OVERCOMING CHRONIC HIP PAIN AND THE RELATED QUALITY OF LIFE AND TRAINING LIMITATIONS OF MOUNTAIN BIKE RIDERS

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ABSTRACT
Introduction: The load and stress experienced by the hip region during cycling have recently garnered significant interest. The implementation of an appropriate physiotherapy approach has the potential to result in a reduction of pain and an enhancement in quality of life.
Methodology: Seven patients with a mean age of 30 years with persistent hip pain (exceeding three months) were selected for the study. These patients followed a personalized physiotherapy protocol, which was meticulously designed to address the individual symptoms exhibited by each patient. The program incorporates exercises that athletes are required to perform on a daily basis. The assessment of hip joint range of motion and the IHOT33 tool were applied to evaluate the patients' condition on the first day of the study, after the first 10 days, and at the conclusion of the one-month treatment period.
Results: The results demonstrated a substantial enhancement in the range of motion (ROM) following the initial 10-day treatment period, with ongoing improvements observed throughout the testing phase. The most significant enhancement in ROM testing pertained to flexion, adduction, and external rotation. All patients exhibited a substantial enhancement in the execution of daily living tasks and activities. Regarding the severity of pain experienced, no visible improvement was observed after the initial 10-day period. However, by the conclusion of the treatment period, a reduction in pain was reported by all athletes when performing training tasks and participating in competitions.
Discussion: This study proposes a pragmatic and uncomplicated approach to mitigating disabilities and reducing pain levels in athletes, while ensuring the continuity of the training process without interruption.
Conclusion: The implementation of the selected exercises has been demonstrated to be an effective strategy for athletes experiencing hip pain, as it facilitates a reduction in pain levels while enhancing their training performance and overall daily activities.

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INTRODUCTION

The experience of chronic hip pain is associated with a significant impact on patients' well-being, daily activities, and overall quality of life. The diagnosis of chronic hip pain is complicated by the frequent presentation of concomitant chronic lumbar spine and/or knee joint pain (Ahuja, 2020; Timothy, 2007).

The increasing load and stress on the hip region experienced by cyclists have led to a growing interest in testing and implementing methodologies that are both easy to execute and effective in addressing the pathokinesiological mechanisms behind pain onset. These interventions aim to improve patients' quality of life significantly. However, ensuring that such methods do not interfere with athletes' training while also providing long-term pain relief remains a significant challenge (Bini, 2014).

In young patients, hip pain is a common complaint that often presents diagnostic difficulties due to its non-specific nature and the potential for referred pain from surrounding anatomical structures, such as the lumbosacral spine, pelvis, and perineum (Yeo, 2025). The presence of overlapping conditions further complicates the identification of the primary cause of hip pain and dysfunction. Therefore, a comprehensive evaluation and accurate diagnosis are essential for selecting effective interventions and facilitating a timely return to play (Timothy, 2007).

Common Causes of Hip Pain in Cyclists

The most common causes of hip pain in cyclists can be grouped into the following categories:

1. **Snapping hip syndrome.** Snapping hip syn-

drome can be categorized into two types, internal and external, depending on the underlying structural elements that precipitate the condition (Byrd, 2015).

2. **Impingement syndrome.** Impingement of the hip bones caused by external forces may result in pain and dysfunction of the affected limb. When cyclists experience this type of pain while pedaling, their chances of achieving a sporting result are reduced (Byrd, 2015).
3. **Labrum injuries.** In cases of labral injury, the torn portion of the labrum may impede joint movement, often accompanied by patient complaints and pain (Byrd, 2015).
4. **Fractures**. Traumatic injuries to the hip may occur as a result of falls or other trauma. Treatment should begin promptly once the injury is identified. In cycling, fractures may also result from systematic overtraining and improper bicycle alignment. These are classified as stress fractures or microfractures (Byrd, 2015).

