A pain-guided rehabilitation program in a recreational long-distance runner with long-standing groin pain: A single-case experimental study

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Introduction

Although groin injuries are among the most common injuries in sports involving changes of direction, kicking, and jumping,[1] they occur less frequently in running sports.[2,3] However, cases of long-standing groin pain in runners have been described in the literature,[4,5] with recovery time in this population ranging from 12 to 18.5 weeks.[5–10]

The etiology of groin pain is often multifactorial and can involve the adductor region, iliopsoas, inguinal canal and ligament, and the pubic region.[11,12] This has been confirmed by recent literature, where most rehabilitation programs include athletes presenting with pain in multiple clinical entities, using exercises that target many entities during long-standing groin pain rehabilitation.[4] Therefore, a rehabilitation plan targeting more than one anatomical entity may have a more positive effect return to sport time and pain reduction in runners compared to programs targeting only a single anatomical entity.

Most rehabilitation programs that included runners used time-based criteria rather than criteria based on injured tissue behavior.[4,6,8,10] Nevertheless, it has been shown that in most cases of long-standing groin pain rehabilitation where progression is guided by criteria such as the presence and severity of pain, return to sport time is reduced compared to time-based programs.[4]

Therefore, this single-case experimental study aims to evaluate the effect of a structured, pain-guided rehabilitation program on return to sport time, pain behaviour, and adductor muscle strength in an amateur long-distance runner with long-standing groin pain.

Aim

The primary aim of this single-case experimental study is to evaluate the efficacy of a pain-guided progressive rehabilitation program on return to sport time, adductor muscle strength, and tissue tolerance in a recreational runner with long-standing groin pain. The secondary aim is to evaluate changes in the athlete's hip-related quality of life and weekly global perceived effect during the intervention.

Methods

Ethical Considerations

Ethical approval was obtained from the University of West Attica ethics committee (68969/07-07-2026). The athlete gave his written informed consent prior to inclusion in accordance with the Declaration of Helsinki.

Injury history

Data were recorded with the use of an assessment form created by the research team, which included demographic information, pain onset, pain duration, pain location (side and specific area of pain), injury mechanism, pain quality, pain intensity, aggravating movements/activities, training level (times/week), training type, history of previous injury, imaging, and previous treatments.

Case description

A 38-year-old male recreational runner reported pain in his right groin (adductor and lower abdomen area). The mean pain level reported was 2 in a numeric pain rating scale (NPRS) of 0-10, which occasionally increased to 3. Aggravating exercises included straight abdominal sit-ups, sliding hip exercise, and hip adductor squeeze at 45°. In addition, symptoms were provoked by laughing and sexual intercourse. The initial onset of pain was nine years before the athlete contacted the research team seeking assistance (2017). Pain was resolved after two years (2019) of systematic resistance training, but reappeared five years later. He did not report any specific mechanism of the initial injury, but described an insidious pain presented during an intense running period. Although the athlete had a number of physiotherapy sessions within the last year, including electrotherapeutic modalities (TENS, radiofrequency therapy) and massage, there was no improvement of the pain in the groin area. His weekly training schedule during the month before the clinical examination included one running session (10 km), one upper limb resistance training session, and one groin-specific resistance training session.[6] The athlete reported no previous musculoskeletal injuries, while he had not undergone any radiological examination.

Clinical examination

Clinical examination will be performed by a physiotherapist specializing in sports-related groin injuries. Groin pain is defined as pain falling into one or more of the following defined clinical entities: adductor-, inguinal-, pubic-, and iliopsoas-related groin pain.[11] Examination will include hip adductor squeeze tests at 0°, 45°, and 90° of hip flexion (short and long lever), resisted hip flexion at 0° and 90°, outer-range resisted hip adduction, outer-range adductor stretch, resisted straight and oblique sit ups, cross test at 0°, the modified Thomas test, the FABER test, the FADIR test, hip internal rotation at 90° of hip flexion, and palpation of all structures in the groin area.[1,13,14] In addition, eccentric and isometric adductor strength will be assessed with the use of a hand held dynamometer (K-Force Muscle Controller, KINVENT, Montpellier, France) and include a unilateral supine eccentric outer-range test, a unilateral supine isometric mid-range test, and a bilateral squeeze test at 0° of hip and knee flexion.

