therapy; MBSR = Mindfulness-Based Stress Reduction; MORE = Mindfulness Oriented Recovery Enhancement; tx = treatment; ASA = Assertive Self-Awareness; CBT-IP = Cognitive Behavioral Therapy for Insomnia and Pain; CBT-P = Cognitive Behavioral Therapy for Pain; CBT-BP = Cognitive Behavioral Therapy for Back Pain; CBT+PT = Cognitive Behavioral Therapy plus Physical Therapy; FibroQoL = Multicomponent intervention for fibromyalgia; CsCBT = Culturally Sensitive Cognitive Behavioral Therapy; APT = Active Physical Treatment; CT = Combined Treatment (of CBT and APT); PCST = Pain Coping Skills Training; BWM = Behavioral Weight Management; OBT = Operant Behavioral Treatment; GrpMI = Group Music and Imagery Intervention; MIE = Motivation Interviewing and physical exercise group program.
Results of Individual Studies and Synthesis of Results

The overall pain intensity outcome effect at post-assessment reported in 51 of the included articles using 8,933 patients was significant and small ($g = 0.28$, 95% CI [.20, .37], $p < .001$; Table 2). Heterogeneity was moderate ($Q = 122.42$, $df = 50$, $p = < .001$, $I^2 = 59\%$) and the 95% prediction interval included the null effect for pain intensity. We have included a typical forest plot (Figure 5) that can assist readers in determining the strength of the relationship between group treatment and pain intensity. These effects were maintained in follow-up assessments among 36 articles when time points were pooled together ($g = 0.27$, 95% CI [.17, .38], $p < .001$) with a slightly higher, but still moderate, heterogeneity ($Q = 108.98$, $df = 35$, $p < .001$, $I^2 = 68\%$). More specifically, short-term follow-up (6 months or less after post assessment) yielded a small but significant effect ($n = 18$, $g = 0.28$, $p < .001$, $I^2 = 68\%$) as well as mid-term follow-up (between 6 and 12 months; $n = 17$, $g = 0.28$, $p < .001$, $I^2 = 75\%$) and long-term follow up (12 months and beyond; $n = 12$, $g = 0.33$, $p = .003$, $I^2 = 80\%$; Table 2).

In an additional step, we conducted a sensitivity analysis and excluded statistical outliers to reduce heterogeneity. Specifically, studies were excluded if effect size confidence intervals did not overlap with the confidence interval of the pooled effect for pain intensity at post-assessment. Two positive (Castel et al., 2012; Thieme et al., 2003) and two negative outliers (Kjeldgaard et al., 2014; Mehlsen et al., 2017) were identified. At the exclusion of these outliers, the results did not change but heterogeneity was reduced to 27% and remained significant ($p = .045$). Additionally, outlier exclusion resulted in the null effect not being included in the 95% prediction interval. Supplementary Figure 1 shows the results of the mean overall effect when statistical outliers are set to a weight of zero.
Analyses of secondary outcomes (Table 2) indicated a small but significant effect of group treatment on variables such as pain frequency \((n = 8, g = 0.43, p = .011, I^2 = 76\%)\), catastrophizing \((n = 13, g = 0.39, p = .001, I^2 = 82\%)\), self-efficacy \((n = 14, g = 0.29, p = .002, I^2 = 69\%)\), beliefs \((n = 10, g = 0.26, p = .001, I^2 = 39\%)\), depression \((n = 27, g = 0.31, p < .001, I^2 = 60\%)\), anxiety \((n = 15, g = 0.21, p < .001, I^2 = 15\%)\), physical functioning \((n = 31, g = 0.28, p < .001, I^2 = 57\%)\), and quality of life (QoL; \(n = 10, g = 0.29, p = .018, I^2 = 76\%\)). One secondary outcome, pain interference, yielded a medium and significant effect \((n = 18, g = 0.51, p < .001, I^2 = 84\%)\) with high heterogeneity.

When sufficient data (i.e., results from five or more studies) were available for analysis, these effects were maintained in follow-up assessments. The pooled follow-up analyses of the secondary outcome revealed a small but significant effect for catastrophizing \((n = 13, g = 0.39, p = .001, I^2 = 82\%)\), self-efficacy \((n = 12, g = 0.22, p = .008, I^2 = 73\%)\), beliefs \((n = 9, g = 0.21, p = .011, I^2 = 63\%)\), anxiety \((n = 11, g = 0.16, p = .001, I^2 = 0\%)\), depression \((n = 18, g = 0.21, p = .002, I^2 = 58\%)\), physical functioning \((n = 23, g = 0.22, p < .001, I^2 = 62\%)\), and quality of life \((n = 12, g = 0.19, p = .016, I^2 = 70\%)\). The medium effect for pain interference was maintained in the pooled follow-up analyses \((n = 16, g = 0.57, p < .001, I^2 = 88\%)\).

