The Efficacy of Hypnosis in the Treatment of Chronic Musculoskeletal Pain: A Systematic Literature Review

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A thesis submitted to

Auckland University of Technology

in partial fulfilment of the requirements for the degree

of

Masters of Health Practice

2021

School of Clinical Sciences

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Abstract

Hypnosis has a long history of use in the treatment of a variety of physical and psychological conditions. However, its effectiveness as a treatment for chronic musculoskeletal pain and the best method for delivery of the hypnotic intervention is still unclear. Therefore, the objective of this study is to review the research surrounding the efficacy of hypnosis for chronic musculoskeletal pain and to identify the most effective intervention delivery strategies. A systematic literature review was performed using the Scopus electronic database to locate all studies that had used hypnosis with a chronic, musculoskeletal pain condition. Thirteen studies met the inclusion criteria, of which 12 were randomised controlled trials. The total number of participants across the studies was 627, with a mean age of 48.3 years. The number of intervention sessions in the hypnosis group ranged from a single session to 14 weekly sessions, with a mean of seven sessions across the studies. The hypnotic intervention session durations ranged in length from 20 minutes up to 2.5 hours and were predominately given on a weekly basis. Collectively, the included studies provided high quality evidence that hypnosis has a positive effect in reducing pain intensity in chronic musculoskeletal conditions compared to standard care and waitlist controls. When compared to relaxation, differences between groups were less consistent but still tended to favour the hypnotherapy groups. Similarly, when compared to physical interventions such as physiotherapy or trigger point therapy, hypnosis was also shown to be more effective. The addition of hypnosis to other psychologically based interventions, such as cognitive behavioural therapy and pain education, created greater improvements in many outcome measures related to a person's pain experience, such as average and worst pain intensity, and catastrophising. The studies that used a larger variety of hypnotic suggestions that targeted pain intensity, and the cognitive and emotional components of pain, achieved better outcomes. Hypnosis can, therefore, be recommended as a viable treatment option, either as a stand-alone-treatment or as an adjunct to other psychological interventions for the treatment of chronic musculoskeletal pain. Studies investigating the efficacy of specific components of the hypnotherapy interventions around dosage and delivery methods, with larger populations of a more homogenous sample are required to establish more robust conclusions regarding these parameters in a chronic musculoskeletal pain population.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed:

Damian Taylor
Date: 20/02/2021

1. Introduction

Chronic pain is an unpleasant sensation that persists for three or more months or beyond the expected time of tissue healing and serves no biological function (Elliott et al., 1999). It is a common problem with approximately 1 in 6 (19.4%) New Zealanders over the age of 15 reporting chronic pain with the prevalence increasing with age (Ministry of Health, 2019). Data from the Global Burden of Disease Study indicates that musculoskeletal conditions are among the greatest causes of years lived with disability (Holopainen et al., 2020). Unrelieved chronic pain can cause a considerable amount of suffering, physical limitation, and emotional distress (Holopainen et al., 2020). Despite escalating health care costs, musculoskeletal pain is a problem that the current health care system has not yet been able to solve (Lewis & O'Sullivan, 2018).

Chronic pain is both a sensory and emotional experience and can involve neuropathic or psychogenic pain mechanisms with biological, psychological and social components (Lewis & Rice, 2014; Nielsen & Henriksson, 2007). A biopsychosocial model is now widely adopted for managing people with chronic musculoskeletal pain, as it addresses the dynamic relationships among these factors that can contribute to and modulate a person's experience of chronic pain (Engel, 2012; Miaskowski et al., 2019). This model addresses limitations of a biomedical model, which has a tendency to attend to only the biological factors of pain. In addition, a biopsychosocial model of management normally incorporates a multidisciplinary approach involving multiple clinicians and aims to provide a coordinated intervention including physical activity, psychology, and medical and pharmacological management. Despite its potential benefits it can be difficult for many people with chronic musculoskeletal pain to access multidisciplinary services, leading to a single clinician from one profession providing a range of interventions (Choinière et al., 2020). This can be challenging for many practitioners who may only have completed training in a single discipline. For example, a previous systematic review suggested that many physiotherapists often feel they have not received sufficient psychological training and, therefore, lack confidence in addressing psychosocial issues (Alexanders et al., 2015). This may be part of the reason that a biopsychosocial approach to management is promising in the management of musculoskeletal pain, but the effect size generally remains small (Guerrero et al., 2018).

Hypnosis is relatively quick and easy to learn, making it a useful tool that could be utilised by a variety health of care providers when treating chronic musculoskeletal pain, particularly when there is a lack of access to multidisciplinary pain management services.

Considering that chronic pain is an area of need in the current healthcare system, and that there are limited multidisciplinary biopsychosocial facilities and services in New Zealand, it would be useful to examine the use of hypnosis in treatment of chronic pain. The following literature review will summarise relevant information on (1) nociceptive system changes in chronic pain; (2) an explanation of hypnosis; (3) physiological mechanisms underpinning the effect of hypnosis on chronic pain; and (4) clinical effects of hypnosis.

2. Literature Review

2.1 Nociceptive System Changes in Chronic Pain

The nociceptive system refers to the various regions of the nervous system involved in the processing of noxious stimuli (Treede, 2006). It is now unanimously accepted that cortical activity is required for the generation of a painful experience (Treede et al., 1999). The effective treatment of chronic pain must be developed based on an accurate understanding of the mechanisms that underpin this system.

The transition from a state of acute pain to chronic pain involves the plasticity of the nervous system. Plasticity of the nervous system involves alterations in neural transmission between an applied stimulus and a perceived pain response within the nociceptive system (Dickenson, 2008). While plasticity of the nociceptive system is beneficial during an acute pain experience, sustained alterations in the nociceptive system are dysfunctional and can lead to chronic pain (Dickenson, 2008).

Plasticity within the nociceptive system includes central sensitisation, which occurs when the nervous system goes through a process called wind-up and is regulated in a state of high reactivity. This arises from a reduction in anti-nociceptive signals and/or an increase in pro-nociceptive signals (Lewis & Rice, 2014). Central sensitisation amplifies nociceptive signals by increasing the responsiveness of the central neurons

causing hyperalgesia (Dickenson, 2008; Lewis & Rice, 2014). This increased responsiveness is related to a decrease in the threshold of dorsal horn neurons, such as the wide dynamic range (WDR) neurons, to nociceptive input (Lewis & Rice, 2014; Nielsen & Henriksson, 2007). This can be due to an increase in production and/or release of excitatory neurotransmitters, or from increased receptor activation and is often a result of continuous nociceptive input (Lewis & Rice, 2014). N-methyl-D-aspartate (NMDA) receptors in particular can be implicated in the 'wind-up' process where sustained C fibre input causes increased responsiveness at the dorsal horn and provides a basis for central hyper excitability (Dickenson, 2008). This facilitation is normal and useful in acute pain, but when it persists beyond the period required for healing, it is no longer normal or functional.

In addition to spinal level plasticity, there may be changes at the supraspinal level in inhibitory and facilitatory descending pathways, increasing excitability of dorsal horn neurons, as well as alterations in areas of the brain implicated in nociceptive processing and interpretation, termed the neuromatrix (Lewis & Rice, 2014; Melzack, 2005). The brainstem is the key site for nociceptive modulation and receives input from ascending pathways as well as the neuromatrix. There are documented alterations in both these inhibitory and facilitatory processes in people with chronic pain (Lewis & Rice, 2014).

The neuromatrix, which is distributed throughout many areas of the brain, comprises a widespread network of neurons that generate patterns, process information that flows through it, and ultimately produces the pattern that is felt as a whole body possessing a sense of self (Melzack, 2005). The neuromatrix is generally considered to consist of the thalamus, the primary somatosensory cortex, the insula, the anterior cingulate cortex (ACC), and the prefrontal cortex (Prichep et al., 2011). It is the activity in these different regions that creates the experience of pain (Jensen et al., 2017). The changes in the neuromatrix in a chronic pain state comprise of altered structure and patterns of activity in these brain areas known to be involved in acute pain as well as regions generally not involved in acute pain sensations (Seifert & Maihöfner, 2009). These alterations in processing, including increased activity, likely contribute to the maintenance of an ongoing pain experience.

Interactions between the neuromatrix and the brainstem create a mechanism for psychological factors to modulate the nociceptive signal (Lewis & Rice, 2014; Nijs &

Van Houdenhove, 2009). Cortical regions involved with a person's thoughts, beliefs, and mood have the capacity to modulate nociceptive signals through strong connections to the brainstem (Zusman, 2002). The balance between inhibitory and facilitatory descending pathways is not constant but can be modulated, for example, by the level of vigilance, attention, and stress (Rygh et al., 2002). Mood disorders and catastrophic beliefs are common in people with chronic pain, and in some cases, these have been linked to abnormal function of descending pathways or to other dysfunctions of the nociceptive system (Nijs & Van Houdenhove, 2009). Therefore, addressing these unhelpful thoughts, beliefs, and moods may serve as a way to normalise the activity of dysfunctional descending modulatory pathways.

