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Research Article

Assessing the Association between Pain Catastrophizing and Functional Recovery in Injured Athletes

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Abstract

Introduction and Aim: Pain perception in injured athletes is influenced by both physical injury and psychological factors. Pain catastrophizing, characterized by rumination, magnification, and feelings of helplessness, has been associated with increased pain intensity, delayed rehabilitation, and poorer return-to-sport outcomes. Despite growing evidence, the relationship between pain catastrophizing and functional recovery in athletes remains underexplored. This study aimed to examine pain catastrophizing and functional recovery patterns in injured athletes using standardized outcome measures.

Method: A cross-sectional, descriptive, quantitative study design was used. Data were collected through a self-administered online questionnaire from injured athletes who had received rehabilitation. Convenience sampling was applied, and participants who met the inclusion criteria were recruited. The questionnaire included demographic information, the Pain Catastrophizing Scale (PCS) to assess pain-related cognitions, the Lower Extremity Functional Scale (LEFS) and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire to measure functional recovery based on injury location, and the Global Rating of Change (GROC) scale to assess perceived recovery. Descriptive data analysis was conducted using IBM SPSS Statistics (version 24.0).

Results: The findings indicated a higher proportion of younger participants, suggesting a possible relationship with increased activity levels. PCS results demonstrated variability in pain perception, with some participants reporting moderate to high psychological distress, while most perceived their pain as manageable. Functional outcome measures showed that although injuries affected specific daily and sport-related activities, most participants maintained relatively good functional ability in both lower and upper extremities, as reflected by LEFS and DASH scores. GROC responses revealed a predominantly positive perception of recovery at the time of assessment.

Conclusion: Most participants reported manageable pain levels, good functional ability, and a positive perception of recovery; however, a subset of athletes experienced moderate to high psychological distress related to pain. This variability highlights individual differences in pain perception and coping responses during recovery. Overall, the findings suggest that pain catastrophizing may be an important consideration when interpreting functional recovery in injured athletes, supporting the relevance of a biopsychosocial perspective in rehabilitation.

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1. Introduction

Pain is a common symptom among injured athletes, but its perception varies significantly due to complex biopsychosocial factors. The severity of reported pain does not always match the extent of physical injury, highlighting the role of psychological influences in pain experiences [1]. Pain catastrophizing is a maladaptive cognitive response to pain, characterized by excessive rumination, magnification of pain severity, and feelings of helplessness [2]. This negative mindset increases emotional distress, prolongs rehabilitation, and impairs functional recovery in athletes [3]. Functional recovery here refers to the restoration of an athlete's ability to perform sport-specific and daily activities without limitations, measured through validated tools such as the Lower Extremity Functional Scale (LEFS) for lower-body injuries [4, 5] and the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire for upper-body injuries [6, 7]. Additionally, the Global Rating of Change (GROC) scale is included to capture athletes' subjective perceptions of improvement over time, providing a holistic view of recovery [8, 9].

High-risk sports, such as gymnastics, often involve increased pain catastrophizing, negatively affecting pain perception and emotional well-being [10]. Studies suggest that athletes with higher pain catastrophizing scores experience greater pain intensity and functional limitations, delaying their return to sports [1, 2]. The Pain Catastrophizing Scale (PCS) is a validated tool used to measure these negative pain cognitions. It assesses three key components: rumination (excessive focus on pain), magnification (exaggeration of pain severity), and helplessness (perceived inability to manage pain) [2]. Research shows that injured athletes have significantly higher PCS scores than their uninjured counterparts, reinforcing the link between pain catastrophizing and prolonged recovery [1, 11].

Fear avoidance behavior, another psychological barrier, further complicates rehabilitation. It involves an excessive fear of movement (kinesiophobia), leading to physical inactivity and prolonged disability [12]. Many athletes, especially those recovering from injuries such as anterior cruciate ligament (ACL) reconstruction or patellofemoral pain syndrome (PFPS), struggle with fear avoidance, which significantly delays their return to play [13]. Nearly 50% of ACL reconstruction patients do not return to their pre-injury level of sports, not due to physical limitations but due to psychological factors like pain-related fear and catastrophizing [11].

Despite advancements in rehabilitation techniques, there is limited understanding of how pain catastrophizing directly affects recovery outcomes in injured athletes. Addressing these psychological barriers through cognitive-behavioral strategies and occupational therapy (OT) could improve rehabilitation adherence and functional outcomes [14]. OT plays a crucial role in pain management by using non-pharmacological interventions that enhance self-management and facilitate a return to daily activities [15]. An integrated biopsychosocial approach to rehabilitation is necessary to optimize recovery and reduce long-term disability [3].

This study aims to assess the relationship between pain catastrophizing and functional recovery in injured athletes, using standardized measures (PCS, LEFS/DASH, and GROC) to provide insights into psychological factors that may hinder rehabilitation and return to sport.

2. Method

2.1. Study Design

This is a cross-sectional, descriptive, and quantitative study that will examine the association between pain catastrophizing and functional recovery in injured athletes. Data will be collected using a self-administered questionnaire including standardized outcome measures.