**Risk of Bias Within and Across Studies**

An overview of the judgements of risk of bias judgements using the Cochrane Risk of Bias Tool for Randomized Trials (ROB2) is provided in Figure 6. The studies were judged according to five domains including randomization processes, deviations from intended interventions, missing outcome data, measurement of outcome, and selective outcome reporting. Approximately 37% of articles were judged as having a “high” overall risk of bias, while 49% of studies were rated as having “some concerns.” In both categories, most ratings were due to
**Figure 5**

*Forest plot of random effects of group therapy on pain intensity at first post-assessment*

<table>
<thead>
<tr>
<th>Study name</th>
<th>Control group</th>
<th>Sample size</th>
<th>Statistics for each study</th>
<th>p-Value</th>
<th>Hedges' g and 95% CI</th>
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</thead>
<tbody>
<tr>
<td>Alonso-Fernandez 2016</td>
<td>Passive</td>
<td>101</td>
<td>-0.13</td>
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<tr>
<td>Altmann 1992</td>
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<td>-0.28</td>
<td>0.365</td>
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<tr>
<td>Basler 1997</td>
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<td>0.889</td>
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<tr>
<td>Blanchard 2007</td>
<td>Active</td>
<td>210</td>
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<tr>
<td>Bourgault 2015</td>
<td>Passive</td>
<td>58</td>
<td>0.15</td>
<td>0.57</td>
<td></td>
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<tr>
<td>Butler 2009</td>
<td>Active</td>
<td>123</td>
<td>0.38</td>
<td>0.033</td>
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<tr>
<td>Castel 2012</td>
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<td>Chetki 2016</td>
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<td>Dambu 2003a</td>
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<td>Goyleord 2011</td>
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<td>Goodwin 2001</td>
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<td>0.47</td>
<td>0.103</td>
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<td>Tse 2011</td>
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*Heterogeneity: I²=59%, Q=122.42, df=50, p<0.001*
Table 2

**Primary and secondary outcomes at post-assessment and follow-up**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>n</th>
<th>Hedges’ g</th>
<th>95% CI</th>
<th>p (g)</th>
<th>Q</th>
<th>p (Q)</th>
<th>$I^2$</th>
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</thead>
<tbody>
<tr>
<td>Intensity</td>
<td>51</td>
<td>0.28</td>
<td>0.20; 0.37</td>
<td>&lt;0.001</td>
<td>122.42</td>
<td>&lt;0.001</td>
<td>59%</td>
</tr>
<tr>
<td>Short-term follow-up</td>
<td>18</td>
<td>0.28</td>
<td>0.14; 0.42</td>
<td>&lt;0.001</td>
<td>53.02</td>
<td>&lt;0.001</td>
<td>68%</td>
</tr>
<tr>
<td>Mid-term follow-up</td>
<td>17</td>
<td>0.28</td>
<td>0.13; 0.42</td>
<td>&lt;0.001</td>
<td>65.09</td>
<td>&lt;0.001</td>
<td>75%</td>
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<tr>
<td>Long-term follow-up</td>
<td>12</td>
<td>0.33</td>
<td>0.11; 0.54</td>
<td>&lt;0.001</td>
<td>56.25</td>
<td>&lt;0.001</td>
<td>80%</td>
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<td>Pain frequency</td>
<td>8</td>
<td>0.43</td>
<td>0.10; 0.76</td>
<td>&lt;0.001</td>
<td>29.92</td>
<td>&lt;0.001</td>
<td>77%</td>
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<tr>
<td>Pain interference</td>
<td>18</td>
<td>0.51</td>
<td>0.25; 0.77</td>
<td>&lt;0.001</td>
<td>108.64</td>
<td>&lt;0.001</td>
<td>84%</td>
</tr>
<tr>
<td>Pooled follow-up</td>
<td>16</td>
<td>0.57</td>
<td>0.28; 0.89</td>
<td>&lt;0.001</td>
<td>120.87</td>
<td>&lt;0.001</td>
<td>88%</td>
</tr>
<tr>
<td>Catastrophizing</td>
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<td>0.001</td>
<td>66.84</td>
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<td>82%</td>
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<tr>
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<td>13</td>
<td>0.39</td>
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<td>0.008</td>
<td>40.59</td>
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<td>73%</td>
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<td>p-value</td>
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<td>Effect Size</td>
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<td>----------</td>
<td>---------</td>
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<td></td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>14</td>
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<td>0.11; 0.47</td>
<td>0.002</td>
<td>41.80</td>
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<tr>
<td>Pooled follow-up</td>
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<td>0.22</td>
<td>0.06; 0.38</td>
<td>0.008</td>
<td>40.59</td>
<td>&lt;0.001</td>
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<td>Beliefs about pain</td>
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<td>108.64</td>
<td>&lt;0.001</td>
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<tr>
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<td>9</td>
<td>0.21</td>
<td>0.05; 0.37</td>
<td>0.011</td>
<td>21.89</td>
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<td>65.63</td>
<td>&lt;0.001</td>
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<tr>
<td>Pooled follow-up</td>
<td>18</td>
<td>0.21</td>
<td>0.08; 0.34</td>
<td>0.002</td>
<td>40.80</td>
<td>0.001</td>
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<tr>
<td>Physical functioning</td>
<td>31</td>
<td>0.28</td>
<td>0.18; 0.38</td>
<td>&lt;0.001</td>
<td>69.36</td>
<td>&lt;0.001</td>
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<tr>
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<td>23</td>
<td>0.22</td>
<td>0.11; 0.32</td>
<td>&lt;0.001</td>
<td>57.18</td>
<td>&lt;0.001</td>
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<td>Quality of Life</td>
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<td>0.29</td>
<td>0.05; 0.53</td>
<td>0.018</td>
<td>38.22</td>
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<td>Pooled follow-up</td>
<td>12</td>
<td>0.19</td>
<td>0.03; 0.34</td>
<td>0.016</td>
<td>36.43</td>
<td>&lt;0.001</td>
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</tr>
</tbody>
</table>

