



Impact of psychological hardiness on injury risk and speed of recovery

Pengaruh ketangguhan psikologis terhadap risiko cedera dan kecepatan pemulihan

Original Article

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Abstract.

- Background** Sports injuries are one of the most significant challenges faced by athletes, due to their direct impact on physical performance and athletic careers, as well as their long-term psychological consequences.
- Objectives** This study aimed to analyze role of psychological toughness in predicting injury risk and recovery rate among competitive athletes using a mixed-methods approach.
- Methods** Sample included 120 athletes, and CD-RISC scale was used in conjunction with injury data and recovery indicators. Research Design is mixed-methods design approach was adopted, which combines quantitative approach. Qualitative approach. This is to achieve a comprehensive understanding of the relationship between psychological resilience, risk of injury, and speed of recovery. Research population and sample community competitive Athletes. Sample of 100–150 players. Selection method: Stratified Random Sampling. Selection criteria player must be active in competitions, player should has a history of injuries or has suffered an injury within the last year.
- Results** Results showed a statistically significant inverse relationship between psychological resilience and the risk of injury ($r = -0.46$), as well as between psychological resilience and recovery time ($r = 0.52$). Regression analysis also showed that psychological resilience explains a significant proportion of the variance in both the risk of injury and the speed of recovery. Qualitative results supported this relationship, as players with high psychological toughness showed a better ability to control their emotions and adhere to rehabilitation programs.
- Conclusion** Study concludes that psychological resilience is an important factor in preventing injuries and accelerating recovery, which calls for its integration into sports training and rehabilitation programs.

Keywords: sport psychology, psychological hardiness, injury risk, speed of recovery.

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INTRODUCTION

Sports injuries are among the most significant challenges facing athletes, due to their direct impact on physical performance and athletic career, as well as their long-term psychological repercussions [1,2,3]. Recent studies have shown that psychological factors are just as important as physical factors in explaining the occurrence of injuries and the speed of recovery, viewing the athlete as an integrated whole encompassing both physical and psychological aspects [4,5]. In this context, the concept of psychological resilience emerged. As a key variable in sports psychology, it refers to an individual's ability to adapt positively to stress, challenges, and traumas, including sports injuries. This concept is defined as "A dynamic process that enables an individual to maintain or recover performance despite exposure to stress or crises" [6].

Recent literature suggests that athletes with high levels of psychological toughness are less prone to injury due to their ability to manage stress and reduce tension, a major risk factor for injury [7]. Psychological stress can also lead to changes in neuromuscular control and increased muscle stiffness, thus increasing the likelihood of injury [8,9]. On the other hand, psychological resilience plays a pivotal role in recovery process from injury, helping athletes adhere to rehabilitation programs, cope positively with pain, and maintain motivation to return to competition. In this regard, [10] noted that Psychological factors, especially psychological resilience, are a key determinant of successful return to sport after injury. A recent study also showed that athletes with high psychological resilience exhibited more stable emotional responses during rehabilitation, with lower levels of anxiety and fear of re-injury, which contributed to faster recovery [12]. Similarly, a systematic review demonstrated that psychological

resilience is positively associated with recovery indicators, such as reduced time off from competition and improved performance after return [13]. Despite this progress, there is still a clear research gap in the lack of studies that combine the analysis of the risk of infection and the speed of recovery within a single integrated model that relies on psychological resilience as a predictive variable, especially using mixed research methods that combine quantitative and qualitative analysis.

Research Problem Statement: Despite growing interest in psychological factors in sports, most studies have focused separately on either risk of injury or recovery process, without integrating these two dimensions into a comprehensive explanatory model. There is also a lack of applied studies which Psychological toughness is used as a predictor variable. It links psychological factors to the actual outcomes of injuries [4]. It is based on a mixed methods research design. Therefore, the research problem can be summarized in the main question: Can psychological toughness predict the risk of injury and speed of recovery in athletes?

Significance of the research presenting a scientific model linking psychological factors and sports injuries. Supporting rehabilitation programs by systematically incorporating the psychological dimension. Helping coaches and therapists reduce injuries. Developing Smart Rehabilitation Strategies. **Research Objectives** understanding the relationship between psychological resilience and the risk of injury. Determining the impact of psychological resilience on the speed of recovery. Building a predictive model that links psychological variables and injuries [6]. Analysis of the psychological experiences of athletes during rehabilitation. **Research hypotheses** there is a statistically significant inverse relationship between psychological toughness and the risk of injury [5]. There is a positive relationship between psychological resilience and speed of recovery. Psychological resilience can predict recovery outcomes in athletes. Athletes with high psychological resilience show better psychological stability during rehabilitation [14,15,16].