2.2. Hypnosis

Modern hypnosis started with Austrian physician Franz Anton Mesmer (1734-1815), who believed in a phenomenon known as mesmerism, which he believed was related to an invisible fluid that runs within the subject or between the subject and the therapist (Radovančević, 2009). The term *hypnotism* was coined by Scottish physician James Braid in 1843, who used it to describe a person who was in a particular sleep state or trance (Radovančević, 2009). In 1934, Spanish physician Santiago Ramo´n y Cajal published one of the first clinical reports on the employment of hypnotic suggestion to induce analgesia, which he termed hypno-analgesia (Lanfranco et al., 2014).

Clinical hypnosis lacks a widely accepted definition, but generally, it is considered to be the intentional organising and augmenting of the power of human consciousness (Short, 2018). An integrative model of hypnosis and hypnotic phenomena introduced by Lynn et al. (2015) involves the interactions of social, cultural, and cognitive variables in producing the multifaceted experience of hypnosis. These can include the participant's attitudes, beliefs, and expectancies about hypnosis; their motivation to respond to suggestions from a hypnotist; their interpretations of how to respond to the suggestions, and willingness and ability to imagine experiences consistent with the suggestions; and their ability to form response sets in keeping with suggested activities (Lynn et al., 2015). Hypnosis can incorporate a number of components such as relaxation, focused attention, guided imagery, interpersonal processing, and dissociation (Jensen & Patterson, 2014). For the treatment of pain, the process usually involves an induction, which can be understood as an initial suggestion to prepare a patient that increases their ability or tendency to respond to subsequent suggestions (Jensen et al., 2017). These

subsequent suggestions often involve attempting to allow a person to make changes to the sensory, cognitive, and emotional domains of their pain experience (Rizzo et al., 2018b).

A variety of hypnotic techniques are used to target the various aspects of the musculoskeletal pain experience (Jensen & Patterson, 2014). This can involve different types of hypnotic inductions and a wide range of hypnotic suggestions (Abrahamsen et al., 2011). No data currently exist regarding the most useful content and delivery methods to use for chronic musculoskeletal pain and therefore this will be examined in this review. Furthermore, there is also currently no consensus about the most useful number, frequency and duration of sessions required to get the best possible outcome in this population. A large variation in dosage can be seen in the literature regarding the hypnotic treatment of chronic pain. For example, a study by Billot et al. (2020) consisted of three 15-min sessions separated by four to six weeks, while another study by Horton-Hausknecht et al. (2000) involved group sessions consisting of one session per week for approximately one and half hours and were conducted over a period of 10 weeks. The relative efficacy of an intervention being given in an individual or group setting has not been investigated in previous reviews and will therefore also be considered.

2.3. Physiological Mechanisms Underpinning the Effect of Hypnosis on Chronic Pain

Scholars have begun to document the effectiveness of hypnosis in the treatment of chronic pain, and to examine the physiological mechanisms behind how hypnosis might produce positive changes in a person's pain experience. Hypnosis can affect various structures within the central nervous system including the prefrontal cortex, somatosensory cortex, medial areas of neuromatrix, insular, thalamus, and the peripheral nociceptive system.

The prefrontal cortex has been shown to be activated by hypnosis (A. Del Casale et al., 2015). The prefrontal cortex is involved with the cognitive reaction to the experience of pain, and processes the implications of the sensations for a person's well-being in the present and the future (Jensen & Patterson, 2014). The meaning we give to pain can impact its severity, so by decreasing a person's negative cognitions about their pain,

alterations can be made to the intensity of their pain (Ehde & Jensen, 2004). Hypnosis can effectively reduce the perception of pain by elevating a patient's perceptual threshold (Hilgard, 2016). Based on this understanding of the link between the prefrontal cortex and pain perception, hypnotic cognitive therapy was developed targeting pain beliefs and cognitions. This approach demonstrated better outcomes than traditional cognitive therapy without hypnosis or hypnotic analgesia alone in the treatment of patients with multiple sclerosis and chronic pain by reducing pain intensity, catastrophising, and pain interference (Jensen et al., 2011). This finding demonstrates that hypnosis-based therapy can improve the effectiveness of cognitive therapy, and that targeting patient's beliefs and cognitions about their pain using hypnosis is more effective than only using it to target reducing pain sensations.

The somatosensory cortex, the region of the neuromatrix that is primarily responsible for the intensity and quality of the pain experience, has been shown to be influenced by hypnosis (Jensen et al., 2017). Using positron emission tomography (PET), Hofbauer et al. (2001) demonstrated both an increased or decreased subjective pain intensity to a consistent painful stimulus using the respective hypnotic suggestion, and were able to show that these changes to nociceptive processing were associated with alterations in the activation of the primary somatosensory cortex. A more recent study by Casiglia et al. (2020) on decreasing subjective pain intensity with hypnosis, found that patients reported a complete absence of subjective pain and a deactivation of primary and secondary somatosensory cortical activity during hypnosis. These studies clearly show hypnosis reduces subjective pain, and that this reduction is associated with changes in nociceptive processing at a cortical level.

Medial areas of the neuromatrix, which are responsible for cognitive and emotional functioning, can also be influenced by hypnosis (Rainville et al., 1997). Part of this medial area, the ACC, is involved with the emotional and suffering components of pain, and the perceived need to address it (Rainville et al., 1997). It assesses the motivational contents of internal and external stimuli, and regulates context-dependent behaviour (Devinsky et al., 1995). A meta-analysis of neuroimaging studies by Del Casale et al. (2015) found that activation in the right dorsal ACC during hypnosis modulated experimental pain more than in control conditions. This indicates that hypnotic suggestions can impact the cognitive and emotional division of the neuromatrix. In support of this, Rainville et al. (1997) demonstrated that suggestions to increase or

decrease the unpleasantness of pain changed the activation of the ACC with no effect on the somatosensory cortex.

The insula, which is another region of the neuromatrix associated with pain experience, is involved with homeostatic control of a sense of physical condition by judging to what extent the body is at risk (Jensen et al., 2009). The insula has been shown to be activated by hypnotic suggestion in a similar way to actual nociceptive stimulation and in a different way to imagined pain (Derbyshire et al., 2004). This means that suggestions to target the insula to encourage homeostasis may potentially affect a person's pain experience.

The thalamus can also be affected by hypnotic suggestions. There is a large amount of communication between the thalamus, somatosensory cortex, insula, ACC, and the prefrontal cortex of the brain, which create the individual's overall pain experience (Rainville et al., 1997). Del Casale et al. (2015) found in their meta-analysis that hypnosis during experimental pain impacted both cortical and subcortical brain activity. They concluded that increases in activation to the anterior cingulate, left superior frontal, and right insular cortices could induce a thalamic deactivation (top-down inhibition), which may produce reductions in pain intensity. Studies have shown this connectivity between brain areas can be decreased or increased by hypnotic suggestion, thereby affecting a pain experience (Del Casale et al., 2015). Suggestions such as re-living a pleasurable autobiographical event or creating comfortable sensations can increase connectivity in these regions, potentially having a positive effect on pain experience (Faymonville et al., 2003). While Fingelkurts et al. (2007) demonstrated that suggestions for a reduction of pain decreased connectivity between different cortical sites in which separate cognitive modules and subsystems may be temporarily incapable of communicating with each other normally, thereby also having a positive effect on a person's pain. Studies have also demonstrated that targeted hypnotic suggestions can decrease (Kiernan et al., 1995) or increase spinal cord nociceptive reflexes (Danziger et al., 1998).

Finally, the peripheral nociceptive system can be also potentially affected by hypnosis (Jensen et al., 2017). Evidence has demonstrated the ability of hypnosis to effect peripheral processes including vascular activity (Casiglia et al., 1997) and wound

healing (Ginandes & Rosenthal, 1999). It may be that these observed hypnotic effects are largely central effects that are manifested peripherally.

There is therefore a variety of potential physiological mechanisms underpinning the effect of hypnosis on chronic pain. This includes documented changes produced by hypnosis in a wide variety of structures involved in the nociceptive process.

2.4. Clinical Effects of Hypnosis

Previous systematic reviews and meta-analyses conducted on the clinical effects of hypnosis on pain have been relatively encouraging. Two meta-analyses have examined the effects of hypnosis on experimentally evoked pain. A recent meta-analysis by Thompson et al. (2019), involving 85 studies, compared hypnotic inductions with no-intervention control conditions on pain ratings, threshold, and tolerance using experimentally-evoked pain models in healthy participants. The meta-analysis demonstrated a meaningful reduction in pain with the hypnosis intervention. In an earlier meta-analysis of the effects of hypnotic analgesia for both clinical and laboratory pain, Montgomery et al. (2000) found that 75% of individuals treated with hypnosis obtained a greater analgesic response than those who were given standard care or no treatment. Their results also indicated that hypnotic suggestions were equally effective in reducing both clinical and experimental pain.