n = number of studies; 95% CI = 95% confidence interval
missing or insufficiently reported information and issues in how the randomization process was reported. One domain, *missing outcome data*, yielded significantly different results for pain intensity when comparing low risk to some concerns/high risk ($p$ of difference = .033). Studies coded as having some concerns or a high risk of bias for missing outcome data produced a smaller effect on pain intensity ($g = 0.16, p = .016$) while studies coded as having low risk of bias for missing outcome data yielded a larger effect ($g = 0.34, p < .001$).

Regarding bias across studies, a symmetrical distribution of studies was observed on the visual inspection of the funnel plot provided (Figure 7) for the majority of outcomes, with two outliers of small studies with large effects also observed. Egger’s regression test was significant ($\beta = 1.82, t(51) = 2.68, p = .01$) but a trim and fill analysis revealed no missing studies indicating no risk for publication bias. A fail-safe N analysis showed that the results are robust as 1,258 new studies would be necessary to bring the $p$ value above .05.

**Figure 6**

*Risk of bias within studies.*
Additional Analyses

We did not find significant differences in intervention effects between different control groups ($p = 0.72$) which is why the overall effect pooled all studies regardless of control type. Further subgroup analyses also did not demonstrate differences in effect sizes for a number of moderator variables such as publication year, country of study, type of pain, treatment orientation, treatment fidelity, leadership type, participant age, group structure, group format, session length, session frequency, study comparator, and group composition.

However, four variables emerged as significant moderators (Figure 8; Table 3). Of those, the pain intensity outcome measure was found to be a moderating variable where all measures yielded a significant effect with the exception of the McGill Pain Questionnaire (MPQ) which was not significant and negative ($n = 5, g = -0.10, 95\% \text{ CI } [-.30; .11], p = .362; p \text{ for difference } = .026$). Gender was found to be another significant moderator where studies that reported on
groups that comprised of only women ($n = 10, g = 0.50, 95\% \text{ CI} [.26; .73], p < .001$) had a greater effect than groups with a mixed presentation of gender ($n = 41, g = 0.24, 95\% \text{ CI} [-.15; .33], p < .001; p$ for difference = .048). Whether or not individuals who participated in the included studies had an official pain diagnosis was also a moderating variable. More specifically, those with a reported diagnosis had a higher effect for pain intensity ($n = 39, g = 0.33, 95\% \text{ CI} [.23; .44], p < .001$) compared to those who did not have a diagnosis ($n = 12, g = 0.13, 95\% \text{ CI} [.01; .25], p < .040; p$ for difference = .014). Finally, results of meta-regression analyses revealed a significant impact of dosage on effect size ($\beta = 0.0153, SE = 0.0074, p = 0.040, R^2 = 0.18$; Figure 8) for pain intensity. Specifically, effect size increases as the number of sessions increases and accounts for approximately 18\% of the variance.

Figure 8

*Regression of Hedge’s g on sessions*
### Table 3

**Significant moderating variables**

<table>
<thead>
<tr>
<th></th>
<th>Summary statistics</th>
<th>Heterogeneity</th>
<th></th>
<th></th>
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<tr>
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<td>n</td>
<td>Hedges’ g</td>
<td>[95% CI]</td>
<td>p (g)</td>
<td>Q</td>
<td>p (Q)</td>
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<td><strong>Pain Intensity Measure</strong></td>
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<td>BPI</td>
<td>7</td>
<td>0.26</td>
<td>0.05; 0.46</td>
<td>0.015</td>
<td>12.71</td>
<td>0.043</td>
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<td>0.04; 0.90</td>
<td>0.032</td>
<td>23.47</td>
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<tr>
<td>MPQ</td>
<td>5</td>
<td>-0.10</td>
<td>-0.30; 0.11</td>
<td>0.362</td>
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<td>NRS</td>
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<td>64.48</td>
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<td>0.13; 0.51</td>
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<td>24.49</td>
<td>0.006</td>
</tr>
<tr>
<td>Other</td>
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<td>0.17; 0.34</td>
<td>&lt;0.001</td>
<td>88.51</td>
<td>&lt;0.001</td>
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<td><strong>Group Gender Composition</strong></td>
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<td></td>
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<td>Female-only</td>
<td>10</td>
<td>0.50</td>
<td>0.26; 0.73</td>
<td>&lt;0.001</td>
<td>22.21</td>
<td>0.008</td>
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<tr>
<td>Mixed-gender</td>
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<td>&lt;0.001</td>
<td>90.06</td>
<td>&lt;0.001</td>
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<td><strong>Pain Diagnosis</strong></td>
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<tr>
<td>Pain diagnosis made explicit</td>
<td>39</td>
<td>0.33</td>
<td>0.23; 0.44</td>
<td>&lt;0.001</td>
<td>96.35</td>
<td>&lt;0.001</td>
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<tr>
<td>Pain diagnosis not mentioned</td>
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<td>0.13</td>
<td>0.01; 0.25</td>
<td>0.040</td>
<td>16.32</td>
<td>0.130</td>
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</tbody>
</table>
n = number of studies; 95% CI = 95% confidence interval; BPI = Brief Pain Inventory; MPI = Multidimensional Pain Inventory; MPQ = McGill Pain Questionnaire; NRS = Numeric Pain Rating Scale; VAS = Visual Analog Scale
Discussion