2.2. Study Area/Setting

The study was conducted across multiple healthcare facilities in Saudi Arabia offering telerehabilitation services for stroke recovery. The primary site was the National Guard Hospital in Al Ahsa. Participants were also recruited from other centers within the Saudi healthcare system to ensure diversity across urban and rural settings.

2.3. Study Subjects

The study was conducted at Alfateh Club. The study subjects included injured athletes who met specific inclusion and exclusion criteria. Athletes were eligible for inclusion if they were aged 18 years or older, had received rehabilitation for an injury, were willing and able to provide informed consent, and were capable of reading and understanding the language of the questionnaire. Athletes were excluded if they were under 18 years of age, had cognitive impairments that could interfere with their ability to complete the questionnaire, or declined to participate or withdrew consent at any stage of the study.

2.4. Sample Size and Sampling Technique

The estimated population includes approximately 20,000 athletes. Using the Raosoft sample size calculator with a 95% confidence interval and 5% margin of error, we determined a minimum sample of 377 athletes who meet the inclusion criteria.

2.5. Data Collection Methods and Instruments

Sampling Technique is Convenience sampling Technique, which is a type of non-probability sampling. The data collect from athletes who received rehabilitation for an injury. All the participants who meet the inclusion criteria. Data will be collected using a structured questionnaire comprising several components. The demographic section will gather basic participant information. Pain-related cognitions will be assessed using the Pain Catastrophizing Scale, a 13-item validated instrument measuring rumination, magnification, and helplessness. Functional recovery will be evaluated using the Lower Extremity Functional Scale for lower limb function and the Disabilities of the Arm, Shoulder and Hand for upper limb function. Perceived recovery will be measured using the Global Rating of Change scale, a single-item subjective assessment. All tools used in this study are standardized and have been validated in musculoskeletal rehabilitation research.

2.6. Statistical Analysis

Data will be entered, managed, and analyzed using IBM SPSS Statistics. Descriptive statistical analyses will be conducted to summarize participant characteristics, including frequencies, percentages, means, and standard deviations where appropriate. Inferential statistical analysis will be performed to examine relationships and draw conclusions from the sample data, allowing generalization to the broader population. Appropriate statistical tests will be applied based on the nature of the variables and study objectives.

2.7. Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) at the National Guard Health Affairs (NGHA). The study was conducted in accordance with the Declaration of Helsinki. The approval number is NRA25/019/5. Confidentiality was maintained, and all data were anonymized. Informed consent was secured from all participants.

3. Results

A total of 378 participants were included in the study, most participants were 18-27 years age (54.2%), followed by 28-43 years (25.7%), 44-60 years (15.3%), and >60 years (4.8%). 73.5% of participants were male, while 26.5% were female. 41.3% of participants sustained their injury within last year, 29.2% had been injured for over a year, and 19.6% had injuries that occurred exactly one year ago. Location of injury: 51.6% of injuries were in the lower extremity, and 48.4% were in the upper extremity. The pain catastrophizing scale results indicated that participants reported varying levels of psychological distress related to their pain: "I feel I can't stand it anymore" had the highest percentage of participants (34.7%), responded "Not at all", indicating that for many, the pain was manageable and did not lead to feelings of helplessness. "It's terrible and I think it's never going to get any better" had the lowest frequency of responses, with only 4% saying "All the time", suggesting that most participants did not experience extreme despair regarding their pain's duration. However, other participants reported moderate to high levels of distress. The functional ability of participants was assessed using the Lower Extremity Functional Scale (LEFS) for lower-limb injuries and Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire for upper-limb injuries. Overall, the results showed variation in functional difficulty, with most participants reporting mild to moderate limitations. Among participants with lower extremity injuries (51.6% of the sample), the results indicated that most individuals experienced mild functional difficulty in day-to-day lower extremity activities. For example, the item "Sitting for 1 hour" had the highest number of participants reporting "No difficulty", while only small percentage of participants reported "Extreme difficulty". Among participants with upper extremity injuries (48.4% of the sample), the results showed that most individuals reported mild to moderate difficulty with activities requiring upper limb function. For example, "Using a knife to cut food" had one of the highest proportions reporting "No difficulty", while only a very small number indicated that they were "Unable" to perform the task. Similarly, the item "During the past week, were you restricted in your work or other usual daily activities because of a problem with your arm, shoulder, or hand?" had the lowest number of participants reporting "Unable", only 2 (1.1% of the participants), indicating that upper limb functional limitations were uncommon. The Global Rating of Change (GROC) scale assessed participants' overall perception of improvement since their injury. The most frequently reported response was "a very great deal better" indicating that a substantial number of participants perceived significant improvement in their condition. Other responses reflected varying degrees of improvement, while only a small proportion of participants reported minimal change or slight worsening.

In this section the finding is clearly described, and the result related to research question or hypothesis is well addressed.

Consists of 3 sections

1. Results related to the descriptive statistics.

For continuous variable, mean ± SD for normally distributed data/ Median and IQR for the data which is not normal. Frequency and Percentage for Categorical variable. Demographic profile and Clinical Characteristics (If applicable) should be mentioned.

2. Results related to inferential statistics

For hypothesis testing, statistical tests to be used with p value. Regarding the writing of p value, the exact p value should be written if less than the significance level. Also, to write the interpretation for p value and the statistical significance.