Reviews have also investigated the effectiveness of hypnosis on acute clinical pain. In a summary of previous reviews covering a wide variety of pain conditions, Stoelb et al. (2009) found hypnotic analgesia consistently resulted in greater decreases in a variety of pain outcomes compared to no treatment and standard care, and that hypnosis frequently out-performed non-hypnotic interventions such as medication management, physical therapy, and education in terms of reductions in pain-related outcomes. One systematic review into the effectiveness of hypnosis with headache pain demonstrated the efficacy to be superior or equivalent to commonly used medication (Hammond, 2007). A further systematic review concluded that hypnosis was an effective pain-control technique in children with cancer procedure-related pain (Tomé-Pires & Miró, 2012).

Other reviews have focused on the effect of hypnosis on various types of chronic pain. A systematic review of controlled prospective trials of hypnosis in the treatment of chronic pain, in which six of the 13 studies included populations with musculoskeletal

pain, concluded that hypnosis was generally more effective than non-hypnotic interventions such as attention, physical therapy, and education (Elkins et al., 2007). In another systematic review and meta-analysis by Garland et al. (2020) exploring the effectiveness of mind-body therapies for opioid-treated pain, the authors concluded that there were moderate to large effect size improvements in both pain outcomes and improvements in opioid related outcomes over the 23 studies in the review that used hypnosis. In another meta-analysis, Adachi et al. (2014) reported that hypnosis provided moderate treatment benefits compared with standard care and showed a moderate superior effect compared to other psychological interventions for people with non-headache chronic pain. However, this review only included two studies involving musculoskeletal pain populations.

Overall, the existing reviews on hypnosis and pain have focused more on experimentally invoked pain or acute pain. Furthermore, in the reviews that have examined chronic pain much of the attention has been given to pain of non-musculoskeletal origin. To address these limitations in the literature, this systematic review examined studies on chronic musculoskeletal pain conditions. In so doing, it aims to provide updated evidence on the effectiveness of hypnosis on the management of chronic musculoskeletal pain, and to determine the most effective method of delivering the hypnotic intervention.

3. Methods

A systematic literature review was performed to locate all studies that had used hypnosis with a chronic musculoskeletal pain population. The following methodological aspects were considered: (1) search strategy; (2) inclusion and exclusion criteria; (3) data extraction; and (4) assessment of methodological quality of the literature.

3.1 Search Strategy

The following search terms were used on the Scopus database: TITLE-ABS-KEY ("chronic pain" OR "long-lasting pain" OR "long-term pain" OR "persistent pain" OR "intractable pain" OR "musculoskeletal pain" OR "musculoskeletal disorder*" OR "shoulder pain" OR "neck pain" OR whiplash OR "back pain" OR "widespread pain" OR fibromyalgia OR fma OR "myofascial pain syndrome" OR myalgia OR "idiopathic pain" OR "diffuse pain" OR "aspecific pain" OR "non-

specific pain" OR "non-cancer pain" OR "non-malignant pain" OR "benign pain" OR arthriti* OR osteoarthritis OR "CRPS" OR "complex regional pain" OR "temporomandibular disorder" OR "spinal pain" OR lumba* OR cervical OR ankle OR knee) AND TITLE-ABS (hypno*).

3.2 Inclusion and Exclusion Criteria

Articles were included in the review if they exclusively had a musculoskeletal pain population, which was defined as people experiencing pain arising from the bones, muscles, ligaments, tendons, and/or nerves and had at least one pain-based outcome measure. The participants had to have experienced symptoms for at least three months and received a minimum of one session of a hypnotic based intervention,

Articles were excluded if they were not published in English, were single case studies, included conditions other than musculoskeletal pain or people with mixed diagnosis, or if the exact duration of pain symptoms was unclear. Articles focused on children and elderly populations were also excluded as their response to a hypnotic intervention may be different. Finally, articles including people with headache symptoms were excluded as a review by Adachi et al. (2014) concluded that there was a different response in this population compared to other musculoskeletal chronic pain, which could bias the results of the review.

3.3 Data Extraction

Variables that were extracted from the studies included the year of publication, the presenting condition(s), and the number, average age, and gender of the participants. Data regarding the type, duration and frequency of the intervention and delivery method were also extracted. An explanation of the delivery techniques used within the studies is outlined in Table 1.

Finally, study design and outcome measures were extracted along with study findings, including outcomes related to pain, depression, anxiety and sleep quality. The extracted data were synthesised qualitatively to determine the evidence for the efficacy of hypnosis in this population.

3.4 Assessment of Methodological Quality of the Literature

The Joanna Briggs Institute (JBI) Quality Appraisal Checklist was selected as a reliable tool to assess the internal (i.e., systematic error) and external (i.e., generalisability)

Table 1

Explanations of Delivery Techniques

Delivery Method	Description (Suggestions targeted specifically at)
Pain control/analgesia	Decreasing the intensity of pain or creating anaesthesia
Pain perception	Changing the organisation, identification, and interpretation of perceived sensory information
Coping strategies	Improving a person's own conscious effort, to solve perceived pain related issues
Guided imagery	Evoking and generating mental images that simulate or re-create a sensory perception such as an autobiographical comfortable place
Dissociation	Separating or disuniting a person from their pain experience
Pain related thoughts	Changing and/or reconceptualising both automatic and non-automatic thoughts related to the pain experience
Regression	Recalling a previous event or regressing to an earlier age, often before there was pain, when movement and functional activity was comfortable
Ego building	Creating an image of themselves as they want to be
Future pacing	Visualising or imagining doing something in the future to test that the change process has been successful
Post hypnotic suggestion	Producing positive automatic responses when certain thoughts or occasions are encountered
Home programme	Continued hypnotic practice to be performed outside of the face-to-face intervention
Anchoring	Connecting a unique stimulus to a specific emotional state

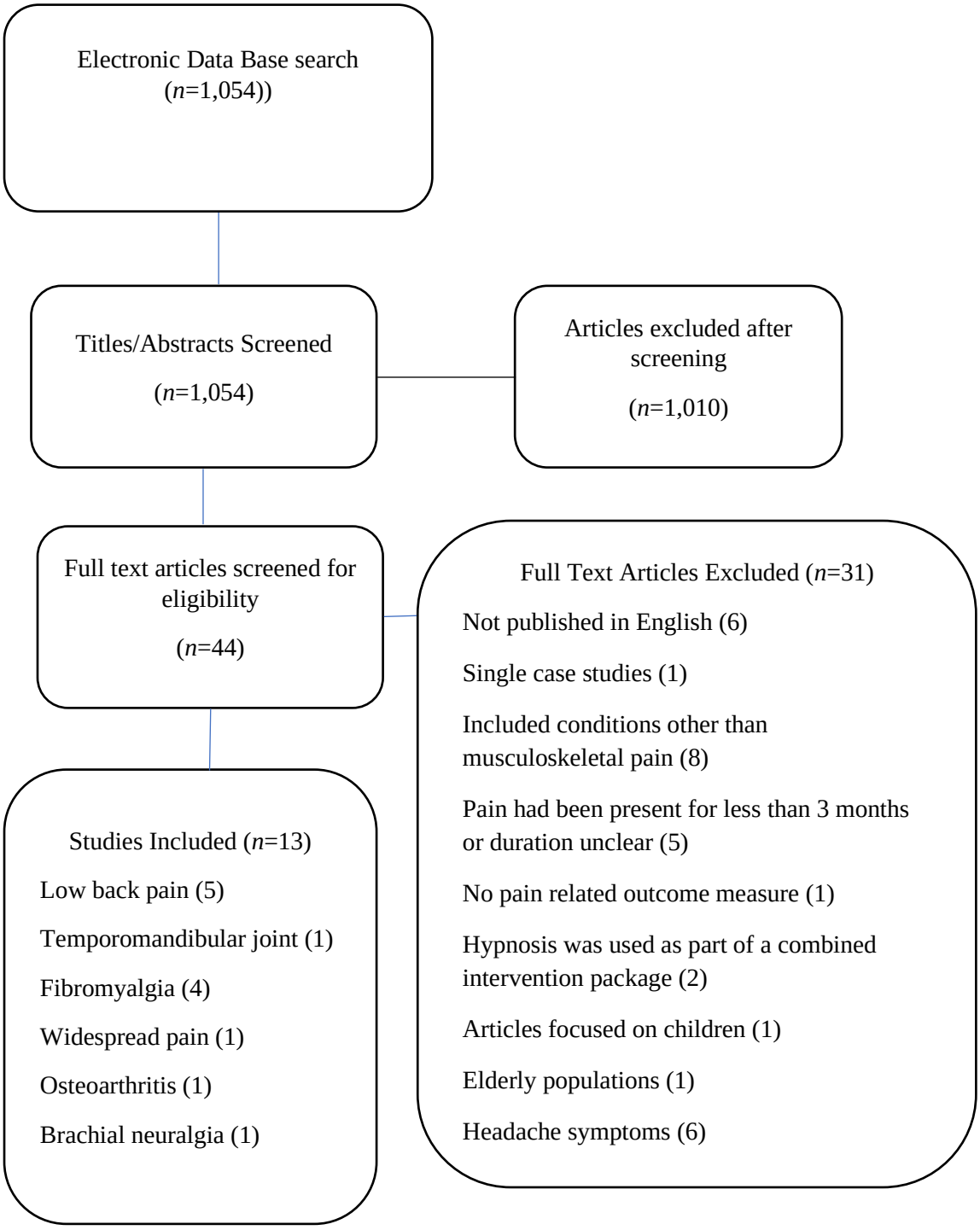
validity of the selected articles (Munn et al., 2015). The relevant JBI Checklist was used for the study design of the articles. The checklists contain questions that ask about the quality of a study, for which articles receive values representing the extent to which they meet the question criteria (Yes=1, No=0, Unclear/Not applicable=0). The assessment tool for randomised controlled trials (RCTs) consists of 13 questions, while the case series tool consists of 10 questions.