Summary of the Evidence

To our knowledge, this is the first meta-analysis that evaluates the general effectiveness of group treatment for pain-related concerns regardless of client age and type of pain. The overarching aim of this study was to assess the efficacy of group therapy for individuals experiencing pain-related issues on relevant outcomes in comparison to a control group. We included 57 randomized clinical trials consisting of 8,933 participants in our final analysis. Our findings indicate that group therapy is more effective than both usual care and no treatment in decreasing pain in patients with a variety of presentations (e.g., chronic low-back pain, fibromyalgia, specific pain). Group was also found to perform significantly better on improving pain intensity when compared to other active treatments. While the primary outcome of interest was pain intensity, significant effects were also found for secondary outcomes such as pain duration, pain interference, catastrophizing, self-efficacy, beliefs, anxiety, depression, physical functioning, and quality of life.

Risk of bias analyses within studies indicated a significant difference between studies coded as having low risk of bias and those coded with high risk/some concerns for missing outcome data. The overall effect for pain intensity increases when only considering studies coded as having a low risk of bias for missing outcome data. Analyses of risk of bias across studies suggested that our results are robust, there are no missing studies, and that there is no significant evidence of publication bias.

Results indicated moderate heterogeneity and each outcome category yielded significant, positive effects of group interventions for pain. Though the overall effect for pain intensity is considered to be small, it is important to keep in mind the complexity of treating a chronic
condition. The chronicity of pain lends to the clinical significance of finding any effect at all and the small effect is consistent with other psychotherapy and pain-related meta-analyses (Veehof et al., 2011; Macea et al., 2010; Lauche et al., 2013; Niknejad et al., 2018; Williams et al., 2020). These effects were maintained in the short, mid, and long-term follow-ups reported by studies. Thus, we see that group treatment is capable of improving the perceived pain intensity of its members and that these improvements are observed to last up to a year after therapy ends.

Looking specifically at secondary outcomes, one stands out as having a significant, medium effect: pain interference. This can be interpreted to mean that being in group treatment helps patients feel less hindered in their day-to-day activities. This effect is not only maintained through follow-up, but it also increases slightly between post and follow-up assessment ($g = 0.51$ vs. $g = 0.57$, respectively). It is important to note, however, that heterogeneity is high at both post-assessment and follow-up (84% and 88%). We hypothesize that the deep connection and bond members form with one another and the strength they may observe in other group members help individuals feel that their pain is more manageable and less disruptive. Under the fear-avoidance model of pain, the improvement in and maintenance of pain interference in follow-up assessments can be seen as evidence that, overtime, the consistent exposure to feared activities leads to a reduction in the overall interference of pain. Because of the displayed efficacy group has on this specific domain when working with pain patients, it may be beneficial for group practitioners to emphasize changes in interference during treatment.

Other secondary outcomes with significant results and effect sizes in the small range include pain frequency, catastrophizing, beliefs about pain, anxiety, depression, pain interference, and quality of life. These effects are maintained in pooled follow-up results across all domains. Heterogeneity varies greatly between the secondary outcomes with some yielding $I^2$
values in the high range (pain frequency, catastrophizing, beliefs about pain, and quality of life) and anxiety in the low range (15%). All others were in the moderate range. From this, we can see that group treatment for chronic pain patients goes beyond the improvement in pain intensity. More specifically, other pain-related outcomes such as frequency, beliefs, and interference improve significantly in group therapy. Outcomes indirectly related to the pain experience such as self-efficacy, catastrophizing, quality of life, anxiety, and depression also improve at rates greater than chance. This is clinically meaningful because of how often pain patients experience comorbid issues and disorders while in treatment for their chronic pain.

The moderate levels of heterogeneity in our overall effect of group on pain intensity led us to conduct moderator analyses. Among the 30+ variables coded for each article, four variables emerged as having a significant moderating effect. One of those variables was pain intensity measure where measures were divided into six different categories. All measure categories demonstrated an effect for group reducing pain intensity with the exception of the McGill Pain Questionnaire (MPQ). It is unclear as to why using MPQ led to nonsignificant effects of group on pain intensity. Early studies demonstrated strong psychometrics and normative data with a sufficient sensitivity to detect differing intensities of pain (Melzack, 1975; Burckhardt & Jones, 2003). However, criticism of the MPQ has stated that the instructions are complex and the descriptor words require a sophisticated vocabulary (Grimmer-Somers et al., 2009). There is also ambiguity around scoring along with differences among age and sex in the selection of pain descriptors. It is important to note, however, that the MPQ was only reported in 5 articles which makes it the measurement category with the smallest n.