3. Tables and figures

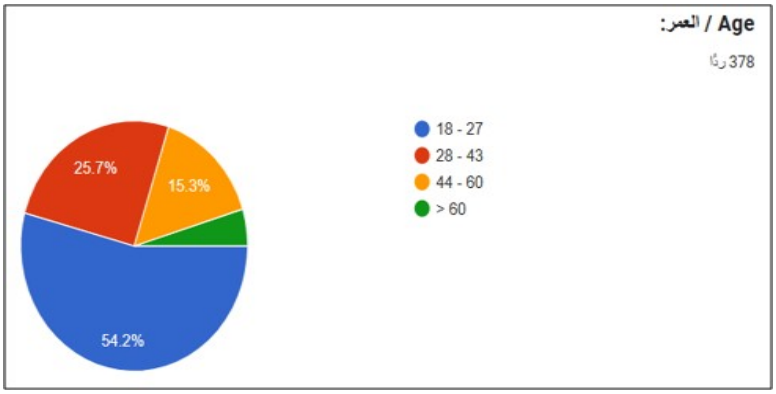


Figure 1: Age

Age	18-27	28-43	44-60	>60
	205 (54.2%)	97 (25.7%)	58 (15.3%)	18 (4.8%)

Gender	**Male**	**Female**
	278 (73.5%)	100 (26.5%)

Time Since Injury	**Less than year**	**1 year**	**More than year**
	156 (41.3%)	74 (19.6%)	148 (39.2%)

Location of injury	**Upper extremity**	**Lower extremity**
	183 (48.4%)	195 (51.6%)