4. Results

The initial search on the 3rd of April 2020 yielded 1,054 results. After scanning the title and abstract of these articles, 1,010 were excluded. The full text of the remaining 44 articles were read and screened using the inclusion and exclusion criteria. Thirteen studies met these criteria and were included in the review (see Figure 1).

Figure 1

Prisma Diagram



4.1 Characteristics of Included Studies

A summary of the included studies can be found in Table 2. Among the total of 13 studies, 12 were RCTs and one was a case series. The studies examined a variety of chronic musculoskeletal conditions including low back pain (LBP) (*n*=5), temporomandibular joint (TMJ) disorder (*n*=1), fibromyalgia (FMA) (*n*=4), widespread pain (*n*=1), osteoarthritis (OA) (*n*=1), and brachial neuralgia (*n*=1).

4.2 Participants

The total number of participants across the studies was 627, with a mean number of 48. Three of the studies included less than 20 people across all groups. The mean age was 48.3 years. Two-thirds of the participants were female, with eleven of the studies having a proportion of one gender of at least 75%.

4.3 Hypnosis Interventions

The number of intervention sessions in the hypnosis group ranged from a single session to 14 weekly sessions, with a mean of seven sessions across the studies. The duration of hypnotic intervention session ranged from 20 minutes up to 2.5 hours, with a mean of 83 mins. In the studies that involved multiple sessions, they were all given on a weekly basis except one which involved twice weekly sessions.

With regards to the format of hypnotic intervention, seven out of 13 studies used a face-to-face format, and six used a group format for the intervention. Seven of the studies taught and encouraged the use of ongoing self-hypnosis with or without audio recordings that complemented the face-to face or group sessions.

The type of hypnotic intervention used within each study is outlined in Table 3. In all the studies with a clear outline of the hypnotic methods, there was a component of relaxation and focused attention, either as part of the induction process or as a suggestion given during the intervention. Twelve of the hypnotic interventions focused on some aspects of pain control or analgesia. Changing the perception of pain was used in five of the studies. Tan et al. (2015) also used specific suggestions aimed specifically at decreasing pain unpleasantness.

Table 2

A Summary of the Included Studies

Study	Study Design	Presenting Condition	Population number, gender, mean age	Hypnosis Interventions	Control Intervention	Outcome Measures	Findings
Abrahamsen et al. (2011)	RCT	TMJ disorder >s	*n* = 39, F = 100%, 36.6 years	Hypnosis plus home CD 4x 1 hour	Relaxation/imagery4 x 1 hour	NPRS	Statistically significant reduction in pain on NPRS in the hypnosis group
Castel et al. (2007)	RCT	Fibromyalgia	*n* = 45, F = 86.7%, 43.7 years	Hypnosis + relaxation suggestions 1x 20m minutes hypnosis + analgesic suggestions 1x 20 minutes	Relaxation 1x 20 minutes	MPQ, VAS	Hypnosis + analgesia decreased pain intensity and sensory dimension of pain compared to both other groups: Hypnosis + relaxation no different than relaxation
Castel et al. (2010)	RCT	Fibromyalgia	*n* = 47, F= 95%, 42 years	Hypnosis + CBT 12 x 90 minutes	CBT 12x 90 minutes, relaxation 12 x 90 minutes	NPRS, FIQ, MPQ	CBT and CBT +hypnosis statistically significant improvement in NPRS, FIQ, MPQ compared to control and hypnosis +CBT decreased post treatment pain intensity compared to CBT

Castel et al. (2012)	RCT	Fibromyalgia	*n* = 93, F = 97%, 49.6 years	Group CBT + hypnosis 14 weekly sessions 120 minutes	CBT 14 weekly group sessions 120 minutes , Standard care	NPRS, CSQ, HADS, FIQ, MOS	Both groups decreased NPRS, CSQ,FIQ, MOS compared to control; hypnosis+ CBT decreased clinically meaningful decrease in pain and psychological distress compared to CBT alone
Gay et al. (2002)	RCT	OA knee/hip	*n* = 36, F = 92%, 64.7 years	Hypnosis 8 x 30 minutes weekly	Relaxation 8 x 30 minutes weekly, waitlist	VAS, STAI, medication use	Both groups sustained decreased pain and decreased analgesic use vs control; hypnosis effects more rapid
Grondahl & Rosvold. (2008)	RCT	Chronic widespread pain	*n* = 16, F = 75% Age range 23-54	Hypnosis 10 x 30 minutes weekly	Standard care	Self-developed questionnaire	Improved symptoms only in the hypnosis group on questionnaire
Haanen et al. (1991)	RCT	Fibromyalgia	*n*= 40, F = 95%, 56 years	Hypnosis 12 weeks 8 x1 hour sessions + cassette tape	Physical therapy (massage and muscle relaxation) 1-2 hours weekly	Duration of morning stiffness in mins, VAS for muscle pain, fatigue on wakening, sleep disturbance and global assessment and HSCL-90, total myalgic score	Significant improvement in VAS, fatigue, sleep and global assessment in hypnotherapy group at 12 and 24 weeks and not in physical therapy. No difference in total myalgic score, morning stiffness

McCauley et al. (1983)	RCT	Low Back Pain	*n* = 17; F = 70%, 40.2 years	Hypnosis 8 x 50 minutes	Relaxation 8 x 50 minutes	Pain diary, MPQ, Beck depression inventory, QOL	Both improved - no difference between groups
Razak et al. (2019)	RCT	Brachial Neuralgia	*n* = 40, F = 0, 38.83 years	Hypnosis sessions + self-hypnosis 4 weekly 90 minute	Acupressure + home patches two fortnightly	VAS, BPI, SF-36v2 - 1	Both improved pain intensity (acupressure greater) and quality of life significantly during treatment – hypnosis better carry-over quality of life and mental components at follow up
Rizzo et al. (2018)	RCT	Low back pain	*n* = 100, F = 80% age 50 years	Group pain education + hypnosis 4 sessions twice weekly (5 hours total)	Group pain education 4 sessions twice weekly (4 hours total)	Roland Morris, average and worst pain intensity rating scales	At 2 weeks – hypnosis group lower worst pain intensity and disability and global perceived benefits – not average pain intensity and at 3 months lower worst pain intensities and catastrophising
Spinhoven & Linssen (1989)	Controlled cross-over trial	Low back pain	*n* = 45, F = 54%, 47 years	Group self-hypnosis	Group pain education 6 x 120 minutes and then reversed 2 months later	Pain diary, SCL-90	Statistically improved post interventions except for pain intensity with combined but no difference between groups
Tan et al. (2010)	Case series	Low back pain	*n* = 9, F = 0%, 56 years	Self-hypnosis + psycho education 4 weekly sessions 1.5-2.5 hours		BPI, NRS, POMS	Significant reduction in pain intensity/interference and pain ratings/mood states session to session – not sustained

Tan et al. (2015)	RCT	Low back pain	*n* = 100, F = 21, 55 years	Self-hypnosis training no recordings 8 weekly sessions, self-hypnosis training with recordings 8 weekly sessions, 2 sessions with recordings and weekly calls	Biofeedback 8 sessions	BPI, Pittsburgh sleep quality questionnaire	Hypnosis groups significantly greater improvement in pain intensity/interference and sleep quality. No difference between hypnosis groups

Note. RCT - Randomised Controlled Trial; n – number; F – female; TMJ - temporomandibular joint; NPRS - Numeric Pain Rating Scale; VAS - Visual Analogue Scale; MPQ - McGill Pain Questionnaire; CBT - cognitive behavioural therapy: FIQ – Fibromyalgia Impact Questionnaire; STAI - State-Trait Anxiety Inventory; HSCL 90 - Hopkins Symptoms Checklist – 90; QOL - Quality of life; CSQ – Coping strategies questionnaire; BPI - Back Pain Inventory, SF-36v2 - Short Form health Survey, SCL – 90 - Symptom Checklist; POMS = Profile of mood states.