– Stress fractures. Stress fractures, which are most commonly observed in cyclists, often occur in the femoral head–neck region (Byrd, 2015).
– Microfractures. Microfractures are defined as disruptions in the integrity of cartilage, the tissue that covers the articular surfaces.

It is important to note that these conditions require medical examination, and in many cases, they may not always be directly related to symptoms of pain.

Aim and objectives:
The present study aims to examine the efficacy of a physiotherapy protocol, which was designed to address the individual symptoms exhibited by each patient. The program incorporates exercises that athletes are required to perform on a daily basis as part of their training regimen.

METHODOLOGY

The study sample was composed of seven patients, with a mean age of 30 years, all of whom were male. All participants provided written informed consent to participate in the study. Each of them participated in cycling disciplines (Table 1).
The following criteria were established for the inclusion of participants:
– A consultation with an orthopedic medical doctor;
– Hip pain that has persisted for a period of at least three months;
– A training session attended a minimum of three times per week;
– Registration with a national championship in at least one mountain bike discipline;
– The following criteria were used to determine exclusion from participation:
 • red flags
 • soft tissue injuries or damage to joint structures
 • autoimmune inflammatory diseases
 • surgeries within the last six months
 • congenital disorders in the lumbar, hip, or pelvic area.

Table 1. *Characteristics of the study sample*

№	Initials	Age	Discipline	Number of workouts per week
1	CN	29	Enduro, 4X	5 times
2	GT	39	Cross-country, Marathon	4 times
3	NA	31	Downhill, Enduro, Cross-Country, and 4X	3 times
4	GC	33	Enduro and Cross-country	4 times
5	AA	25	Downhill and Enduro	4 times
6	BC	36	Cross-country and Enduro	6 times
7	IC	31	Downhill and Enduro	4 times

For the present study, exercises were selected and utilized that athletes could perform independently at home, without disruption to their competitive training regimen (Table 2).

Table 2. *Characteristics of the experimental physiotherapy protocol*

Exercise	Dosage
Elevation of the pelvis to stimulate extension of the hips;	3sets by 10reps
Rotation of the lower limbs by touching the palms with the opposite side foot to stimulate lower trunk rotation;	3sets by 10reps each side
External and internal rotation of the hip joint;	3sets by 10reps each side
Performing extension of the front foot;	3sets by 10reps each side
Performing extension of the hips and knees;	3sets by 10reps

The study lasted one month. During this time, the physiotherapy protocol was administered once daily at a time convenient for the patients. The exercise regimen consisted of three sets of ten repetitions performed in a circuit training format (Table 2).

Functional testing methods were employed at the beginning, after the first 10 days of treatment, and at the conclusion of the one-month treatment period to ascertain the functional status of the athletes and to monitor the effect of the therapeutic methodology applied. To facilitate reporting results, a pre-prepared study sheet was used, modified for each participant. The following tests and assessment methods were used:

1. **Range of motion:**
   Goniometry using the standard methodology adopted in Vancouver in 1964 was applied. This methodology, known as the SFTR Moore method, measures the range of motion in all anatomical planes of the human body using a standard goniometer. (Bankov, S., 1991).
2. **Patric test (FABER):**
   The Patric test (FABER) was used to evaluate hip joint pain and symptoms. (Magee, 2009).
3. **IHOT33 questionnaire:**
   The International Hip Outcome Tool (IHOT)33 was developed by Mohtadi et al. The objective of the IHOT is to evaluate patients' capacity to regain their sporting fitness and activities. The tool accomplishes this objective by collecting subjective symptom information and assessing patients' emotional status. This methodology was developed in recognition of the fact that existing hip pain questionnaires were designed primarily for patients with severe pathologies or who had undergone surgery. In such cases, the consequences of "exaggeration" are evident in patients' current conditions. Meanwhile, IHOT33 has been shown to be effective in young, active individuals. The inquiries were meticulously structured according to a 10-point scoring system. Patients with the highest number of points are in the best clinical and functional condition. (Mohtadi, 2012).