Our results suggest that outcomes were more favorable among groups made up of a homogenous gender identity. More specifically, female-only groups yielded a stronger positive
effect compared to mixed-gender groups. Although the literature is mixed regarding the
differential effectiveness of single-gender groups versus mixed-gender groups, past studies have
also found differential effects favoring female-only groups (Sugarman et al., 2016; Greenfield et
al., 2013). More specifically, women in female-only groups reported feeling safe and intimate
more often where elements such as honesty, empathy, and having their needs met are more
prevalent compared to those in mixed-gender groups.

It is important to point out that increased efficacy of group therapy with women-only
groups may, in part, be related to homogeneous presentations of pain or an increased efficacy in
treating fibromyalgia. In our analysis, the type of pain being treated in group therapy did not
meet conventional significance ($p = .055$) to be considered a moderating variable. The effect that
group had on improving pain intensity was $g = 0.52$ for groups treating only fibromyalgia ($n = 12$) compared to the effect of $g = 0.23$ for all others. However, four out of the 10 studies using
women-only groups were not treating fibromyalgia which lends evidence to the notion that
greater effects may be more attributable to same-gender groups rather than a product of pain
homogeneity or treatability of fibromyalgia.

A significant dose effect was found which suggests that group’s efficiency in improving
pain intensity increases as the number of therapy sessions increases. This was found to account
for approximately 18% of the variability and equates to about a 0.15 unit increase in effect size
for every 10 sessions of group treatment. This is promising in the context of treating a chronic
condition as it provides evidence that prolonged treatment is able to not only maintain positive
effects, but that the effects tend to increase with more sessions. It is unclear, however, if there is
a ceiling to this increase in effect. The highest amount of group sessions reported among the
studies was 24.
Differential effects were also observed between articles based on whether an official pain diagnosis from a medical professional was explicitly stated as a prerequisite for inclusion into the study. Studies using participants with a diagnosis of pain yielded higher effects compared to studies with no mention of pain diagnosis. Differences between individuals with and without a pain diagnosis may include severity, chronicity, level of interaction with medical professionals, and access to treatment (e.g., medication). It is interesting to note that the greater effect was observed for those with a pain diagnosis which may entail a greater severity of the experienced pain and increased interreference. These results suggest that whatever factors may contribute to an individual being diagnosed with a pain-related condition may also be at play when it comes to group’s efficacy in reducing the intensity of pain.

It is important to point out the variables which did not produce a significant moderating effect in our study but have been observed in other group-focused meta-analyses. Significant moderators for group therapy on pain did not include variables such as theoretical orientation, type of control group used, patient age, use of a manualized protocol, nor treatment setting. In many ways, this offers evidence to group’s overarching and general effect on pain. Along with finding that there is no significant difference in efficacy across pain types, group can be viewed as relatively robust and versatile when it comes to treating pain. Clinicians can feel confident in referring pain patients to group knowing that group has a wide reach and dynamic applicability for these patients.

**Comparison to Other Reviews**

In comparing our results to those from other pain-related meta-analyses, it is easy to notice overarching consistency. This is especially true for studies looking at psychological approaches which also find a significant and small effect on pain intensity. Past meta-analyses
with comparable results for pain intensity include Williams and colleagues’ (2020) meta-analysis on CBT; Niknejad and colleagues’ (2018) meta-analysis on psychological approaches in general; Lauche and colleagues’ (2013) meta-analysis on mindfulness-based stress reduction; Veehof and colleagues’ (2011) meta-analysis on acceptance-based interventions; and Macea and colleagues’ (2010) meta-analysis on web-based CBT.

Comparable results are also prevalent in meta-analyses looking at additional variables in pain patients such as depression (Niknejad et al., 2018; Malone & Strube, 1988), quality of life (Lauche et al., 2013), and physical function (disability; Williams et al., 2020). In comparing secondary outcomes found in Niknejad et al.’s (2018) meta-analysis, we see overlap of significant results in categories such as catastrophizing and self-efficacy. Their meta-analysis also found similar small yet significant effects on pain intensity maintained in follow-up assessments.

It is important to also consider how group therapy’s efficacy in treating chronic pain compares to standard medical care involving the use of opioids. An earlier meta-analysis looking at opioid treatment and noncancer chronic pain found medium effects \((n = 28; \text{SMD} = -0.60)\) for pain relief and small effects \((n = 20; \text{SMD} = -0.31)\) for functional outcomes (Furlan et al., 2006). In this same meta-analysis, statistically significant side-effects were found to include constipation, nausea, dizziness, drowsiness, dry skin, vomiting, and pruritus.

A more recent meta-analysis on opioid treatment paints a different picture. Meske et al.’s (2018) meta-analysis included 15 enriched enrollment randomized withdrawal studies and reported a small effect \((\text{SMD} = -0.41)\) on pain intensity. The authors indicated that only “minor benefits” were found for physical functioning and no significant effects found for mental
function. In their discussion, the authors mention that their review does not support the use of opioids alone to improve physical function.

These meta-analyses join others (e.g., Sommer et al., 2020) that report effects comparable to those found in the present study, especially among secondary outcomes. From this, medical professionals and researchers are hard-pressed to justify the use of opioids based on the known side-effects and small (or in some cases, negligible) added benefit over nonpharmacological approaches. Use of opioids seems to be at odds compared to alternative treatments that do not have obvious or significant aversive side-effects. This is especially true when meta-analyses on opioids fail to find any benefit for comorbid psychological and emotional concerns.