Table 3

Study Delivery Methods

Study -Author / Year	Pain control	Perception	Coping strategies	Guided imagery	Dissociation	Thoughts	Regression	Ego build	Future pacing	Post hypnotic	Home Programme
Abrahamsen et al. (2011)	+	+	+	+	+	+	+	+	+	+	+
Castel et al. (2007)	+			+							
Castel et al. (2009)	+			+							
Castel et al. (2012)	+		+	+					+		+
Gay et al. (2002)				+			+				
Grondahl & Rosvold. (2008)	+	+				+				+	+
Haanen et al. (1991)	+							+			+
McCauley et al. (1983)	+			+	+		+				
Razak et al. (2019)	+										

Some type of guided imagery was used in seven of the 13 studies, mostly involving a place of comfort or wellbeing. Regression techniques were used in three of the studies and involved suggestions about going back in time to positive memories, where movement was easy and comfortable.

Two of the studies used anchoring, which involves using a specific trigger that connects to a particular feeling or state of mind encountered while in hypnosis to trigger associated suggestions and reactions when required later. Often this will involve anchoring feelings of comfort or resilience, which can be used when about to perform an activity that may be perceived to cause pain. This included examples such as cueing key phrases for pain reduction and dissociation from the pain when required.

Three of the studies used post-hypnotic suggestions, with the aim of producing positive automatic responses when certain thoughts or occasions are encountered. This included suggestions to forget about thinking about pain and instead letting thoughts turn to favourite activities and positive memories. Six of the studies used future pacing, which is a technique where suggestions are given to take positive changes that may have occurred during a session and visualising using these new skills on future occasions (Grøndahl & Rosvold, 2008). Abrahamsen et al. (2011) used a progression technique where, after the patient visualises themselves in a desired state in the future, they deliberately bring back the feeling and mindset to the current time.

4.4 Control Interventions

Three of the 13 studies used a waitlist or standard care as the control. Five studies compared hypnosis for pain relief to relaxation and another used biofeedback as the control. The control interventions for these studies were all matched for clinical contact time and there was consistency regarding group or individual settings. Two studies compared hypnosis to a physical intervention, one using physiotherapy and another acupressure. Two of the reviewed studies compared the combination of hypnosis and cognitive behavioural therapy (CBT) to CBT alone, while another compared hypnosis and pain education to pain education alone. One study compared pain education to self-hypnosis.

4.5 Outcome Measures

A variety of outcome measures were used across the studies. All the 13 studies included the reporting of a subjective measurement of pain as this was part of the inclusion criteria. A visual analogue scale (VAS) (*n*=4) or a numeric pain rating scale (NPRS) (*n*=4) were the most common outcome measures used, followed by the Brief Pain Inventory (BPI) (*n*=3) and simple pain diaries (*n*=3). The VAS, NPRS and BPI are valid and reliable assessments of pain (Ferreira-Valente et al., 2011; Hawker et al., 2011), while pain diaries have been shown to be more accurate than retrospective reporting of pain levels (Lewandowski et al., 2009).

Three of the studies used various forms of the McGill Pain Questionnaire to evaluate the participant's description of the quality of their pain (Castel et al., 2007; Castel et al., 2009; McCauley et al., 1983). The questionnaire consists primarily of sensory, affective and evaluative experience word descriptors used by the participant to describe their pain (Melzack, 1975). Dworkin et al. (2009) found that the SF-MPQ-2 had excellent reliability and validity for four readily interpretable subscales including continuous pain, intermittent pain, predominantly neuropathic pain, and affective descriptors.

Several studies assessed other outcome domains in addition to pain, including mood, sleep, physical function, and quality of life. McCauley et al. (1983) used the Beck Depression Inventory (BDI), which is a 21-item, self-report rating inventory that measures characteristic attitudes and symptoms of depression (Beck et al., 1961). It has been shown to be a relevant psychometric instrument, showing high reliability in its capacity to discriminate between depressed and non-depressed subjects (Wang & Gorenstein, 2013). Gay et al. (2002) used the State-Trait Anxiety Inventory (STAI), which is a commonly used measure of trait and state anxiety (Spielberger et al., 1983). It can be used in clinical settings to diagnose anxiety and to distinguish it from depressive syndromes and has good reliability and internal consistency (Spielberger & Vagg, 1984). Spinhoven and Linssen (1989) used the Hopkins Symptom Checklist (HSCL), which is a large group of questionnaires developed from the Discomfort Scale (Parloff, Kelman, & Frank, 1954). It has acceptable sensitivity and specificity for diagnosing depressive and anxiety disorders in people with chronic low back pain (Reme et al. 2014).

Three studies evaluated the effect of the intervention on sleep. Tan et al. (2015) used the Pittsburgh Sleep Quality Index (PSQI), which is a self-report questionnaire that assesses sleep quality over a one month time interval. Spira et al. (2012) demonstrated internal consistency reliability and construct validity of the PSQI. Haanen et al. (1991) measured fatigue on waking and sleep disturbance for their outcome measures to assess the effect of the interventions on sleep. Castel et al. (2012) used the Medical Outcomes Study Sleep Scale, which is a patient-reported measure consisting of 12 items that assess the quality and duration of sleep. The scale has been found to be a reliable and valid assessment of sleep disturbances in patients with fibromyalgia (Martin et el. 2009).

Other outcome measures assessed more general aspects of a person's health and well-being. Rizzo et al. (2018a) used the Roland-Morris Disability Questionnaire, which is a reliable and sensitive measure of disability in low back pain (Roland & Morris, 1983). McCauley et al. (1983) used a quality of life (QOL) scale that they developed for their back pain participants. This measure was obtained by rating how much pain interfered with their enjoyment of sleep, sexual activities, family life, hobbies and relaxation, work, and socialising. No evidence was given to validate the reliability of this scale as an outcome measure. Razak et al. (2019) used the Short Form 36 Health Survey Questionnaire version 2 (SF-36v2), which is a self-reported health status measure used in the evaluation and assessment of the outcomes of health interventions. It has been shown to have good reliability and validity across a wide range of diseases and conditions (Ware, 2000). Grøndahl and Rosvold (2008) developed their own questionnaire for assessing quality of life based on other published questionnaires. Due to the hybrid nature of this outcome measure, the reliability and validity is unknown.

The timing of when outcome measures were assessed varied notably. Four of the studies only recorded measures immediately post-treatment, while the remaining studies ranged in follow-up period from 1 to 12 months, with a median of 4.75 months.

4.6 Study Findings

All three studies comparing hypnosis to a waitlist or standard care control showed significantly greater reductions in pain with the hypnosis intervention. Findings from studies comparing hypnosis to another psychological based treatment were more mixed but generally demonstrated better pain related outcomes in the hypnosis groups. Four of

the five RCTs comparing hypnosis to relaxation showed significantly greater improvements in pain outcomes in the hypnosis group, with the final study demonstrating no significant difference between groups. One study demonstrated a superior effect of hypnosis on pain control compared to a biofeedback control intervention. Another study demonstrated statistically significant improvements in psychoneurosis and depression scores with pain education and self-hypnosis. However, using a cross over design no significant difference was found in outcomes between the individual interventions.

Three RCTs evaluated the effectiveness of adding hypnosis to another psychological intervention. Two studies compared the effect of adding hypnosis to a CBT intervention. Castel et al. (2009) found no statistically significant differences between groups, but demonstrated a higher percentage of participants in the combined group reporting a post-treatment decrease in pain intensity. Castel et al. (2012) found no difference in pain catastrophising or sleep quality between groups but did show significantly greater effects of CBT with hypnosis on psychological distress and the percentage of participants who met the standard criteria for minimal clinically significant difference in pain post-treatment. Rizzo et al. (2018a) also demonstrated beneficial findings in their group of low back pain patients. In their study, there was no difference in average pain between the hypnosis with pain education and pain education alone groups at two weeks or at three months. There was however a significant improvement in terms of decreased worst pain intensity and catastrophising at three months when hypnosis was added to pain education. Tan et al. (2010) in their case series showed short term improvement in pain intensity, pain interference and mood states when hypnosis was combined with psychoeducation, but there was no control group and the improvements were not maintained at follow up. Castel et al. (2007) demonstrated no difference between hypnosis with relaxation and just relaxation, with both these groups showing greater reductions in the emotional aspect of their pain than on their pain intensity.

Two studies compared a hypnotic intervention to a physical treatment. Razak et al. (2019) compared hypnosis to acupressure in a population suffering from chronic brachialgia and found that both interventions had significantly positive effects on pain intensity and quality of life. They also found that acupressure provided faster pain relief than hypnosis, but the hypnosis group had better outcomes regarding quality of life and

the mental health components of the SF-36 v2 at the four month follow up. One study compared hypnotherapy and physiotherapy, which consisted of muscle relaxation training and massage, and found significantly better outcomes with respect to the participant's pain experience, fatigue on waking, sleep pattern and global assessment in the hypnosis group (Haanen et al., 1991). However, there was no difference in the objective variables of total myalgic score and number of tender points between groups.

Only one of the studies compared the effectiveness of two different hypnotic suggestions. Castel et al. (2007) found in participants with fibromyalgia that hypnosis followed by analgesic suggestions had a greater effect on pain intensity and the sensory dimension of pain compared to hypnosis followed by relaxation suggestions.