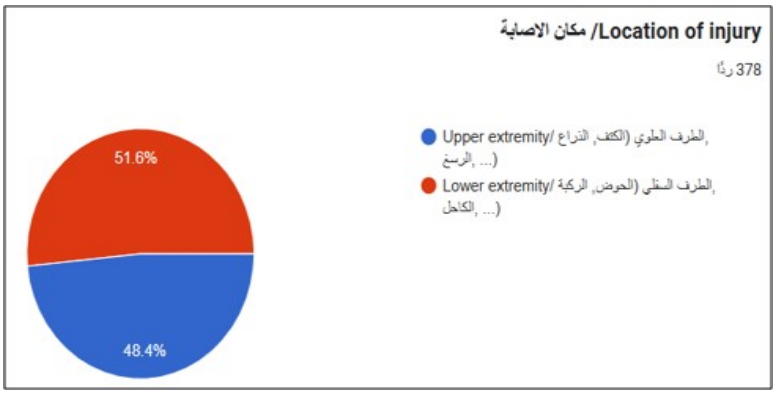


Figure 2: Location of injury

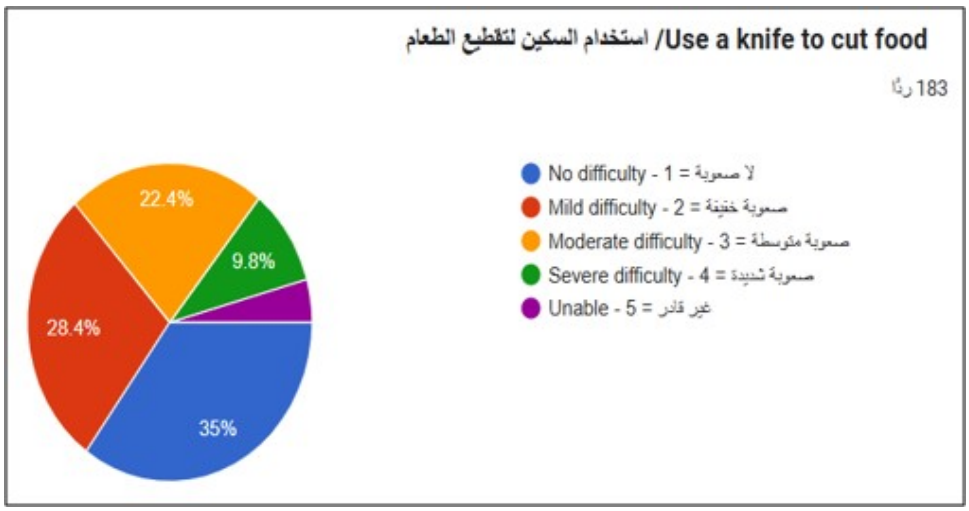


Figure 3: Use a knife to cut

Table 1: Upper Extremity

Upper	No difficulty	Mild difficulty	Moderate difficulty	Severe difficulty	Unable
Open a tight or new jar	58 (31.7%)	57 (31.1%)	52 (28.4%)	11 (6%)	5 (2.7%)
Do heavy household chores (e.g., wash walls, floors)	42 (23%)	52 (28.4%)	59 (32.2%)	23 (12.6%)	7 (3.8)
Carry a shopping bag or briefcase	51 (27.9%)	52 (28.4%)	38 (20.8%)	38 (20.8%)	4 (2.2%)
Wash your back	43 (23.5%)	58 (31.7%)	43 (23.5%)	28 (15.3%)	11 (6%)
Use a knife to cut food	64 (35%)	52 (28.4%)	41 (22.4%)	18 (9.8%)	8 (4.4%)
Recreational activities in which you take some force or impact through your arm, shoulder or hand (e.g., golf, hammering, tennis, etc.)	48 (26.2%)	41 (22.4%)	54 (29.5%)	28 (15.3%)	12 (6.6%)
During the past week, to what extent has your arm, shoulder, or hand problem affected your usual social activities with family, friends, neighbors, or groups?	62 (33.9%)	54 (29.5%)	45 (24.6%)	19 (10.4%)	3 (1.6%)
During the past week, were you restricted in your work or other usual daily activities because of a problem with your arm, shoulder, or hand?	51 (27.9%)	55 (30.1%)	49 (21.3%)	36 (19.7%)	2 (1.1%)
Arm, shoulder or hand pain	40 (21.9%)	47 (25.7%)	49 (26.8%)	40 (21.9%)	7 (3.8%)
Tingling (pins and needles) in your arm, shoulder or hand	59 (32.2%)	55 (30.1%)	35 (19.1%)	31 (16.9%)	3 (1.6%)
During the past week, how much difficulty have you had sleeping because of the pain in your arm, shoulder or hand?	51 (27.9%)	55 (30.1%)	47 (25.7%)	26 (14.2%)	4 (2.2%)

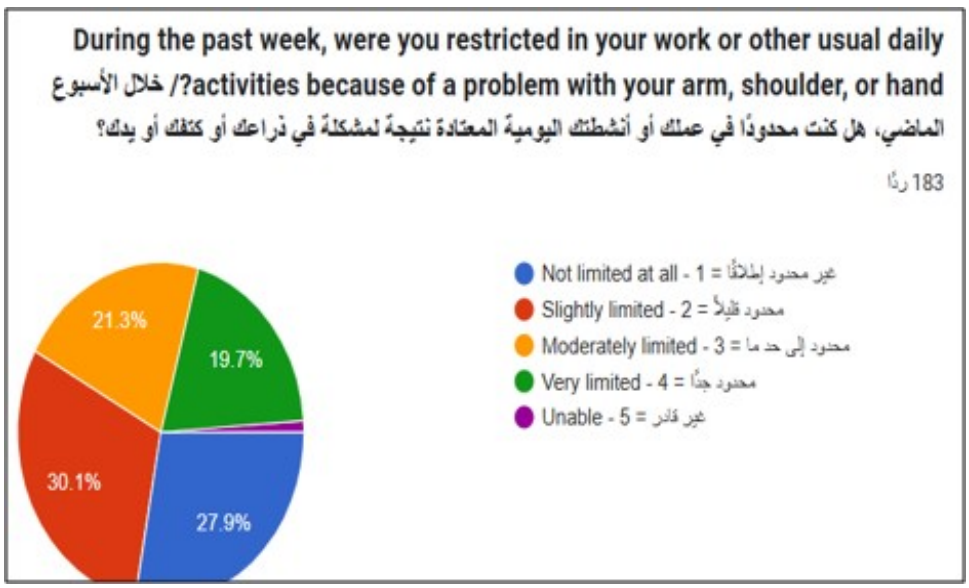
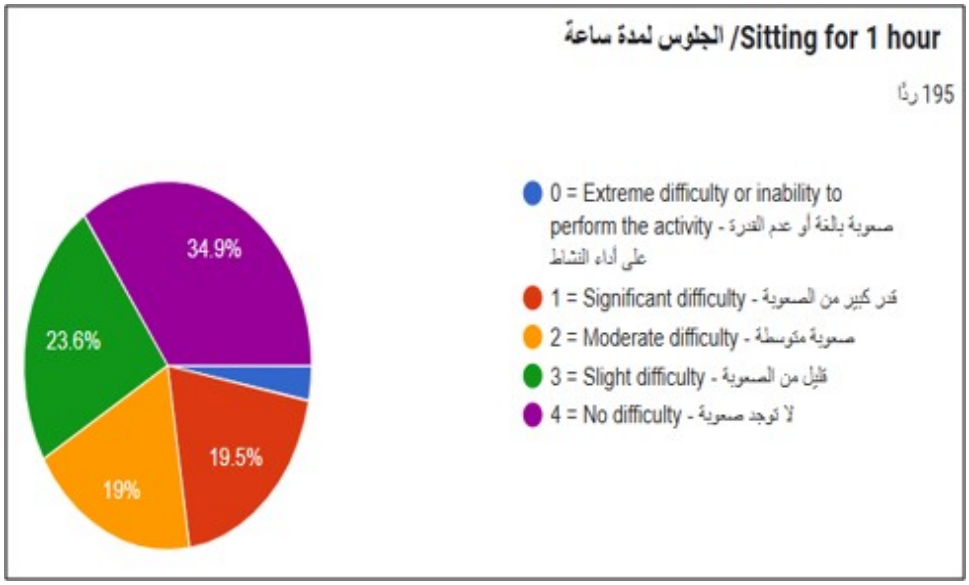