Descriptive Statistics and Overall Comparison

Means (M) and standard deviations (SD) were calculated for all outcome measures at three time points: pre-treatment, 10 days, and post-treatment. Analyses were conducted on a sample of seven patients ($N = 7$).

To examine the effect of time on outcome variables—including hip flexion, extension, adduction (left and right), and the International Hip Outcome Tool-33 (iHOT-33) score—a one-way repeated measures analysis of variance (RM-ANOVA) was performed. Sphericity was assessed, and although Greenhouse-Geisser corrections are typically applied in cases of violation, conservative degrees of freedom were maintained due to the small sample size ($N = 7$) and manual computation. The significance level for the omnibus F test was set at $\alpha = .05$.

Post Hoc Analysis

When the RM-ANOVA indicated a significant effect of time ($p < .05$), paired-samples t-tests were conducted to compare the time points. To adjust for multiple comparisons (pre vs. 10 days, 10 days vs. post, pre vs. post), the Bonferroni correction was applied, resulting in a significance threshold of $p < .017$. All calculations were performed manually using established formulas for RM-ANOVA and paired t-tests.

RESULTS

Following the one-month treatment program, all athletes demonstrated marked improvement in hip joint range of motion (ROM). Table 3 presents the mean changes from baseline to the post-treatment period. The greatest improvements were observed in flexion, extension, and adduction.

A one-way repeated measures ANOVA revealed a significant effect of time on left hip flexion, $F(2, 12) = 184.44$, $p < .001$, indicating that mean flexion differed significantly across the three time points.

Pre-treatment vs. 10 days: The mean increase of 5.71° did not reach significance after Bonferroni correction, $t(6) = 3.36$, $p = .046$.

10 days vs. post-treatment: Flexion increased significantly by 7.14°, $t(6) = 4.80$, $p = .009$.

Pre-treatment vs. post-treatment: The total improvement of 12.86° was highly significant, $t(6) = 5.35$, $p = .005$.

Table 3. *Results of Repeated Measures ANOVA and Post-Hoc Pairwise Comparisons for Hip Range of Motion Across Three Time Points (N = 7)*

Variable	Time Point	*M*	*SD*	F(2, 12)	*p*	Post-hoc Comparison	Δ*M*	*t*(6)	*p*(Bonf)
Hip Flexion (Left)	Pre	100.00	18.48	18.67	< .001	Pre vs. 10 Days	7.14	4.80	.009[a]
(Degrees)	10 Days	107.14	16.55			10 Days vs. Post	4.29	3.29	.050
	Post	111.43	15.74			Pre vs. Post	11.43	4.38	.014[b]
Hip Flexion (Right)	Pre	96.43	14.06	23.40	< .001	Pre vs. 10 Days	5.71	3.36	.046
(Degrees)	10 Days	102.14	14.39			10 Days vs. Post	7.86	5.28	.006[a]
	Post	110.00	16.58			Pre vs. Post	13.57	5.20	.006[a]
Hip Extension (Left)	Pre	6.43	2.44	12.00	.001	Pre vs. 10 Days	2.86	2.83	.090
(Degrees)	10 Days	9.29	3.45			10 Days vs. Post	1.43	1.55	.517
	Post	10.71	1.89			Pre vs. Post	4.29	6.00	.003[a]
Hip Extension (Right)	Pre	7.14	3.93	16.75	< .001	Pre vs. 10 Days	1.43	1.55	.517
(Degrees)	10 Days	8.57	3.78			10 Days vs. Post	5.00	3.24	.053
	Post	13.57	4.76			Pre vs. Post	6.43	6.97	.001[a]
Hip Adduction (Left)	Pre	11.43	3.78	1.41	.281	Pre vs. 10 Days	1.43	1.55	.517
(Degrees)	10 Days	12.86	3.93			10 Days vs. Post	0.00	0.00	1.00
	Post	12.86	5.67			Pre vs. Post	1.43	1.55	.517
Hip Adduction (Right)	Pre	9.29	4.50	14.00	< .001	Pre vs. 10 Days	3.57	3.87	.025
(Degrees)	10 Days	12.86	3.93			10 Days vs. Post	2.14	2.12	.234
	Post	15.00	4.08			Pre vs. Post	5.71	4.38	.014[b]