Generally, follow-up periods were short or non-existent. The two studies that had reasonable numbers at six month follow up indicated that improvements in pain intensity had been maintained in the hypnosis intervention groups compared to the control groups (Rizzo et al., 2018a; Tan et al., 2015).

4.7 Methodological Quality of the Literature

A summary of the methodological quality of the included articles is presented in Tables 4 and 5. The overall quality of the studies was high, with 10 of the 12 RCTs having high internal validity. Nine of the 12 RCTs included in the review used true randomisation, however the allocation to treatment groups was concealed only in three of them. Given the nature of a hypnotic intervention, in 11 of the RCT studies either the participants or those delivering the intervention were not blind to treatment assignment. Only three of the RCT studies clearly stated that the outcome assessors were blinded to treatment assignment while in the remainder, they were not blinded, or blinding was not made clear.

Outcomes were measured in a reliable way in all 12 of the RCT studies and appropriate statistical analysis used in nine of them. The trial design was appropriate in all studies. Treatment groups were clearly similar at baseline in 10 of the studies. Eight of the RCT studies either completed a follow-up or the difference in groups was adequately described and analysed. Only six of the RCT studies clearly analysed the groups with an intention to treat analysis, although 11 of the RCT studies measured outcomes in the same way for both treatment groups. The one study analysed using the case series tool

scored a positive result in eight of the 10 questions, suggesting this was a well conducted case series.

Table 4

Joanna Briggs Institute Critical Appraisal Checklist for Randomised Controlled Trials

Study / Author / Year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q 10	Q 11	Q 12	Q 13
Abrahamsen et al. (2011)	+	+	+	+	+	?	+	−	+	+	+	+	+
Castel et al. (2007)	+	−	−	−	−	−	+	−	−	+	+	+	+
Castel et al. (2009)	+	−	+	−	−	−	+	−	−	?	+	−	+
Castel et al. (2012)	+	−	+	−	−	−	−	+	+	+	+	+	+
Gay et al. (2002)	?	−	+	−	−	?	−	−	−	+	+	+	+
Grondahl and Rosvold. (2008)	?	?	?	−	−	?	−	−	+	+	−	−	+
Haanen et al. (1991)	+	−	+	−	−	+	+	+	+	+	+	+	+
McCauley et al. (1983)	+	−	+	−	−	+	−	−	−	+	+	+	+
Razak et al. (2019)	+	−	+	?	−	?	+	−	+	+	+	−	+
Rizzo et al. (2018)	+	+	+	−	−	+	+	+	+	+	+	+	+
Spinhoven & Linssen. (1989)	?	?	+	?	−	?	+	−	−	+	+	+	+
Tan et al. (2015)	+	+	+	?	−	?	+	+	−	+	+	+	+

Note. 1.Was true randomisation used for assignment of participants to treatment groups? 2. Was allocation to treatment groups concealed? 3. Were treatment groups similar at the baseline? 4. Were participants blind to treatment assignment? 5. Were those delivering treatment blind to treatment assignment? 6. Were outcomes assessors blind to treatment assignment? 7. Were treatment groups treated identically other than the intervention of interest? 8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed? 9. Were participants analysed in the groups to which they were randomized? 10. Were outcomes measured in the same way for treatment groups? 11. Were outcomes measured in a reliable way? 12. Was appropriate statistical analysis used? 13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomisation, parallel groups) accounted for in the conduct and analysis of the trial?

Table 5

Joanna Briggs Institute Case Series Appraisal Checklist

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Tan et al. (2010)	+	+	+	?	−	+	+	+	+	+

Note. 1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls? 2. Were cases and controls matched appropriately? 3. Were the same criteria used for identification of cases and controls? 4. Was exposure measured in a standard, valid and reliable way? 5. Was exposure measured in the same way for cases and controls? 6. Were confounding factors identified? 7. Were strategies to deal with confounding factors stated? 8. Were outcomes assessed in a standard, valid and reliable way for cases and controls? 9. Was the exposure period of interest long enough to be meaningful? 10. Was appropriate statistical analysis used?

5. Discussion

Overall, the included 13 studies were of good quality with high levels of internal validity. There was strong evidence to support the use of hypnosis in decreasing pain intensity in a chronic musculoskeletal pain population compared to usual care or a waitlist control. Hypnosis appears to be better than physical interventions and may also be better than other psychological interventions such as CBT. It also improves the efficacy of a variety of other interventions, suggesting that hypnotic interventions may not have to be mutually exclusive to other treatments. When compared to other similar interventions such as relaxation and biofeedback, there was significantly better pain-related outcomes in five studies in the hypnosis group, with one study not showing a significant difference between groups. This provides evidence that hypnosis is a more effective intervention then these other modalities. These findings are discussed in more detail below.

5.1 Hypnosis Compared to Usual Care

Three of the reviewed studies used a waitlist or standard care as a control, and all three studies showed statistically better pain outcomes in the hypnosis group. This finding, therefore, agrees with the conclusion of Adachi et al. (2014) that hypnosis is more effective in chronic pain management compared to usual care. However, this conclusion needs to be considered with caution, as this study design fails to control for clinician contact effects. The potential benefits of clinician contact have been widely recognised

(Boot et al., 2013), and therefore, it can potentially bias the outcomes by making it difficult to evaluate whether the changes occurred as a result of the hypnosis intervention or were related to clinical contact time. The positive effects of hypnosis may also have been related to the group setting used in one of the studies, as this interaction can also have positive effects on cognitive and affective outcomes (Nadler, 1979). Few conclusions from the improvements in the hypnosis group demonstrated in the case series by Tan et al. (2010) could be made as their follow-up data were largely inconclusive, and the study design suffered from a lack of a control, small group sizes, and a high drop-out rate.

5.2 Hypnosis Compared to Other Interventions

Seven of the studies compared hypnosis to another intervention. Five studies compared hypnosis to relaxation, and with four of the five studies demonstrating a significantly greater improvement in pain outcomes in the hypnosis group, it appears that hypnosis is more effective than relaxation training for chronic musculoskeletal pain. This concurs with the conclusions of a meta-analysis and systematic review by Garland et al. (2020), who found that studies involving hypnosis reported significantly more beneficial opioid related outcomes, including opioid dosing, cravings and misuse, compared to relaxation studies. All the studies comparing hypnosis to relaxation used the same clinical contact time in both intervention groups, and therefore the only difference between groups was the form of intervention used. Differentiating relaxation and hypnosis interventions can be a difficult endeavour, as both usually contain similar elements of relaxation and focused attention. There appeared to be some overlap in the components of the relaxation and hypnotic interventions used in some of the studies that compared these two interventions, specifically around suggestions of feelings of well-being. Gay et al. (2002) attempted to separate the effects of relaxation from those that are specific to hypnosis. However, the relaxation protocols used in each arm of this study were different in terms of content, making this separation difficult. The similarity of relaxation and hypnosis, combined with low participant numbers and limited or no follow up, may explain why McCauley et al. (1983) found no significant difference between the hypnosis and relaxation groups. Castel et al. (2007) also found no difference between hypnosis followed by relaxation suggestions compared to relaxation but, importantly, found hypnosis combined with analgesic suggestions showed significantly greater improvements in pain intensity compared to the relaxation group.

This suggests that some type of analgesic suggestion should be used within the hypnosis session.

Tan et al. (2015) used surface electromyography biofeedback as a control. Biofeedback involves face-to-face treatment sessions, includes relaxation and focused attention similar to hypnosis, and has been found to be somewhat effective in improving pain, pain interference, and sleep quality (Jensen et al., 2009). This form of control prevents some of the clinician contact bias discussed in previous studies that used a waitlist or standard care as a control. Despite these similarities with the active control condition, there was still a significantly greater improvement in the hypnosis groups with regard to pain interference and sleep quality. They demonstrated that the beneficial outcomes were maintained for at least six months post-treatment for the hypnosis groups**.** This provides further support that hypnosis is a more effective intervention than other relaxation techniques in this population.

Spinhoven and Linssen (1989) evaluated the effect of pain education and self-hypnosis on a population of people with low back pain in a cross-over designed study. They found an overall significant improvement in their outcome measures except for pain intensity, suggesting an improved capacity of the participants to adjust to being in pain. However, they found no difference in effectiveness between the two groups and that the order of delivery of the pain education intervention and the self-hypnosis training had no effect on the outcome. This conclusion differs from the findings of a meta-analysis by Adachi et al. (2014), who found hypnosis was associated with larger effect sizes when compared to other psychological interventions for managing non-headache chronic pain. This may have been related to the quality of the study by Spinhoven and Linssen (1989), which was affected by a restricted form of random assignment of patients, small group sizes and a high attrition rate. The review by Adachi et al. (2014) also included various types of non-musculoskeletal chronic pain.