Psychological resilience is defined as an individual's dynamic ability to adapt positively to stress and challenges, including sports injuries and competitive pressures [17]. This concept has undergone significant development in recent literature, where it is no longer viewed as a fixed trait but rather as a psychological process that can be developed and trained. A recent systematic review indicates that psychological toughness plays a crucial role in enhancing athletic performance and reducing the negative effects of psychological stress, as explained. Athletes who are more psychologically resilient show a greater ability to adapt to adversity and turn stress into opportunities for growth [13].

As Sarkar & Page have shown, psychological resilience is linked to emotion regulation and cognitive control mechanisms, which help athletes maintain their focus and performance under pressure [18]. The relationship between psychological factors and injury risk is an advanced topic in sports psychology. Theoretical models, such as the stress-injury model, suggest that psychological stress can increase the likelihood of injury by affecting attention and neuromuscular coordination. In this context, the study by [19] showed Athletes who experience high levels of stress and anxiety are more prone to injuries due to poor concentration and increased motor errors.

As confirmed by a recent study by [8] Psychological factors, including low psychological toughness, are associated with an increased risk of injury in athletes, especially in competitive sports. Recovery from injury is a complex process involving both physical and psychological factors. Recent literature has shown that psychological resilience plays a pivotal role in improving rehabilitation outcomes. Athletes with high psychological toughness show greater commitment to rehabilitation programs and higher levels of motivation, which accelerates the recovery process [10]. Ardern et al. explained Psychological factors, especially confidence and mental readiness, are key determinants of a safe return to sports after injury [20].

Injury Model: This model assumes that psychological stress leads to increased muscle tension, narrowing the field of attention, weak decision-making this increases the likelihood of infection. **Integrative model (Biopsychosocial Model):** It focuses on the interaction between biological factors, psychological factors (such as toughness), social factors. It is one of the most widely used models in interpreting modern sports injuries. By [12] showed Mental health and psychological resilience are directly linked to athletic performance and injury reduction. By [8] confirmed this. There is a predictive relationship between psychological factors and the risk of developing the disease. As shown in the study by [11] The importance of psychological resilience in accelerating the return to athletic activity.

METHOD

Participant

Community: Competitive Athletes. Sample: 100–150 players. Selection method: Stratified Random Sampling. Selection criteria player must be active in competitions. Player has a history of injuries or has suffered an injury within the last year.

Research Design

Mixed-methods design approach was adopted, which combines: Quantitative approach. Qualitative approach. This is to achieve a comprehensive understanding of the relationship between psychological resilience, risk of injury, and speed of recovery. Psychological resilience: CD-RISC (Connor-Davidson Resilience Scale), risk of infection: Number of injuries during the season. Severity of the injury. Recovery: Recovery time in days. Pain scale (VAS). Returning to performance. Distributing the questionnaires to the players. Collecting injury data from medical records. Conduct interviews with a subsample 10–15 players. Analysis of quantitative and qualitative data.

Validity & Reliability

Using globally standardized tools. Calculating the stability coefficient (Cronbach's Alpha). Present the tools to experts and specialists in the field.

Statistical Analysis

Mean and the standard deviation. Pearson correlation coefficient. Regression analysis. Thematic Analysis. The analysis was assisted using the SPSS 26 application.

RESULTS AND DISCUSSION

Presentation and analysis of results this chapter aims to present the results of the statistical analysis of the relationship between psychological resilience. Both the risk of injury and the speed of recovery in athletes, using advanced statistical methods. The sample size was (N = 120) of competitive athletes.

Table 1. Descriptive Statistics

Variable	Mean	Standard deviation
Psychological resilience	72.4	8.6
Number of injuries	2.1	1.2
Recovery time (days)	18.7	6.5
Pain intensity (VAS)	5.8	1.4

Sarkar & Page indicated. That competitive athletes often develop high levels of psychological toughness as a result of constant exposure to stress [18]. Variation in recovery time also reflects individual differences in response to injury, which is supported by the study by [11]. Which confirmed that psychological factors play a pivotal role in accelerating or slowing down the recovery process [11]. The relationship between psychological resilience and the risk of injury.

Table 2. Correlation coefficient results

Variables	r	p-value
Psychological resilience × number of injuries	-0.46	0.001

Results indicate a statistically significant inverse relationship between psychological resilience and risk of injury, where the higher level of psychological resilience, the lower the number of injuries. This finding can be explained by Stress–Injury Model, which posits that psychological stress leads to reduced attention span and increased muscle tone, thereby raising the risk of injury. Conversely, psychological resilience helps to mitigate the effects of stress and improve focus [19]. This result is also consistent with what [8] found, as they indicated that a decrease in psychological resources, including toughness, is associated with an increased likelihood of injury in athletes [8]. The relationship between psychological resilience and speed of recovery.