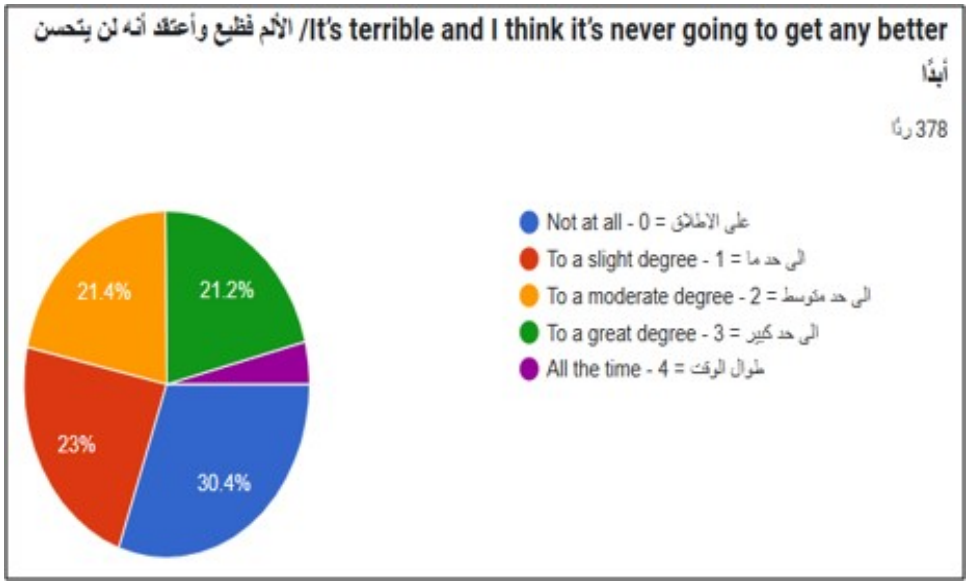
Table 2: Lower Extremity

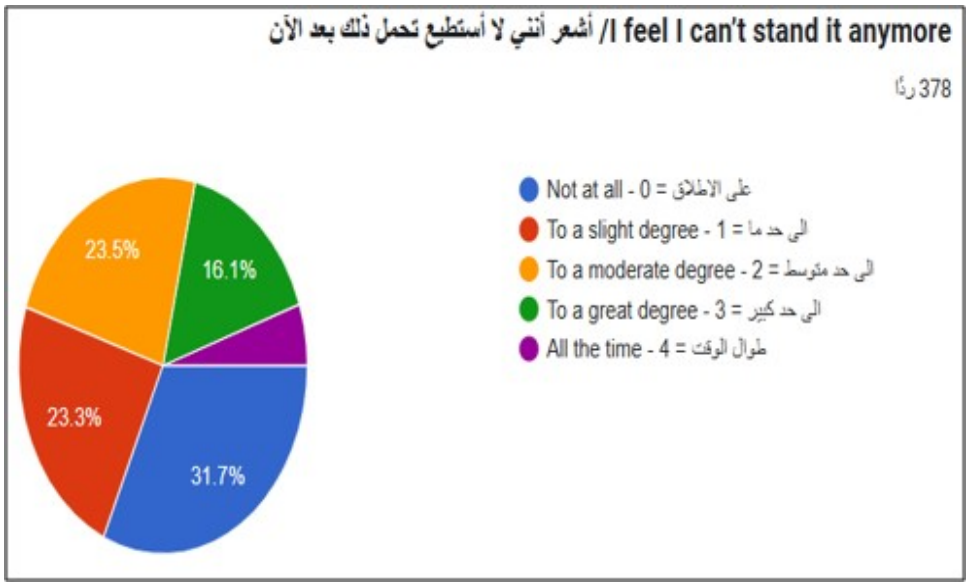
Lower	Extreme difficulty	Significant difficulty	Moderate difficulty	Slight difficulty	No difficulty
Any of your usual work, housework or school activities	19 (9.7%)	45 (23.1%)	56 (28.7%)	45 (23.1%)	30 (15.4%)
Your usual hobbies, recreational activities or sports	20 (10.3%)	56 (28.7%)	61 (31.3%)	38 (19.5%)	20 (10.3%)
Getting into or out of the bath	12 (6.2%)	42 (21.5%)	39 (20%)	47 (24.1%)	55 (28.2%)
Walking between rooms	11 (5.6%)	29 (14.9%)	43 (22.1%)	44 (22.6%)	68 (34.9%)
Putting on your shoes or socks	13 (6.7%)	38 (19.5%)	34 (17.4%)	45 (23.1%)	65 (33.3%)
Squatting	23 (11.8%)	40 (20.5%)	50 (25.6%)	45 (23.1%)	47 (19%)
Lifting an object, like a bag of groceries from the floor	16 (8.2%)	27 (13.8%)	43 (22.1%)	46 (23.6%)	63 (32.3%)
Performing light activities around your home	11 (5.6%)	27 (13.8%)	50 (25.6%)	56 (28.7%)	51 (26.2%)
Performing heavy activities around your home	24 (12.3%)	41 (21%)	52 (26.7%)	48 (24.6%)	30 (15.4%)
Getting into or out of a car	12 (6.2%)	33 (16.9%)	49 (25.1%)	37 (19%)	64 (32.8%)
Walking 2 blocks	13 (6.7%)	33 (16.9%)	36 (18.5%)	58 (29.7%)	55 (28.2%)
Walk for a mile (about 1.6 kilometers)	19 (9.7%)	49 (25.1%)	39 (20%)	54 (27.7%)	34 (17.4%)
Going up or down 10 stairs (about 1 flight of stairs)	17 (8.7%)	50 (25.6%)	45 (23.1%)	53 (27.2%)	30 (15.4%)
Standing for 1 hour	23 (11.8%)	48 (24.6%)	43 (22.1%)	57 (29.2%)	24 (12.3%)
Sitting for 1 hour	6 (3.1%)	28 (19.5%)	37 (19%)	46 (23.6%)	68 (34.9%)
Running on even ground	21 (10.9%)	42 (21.8%)	53 (27.5%)	45 (23.3%)	32 (16.6%)
Running on uneven ground	36 (18.5%)	57 (29.2%)	41 (21%)	49 (25.1%)	12 (6.2%)
Making sharp turns while running fast	41 (21%)	46 (23.6%)	52 (26.7%)	40 (20.5%)	16 (8.2%)
Hopping	37 (19%)	45 (23.1%)	50 (25.6%)	46 (23.6%)	17 (8.7%)
Rolling over in bed	13 (6.7%)	39 (20%)	50 (25.6%)	35 (17.9%)	58 (29.7%)