There were two studies that compared hypnosis to a physical intervention. Razak et al. (2019) found that improvements in pain intensity were faster in the acupressure group compared to hypnosis, suggesting that the physical intervention was more effective in the short term. However, the positive effects of the hypnotic intervention, including improved emotional and mental aspects, lasted significantly longer than the effects of the acupressure intervention. The authors concluded that this was potentially related to

this group remaining more positive, with the aid of ongoing self-hypnosis, at the four month follow-up. However, further research is required to confirm this conclusion.

One study compared hypnotherapy to physiotherapy, which consisted of muscle relaxation training and massage, and found significantly better outcomes with respect to pain experience, fatigue on waking, sleep pattern and global assessment in the hypnosis group (Haanen et al., 1991). This outcome would suggest that hypnosis is superior to physiotherapy and agrees with a review of prospective trials by Elkins et al. (2007), who concluded that hypnosis was generally more effective than nonhypnotic interventions, such as physiotherapy. However, this type of physiotherapy intervention is not consistent with more modern methods of managing chronic musculoskeletal pain (Lewis & O'Sullivan, 2018). While more research could be undertaken to compare hypnosis to more modern physiotherapy techniques, these interventions may be best used in combination rather than isolation. Other reviews have indicated combining physiotherapy with psychological interventions is beneficial (Wood & Hendrick, 2019), and this would fit better with a biopsychosocial model. Studies combining hypnosis with other interventions are discussed in the following section.

5.3 Hypnosis as an Adjunct Intervention

Three of the studies evaluated the effectiveness of adding hypnosis to a CBT or a pain education programme. Pain perception can be altered using CBT, with the aim of improving self-efficacy in managing pain and disability (Bandura, 1991). One study included in this review demonstrated a significantly better outcome of hypnosis combined with CBT compared to CBT alone, while another smaller study found no significant differences between the groups but reported a trend towards greater improvements in pain intensity in the combined group. An RCT by Jensen et al. (2011) provided evidence that hypnosis can increase the beneficial effects of CBT by reducing worst pain intensity in patients with multiple sclerosis and an earlier meta-analytic review by Kirsch et al. (1995) concluded overall that hypnosis can enhance the effect of CBT on a variety of conditions often treated by hypnosis. However, the only two studies included in the meta-analysis that involved chronic pain populations showed no greater benefit of combining hypnosis with CBT compared to CBT alone. The cause of the pain in one of these studies was not clear (Edelson & Fitzpatrick, 1989) and the other involved acute dental pain (Mc Ammond et al., 1971), and so they were not

included in the current review. It does raise the possibility that combining CBT and hypnosis may have different effectiveness in different chronic pain populations.

Pain education has already shown promise for reducing disability, catastrophizing, and increasing function in chronic pain populations (Louw et al., 2016). Rizzo et al. (2018a), in a high quality study combining hypnosis with pain education in a population of low back pain patients, demonstrated benefits over patient education alone with respect to worst pain intensity, disability, and global perceived benefits in the short term (2 weeks). They also showed that the hypnosis group maintained its superiority for reducing the worst pain intensity at medium term (3 months), with the additional benefit of also reducing catastrophising. They integrated specific suggestions into the pain education programme with a goal of boosting the effectiveness of a particular training module. These included suggestions to enhance the effect of improved coping strategies, negative thoughts, and sleep. However, there was greater time spent with the group receiving the additional hypnosis intervention which may have biased the outcomes towards those in the hypnosis group.

Overall, these studies suggest there is moderate-high quality evidence that by combining hypnosis with different psychosocial interventions, their efficacy increases.

5.4 Effect of Hypnosis on Other Domains

As the inclusion criteria for this systematic review required a primary pain outcome, studies that solely evaluated the effectiveness on other domains related to chronic pain may not have been included. However, due to the importance of these domains in relation to a person's pain experience, some discussion of these secondary domains that were investigated in these studies is presented below.

Previous research has shown that people with chronic pain are more likely to suffer from depression, anxiety, and other mood states (Tan et al., 2008). A meta-analysis by Shih et al. (2009) concluded that hypnosis is a viable nonpharmacologic intervention for people with depression. An improvement in a person's general mood and mental health may be a mechanism behind the improvements seen in pain outcomes in some of the other studies included in this review, especially where suggestions were given

specifically for ego strengthening and general well-being. In the current review, only McCauley et al. (1983) used a specific outcome measure targeting depression and found that both the hypnosis and relaxation groups demonstrated similar improvements in both pain and depression. Dilmahomed and Jovani-Sancho (2018) concluded from a recent literature review that anxiety around dental pain could be positively affected by hypnosis. Gay et al. (2002) measured anxiety using the STAI and found improvements in the hypnosis group but, again, this was not significantly different to the relaxation intervention. Therefore, there is evidence in this review that hypnosis has benefits with regard to the domains of depression and anxiety, but not significantly different to the benefits of relaxation in these populations of chronic pain participants. However, as only one study examined each of these domains, future research, or more targeted reviews where these measures are a primary component of the inclusion criteria, are required to determine the exact effect hypnosis may have on these outcomes.

Tang (2009) demonstrated that sleep disturbances are strongly related to disability in patients who present with chronic pain. A previous meta-analysis found hypnotherapy significantly shortened sleep latency compared to a waitlist in people with insomnia (Lam et al., 2015). Of the included studies in the current review, only Tan et al. (2015) measured sleep, effectively demonstrating improvements across the hypnosis groups. In fact, they concluded that one probable explanation for this progressive improvement in pain-related outcomes in all their hypnosis groups may have been related to the participant's decrease in sleep disturbance. If hypnosis can improve a person's sleep then this may be an important factor in improving their chronic pain experience. There is therefore potential for beneficial effects of hypnosis across multiple domains associated with chronic pain, but more research is required to investigate this more fully.

5.5 Components of Hypnosis

There was a large heterogeneity in the exact type of hypnotic intervention delivered across the studies but many of the studies used common themes within their hypnotic suggestions. The exact script or outline of the suggestions given was not available in many of the studies, making comparison between them difficult. Twelve of the hypnotic interventions expectedly focused on some aspect of pain control or analgesia. The exception was Gay et al. (2002), who deliberately avoided such suggestions to allow the

participants to mobilise their own personal resources and knowledge to gain a beneficial effect. The lack of a significant difference between intervention groups in this study may suggest that this approach is not as useful.

The findings of Castel et al. (2007) that hypnosis followed by analgesic suggestions had a greater effect on pain intensity and the sensory dimension of pain compared to hypnosis followed by relaxation suggestions, provides some evidence that the nature of the suggestions can make a difference. This is a similar finding to De Pascalis et al. (1999), who compared the analgesic effects produced by the experimental conditions of deep relaxation and focused analgesia and found that focused analgesia reduced pain more. This demonstrates that the content of the suggestions is important in creating the desired outcome and aligns with Jensen et al. (2011), who made evident that suggestions that target more than just pain sensations with hypnosis can increase its efficacy. The two high quality studies, where the suggestions used were described in the greatest detail, both had significantly better outcomes in the hypnosis group (Abrahamsen et al., 2011; Rizzo et al., 2018a). These studies used a large variety of suggestions covering several aspects of pain, including both pain reduction and the cognitive and emotional dimensions of a person's pain experience. This suggests using a large variety of different suggestions, including analgesic or pain reducing elements, is indicated. However, as previous research has demonstrated that the nature of the suggestions specifically effects different parts of the brain associated with chronic pain and produces specific participant responses (Hofbauer et al. (2001), future research could investigate whether a thorough evaluation of a person could lead to a more targeted intervention to produce the desired outcome. This could involve exploring whether an attempt to subclassify participants based on their beliefs, cognitions, and emotions that are contributing to their pain experience is worthwhile and whether further investigations including biopsychosocial analysis regarding sleep patterns and general levels of anxiety and depression could potentially further guide the hypnotic suggestions given.

Hypnotic susceptibility in a group session has been shown to be similar to susceptibility in an individual session (Bentler & Hilgard, 1963). A review by Burlingame et al. (2016) indicates psychotherapy interventions are equivalent in terms of efficacy when delivered in a group or individual setting. However, there are no previous studies directly comparing group and individual hypnosis interventions in a chronic

musculoskeletal pain population. In this review, there were good outcomes in the hypnosis group in studies that delivered the hypnosis intervention individually and in groups. However, due to the large heterogeneity in the studies reviewed and as none of the studies directly compare this variable, it is impossible to make definite conclusions around whether there is a difference in outcomes between using hypnosis in a group or individual setting for this population.

Due to the varying nature of the interventions and the different populations studied in this review, it was impossible to evaluate the optimal number of intervention sessions or the duration of intervention sessions. However, Tan et al. (2015) found, when comparing different lengths of hypnotic interventions, that there was no significant difference in outcomes between a chronic low back pain group that received two sessions of self-hypnosis training with six brief follow up phone calls and those that received eight sessions of face-to-face hypnosis. This suggests a shorter, and therefore potentially more cost effective, intervention may be all that is required.

Some type of self-hypnosis training was given in seven of the studies but only Rizzo et al. (2018a) measured and reported adherence to the home practice effectively. At three months, they found an average of only 37% of the intervention groups were undertaking regular practice. They demonstrated greater positive outcomes when hypnosis was added to pain education compared to pain education alone, in terms of catastrophising and reported worst pain intensity, but what role the self-hypnosis played in the beneficial outcomes is unclear.