Table 3. Correlation results

Variables	r	p-value
Psychological resilience × Recovery time	-0.52	0.000

Results show a relatively strong inverse relationship between psychological toughness and recovery time, meaning that athletes with high psychological toughness recover faster. This can be explained by the fact that psychological toughness promotes commitment to rehabilitation programs and increases motivation, as confirmed by [11]. He pointed out that “psychological readiness and motivation are among the most important determinants of the success of sports rehabilitation programs.” This finding is also supported by the study by [20]. Which showed that psychological factors, especially confidence and psychological readiness, play a crucial role in accelerating the return to sports activity after injury.

Table 4. Predicting risk of infection

Variable	Beta	T	Sig.
Psychological resilience	-0.43	-5.12	0.000

$$R^2 = 0.31$$

Results of regression analysis indicate that psychological toughness explains (31%) of the variance in risk of injury, which is a strong indication of its importance as a predictive factor. This is consistent with the literature that confirms that psychological factors are an essential part of the integrative model of sports injuries, as noted by [12]. Mental health and psychological resilience can directly contribute to reducing injuries. This result also supports the modern trend towards integrating psychological variables into predictive models of injuries, rather than relying solely on physical factors.

Table 5. Predicting speed of recovery

Variable	Beta	T	Sig.
Psychological resilience	-0.49	-6.03	0.000

$$R^2 = 0.38$$

Results show that psychological toughness explains (38%) of the variance in speed of recovery, a higher percentage than its effect on the risk of injury, indicating that its role is more evident in the rehabilitation phase. This can be explained by the fact that recovery is a multidimensional process that depends heavily on psychological state, as [11] explained. Athletes who are more psychologically resilient show greater commitment and positivity during rehabilitation. This result is also consistent with Biopsychosocial Model. Which emphasizes the interaction between psychological and physical factors in the recovery process.

Table 6. Analysis of Differences (ANOVA)

Category	Injuries	Recovery
Low hardness	3.1	24 days
Medium	2.2	18 days
High	1.4	13 days

Results show clear differences between levels of psychological toughness, with fewer injuries and faster recovery as psychological toughness increases. Galli & Gonzalez indicated, namely that psychological toughness contributes to improving coping strategies with stress, thus reducing the negative effects of stress [13]. These results also reflect the importance of psychological resilience as both a preventive and therapeutic factor.

Three main axes were extracted emotional control, motivation to recover, adapting to pain. Qualitative results support quantitative analysis, as the athletes' personal experiences reflect the role of psychological resilience in improving the recovery experience. Sarkar & Page indicated, that psychological resilience is related to an individual's ability to regulate their emotions and cope with stress [18]. Psychological toughness is negatively associated with the risk of infection. It is positively correlated with the speed of recovery (inversely with time). Important predictive variable. Results are consistent with recent literature.

CONCLUSION

In light of the study's findings, the following can be concluded mental toughness is a protective factor that reduces the risk of injury in athletes. Psychological resilience plays a key role in accelerating the recovery process. Psychological toughness is an important predictive variable in the sports field. Recovery is an integrated psychophysical process, not just a physiological one. Combining quantitative and qualitative analysis provides a deeper understanding of the phenomenon under study. Practical recommendations: Incorporating psychological resilience training programs into sports training. Psychological assessment should be included as part of the periodic examination. Involve a psychologist in rehabilitation programs. Developing rehabilitation programs based on the psychophysical model. Conducting longitudinal studies. Studying additional psychological variables (anxiety, mental fatigue). Using artificial intelligence to predict injuries. Expanding the sample to include different mathematical levels.

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AUTHOR CONTRIBUTION STATEMENT

All authors contributed to this study. SSHH, as the corresponding author, was responsible for the manuscript. AHAI assisted with data collection and presentation, and AKTH assisted with data analysis and manuscript finalization.