Table 3: Pain Catastrophizing

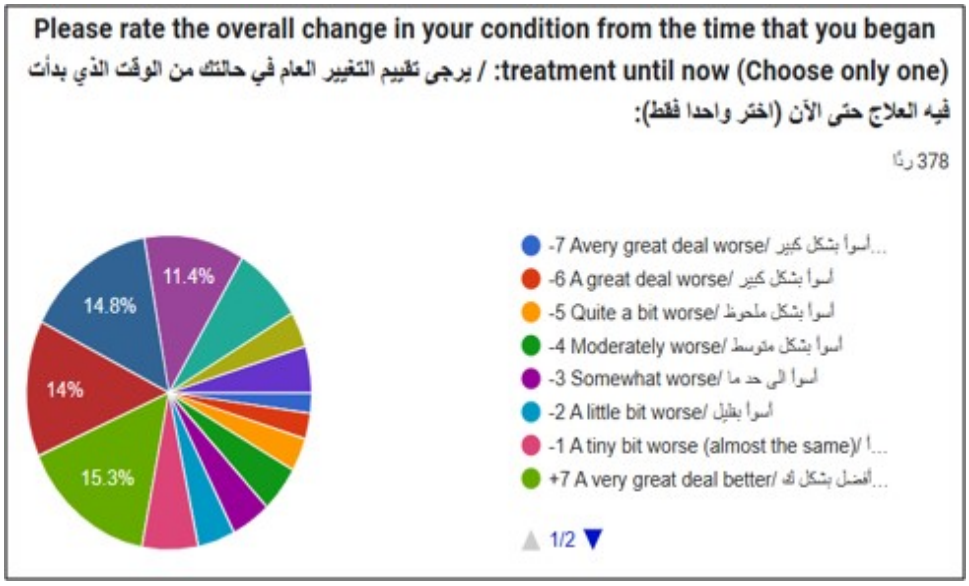
Pain Catastrophizing	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
I worry all the time about whether the pain will end	74 (19.6%)	114 (30.2%)	114 (32.2%)	58 (15.3%)	18 (4.8%)
I feel I can't go on	88 (23.3%)	102 (27%)	85 (22.5%)	80 (21.2%)	23 (6.1%)
It's terrible and I think it's Never going to get any better	115 (30.4%)	87 (23%)	81 (21.4%)	80 (21.2%)	15 (4%)
It's awful and I feel that it overwhelms me	115 (30.4%)	74 (19.6%)	88 (23.3%)	80 (21.2%)	21 (5.6%)
I feel I can't stand it anymore	120 (31.7%)	88 (23.3%)	89 (23.5%)	61 (16.1%)	20 (5.3%)
I become afraid that the pain will get worse	80 (21.2%)	83 (22%)	97 (25.7%)	82 (21.7%)	36 (9.5%)
I keep thinking of other painful events	111 (29.4%)	84 (22.2%)	94 (24.9%)	67 (17.7%)	22 (5.8%)
I anxiously want the pain to go away	84 (22.2%)	87 (23%)	93 (24.6%)	82 (21.7%)	32 (8.5%)
I can't seem to keep it out of my mind	100 (26.5%)	83 (22%)	95 (25.1%)	76 (20.1%)	24 (6.3%)
I keep thinking about how much it hurts	104 (27.5%)	77 (20.4%)	91 (24.1%)	78 (20.6%)	28 (7.4%)
I keep thinking about how badly I want the pain to stop	80 (21.2%)	90 (23.8%)	84 (22.2%)	83 (22%)	41 (10.8%)
There's nothing I can do to reduce the intensity of the pain	98 (25.9%)	80 (21.2%)	107 (28.3%)	67 (17.7%)	26 (6.9%)
I wonder whether something serious may happen	106 (28%)	82 (21.7%)	93 (24.6%)	70 (18.5%)	27 (7.1%)


