Journal of Physical Education, Sport, and Human Performance (JPESHP) Vol 2 Issue 2 2026
P-ISSN: 3123-9544 | E-ISSN: 3124-3649
Journal of Physical Education, Sport, and Human Performance (JPESHP)
Journal Homepage: https://lenteracendekia.co.id/jpeshp

Prevalence, Characteristics, and Initial Management of Injuries Among Student Futsal Athletes

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ARTICLE INFO

Keywords:
Futsal
Injury prevalence
Ankle sprain
Injury management

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ABSTRACT

Introduction. Futsal carries a high injury risk, especially for student-athletes balancing academic and training demands. In this study, 12-month injuries were defined as any physical impairment from futsal causing time-loss, functional limitation, or requiring medical/first-aid intervention. This study aimed to identify the prevalence, types, anatomical locations, causative factors, and initial management practices of these injuries among FIKK UNM student futsal athletes.. **Methods.** A quantitative descriptive cross-sectional design was employed using a validated questionnaire administered to 36 active student futsal athletes (aged 18–21 years; mean 19.7 ± 1.1 years) recruited through total sampling. Data were analysed using descriptive statistics (frequency and percentage) in SPSS version 26. **Results.** Injury prevalence over the preceding 12 months was 83.3% (n = 30). Sprains were the most common injury type (58.3%), followed by strains (19.4%), and the ankle/foot was the most frequently injured site (63.9%). Non-contact mechanisms were the primary causative factor (27.8%), followed by direct physical contact and inadequate warm-up (25.0% each). Although 47.2% of athletes correctly applied the PRICE method (protection, rest, ice, compression, elevation), 33.3% still relied on clinically contraindicated practices. **Conclusion.** The high injury prevalence underscores the urgent need for evidence-based injury prevention education, structured warm-up protocols, medical supervision, and integrated psychological support within the university setting.

1. Introduction

Futsal is one of the fastest-growing team sports worldwide, including in Indonesia. The game is contested between two teams of five players on a relatively small indoor court over two 20-minute halves. Its distinctive characteristics, extremely rapid movement, agility demands, sudden directional changes, repeated sprints, and close-contact physical play in a confined space, place considerable physiological and biomechanical stress on the musculoskeletal system (Ruiz-Pérez et al., 2021). The high physical intensity inherent to futsal directly elevates the risk of injury (Kadir et al., 2022).

Sports injuries can happen due to excessive physical activity (Al-Ghifari et al., 2023). Sports injuries represent a major public health concern, ranking as the second leading cause of non-fatal accidents after domestic incidents (Nurrokhmah & Anggita, 2024). In futsal, injury patterns predominantly involve the lower extremities, particularly the ankle, knee, and thigh musculature, consistent with the sport's dominant movement patterns (Ruiz-Pérez et al., 2021). Global epidemiological surveillance indicates high match injury rates, reaching up to 44.9 injuries per 1,000 match-hours in elite populations (Ruiz-Pérez et al., 2021) and 52.7 per 1,000 player-hours in professional league settings (Lopes et al., 2023). Importantly, epidemiological investigations in collegiate and student-athlete populations reveal similarly alarming injury burdens; studies on university futsal and collegiate sports report injury prevalence rates ranging from 60% to over 80%, with lower-extremity trauma and recurrent sprains dominating the profile due to inconsistent conditioning and unmonitored playing loads (Lopes et al., 2023).

In the university environment, student-athletes face a unique dual burden of academic responsibilities and intense athletic training. Students at the Faculty of Sports Science and Health, Universitas Negeri Makassar (UNM), are required to attend rigorous theoretical lectures and mandatory daily practical coursework in the morning, followed by independent team training sessions in the

afternoon. This combined burden generates significant cumulative physical fatigue, compromised movement mechanics, and heightened susceptibility to overuse and overload injuries (Frisch et al., 2009; Putri et al., 2024). Furthermore, the limited availability of dedicated athletic trainers or medical personnel during informal campus sessions compounds both the primary injury risk and the likelihood of inappropriate immediate post-injury management (Putri et al., 2024).

Inappropriate management during the acute phase-such as applying direct massage or thermotherapy within the first 72 hours, or continuing to play through pain-exacerbates local tissue trauma, prolongs recovery trajectories, and significantly increases chronic re-injury rates (Martin et al., 2021). The psychological consequences of injury are equally substantial; acute and recurrent injuries frequently trigger psychological distress, including anxiety, frustration, and fear of re-injury, all of which compromise athletic performance and overall quality of life (Husain et al., 2024).

Although futsal injury epidemiology has been documented globally, existing literature primarily focuses on professional or elite populations, leaving a critical knowledge gap regarding university student-athletes in developing nations like Indonesia. Crucially, most epidemiological studies stop at reporting injury rates, biomechanical risk factors, and anatomical locations, while failing to evaluate the immediate self-management behaviors and acute-phase interventions adopted by student-athletes post-injury. In campus settings like FIKK UNM, where student-athletes endure a unique dual burden of academic coursework and athletic training without dedicated on-site medical staff, inappropriate initial self-management (such as acute massage or heat application) poses a severe, unaddressed risk for chronic injury recurrence.

This study directly addresses these gaps by integrating epidemiological profiling (prevalence, anatomical sites, and etiology) with an empirical evaluation of initial post-injury management practices in a university cohort. By identifying both systemic injury patterns and critical post-injury management errors in a campus setting, this study provides actionable, localized evidence to guide targeted prevention protocols and athletic healthcare policies in higher education. Accordingly, this study aimed to: (1) determine injury prevalence and types; (2) identify the most frequently injured anatomical sites; (3) analyse causative factors; and (4) evaluate initial injury management practices among student futsal athletes at FIKK UNM.