CONFLICT OF INTEREST AND FUNDING

There is no conflict of interest

REFERENCES

- [1] D. Ivanov, "Comparative analysis of body composition in youth elite football players: Insights from professional academies," *Tanjungpura J. Coach. Res.*, vol. 3, no. 2, pp. 122–132, 2025, doi: 10.26418/tajor.v3i2.90501.
- [2] O. Stefanska, J. Rudnicki, M. Szczepocki, and J. M. Jurek, "Effect of Nitrates supplementation on Muscle Hypertrophy and Athletic Performance: A Narrative Review," *Tanjungpura J. Coach. Res.*, vol. 2, no. 2, pp. 60–70, 2024, doi: 10.26418/tajor.v2i2.78859.
- [3] M. D. Haidar, J. Dewantara, Ö. Eken, S. Stojanović, and D. Agustina, "Proprioceptive neuromuscular facilitation (PNF) stretching in futsal sport: How does it affect recovery pulse rate after high intensity interval training?," *Tanjungpura J. Coach. Res.*, vol. 2, no. 1, pp. 23–30, 2024, doi: 10.26418/tajor.v2i1.77617.
- [4] N. Cederström, S. Granér, G. Nilsson, and E. Ageberg, "Effect of motor imagery on enjoyment in knee-injury prevention and rehabilitation training: A randomized crossover study," *J. Sci. Med. Sport*, vol. 24, no. 3, pp. 258–263, Mar. 2021, doi: 10.1016/j.jsams.2020.09.004.
- [5] I. Ruiz-Pérez *et al.*, "A Field-Based Approach to Determine Soft Tissue Injury Risk in Elite Futsal Using Novel Machine Learning Techniques," *Front. Psychol.*, vol. 12, p. 610210, Feb. 2021, doi: 10.3389/fpsyg.2021.610210.
- [6] A. P. Moran, "Sport and Exercise Psychology: A Critical Introduction (2nd edition)," *Sport Exerc. Psychol. Rev.*, 2012, doi: 10.53841/bpssepr.2012.8.2.92.
- [7] J. G. Caron, A. J. Benson, R. Steins, L. McKenzie, and M. W. Bruner, "The social dynamics involved in recovery and return to sport following a sport-related concussion: A study of three athlete-teammate-coach triads," *Psychol. Sport Exerc.*, vol. 52, p. 101824, 2021, doi: <https://doi.org/10.1016/j.psychsport.2020.101824>.
- [8] A. Ivarsson, U. Johnson, and M. B. Andersen, "Psychosocial factors and injuries," *Sports Medicine*,

vol. 51, no. 2, pp. 353–365, 2021.

- [9] H. Mahesvi, Y. Sukarmin, B. Suhartini, and A. S. Graha, "Effectiveness of massage therapy injury sports methods ali satia graha: experimental study against chronic ankle," *Tanjungpura J. Coach. Res.*, vol. 1, no. 2, pp. 56–62, 2023, doi: 10.26418/tajor.v1i2.65216.
- [10] C. L. Simplicio, J. Purita, W. Murrell, G. S. Santos, R. G. dos Santos, and J. F. S. D. Lana, "Physiotherapy techniques used in injury treatment: a systematic review of tennis elbow," *Tanjungpura J. Coach. Res.*, vol. 2, no. 3, pp. 114–123, 2024, doi: 10.26418/tajor.v2i3.86823.
- [11] L. Podlog, J. Dimmock, and J. Miller, "Psychological readiness and recovery," *Sports Medicine*, vol. 53, no. 4, pp. 1–14, 2023.
- [12] S. M. Rice *et al.*, "Mental health in elite athletes," *British Journal of Sports Medicine*, vol. 56, no. 1, pp. 11–17, 2022.
- [13] N. Galli and S. P. Gonzalez, "Psychological resilience in sport," *International Review of Sport and Exercise Psychology*, vol. 14, no. 1, pp. 1–23, 2021.
- [14] A. Guillot and C. Collet, "Construction of the Motor Imagery Integrative Model in Sport: a review and theoretical investigation of motor imagery use," *Int. Rev. Sport Exerc. Psychol.*, vol. 1, no. 1, pp. 31–44, 2008, doi: 10.1080/17509840701823139.
- [15] H. Keriven *et al.*, "Psychological wellbeing of student-athletes: a comparative study between European and American athletes," *Front. Psychol.*, vol. 16, p. 1604783, 2025, doi: 10.3389/fpsyg.2025.1604783.
- [16] A. Cejudo, I. Ruiz-Pérez, S. Hernández-Sánchez, M. De Ste Croix, P. Sainz de Baranda, and F. Ayala, "Comprehensive Lower Extremities Joints Range of Motion Profile in Futsal Players," *Front. Psychol.*, vol. 12, p. 2233, Jun. 2021, doi: 10.3389/fpsyg.2021.658996.
- [17] D. Aydoğan and G. Hadi, "Resilience in Turkish Physically Disabled Athletes: The Role of Sport Participation TT - Türk Fiziksel Engelli Sporcularda Yılmazlık: Spora Katılımın Rolü," *OPUS Int. J. Soc. Res.*, vol. 31, no. 10, pp. 2401–2425, 2020.
- [18] M. Sarkar and A. E. Page, "Resilience and stress," *Sports Medicine*, vol. 52, no. 2, pp. 1–15, 2022.
- [19] R. E. Smith, F. L. Smoll, and J. T. Ptacek, "Stress and injury," *Journal of Sport and Exercise Psychology*, vol. 42, no. 3, pp. 1–10, 2020.
- [20] C. L. Ardern, N. F. Taylor, J. A. Feller, and K. E. Webster, "Fifty-five per cent return to competitive sport following ACL reconstruction," *British Journal of Sports Medicine*, vol. 55, no. 10, pp. 1–8, 2021.