Sitting for 1 hour/ الجلوس لمدة ساعة
195 ردًا
34.9%
23.6%
19.5%
19%
0 = Extreme difficulty or inability to perform the activity - صعوبة بالغة أو عدم القدرة على أداء النشاط
1 = Significant difficulty - قدر كبير من الصعوبة
2 = Moderate difficulty - صعوبة متوسطة
3 = Slight difficulty - قليل من الصعوبة
4 = No difficulty - لا توجد صعوبة


It's terrible and I think it's never going to get any better/ الألم فظيع وأعتقد أنه لن يتحسن أبدًا
378 ردًا
21.4%
21.2%
23%
30.4%
Not at all - 0 = على الاطلاق
To a slight degree - 1 = الى حد ما
To a moderate degree - 2 = الى حد متوسط
To a great degree - 3 = الى حد كبير
All the time - 4 = طوال الوقت


I feel I can't stand it anymore/ أشعر أنني لا أستطيع تحمل ذلك بعد الآن
378 ردًا
23.5%
16.1%
23.3%
31.7%
Not at all - 0 = على الاطلاق
To a slight degree - 1 = الى حد ما
To a moderate degree - 2 = الى حد متوسط
To a great degree - 3 = الى حد كبير
All the time - 4 = طوال الوقت

GROC	-
A very great deal worse	8 (2.1%)
A great deal worse	10 (2.6%)
Quite a bit worse	13 (3.4%)
Moderately worse	18 (4.8%)
Somewhat worse	17 (4.5%)
A little bit worse	16 (4.2%)
A tiny bit worse (almost the same)	24 (6.3%)
A very great deal better	58 (15.3%)
A great deal better	53 (14%)
Quite a bit better	56 (14.8%)
Moderately better	43 (11.4%)
Somewhat better	30 (7.9%)
A little bit better	14 (3.7%)
A tiny bit better	18 (4.8%)



The figures and tables illuminate the presentation of results. Table No. and title of table should be written above the table. Vertical and Horizontal axes should be well defined. Chart title should be there. For the figure, the No. and figure title should be below the figure.

4. Discussion

The findings of this study indicate a high proportion of younger participants, which may be associated with greater activity levels or occupational demands, particularly among younger males. This observation aligns with the understanding that younger individuals are more likely to engage in physically demanding activities, including sports, which may increase their susceptibility to injuries. Further exploration of specific activity types, such as different sports disciplines or physically demanding occupations, may help clarify the relationship between activity level and injury patterns.

The results of the Pain Catastrophizing Scale demonstrated considerable variability in pain perception among participants. While many individuals reported their pain as tolerable, a subset experienced moderate to high levels of psychological distress characterized by rumination, magnification, and feelings of helplessness. This variability highlights the psychological differences in how individuals cope with pain and suggests that pain catastrophizing plays a significant role in shaping recovery experiences. Individuals with higher levels of catastrophizing may be more likely to perceive pain as overwhelming, which can negatively influence their engagement in rehabilitation and overall recovery outcomes.

Functional recovery outcomes, assessed using the Lower Extremity Functional Scale and the Disabilities of the Arm, Shoulder and Hand, indicated that although injuries impacted certain daily and sport-specific activities, most participants maintained relatively good functional ability. Lower-limb injuries were found to affect activities such as walking, running, and climbing stairs, while upper-limb injuries influenced fine motor tasks and strength-dependent activities. Despite these limitations, the majority of participants demonstrated mild to moderate functional impairment, suggesting a generally favorable recovery profile.

Perceived recovery, measured using the Global Rating of Change scale, revealed a predominantly positive outlook among participants. However, athletes who reported higher levels of pain catastrophizing tended to demonstrate greater functional limitations and less favorable perceptions of recovery. This finding suggests a potential association between elevated pain catastrophizing and poorer functional outcomes, supporting the importance of addressing psychological factors in rehabilitation.

These findings are consistent with previous research, which has shown that psychological factors, particularly pain catastrophizing, are associated with increased pain intensity, reduced functional performance, and delayed return to activity. The results reinforce the relevance

of the biopsychosocial model in rehabilitation, emphasizing that recovery is influenced not only by physical injury but also by cognitive and emotional responses to pain.

Despite its contributions, this study has several limitations. The cross-sectional design restricts the ability to establish causal relationships between pain catastrophizing and functional recovery. Additionally, reliance on self-reported data may introduce response bias, as participants may overestimate or underestimate their symptoms and functional abilities. The use of convenience sampling further limits the generalizability of the findings to the broader population of injured athletes.

Future research should consider longitudinal study designs to track recovery trajectories over time and better understand causal relationships. Intervention studies targeting athletes with high levels of pain catastrophizing may also be beneficial in improving rehabilitation outcomes. Furthermore, exploring differences across various types of sports and injury severity could provide more specific insights into the relationship between psychological factors and functional recovery.

In conclusion, this study highlights the importance of considering psychological factors, particularly pain catastrophizing, in the rehabilitation of injured athletes. While most participants demonstrated good functional recovery and positive perceptions of improvement, a subset experienced significant psychological distress that may hinder optimal recovery. These findings support the integration of psychological assessment and interventions within physiotherapy and rehabilitation programs to promote more comprehensive and effective patient care.

