Physiotherapy 104 (2018) 187–193

Kinesiophobia is associated with pain intensity but not pain sensitivity before and after exercise: an explorative analysis

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Abstract

Objective To compare clinical pain intensity, exercise performance, pain sensitivity and the effect of aerobic and isometric exercise on local and remote pressure pain thresholds (PPTs) in patients with chronic musculoskeletal pain with high and low levels of kinesiophobia.
Design An experimental pre–post within-subject study.
Setting An exercise laboratory in a multidisciplinary pain clinic.
Participants Fifty-four patients with chronic musculoskeletal pain.
Interventions Acute aerobic and isometric leg exercises.
Main outcome measures Clinical pain intensity (numerical rating scale, range 0 to 10), Tampa Scale of Kinesiophobia, aerobic and isometric exercise performances (intensity and maximal voluntary contraction), and PPTs at local and remote body areas before and after exercise conditions.
Results Patients with a high degree of kinesiophobia demonstrated increased pain intensity compared with patients with a low degree of kinesiophobia [high degree of kinesiophobia: 7.3 (1.6) on NRS; low degree of kinesiophobia: 6.3 (1.6) on NRS; mean difference 1.0 (95% confidence interval 0.08 to 1.9) on NRS]. Aerobic and isometric exercises increased PPTs, but no significant group differences were found in PPTs before and after exercise.
Conclusions Clinical pain intensity was significantly higher in patients with a high degree of kinesiophobia compared with patients with a low degree of kinesiophobia. Despite a difference in isometric exercise performance, the hypoalgesic responses after cycling and isometric knee exercise were comparable between patients with high and low degrees of kinesiophobia. If replicated in larger studies, these findings indicate that although kinesiophobic beliefs influence pain intensity, they do not significantly influence PPTs and exercise-induced hypoalgesia in patients with chronic musculoskeletal pain.

Keywords: Kinesiophobia; Fear of movement; Pain; Exercise; Physical activity

Introduction

Chronic pain is one of the most disabling conditions [1]. Several mechanisms may be involved, including facilitation of central pain mechanisms and reduced efficiency of pain descending pain inhibitory pathways [2,3], as well as psychological factors. Among people with chronic musculoskeletal pain, fear of performing physical exercise or body movements due to the assumption of increased pain or further injury (e.g. fear avoidance or kinesiophobia) [4,5] is common [6], and has been associated with increased pain intensity [7] and disability [8,9].

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https://doi.org/10.1016/j.physio.2017.10.001
0031-9406/

Despite these beliefs, physical exercise is an important component in the treatment of chronic musculoskeletal pain [10]. Physical exercise decreases pain sensitivity [exercise-induced hypoalgesia (EIH)] in healthy subjects [11] and in patients with chronic musculoskeletal pain, although less efficiently [12]. In healthy subjects, modulation of pain sensitivity has often been characterised by elevations in pain thresholds in exercising limbs (i.e. local EIH) and non-exercising limbs (i.e. remote EIH) following both high-intensity aerobic exercise (e.g. cycling or running) [13,14] and low- and high-intensity isometric exercise (i.e. muscle contraction without joint movement) [13,15,16]. In subjects with different musculoskeletal pain conditions, the effect of exercise on pain sensitivity is still controversial as both hypoalgesia [17,18] and hyperalgesia [19,20] have been reported. Reduced EIH has been related to older age and increased pain sensitivity [21], as well as reduced efficiency of pain modulatory pathways [22]. However, no studies have investigated the influence of fear of movement beliefs on EIH, which represents a major knowledge gap. Such knowledge may have clinical implications, as management of fear of movement beliefs could improve the effects of exercise. Previous studies have demonstrated that the presence of fear of movement may influence treatment outcome [23,24].

A previous experimental crossover study investigated the effect of different types of exercise on pain sensitivity in patients with chronic musculoskeletal pain, and found reduced EIH in patients with chronic pain with high vs low pain sensitivity [25]. Information was also collected on fear of movement, and these data now provide a unique opportunity to investigate the influence of fear of movement on EIH. Thus, the primary aim of this explorative analysis was to compare the effects of aerobic and isometric exercise on local and remote pressure pain thresholds (PPTs) between patients with chronic musculoskeletal pain with high and low fear of movement. A secondary aim was to compare the clinical pain intensity and exercise performance between groups. It was hypothesised that patients with high fear of movement would demonstrate: (1) reduced EIH and less intense exercise performance; and (2) increased clinical pain intensity.

Materials and methods

Subjects

This explorative analysis was performed using data on fear of movement and EIH at local and remote assessment sites in 54 out of 61 patients with chronic musculoskeletal pain {mean age 45.7 [standard deviation (SD) 11.2] years; 39 females} included in a previous experimental crossover study that investigated the effect of cold pressor test, aerobic exercise, isometric exercise and quiet resting on pressure pain sensitivity in patients with chronic musculoskeletal pain [25]. The remaining seven patients did not complete the relevant questionnaire. All patients were recruited by letter after referral to a multidisciplinary pain clinic from January to December 2013. Patients were asked to refrain from physical exercise, coffee and nicotine on the days of participation. All patients provided written informed consent, and the experimental study was conducted in accordance with the Declaration of Helsinki and approved by the local ethical committee (S-20110070).

Procedure

At inclusion, patients completed the 17-item Tampa Scale of Kinesiophobia (TSK) questionnaire [4] prior to participating in the experimental crossover study. Data on clinical peak pain intensity on a numerical rating scale (NRS) (range 0 to 10; 0 = no pain, 10 = worst pain imaginable) during the previous 24 hours was also collected. The NRS has shown good test–retest reliability in patients with chronic pain ($r = 0.96$, $P < 0.05$) [26]. On two different days, all patients performed two exercise conditions (cycling and isometric contraction) in randomised and counterbalanced order, and PPTs were recorded at the legs, arm and shoulder before and immediately after both exercise conditions.

Pressure pain thresholds

PPTs at four different sites were assessed with a handheld pressure algometer (Somedic, Hörby, Sweden) with a stimulation area of 1 cm^2 and an increment rate at 30 kPa/second. The patient was instructed to press a button the first time the pressure was perceived as slightly painful. Two assessments were completed for each site, and the average was used for further analysis. Site 1 was located in the middle of the dominant quadriceps femoris muscle, 20 cm proximal to the base of the patella. Site 2 was located in the middle of the non-dominant quadriceps femoris muscle, 20 cm proximal to the base of the patella. Site 3 was located in the middle of the dominant biceps brachii muscle, 10 cm proximal to the cubital fossa. Site 4 was located in the non-dominant upper trapezius muscle, 10 cm from the acromion in direct line with the neck. Within- and between-session test–retest reliability of handheld pressure algometry for assessment of pain sensitivity has been demonstrated previously in patients with chronic pain [25].

Aerobic exercise

As described previously [25], the aerobic exercise condition consisted of a 15-minute cycling exercise (Ergomedic 928E, Monark Exercise AB, Vansbro, Sweden) at age-related target heart rates corresponding to 75% of patients' maximum oxygen consumption (VO_{2max}). Patients were instructed to maintain a pedal rate as close to 70 revolutions per min as possible throughout the 15-minute cycling exercise, and a heart rate monitor (Monark Exercise AB) was strapped around the patient's chest. Exercise resistance was manipulated, if necessary, to keep the heart rate at the desired level.