Rehabilitation program content

The program will comprise two distinct phases. Phase A will consist of a baseline monitoring period, during which the athlete will exclusively perform adductor strength testing without any exercise intervention. This phase will serve to establish a stable baseline strength level

before the athlete starts the rehabilitation program. Transition to Phase B will be determined by the strength variance between sessions; if there is a difference of ≤ 10% across the first three sessions for each leg, the athlete will move to Phase B at the fourth week. Otherwise, further testing sessions will be needed before the athlete starts the program, provided that a difference of ≤ 10% is achieved across three consecutive testing sessions.

During the rehabilitation period, the athlete will not be allowed to participate in any other form of training outside the predefined protocol. Additional upper limb exercises and any therapeutic options will be allowed after discussion with the research team, provided they do not interfere with the rehabilitation protocol implementation.

Exercise supervision

The rehabilitation protocol will be performed as an unsupervised intervention, reflecting pragmatic clinical scenarios where recreational athletes lack access to clinical supervision due to financial or other constraints. However, adherence, exercise execution, or any difficulties during rehabilitation will be addressed during weekly meetings with the physiotherapist performing strength testing. During these meetings, the physiotherapist will ensure that exercises are executed with proper form and any queries by the athlete are answered. In addition, prior to initiation of the rehabilitation the athlete will be provided with documents including detailed exercise descriptions, ensuring understanding and proper execution.

Exercise recording

Exercise sessions will be recorded by the athlete on a weekly basis using a form provided by the research team. In addition, weekly exercise sessions will be recorded via an online platform to which both the athlete and the research team will have direct access. Exercise recording will include exercise type, sets, repetitions, load/intensity, pain level (when applicable), and date of each session.

Outcome Measures

Primary outcome measures

Return to sport time

The time to return to sport is defined as the total number of weeks recorded from the date of the first rehabilitation session to the day the athlete fulfils the return to sport criteria.

Adductor muscle strength

Maximum eccentric and isometric adductor muscle strength will be assessed with a mid-range unilateral supine isometric adduction test and an outer-range unilateral supine

eccentric adduction test, following standardized procedures which have demonstrated good intra-tester reliability [EHAD ICC 0.91 (0.70-0.98), SEM: 6.3%, IHAD ICC 0.78 (0.30-0.95), SEM: 7.3%].[14,16] Strength values will be normalized to the athlete's body weight and recorded as Nm/kg.

Tissue tolerance

Tissue tolerance is defined as the maximum adductor strength generated when the athlete reaches a pain level of 2/10 of the NPRS, and will be assessed with the use of a bilateral squeeze test at 0° of hip and knee flexion.[17] Strength values will be normalized to the athlete's body weight and recorded as Nm/kg.

Secondary outcome measures

Hip-related quality of life

Hip-related quality of life will be evaluated with the use of the Greek version of the 12-item International Hip Outcome Tool (iHOT-12).[18] The iHOT-12 is a validated tool which assesses domains including symptoms and functional limitations, sport and recreational activities, job-related concerns, and social, emotional, and lifestyle concerns.[19]

Athlete's recovery perception

Subjective overall recovery perception will be evaluated via the validated Greek version of the Global Perceived Effect (GPE) scale.[20]

Data collection

Adductor muscle testing

Strength and tissue tolerance testing will be performed on a weekly basis by a physiotherapist until the athlete returns to sport. Results will be recorded in a form created by the research team following each testing session. Testing sessions will be performed the same day and time every week.

Hip-related quality of life

The iHOT-12 will be administered prior to the first strength testing session and upon completion of the rehabilitation program.

Athlete's recovery perception

The GPE scale will be administered on a weekly basis and recorded through an online platform by the athlete the same day and time every week.

Data Analysis

Strength values will be presented as mean and standard deviation. Maximum eccentric and isometric adductor strength, and tissue tolerance will be analyzed with the use of the Two-Standard Deviation Band (2-SD) method. A statistically significant effect of the rehabilitation program will be defined as at least two consecutive data points in Phase B falling completely above 2-SD. To ensure that changes represent true tissue adaptations, improvements must exceed the predefined standard errors of measurement (SEM) for the hand-held dynamometer. The magnitude of effect will be quantified using the Percentage of Non-Overlapping Data (PND), calculated as the percentage of weekly Phase B data points that exceed the single highest strength value recorded during Phase A. The absolute difference score (Δ) and Minimal Clinically Important Difference (MCID) between baseline and follow-up will be determined for the 12-item International Hip Outcome Tool (iHOT-12). Weekly Global Perceived Effect (GPE) data will be evaluated via descriptive trend lines, setting meaningful recovery as a stable score of ("much improved").

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