5. Conclusions

In conclusion, the findings suggest that pain catastrophizing is associated with functional recovery in injured athletes, participants demonstrated mild to moderate functional impairment and largely positive perceptions of recovery. However, variability in pain catastrophizing highlights the importance of addressing psychological factors alongside physical rehabilitation to support optimal recovery outcomes.

Article Information

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Author Contributions: Paramasivan- Conceptualization, Writing – original draft, Writing – review & editing and Supervision; Meshal AlAnazi - Methodology; Haidar AlJilwah, Rayan Al-Thaqib, Hisham Alherz and Abdulelah Majrashi - Data curation, Formal analysis;

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Disclosure of conflict of interest: The authors declare no conflict of interest.

Statement of ethical approval: Ethical approval was obtained from the Institutional Review Board (IRB) of National Guard Health Affairs (Approval No: NRA24/008/11). The study was conducted in accordance with the Declaration of Helsinki and involved human participants.

Statement of informed consent: Informed consent was obtained from all individual participants included in the study.

Data Availability Statement: Data available on reasonable request.

References

[1] M. N. Houston, J. M. Hoch, and M. C. Hoch. The relationship between pain catastrophizing and pain intensity in athletes: A systematic review. *J Sport Rehabil*, 29(2):168–174, 2019. doi:10.1123/jsr.2018-0056.

[2] Rehabilitation Measures Database. *Pain Catastrophizing Scale (PCS)*. Shirley Ryan AbilityLab. URL https://www.sralab.org/rehabilitation-measures/pain-catastrophizing-scale.

[3] D. Vancampfort, J. Knapen, M. Probst, et al. Fear avoidance beliefs and physical activity in injured athletes: A cross-sectional study. *PMR*, 10(3):225–231, 2018. URL https://doi.org/10.1016/j.pmrj.2017.10.001.

[4] J. M. Binkley, P. W. Stratford, S. A. Lott, and D. L. Riddle. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. *Phys Ther*, 79(4):371–383, 1999. URL https://doi.org/10.1093/ptj/79.4.371.

[5] Emory Healthcare. LEFS (Lower Extremity Functional Scale) form. URL https://www.emoryhealthcare.org/-/media/Project/EH/Emory/ui/pdfs/msk-pt-forms/hip-lefs.pdf.

[6] D. E. Beaton, J. N. Katz, A. H. Fossel, J. G. Wright, V. Tarasuk, and C. Bombardier. Measuring the whole or the parts? Validity, reliability, and responsiveness of the Disabilities of the Arm, Shoulder and Hand outcome measure in different regions of the upper extremity. *J Hand Ther*, 14(2):128–146, 2001.

[7] Michigan State. *University Healthcare*. DASH Questionnaire. URL https://healthcare.msu.edu/_assets/documents/lymphedema/DASH-questionnaire.pdf.

[8] S. J. Kamper, C. G. Maher, and G. Mackay. Global rating of change scales: a review of strengths and weaknesses and considerations for design. *J Man Manip Ther*, 17(3):163–170, 2009.

[9] Boston University. Global Rating of Change (GROC) Scale. URL https://www.bu.edu/rehab/files/2020/03/GROC_English_fillable.pdf.

[10] NIH. *Injuries, pain, and catastrophizing level in gymnasts: A retrospective analysis of a cohort of Spanish athletes*. National Institutes of Health. URL https://pmc.ncbi.nlm.nih.gov/articles/PMC9141380/.

[11] D. C. Flanigan, J. S. Everhart, A. Pedroza, T. Smith, and C. C. Kaeding. Fear of reinjury (kinesiophobia) and persistent knee symptoms are common factors for lack of return to sport after anterior cruciate ligament reconstruction. *Arthroscopy*, 29(8):1322–1329, 2013. URL https://doi.org/10.1016/j.arthro.2013.05.015.

[12] Research Square. Psychological factors and functional performance in male athletes with patellofemoral pain syndrome: A cross-sectional study. 2024. URL https://assets.researchsquare.com/files/rs-3844588/v1/f764ce68-da52-4tee-bfef-8a093b117dee.pdf.

[13] T. A. Lentz, G. Zeppieri, S. Z. George, S. M. Tillman, M. W. Moser, K. W. Farmer, and T. L. Chmielewski. Comparison of physical impairment, functional, and psychosocial measures based on fear of reinjury level after ACL reconstruction. *J Sport Health Sci*, 5(1): 20–27, 2016. URL https://doi.org/10.1016/j.jshs.2015.02.003.

[14] L. Maestroni, M. Rabey, C. Mariani, V. Villa, L. Landi, A. Rodi, et al. Pain catastrophizing, beliefs and perception, and their association with profiling characteristics in athletes. *J Sport Rehabil*, 1(aop):1–8, 2024. URL https://doi.org/10.1123/jsr.2024-0122.

[15] American Occupational Therapy Association. The Role of Occupational Therapy in Pain Management. 2021. URL https://www.aota.org/practice/practice-essentials/quality/quality-resources/role-of-ot-pain-management.