Note. Mean (M) and Standard Deviation (SD) values are presented for the Pre-Treatment, 10-day, and Post-Treatment time points. Omnibus effects were tested using a one-way repeated measures ANOVA. Post-hoc comparisons were conducted using paired t-tests with a Bonferroni correction (adjusted α≈.017). Mean differences (ΔM) are calculated as (Later Time Point - Earlier Time Point). ap<.01. bp<.017.

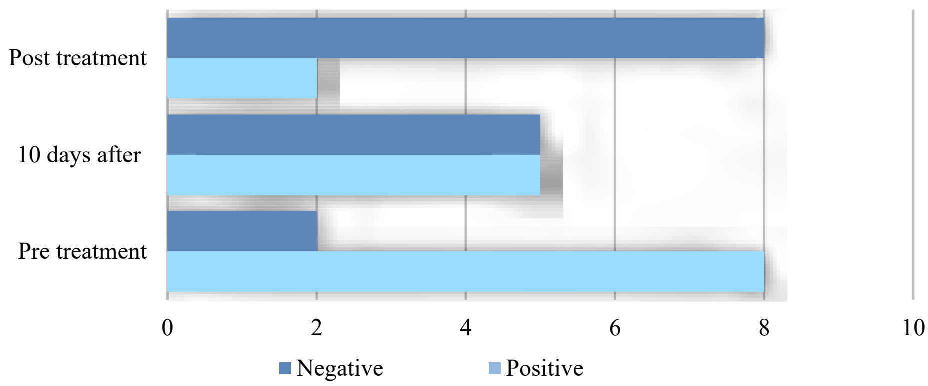

Figure 1. *Patrick's test, left leg - number of patients with positive results*

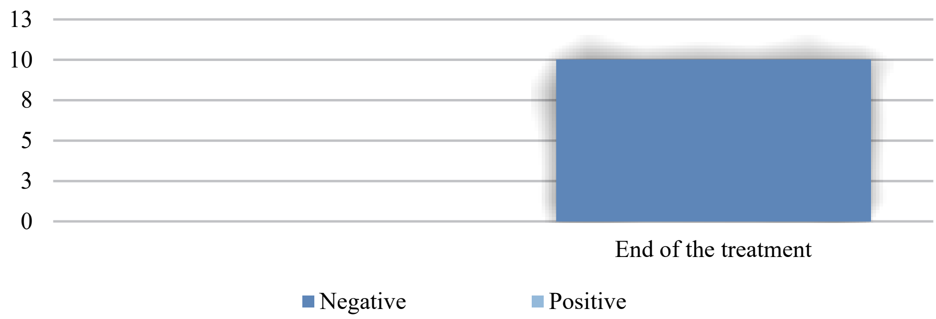

Figure 2. *Patrick's test, right leg - number of patients with positive results*

As shown in Figures 1 and 2, most athletes demonstrated a positive Patrick's test result at baseline. Following the physiotherapy intervention, however, the majority of participants exhibited a negative test result.