It is interesting to compare the results of our meta-analysis to others that also look at group therapy for specific concerns. The majority of past meta-analyses report medium and large effects for group therapy on treating various disorders such as PTSD, borderline personality disorder, panic disorder, obsessive compulsive disorder, and social anxiety disorder (Barkowski et al., 2016; Barkowski et al., 2020; Schwartze et al., 2016; Schwartze et al., 2017; McLaughlin et al., 2019; Schwartze et al., 2019). However, a recent meta-analysis on group therapy for schizophrenia also yielded a significant yet small effect (g = 0.30; Burlingame et al., 2020). We hypothesize that smaller effect sizes may be attributable to the level of chronicity of symptoms experienced. It is understandable that group therapy will appear to perform less effectively when treating conditions associated with severe and persistent symptoms.

With this meta-analysis, we were able to extend the evidence base of previous meta-analytic summaries by including 57 well-executed RCTs with sufficient sample sizes for chronic pain. Our wide inclusivity, which was not limited by variables such as age, pain type, control used, etc. helps readers get a general sense for group’s efficacy on pain. Additional strengths of
this study include its pre-registration, the evaluation of potential bias using the most current version of the Cochrane risk of bias tool (ROB2), and extensive coding of variables to carry out a thorough moderator analysis. Because of the data available, we were also able to conduct relatively strong analyses on follow-up data to give us a clear picture on how well positive effects are maintained after treatment ends. This study is clinically important because it signals the significant effectiveness of a nonpharmacological treatment for chronic pain. Given the known risks of medication use for pain management, this meta-analysis should give healthcare providers confidence in referring patients who suffer from chronic pain to psychological treatments, specifically group therapy.

Limitations

The present study has several noteworthy limitations. One weakness of this meta-analysis, consistent with other reviews, is that the patient populations, treatment settings, interventions and control conditions, and the outcome definitions are not the same across studies. This widespread variability may have led to the high levels of unexplained heterogeneity which complicates the results found herein. Another weakness consistent with other reviews is the possibility that unpublished literature, if included, may produce a smaller effect had it been published and searchable for our analysis. In an attempt to include only studies with rigorous methods, we excluded studies that did not have at least 20 participants in each trail arm at the first post-assessment. This may have led to the exclusion of studies that could have provided additional power to our results and thus added more clarity. Only including studies published in the English language may have also led to the exclusion of studies conducted with diverse participant populations. The generalizability of our findings is hampered by the limited diversity across the populations assessed in the studies included in our analysis. It is unclear whether the
effects of group therapy are different across race and ethnicity, non-adult populations, and other minority groups.

**Implications for Research and Practice**

Future research will be important to determine what group processes are at play in the improvement of pain intensity and adjacent issues. Because there were no male-only groups among the studies included in this meta-analysis, it may be helpful for future research to investigate how effective male-only groups are compared to female-only and mixed gender. Because the maximum number of sessions reported among the included studies was 24, future research should assess effects beyond 24 sessions and determine if there is an optimal amount of sessions for group to be most effective. Based on our results, we suggest that researchers investigating group therapy’s efficacy for treating pain use only participants who have been previously diagnosed with a pain-related condition by a medical professional and that they select measures other than the McGill Pain Questionnaire (MPQ) to assess pain intensity. Future research should also attempt to replicate the null findings for differences among various theoretical orientations.

The results of our meta-analysis demonstrate that the majority of studies investigating group therapy for pain yield positive effects for group with a small mean effect. This lends support for the utilization of group therapy for chronic pain patients. Our study included a wide array of pain-related presenting concerns across a variety of age groups and treatment settings. While a specific theoretical orientation did not seem to influence group’s efficacy, we suggest that groups may be more effective when the composition is made up of a homogeneous gender identity. Groups may also be more effective when including only members with a diagnosed pain-related condition from a medical professional. Groups should also be set up in a way that
offers long-term treatment as it seems to have a continued benefit over an extended number of sessions.

We echo Niknejad et al.’s (2018) encouragement to clinicians to not only consider psychological approaches for chronic pain, but to give precedence to group-based approaches. Group therapy is a viable option for treating chronic pain and does not produce the known side-effects of pharmaceutical approaches. In many ways, group also tends to be cost-effective for clinics because of the unique ability to treat multiple patients simultaneously. Healthcare centers are encouraged to implement group therapy programs for patients experiencing chronic pain.
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References marked with an asterisk indicate studies included in the meta-analysis.


