

## Exercise/Physical Activity in Prevention and Treatment of Chronic Pain: Myth or Reality?

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### Abstract

This short communication was aimed to address the role of physical activity by updating the existing evidence from a literature overview of studies on prevention and treatment of chronic pain. Experimental evidence suggested that physical activity might prevent development of chronic pain. Treatment of chronic pain using quota-based exercise/physical activity programs not only produced increases in activity but also subjective expectancies of capability. Cognitive behavioural strategies incorporating exercise/physical activity aims in improving fitness, counteracting unhelpful beliefs and improving stress levels in people with chronic pain. Exercise positively influenced pain behaviours and pain perceptions, activated endogenous analgesic mechanisms and has immediate anti-depressive and anxiolytic effects. A comprehensive supervised exercise program (stretching, strengthening, balance training, aerobic training) with or without motivational interviewing demonstrated beneficial effects on people with chronic pain. Evidence-informed recommendation for physical

activity existed for chronic low back pain and fibromyalgia.

**Keywords:** Behavioral analgesia; Pain rehabilitation; bio-psycho-social model.

This short communication was aimed to address the role of physical activity (PA) by updating the existing evidence from a literature overview of studies on prevention and treatment of chronic pain.

### Prevention

Sluka *et al*[1] induced physical activity by placing running wheels in home cages of mice for 5 days or 8 wk and compared these to sedentary mice without running wheels in their home cages, and demonstrated that regular physical activity prevented the development of chronic muscle pain and exercise-induced muscle pain by reducing phosphorylation of the NR1 subunit of the NMDA receptor in the central nervous system.

### Treatment

Dolce *et al*[2] found that exercise quota systems produce systematic increases in both exercise levels and expectancies of capability while reducing worry and concern about exercising. These data highlighted the importance of avoidance learning in chronic pain and suggested that the effectiveness of exercise quota systems was related to a deconditioning process based on exposure rather than the process of applying reinforcement to quota achievement.

Hall *et al*[3] expressed that cognitive behavioural

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strategies aims at improving fitness, counteracting unhelpful beliefs and improving stress levels. Doleys *et al*[4] examined the effects of setting exercise quotas in 26 subjects with chronic pain. The subjects responded to quotas by showing steady and gradual increases in exercise activity.

Fordyce *et al*[5] correlated observed pain complaints with amount of prescribed exercise performed by chronic pain patients when exercising to tolerance. Exercises were aimed at improving body mobility and general activity. Increased exercising was related to decreased pain behaviors.

Geiger *et al*[6] studied the effects of feedback about progress and contingent reinforcement on rate of walking which were provided at certain intervals during each observation session. There were systematic increases in walking rate, while the no-reinforcement and non-contingent reinforcement procedures produced no systematic effect. Pre-post ratings also showed an average decrease in reported pain.

Hoffman and Hoffman[7] said that aerobic exercise can cause an acute improvement in mood as well as a reduction in the perception of pain from a painful stimulus. Regular exercise training also may offer some protection from depression, is clinically useful in treating certain psychiatric and chronic pain conditions.

Sullivan *et al*[8] opined, "the goal was to increase awareness of the significance of physical activity, as well as examine additional cost-effective, integrated approaches to help manage the complex and debilitating effects of chronic pain. They summarized the types of exercise in the rehabilitation of chronic pain patients and provide practical recommendations for the clinician based on empirical and clinical experience.

Sullivan *et al*[9] determined the acute

effects of a brief, 10-minute exercise protocol on pain, mood, and perceived exertion in 28 subjects who completed an experimenter-designed and controlled treadmill protocol. The brief exercise protocol was found to be associated with self-report of immediate antidepressant and anxiolytic effects.

Tse *et al*[10] examined the effectiveness of an integrated motivational interviewing and physical exercise programme on pain, physical and psychological function, quality of life, self-efficacy, and compliance with exercise for 56 community-dwelling older persons with chronic pain. Participants in the experimental group received an 8-week integrated motivational interviewing and physical exercise programme, while the control group received regular activities in the centre. Motivational interviewing and physical exercise programme was found to be effective in improving pain, physical mobility, psychological well-being and self-efficacy.

Tse *et al*[11] administered a 8-week physical exercise programme (stretching, strengthening, balancing, towel dancing and self-administered massage to acupressure points) for 75 older adults living in nursing homes. On completion of the physical exercise programme, there was a significant decrease in pain intensity, increase in range of movement in the neck, shoulder, back, hip and knee rotation, flex and abduction. Improved mobility levels without changes in activities of daily living were observed.

Mior[12] identified three systematic reviews and three randomized controlled trials addressing the effectiveness of exercise for the management of chronic low back pain, one systematic review and one randomized controlled trial addressing chronic neck pain, two systematic reviews and three randomized controlled trials addressing upper

extremity pain, and three randomized controlled trials addressing fibromyalgia." Exercise was effective for the management of chronic low back pain for up to 1 year after treatment and for fibromyalgia syndrome for up to 6 months (level 2). There was conflicting evidence (level 4b) about which exercise program was effective for chronic low back pain. For chronic neck pain and for chronic soft tissue shoulder disorders and chronic lateral epicondylitis, evidence of effectiveness of exercise was limited (level 3)."

Nijs *et al*[13] opined- "Exercise activates endogenous analgesia in healthy individuals. The increased pain threshold following exercise is due to the release of endogenous opioids and activation of (supra)spinal nociceptive inhibitory mechanisms orchestrated by the brain. Exercise triggers the release of beta-endorphins from the pituitary (peripherally) and the hypothalamus (centrally), which in turn enables analgesic effects by activating  $\mu$ -opioid receptors peripherally and centrally, respectively. The hypothalamus, through its projections on the periaqueductal grey, has the capacity to activate descending nociceptive inhibitory mechanisms. However, several groups have shown dysfunctioning of endogenous analgesia in response to exercise in patients with chronic pain. Muscle contractions activate generalized endogenous analgesia in healthy, pain-free humans and patients with either osteoarthritis or rheumatoid arthritis, but result in increased generalized pain sensitivity in fibromyalgia patients. In patients having local muscular pain (e.g. shoulder myalgia), exercising non-painful muscles activates generalized endogenous analgesia."

Treatment of chronic pain using quota-based exercise/physical activity programs not only produced increases in activity but also subjective expectancies

of capability. Cognitive behavioural strategies incorporating exercise/physical activity aims in improving fitness, counteracting unhelpful beliefs and improving stress levels in people with chronic pain. Exercise positively influenced pain behaviours and pain perceptions, activated endogenous analgesic mechanisms and has immediate anti-depressive and anxiolytic effects. A comprehensive supervised exercise program (stretching, strengthening, balance training, aerobic training) with or without motivational interviewing demonstrated beneficial effects on people with chronic pain. Evidence-informed recommendation for physical activity existed for chronic low back pain and fibromyalgia.

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