Table 4. *Results of Repeated Measures ANOVA and Post-Hoc Pairwise Comparisons for Hip Outcomes Tool-33 (IHOT-33) Scores Across Three Time Points (N = 7)*

Variable	Time Point	*M*	*SD*	F(df)	*p*	Post-Hoc Comparison	Δ*M*	*t*(df)	*p*Bonf
IHOT-33 Score	Pre	47.57	15.02	27.29 (2,12)	<.001	Pre vs. 10 Days	19.71	3.97(6)	.022
(0-100)	10 Days	67.29	18.89			10 Days vs. Post	13.57	3.94(6)	.023
	Post	80.86	14.75			Pre vs. Post	33.29	6.65(6)	.002a

IHOT-33 Results

As shown in Table 4, International Hip Outcome Tool-33 (iHOT-33) scores improved substantially across the study period. Participants reported reductions in pain intensity and improvements in quality of life following the physiotherapy program. At baseline, many athletes reported difficulty with daily activities and maintaining their athletic performance. Mean iHOT-33 scores increased by 33 points from pre-treatment to post-treatment. Across all three paired comparisons, the calculated t-values exceeded the critical value ($t(6) = 2.45$, $\alpha = .05$), indicating statistically significant differences.

The repeated measures ANOVA revealed a significant main effect of time on iHOT-33 scores, $F(2, 12) = 27.29$, $p < .001$. Post hoc comparisons with Bonferroni adjustment showed a significant overall improvement from pre-treatment to post-treatment ($p = .0017$). However, improvements in the early (pre vs. 10 days) and intermediate (10 days vs. post) phases did not reach the adjusted significance threshold.

DISCUSSION

The exercises, which were meticulously selected and systematized, exhibited a favorable impact on the primary symptom of pain and discomfort in daily activities. The methodology developed had a positive impact on athletes' functional abilities, significantly improving their neuromuscular control. In relation to this conclusion, Michael Torry concludes that maintaining an appropriate femoral head position within the joint capsule and labral complex is paramount to normal hip function and failure in this mechanism can lead to debilitating labral and cartilage compression in active individuals (Torry, 2006, pp. 179-97).

The intervention led to notable enhancements in the subjects' subjective experiences during physical exertion, accompanied by a substantial reduction in discomfort and pain complaints, particularly in the TBS and hip regions. The exercises selected for self-performance in the home environment have been shown to have a beneficial effect on cyclists experiencing chronic hip pain. With the same conclusion came Ryab McGovern and colleagues, who suggest the rehabilitation should address biomechanical deficiencies with neuromuscular training of the hip and lumbopelvic regions.

The intervention resulted in notable improvements in the patients' subjective experiences during physical exertion, accompanied by a substantial reduction in discomfort and pain complaints, particularly in the hip region. The exercises selected for home-based self-execution have been shown to have a beneficial effect on cyclists experiencing chronic hip pain. A similar conclusion was arrived at by McGovern et al. (2019). The researchers suggest that rehabilitation efforts should target biomechanical deficiencies by focusing on neuromuscular training of the hip and lumbopelvic regions. (McGovern, 2019).

To achieve more long-lasting results and prevent pain symptoms, all patients were recommended to adhere to the established protocol, including a comprehensive exercise regimen, for an extended period.

Notable limitations of the present study include that the assessment tests were conducted by the same therapist who developed the protocol and systematically analyzed the results. This potential influence on the results is a matter of concern. In subsequent studies, the assessments and therapeutic interventions will be administered by a different set of therapists. This approach is designed to minimize the potential for bias. A further limitation is the absence of a comprehensive and meticulously curated statistical analysis, which is crucial for interpreting statistical significance.

The physiotherapy approach developed for this study was designed to address chronic groin pain in athletes. The approach substantially enhanced the sporting fitness and activity levels of the examined athletes, as evaluated with the IHOT-33 tool. The implementation of the physiotherapy approach in the athletic training routine has yielded favorable outcomes in terms of its short-term effectiveness and applicability. The exercises incorporated into the training regimen were designed to be executed in a variety of environments, thereby obviating the necessity for athletes to utilize specialized equipment. In relation to training and race protocols, the physiotherapy approach was very well accepted by the coaches.

CONCLUSION

The physiotherapy approach demonstrated immediate results, as evidenced by improvements in range of motion and a reduction in pain, both during specific mountain biking maneuvers and in daily activities.

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