6. Conclusions and Clinical Implications

6.1 Clinical Implications and Potential Intervention Strategies

Clinically, this review suggests that hypnosis is a useful and effective psychological intervention for managing chronic musculoskeletal pain. It is a non-invasive, non-pharmacological intervention with no reported side-effects or safety concerns. This review presents a high level of evidence that hypnosis is an effective tool across a large variety of chronic musculoskeletal pain conditions, in a large age range of both men and women. Hypnosis outperformed standard care or a wait list control in terms of pain outcomes in the three studies that compared these interventions. This supports previous

reviews that hypnosis provides good efficacy for treating chronic musculoskeletal pain compared to these non-specific interventions and can be considered and recommended as a viable first line treatment for the management of chronic musculoskeletal pain. It is a technique that is relatively easy to learn and administer for many types of clinician involved with the treatment of chronic pain and could fit well into a biopsychosocial approach.

When compared to other interventions, such as relaxation and biofeedback, there also appears to be more beneficial effects in favour of hypnosis. Despite similarities in these approaches, there is some evidence that additional benefits can be gained by using analgesic suggestions rather than relaxation suggestions. Hypnosis usually involves suggestions not only for perceptual changes that can occur during relaxation training but also for other clinical benefits allowing clinicians to target a much larger variety of outcomes such as changes in sensory experiences, thoughts, emotions, and behaviour. Therefore, this review recommends the use of hypnosis rather than relaxation or biofeedback for this chronic pain population.

When hypnosis was compared to physiotherapy, there were statistically better subjective outcomes in the hypnosis group. However, this study compared the hypnotic intervention with a physiotherapy intervention of muscle relaxation and massage that is not reflective of current evidence-based physiotherapy practice. Therefore, no conclusions or recommendations can be made about the relative effectiveness of hypnosis compared to more modern physiotherapy approaches.

Although these results suggest that hypnosis may be more effective than CBT, the interventions do not need to be mutually exclusive. The combination of the interventions achieved even better outcomes than the individual interventions alone, and therefore using them in combination is recommended based on this review. The results from a recent high-quality study by Rizzo et al. (2018a) suggests using hypnosis as an adjunct to pain education, which itself is a validated psychological intervention for chronic musculoskeletal pain, increases its effectiveness and is also recommended based on this review. There is evidence that the order of presenting pain education and hypnosis has no effect on the outcome and integrating hypnosis into pain education was shown to be an effective delivery method. This suggests there may be a wide variety of methods that are effective clinically in delivering this type of combined intervention.

Unfortunately, due to the heterogeneity of the studies, it was not possible from this research to gain quantitative conclusions about outcome modifiers regarding ideal intervention frequency, duration, and the number of sessions to be used. Most of the studies were performed weekly so this may be a reasonable clinical frequency to start with. There was a large range of intervention durations, again making meaningful comparisons difficult. Post intervention improvements in pain outcomes were found from interventions that were as short as 20 minutes in duration, but as there was no follow-up data collected in this group it is not possible to know if these positive changes were maintained. Longer sessions of one to two hours were used in the studies with an extended duration of follow-up and demonstrated continued positive outcomes and therefore are recommended based on this review. Again, there was a large variety in the number of sessions delivered across the studies. Some evidence was presented that only brief interventions of two sessions combined with self-hypnosis practice was enough to improve pain outcomes and was equally as effective as eight sessions of hypnosis. This may suggest that two sessions are all that is required and is recommended from this review. However further research into the comparison of treatment numbers is required.

Seven of the included studies used an individual hypnotic intervention while six used a group intervention, with no clear difference in pain outcomes between these approaches. This suggests that both group and individual formats may be equally beneficial, with a group setting potentially being a more cost-effective clinical approach.

Some evidence was presented that the nature of the suggestions does have an effect on pain outcomes. However, due to a large variety in the suggestions used across the studies it is difficult to make definitive conclusions regarding the most effective to use clinically. Combining hypnosis with some type of pain control or analgesic suggestion may be more effective than combining hypnosis with relaxation suggestions and therefore the former should be included within a clinical intervention. Also, the studies that used the largest variety of suggestions appeared to gain the most significant results and so it is recommended that this strategy be followed until more research is undertaken to compare delivery methods.

Seven of the studies used self-hypnosis training or encouraged ongoing hypnosis practice of some form. Unfortunately, none of the studies monitored adherence to this

programme effectively and, due to the general lack of long-term follow up data, it is not possible to make a recommendation from this review on the usefulness of self-hypnosis.

As hypnosis is relatively quick and easy to learn it could be incorporated by other health care providers such as physiotherapists and psychologists into the current methods they utilise when treating people with chronic musculoskeletal pain. The evidence presented suggests that by doing this the efficacy of current interventions such as CBT and pain education can be increased.

6.2. Strengths and Limitations

There were several strengths to this study. It was a systematic review with a well-developed search strategy and clear inclusion and exclusion criteria. The review contained 13 studies with all but one of them being an RCT, and the overall quality of evidence was good when critiqued by a validated tool. There was a reasonable level of consistency in the findings of the included studies.

There were also some limitations to the review. Only one database was searched, and relevant articles were screened by only one author, creating the possibility of relevant studies not being included. Overall, there was a large heterogeneity between studies in terms of pathology, population, and type and dose of hypnotic intervention, making it difficult to come to definitive conclusions regarding these parameters in the treatment of chronic musculoskeletal pain. The small sample size in many of the studies, including three with less than 20 participants across all groups, reduced statistical power and may have impacted the ability to detect significant findings. Blinding of participants in the studies was difficult due to the nature of a hypnotic intervention. Only one study attempted to do this, with Abrahamsen et al. (2011) blinding the participants by recruiting a population with no prior experience of hypnosis and then informing both the control and hypnosis groups that two types of hypnosis were being tested. However, the effectiveness of the blinding in this study was not assessed and it is therefore difficult to evaluate if this action was worthwhile and should be used in future research.

In many of the studies, only a very brief description of the intervention was given with the exact transcripts not available, making it difficult to compare delivery methods. There is a need to clearly differentiate the components of the hypnotic intervention from

other hypnotic-like interventions, such as relaxation training. Generally, long-term follow-up was poor across the studies with most studies only reassessing immediately post-intervention or having short follow-up periods further adding to the difficulty in comparing the long-term effects of different methods used.

Rizzo et al. (2018a) were the only study to measure worst pain intensity and demonstrated that hypnosis was effective in reducing this. A previous study by Jensen et al. (2011) did not find a statistically significant difference in the average pain intensity, but they did detect a difference in the worst pain intensity in favour of the clinical hypnosis group. Compared to average pain, worst pain intensity tends to be more strongly correlated with pain interference with regard to mood, social relationships, walking, work and enjoyment of life (Daut et al., 1983). This suggests that potential changes in pain experience may not have been found in some of the studies that only measured average pain intensity.

There was generally a lack of good follow-up data across the studies, with none of the studies evaluating their participants longer than 12 months. This created difficulty in establishing the long-term effectiveness of the interventions. It was hard to come to definitive conclusions about outcome modifiers, such as dose or delivery format, or about durability of treatment outcomes because of the high level of study heterogeneity.

6.3 Future Research

There are several recommendations for further research based on the findings of this review. To determine the optimum dosage, future research should investigate the most effective length, frequency, and number of sessions required to gain beneficial outcomes from hypnosis in populations with chronic musculoskeletal pain. Also, comparing the efficacy of group and individual interventions of hypnosis for chronic musculoskeletal pain would be useful to help establish if either is superior. These studies need to include larger participant numbers to ensure they are adequately powered to achieve statistical significance. They should also have longer-term follow-up procedures of at least 2 years to establish whether any differences between groups that may occur are maintained in the long term.

To help guide the content of hypnotic interventions, comparison between individualised suggestions deliberately targeting certain aspects of an individual's pain experience, or specific parts of the brain, and the more generic interventions used in many of these studies should be made. The effectiveness of the addition of self-hypnosis also needs to be examined. Future studies should also consider monitoring adherence to self-hypnosis practice and compare outcomes related to this component alone to allow a more accurate evaluation of its efficacy.

6.4. Conclusions

From the studies reviewed, there is a high level of evidence that hypnosis has a positive effect in reducing multiple aspects of pain in chronic musculoskeletal conditions compared to standard care and waitlist controls. When compared to other interventions, such as relaxation, the benefits of hypnosis were less consistent across the studies, but there was still a moderate level of evidence demonstrating significantly better outcomes in the hypnosis groups. There is also a moderate level of evidence that the addition of hypnosis to other psychologically based interventions, such as CBT and pain education, creates greater improvements in pain related outcomes. Conclusions were unable to be made regarding the relative efficacy of various delivery formats and dosage due to the high levels of study heterogeneity. Future research should focus on the optimal delivery methods and components of the hypnotic intervention for this population.

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