



How physical activity and exercise influence chronic musculoskeletal pain

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Physical activity (PA) and exercise (EX) are the first-line strategies for managing non-inflammatory chronic musculoskeletal pain, recommended by multiple clinical practice guidelines. Understanding the mechanisms through which PA and EX improve overall symptoms, function, and wellbeing in this population is a subject of considerable interest and significance. Before delving into this topic, it is important to define PA vs. EX. PA encompasses any movement generated by skeletal muscles, requiring an expenditure of energy, such as walking to the store, climbing stairs, doing household chores, gardening, and playing sports – all of which burn calories. Conversely, EX is a planned, structured, and purposeful form of PA aiming at maintaining or enhancing physical fitness, such as a daily 30-minute walk and a dedicated yoga or weightlifting session. It is worth noting that EX is a subtype of PA, but not all PA qualifies as EX. In the literature addressing the relationship between PA/EX and pain, these terms are often used interchangeably, although they may involve overlapping and distinctive biopsychosocial pathways.

Effect of PA/EX on pain in individuals without chronic musculoskeletal pain

A single bout of EX has been shown to produce short-lasting (ranging from 5 to 30 minutes) hypoalgesia, a period of decreased sensitivity to painful stimuli¹, in pain-free healthy individuals. However, the mechanisms underlying this hypoalgesic effect are not fully understood. Animal studies suggest that it may be attributed to increased release of endogenous opioids and serotonin in the pain inhibitory pathway and reduced excitability of central neurons². Different modes of EX, including aerobic,

isometric, and dynamic resistance, have demonstrated the ability to lower pain sensitivity, quantified by increased pain threshold, reduced temporal summation of pain, or increased conditioned pain modulation³. Positive treatment expectations may also play a role in greater exercise-induced hypoalgesia, whereas negative expectations were shown to have the opposite effect⁴.

Effect of PA/EX on pain in individuals with chronic musculoskeletal pain

The relationship between PA/EX and pain in individuals experiencing chronic musculoskeletal pain is more complicated. While epidemiological data support the potential protective role of moderate PA in reducing pain intensity and sensitivity^{5,6}, and PA and EX interventions have shown small and modest pain-relieving effects⁷, the hypoalgesic effect of EX in those with chronic musculoskeletal symptoms varies: some experienced no change, some worse, some better^{1,3}. Notably, those with dysfunctional pain modulation or widespread pain may be less likely to experience pain relief from exercise therapy⁸.

Several potential factors may attenuate the hypoalgesic effect of EX in individuals with chronic musculoskeletal pain. They include facilitated central pain mechanisms (e.g., impaired conditioned pain modulation), the presence of widespread pain, analgesics use, a negative belief about EX and pain flares or tissue damage, and EX intensity (e.g., intense EX may cause hyperalgesic response)⁴.

Despite the varying and sometimes inconsistent relationship between EX and pain, PA and EX remain the best available low-cost, minimal-risk, and convenient intervention for managing symptoms

and improving functions in non-inflammatory chronic musculoskeletal pain. They offer a multitude of physical and psychosocial benefits, some of which can indirectly contribute to symptom improvement. For example, PA/EX promotes weight loss, strengthens the neuromusculoskeletal system, enhances mood and mental health, improves sleep duration and quality, reduces chronic inflammation, and fosters movement self-efficacy and positive beliefs about the relationship between PA/EX and pain^{9,10}. These factors collectively lead to more effective pain management and better function.

Engaging in PA/EX in the presence of chronic musculoskeletal pain

It is widely accepted that engaging in any level of PA/EX, regardless of its type or amount, is better than being mostly sedentary. There is no one-size-fits-all approach. Partnering with healthcare providers to personalize PA/EX based on individual medical conditions and restrictions, and monitoring progress while making necessary adjustments, will optimize the benefits. Determining how and when an individual should initiate or increase PA/EX engagement is influenced by many internal (e.g., mental and physical health) and external (e.g., seasonal changes, environmental resources) factors. For example, individuals experiencing severe pain may start by moving the non-painful body parts. Regardless of the approach taken, it is vital for individuals with musculoskeletal pain to closely monitor their symptoms (e.g., pain, fatigue) within 24 hours of a PA/EX session and adjust their activities accordingly. They should start with a gradual increase and aim to be as active as their condition allows, incorporating appropriate pacing and intervals of rest both within and between PA/EX sessions. This will prevent signs of overexertion, which may manifest as pain exacerbations, sleep disturbance, fatigue, and many other undesirable symptoms. Experiencing these symptoms can lead to negative beliefs towards PA/EX, which reinforce chronic pain behaviors of activity avoidance.

Summary

Multiple interconnected factors contribute to an individual's chronic musculoskeletal pain experience. While the mechanisms underlying PA/EX-induced symptom relief are not well understood, and the responses may vary, PA/EX offers cost-effective interventions with substantial benefits to overall wellbeing.

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