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randomized controlled trial. *Journal of General Internal Medicine, 25*(10), 1064-1070.

https://doi.org/10.1007/s11606-010-1418-6


https://doi.org/10.1136/bmj.39343.408449.80


https://doi.org/10.1080/10503307.2020.1817603


https://doi.org/10.1093/clipsy/bpg016


https://doi.org/10.1016/S1090-3801(97)90037-9


https://doi.org/10.1002/acr.20347


https://doi.org/10.1146/annurev-clinpsy-090310-120430


Psychosomatic Medicine, 77(3), 333–341.
https://doi.org/10.1097/PSY.0000000000000158

https://doi.org/10.1016/0005-7967(83)90009-8


https://doi.org/10.1002/art.22471

https://doi.org/10.3233/BMR-140518

https://doi.org/10.1097/00002508-200503000-00001


https://doi.org/10.1016/j.jpain.2010.06.005


https://doi.org/10.1016/j.ajp.2017.11.025


https://doi.org/10.1016/S0304-3959(98)00255-3

behavioural therapy in the clinic: Evaluation of a CBT informed pain management


*Morone, N. E., Greco, C. M., Moore, C. G., Rollman, B. L., Lane, B., Morrow, L. A., Glynn,
https://doi.org/10.1001/jamainternmed.2015.8033


https://doi.org/10.1016/j.jpain.2015.05.002

https://doi.org/10.1136/jnnp.37.12.1366

trends in the health of Americans with special feature on mortality*. Retrieved from
https://www.cdc.gov/nchs/hus/index.htm


https://doi.org/10.1016/j.pain.2009.05.020


## Appendix

### Supplementary Tables 1

*Search terms for CENTRAL*

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## Supplementary Tables 2

**Search terms for MEDLINE (Ovid)**

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<td>exp psychotherapy, group/ or group processes/</td>
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<td>AND</td>
<td>OR</td>
</tr>
<tr>
<td>(&quot;group therap*&quot; OR &quot;group psychotherapy*&quot; OR &quot;group CBT&quot; OR &quot;group counseling*&quot; OR &quot;group exposure&quot; OR &quot;group format&quot; OR &quot;group approach&quot; OR &quot;group program*&quot; OR &quot;group psychoanaly*&quot; OR &quot;group strateg*&quot; OR &quot;group train*&quot; OR &quot;train* group&quot; OR &quot;group session$&quot; OR &quot;group setting$&quot; OR &quot;support group&quot;).ti,ab,kf. OR (group-based or group-focused or group-centered or &quot;group intervention&quot; or &quot;group treatment&quot; or CBGT or &quot;group guided imagery&quot; or &quot;group cognitive behavioral intervention&quot; or &quot;group cognitive behavioural intervention&quot; or &quot;group cognitive intervention&quot; or &quot;group behavioral intervention&quot; or &quot;group behavioural intervention&quot; or &quot;group psychodynamic intervention&quot; or &quot;group supportive intervention&quot; or &quot;group conversational intervention&quot; or &quot;group social skills intervention&quot; or &quot;group cognitive behavioral treatment&quot;</td>
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| AND | "treatment group$1".ti,ab,kf. or "group behavioral treatment" or "group conversational treatment" or "group psychodynamic treatment" or "group supportive treatment"
| OR | (intervention* or treatment*).ti,ab,kf. not ("intervention group$1".ti,ab,kf. or "treatment group$1".ti,ab,kf.)
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")
| OR | (group$1 adj3 (CBT or psychotherap* or therap* or counseling* or exposure* or format* or approach* or program* or psychoanaly* or strateg* or support* or train* or setting* or session* or "cognitive restructuring" or "cognitive technique"* or "group-based or group-focused or group-centered or group-delivered or CBGT or "group intervention" or "group treatment" or "group cognitive behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group cognitive behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual"):ti,ab,kf.}
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<td>(((control* or compar* or clinic*) adj3 (studies or study)) or ((treatment or intervention or studi* or study) adj2 (effectiveness or efficacy)) or random* or placebo* or assign* or allocat* or &quot;experimental design&quot; or trial* or dismantling or &quot;control group$1&quot;).ti,ab,kf.</td>
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### Supplementary Tables 3

**Search terms for psycINFO**


| OR

| TI (“pain disorder” OR “psychogenic pain*” OR “pain” OR “chronic pain” OR “back pain” OR “lower back pain” OR “low-back pain” OR “low back pain” OR “pain management” OR “PSOCQ” OR “fibromyalgia” OR “backpain” OR “somatoform pain”) OR AB (“pain disorder” OR “psychogenic pain” OR “pain” OR “chronic pain” OR “back pain” OR “lower back pain” OR “low-back pain” OR “low back pain” OR “pain management” OR “PSOCQ” OR “fibromyalgia” OR “somatoform pain” OR “Backpain”) OR KW (“pain disorder” OR “psychogenic pain” OR “pain” OR “chronic pain” OR “back pain” OR “lower back pain” OR “low-back pain” OR “low back pain” OR “pain management” OR “PSOCQ” OR “fibromyalgia” OR “backpain” OR “somatoform pain”) |

| AND |

| Intervention | DE "Group Psychotherapy" OR DE "Group Intervention" OR DE "Group Counseling" OR DE "Group Cohesion" OR DE "Group Development" OR DE "Group Dynamics" OR |

