



Review article

A current review of distraction-based interventions for chronic pain management



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ABSTRACT

Introduction: Chronic pain is a global public health problem, which impairs the physical, mental and social well-being of afflicted individuals. Distraction-based interventions have been posited as one approach to divert attention away from noxious stimulation and thereby modulate the severity of pain. The current review aimed to identify studies that explicitly used distraction-based interventions for patients with chronic pain.

Methods: The review methodology was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria. Databases including PubMed, EMBASE, PsychINFO, and CINAHL were searched using combinations of keywords. Studies from the last decade (2005–2015) were included if they (a) were published in English, (b) used experimental or quasi-experimental designs, (c) explicitly used distraction as an intervention for pain, and, (d) evaluated measures of pain pre-post intervention. **Results:** A total of 12 studies that examined distraction-based interventions for chronic pain were included in this review. Most interventions were evaluated in adults with chronic pain conditions, such as fibromyalgia, and involved a combination of activities including internal and external distraction techniques. There was wide variation in the implementation of interventions, particularly in the use of practice sessions, dose frequency and duration.

Conclusion: Distraction was not sufficiently elaborated upon in the theoretical frameworks. Directions for future research are discussed including the use of standardized pain, symptom, and outcome measures and tailored intervention approaches based on the individual's level of distractibility. Strategies to target the individual's distraction threshold could lead to greater precision in delivery of effective interventions to reduce pain.

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1. Introduction

Chronic pain is defined as persistent, recurrent, longstanding pain that adversely affects quality of life and is considered an “illness in itself” with disabling, expensive results [1,2]. When considering the prevalence of chronic pain in adults, at least 100 million Americans [3] and approximately 20% of the European population suffer from chronic pain [4]. Further, while there are few estimates of the incidence of chronic pain globally, the World Health Organization (WHO) estimates that as many as 1 in 10 adults are newly diagnosed with chronic pain each year [5]. In the pediatric population, global estimates of chronic pain range from 20% to 35% [6,7].

Economically, in the United States (U.S.) alone, chronic pain reportedly costs the nation up to \$635 billion annually due to medical treatment and lost productivity [3]. In Europe, annual financial costs have been estimated at more than \$228 billion (€200 billion) [4]. Although chronic pain has been described as an “illness in itself”, it often occurs in the context of pain-inducing conditions that can include, among others, irritable bowel syndrome, fibromyalgia, rheumatoid arthritis, myasthenia gravis and multiple sclerosis. In children and adolescents, the most common chronic pain conditions reportedly include musculoskeletal pain, headaches and abdominal pain [2,6,8]. Given that chronic pain conditions comprise 3 of the top 5 conditions that produce the greatest disease burden in the U.S., contributing to impairments in physical, emotional and social functioning, it is not surprising that management of chronic pain remains a constant clinical concern [2–4].

One of the most widely accepted models for guiding chronic pain management, the biopsychosocial model of pain, provides a framework for understanding the interactions among biological, psychological and sociocultural factors that influence the impact of pain on the individual [9]. A basic premise of the model is the distinction between pain as disease, and pain as illness. Disease represents the pathophysiological process of nociception whether it is through tissue injury, a neural lesion or other source, whereas illness refers to the subjective experience of pain and its impact on individual functioning. Nociceptive input is filtered through an individual's biological (anatomical, physiological, genetic) architecture, psychological status and sociocultural context, with each of these factors contributing to how the individual lives with and responds to the perception of pain (illness).

The biopsychosocial model views consciousness as a prerequisite for pain to be perceived, even when nociception can be detected [10]. Treatment strategies focused on developing individual coping mechanisms can be designed to alter conscious attention away from the perception of pain (distraction) in order to decrease the impact of pain and illness behavior. Distraction is defined as diverting attention away from noxious stimulation [11]. Because attention can be focused both internally and externally, distraction can be further classified as internal or external distraction. Internal distraction is directing attention inward through psychological means, i.e., activating one's mind to purposefully generate an internal focus, whereas, external distraction is directing attention outward towards an environmental stimulus. Depending upon the individual's selected stimulus source, both approaches have the potential to distract attention away from the experience of pain [12,13]. Individuals with chronic pain may have alterations in nociceptive processing

that include phenotypic cellular changes with an increase in neurotrophic factors and other mediators of pain signaling, reduced pain threshold with spontaneous synaptic firing, or dysfunctional descending inhibitory mechanisms that normally dampen the barrage of pain messages that reach the brain [14]. Even with these alterations present, distraction may provide analgesia through release of endogenous opioids and subsequent binding at opioid receptor sites that change the electrophysiological properties of peripheral sensory fibers. Activation of opiate receptors at the interneuronal (spinal cord) level produces hyperpolarization of the neurons, which results in the inhibition of firing. It is suggested that the release of endogenous opioids may increase in response to comforting images or sounds, such as those used in distraction-based pain management techniques.

The periaqueductal gray (PAG) region of the brain is responsible for modulation of the descending pain control system, which can facilitate or inhibit incoming pain information from the spinal cord level [15]. Functional magnetic resonance imaging has been used to study the mechanism of distraction during experimental pain. Along with significantly reduced pain perception, these studies have shown that distraction reduces pain-related activation in multiple brain areas, including the medial pain system [16,17]. The medial pain system projects through the medial thalamic nuclei to brain regions including the prefrontal and anterior cingulate cortices, which are thought to be responsible for the affective-emotional aspects of pain. Simultaneously, distraction has been shown to significantly increase activation of the cingulo-frontal cortex including the orbitofrontal and perigenual anterior cingulate cortex (ACC) as well as the periaqueductal gray (PAG) region and posterior thalamus. These brain regions are thought to be intimately involved in modulation of pain during distraction [18–20].

The effectiveness of distraction in providing acute pain analgesia has been shown in adults during conscious surgery [21,22] and on postoperative pain [23]. In addition, multiple systematic reviews and meta-syntheses have been performed to evaluate distraction in acute pain paradigms, including for medical and dental procedures [24–26]. Reviews have also been published for children with cancer-related pain [27]. Novel strategies for using distraction-based techniques for children undergoing painful medical procedures that are based on the child's distress score have been developed [28]. However, less evidence exists for assessing the efficacy of distraction in the management of chronic pain. Therefore, the focus of this review was to provide a synthesis of studies that explicitly defined distraction as a component of a chronic pain management intervention for the purpose of answering the following questions: (1) In which chronic pain populations have distraction-based psychological interventions been conducted?; (2) How were the interventions implemented in the studies (e.g. activities employed, delivery, personnel involved, duration period of the intervention; and, (3) What measures have been used to evaluate distraction-based psychological interventions in patients with chronic pain?

2. Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement provides a 27-item checklist and a four phase flow diagram that include items deemed essential for transparent reporting in systematic reviews [29]. The methods

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