| OR |
TI ("group treatment" OR "group intervention" OR "group setting" OR
"group strategy" OR "group session" OR "group therap*") OR "group
psychotherap*" OR "group psychoanal*y*" OR "group cognitive behav*
therap*") OR "group CBT" OR "group training" OR "training group" OR
"group format" OR "group exposure" OR "group program" OR "group
counselling" OR "group approach" OR "group support*") OR "group
based" OR "group focused" OR "group centred" OR "group delivered" OR
CBGT OR "group vs individual" OR "group versus individual" OR
"cognitive restructuring" OR "cognitive technique*" OR "guided imagery")
OR AB ("group treatment" OR "group intervention" OR "group setting"
OR "group strategy" OR "group session" OR "group therap*" OR "group
psychotherap*" OR "group psychoanal*y*" OR "group cognitive behav*
therap*") OR "group CBT" OR "group training" OR "training group" OR
"group format" OR "group exposure" OR "group program" OR "group
counselling" OR "group approach" OR "group support*") OR "group
based" OR "group focused" OR "group centred" OR "group delivered" OR
CBGT OR "group vs individual" OR "group versus individual" OR
"cognitive restructuring" OR "cognitive technique*" OR "guided imagery")
OR KW ("group treatment" OR "group intervention" OR "group setting"
OR "group strategy" OR "group session" OR "group therap*" OR "group
psychotherap*" OR "group psychoanal*y*" OR "group cognitive behav*
therap*") OR "group CBT" OR "group training" OR "training group" OR
"group format" OR "group exposure" OR "group program" OR "group
counselling” OR “group approach” OR “group support*” OR "group based" OR "group focused" OR "group centred" OR "group delivered" OR CBGT OR "group vs individual" OR "group versus individual" OR "cognitive restructuring" OR "cognitive technique*" OR "guided imagery")

TI (group W3 (treatment OR intervention OR setting OR strategy OR session) OR group N3 (therap* OR psychotherap* OR psychoanaly* OR "cognitive behav* therap*" OR CBT OR training OR format OR exposure OR program OR counseling OR approach OR support* ) OR "group based" OR "group focused" OR "group centred" OR "group delivered" OR CBGT OR "group vs individual" OR "group versus individual" OR "cognitive restructuring" OR "cognitive technique*" OR "guided imagery")

OR AB (group W3 (treatment OR intervention OR setting OR strategy OR session) OR group N3 (therap* OR psychotherap* OR psychoanaly* OR "cognitive behav* therap*" OR CBT OR training OR format OR exposure OR program OR counseling OR approach OR support* ) OR "group based" OR "group focused" OR "group centred" OR "group delivered" OR CBGT OR "group vs individual" OR "group versus individual" OR "cognitive restructuring" OR "cognitive technique*" OR "guided imagery")

OR KW (group W3 (treatment OR intervention OR setting OR strategy OR session) OR group N3 (therap* OR psychotherap* OR psychoanaly* OR "cognitive behav* therap*" OR CBT OR training OR format OR exposure OR program OR counseling OR approach OR support* ) OR "group based" OR "group focused" OR "group centred" OR "group delivered" OR
| Design | DE "Random Sampling" OR DE "Experimental Design" OR DE "Clinical Trials" OR DE "Treatment Effectiveness Evaluation" OR DE "Treatment Outcomes" OR 
|        | TI (random* OR assign* OR allocat* OR trial* OR "control group" OR "experimental design" OR placebo OR (treatment OR intervention OR studi* OR study) N3 (effectiveness OR efficacy) OR (control* OR compar* OR clinic) N3 (studi* OR study)) OR AB ( random* OR assign* OR allocat* OR trial* OR "control group" OR "experimental design" OR placebo OR (treatment OR intervention OR studi* OR study) N3 (effectiveness OR efficacy) OR (control* OR compar* OR clinic) N3 (studi* OR study)) OR KW ( random* OR assign* OR allocat* OR trial* OR "control group" OR "experimental design" OR placebo OR (treatment OR intervention OR studi* OR study) N3 (effectiveness OR efficacy) OR (control* OR compar* OR clinic) N3 (studi* OR study)) |
### Supplementary Tables 4

**Search terms for Web of Science**

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"group social skills intervention" or "group cognitive behavioral treatment" or “group cognitive behavioural treatment” or "group cognitive treatment" or "group behavioral treatment" or “group behavioural treatment” or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual")

TS=(group NEAR/3 (CBT or psychotherap* or therap* or counseling* or exposure* or format$ or approach* or program* or psychoanal* or strateg* or support* or train* or setting$ or session$ or "cognitive technique*" or "cognitive restructuring" or "guided imagery")) or

TS=(group-based or group-focused or group-centered or "group intervention" or "group treatment" or CBGT or "group guided imagery" or "group cognitive behavioral intervention" or "group cognitive intervention" or "group behavioral intervention" or "group psychodynamic intervention" or "group supportive intervention" or "group conversational intervention" or "group social skills intervention" or "group cognitive behavioral treatment" or "group cognitive treatment" or "group behavioral treatment" or "group psychodynamic treatment" or "group supportive treatment" or "group conversational treatment" or "group social skills treatment" or "group versus individual" or "group vs individual") or

TS=(group NEAR/3 (intervention* or treatment*) not ("intervention group*" or "treatment group*"))
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### Supplementary Figure 1

**Random effects analysis on group therapy for pain intensity excluding outliers**

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**Random effects model**

| Hedge’s g and 95% CI |
|----------------------|-------------------|
| Prediction interval  |

**Heterogeneity: I²=27%, Q=63.14, df=16, p=0.001**

| Hedge’s g and 95% CI |
|----------------------|-------------------|
| Prediction interval  |

**Favors group** **Favors control**