2. Methods

Research design

This study employed a quantitative descriptive cross-sectional approach, which systematically describes phenomena through numerical data processed into frequencies and percentages. A descriptive design was selected because the study did not seek to test causal relationships, but rather to provide a comprehensive profile of injuries sustained by student futsal athletes.

Participants

The study population comprised all active students registered as futsal athletes at FIKK UNM who were actively participating in training and competition during the 2024/2025 academic year. Total sampling was used, yielding 36 respondents who met the inclusion criteria: (a) active FIKK UNM students, (b) members of a futsal team or activity unit, and (c) willing to participate voluntarily. Exclusion criteria included students undergoing rehabilitation for severe injuries who were unable to complete the questionnaire independently. Respondents ranged in age from 18 to 21 years (mean 19.7 ± 1.1 years), with a predominant training frequency of three to five sessions per week. Playing positions represented included anchor, flank, pivot, and goalkeeper. All participants have voluntarily stated their willingness and signed the informed consent before participating in this study.

Research instrument

Data were collected using a structured questionnaire developed on the basis of instruments previously employed in sports injury epidemiology research. Prior to data collection, the instrument underwent a content and construct validation process evaluated by expert judgment in sports medicine and physical education to

ensure item appropriateness. Furthermore, a reliability test was conducted on a sample of student-athletes outside the main study population, yielding a Cronbach's alpha coefficient exceeding the acceptable threshold ($\alpha > 0{,}70$), thereby confirming the internal consistency and reliability of the questionnaire. The questionnaire encompassed: (1) demographic data and athlete profile; (2) injury history over the preceding 12 months; (3) injury type and anatomical location; (4) causative factors; and (5) initial management practices. The questionnaire was administered directly to all respondents by the researcher.

Data analysis

Collected data were analysed using descriptive statistics, comprising calculations of frequency (*f*) and percentage (%) for each study variable. Results are presented in frequency distribution tables accompanied by descriptive narrative. All analyses were performed using SPSS version 26.

3. Results

Complete data were obtained from all 36 respondents (response rate 100%). The predominant training frequency was three to five sessions per week (72.2%), and 66.7% of respondents had been actively playing futsal for more than two years. The flank position was the most commonly played (38.9%), followed by anchor (27.8%), pivot (22.2%), and goalkeeper (11.1%).

Injury prevalence and types

Table 1 shows that 83.3% of respondents (n = 30) sustained at least one injury during the preceding 12 months. Sprain was the most prevalent injury type (58.3%; n = 21), followed by muscle/tendon strain (19.4%; n = 7) and open wounds/abrasions (13.9%; n = 5). Additionally, 44.4% of respondents experienced more than three injuries within a single year, indicating a high rate of recurrent injury in this population.

Table 1. Prevalence and types of injuries (N = 36)

Injury type	*f*	%
Sprain (ligament/capsular sprain)	21	58.3
Strain (muscle/tendon injury)	7	19.4
Open wound (abrasion/laceration)	5	13.9
Contusion (bruise)	3	8.3
Joint dislocation	2	5.6
Ligament tear (ACL/LCL)	1	2.8
No injury	6	16.7

Note. f = frequency; % = percentage of all respondents (N = 36); ACL = anterior cruciate ligament; LCL = lateral collateral ligament. Because 30 respondents reported at least one injury and the injury-type frequencies total 39, respondents could report more than one injury type; the frequencies therefore do not sum to 36.

Causative factors

Table 2 demonstrates that non-contact mechanisms were the dominant causative factor (27.8%), followed by direct physical contact between players and inadequate warm-up, each contributing 25.0%. Poor court conditions (13.9%) and excessive fatigue (8.3%) made smaller but clinically significant contributions.

Table 2. Causative factors of injury (N = 36)

Causative factor	*f*	%
Non-contact mechanism (misstep, sudden stop, pivot)	10	27.8
Direct physical contact between players	9	25.0
Inadequate warm-up	9	25.0
Poor court conditions (slippery/hard surface)	5	13.9
Excessive fatigue (overtraining)	3	8.3

Note. f = frequency; % = percentage of all respondents (N = 36).

Anatomical distribution of injuries

Table 3 reveals that the ankle was by far the most frequently injured anatomical region (63.9%). The thigh (13.9%) and knee (11.1%) ranked second and third, respectively, consistent with injury patterns reported in multidirectional sports.

Table 3. Anatomical distribution of injuries (N = 36)

Injury location (anatomical region)	*f*	%
Ankle/foot	23	63.9
Thigh (quadriceps/hamstring)	5	13.9
Knee joint	4	11.1
Calf (gastrocnemius/soleus)	2	5.6
Lumbar/lower back	1	2.8
Other regions	1	2.8

Note. f = frequency; % = percentage of all respondents (N = 36).

Initial injury management practices

Table 4 indicates that while 47.2% of athletes correctly applied the evidence-based PRICE method, 33.3% still employed clinically contraindicated practices—namely direct massage (13.9%), heat application (11.1%), and continuing to play without rest (8.3%). These findings point to a significant gap in injury management knowledge and practice.

Table 4. Initial injury management practices (N = 36)

Initial management practice	*f*	%
Ice pack – PRICE method	17	47.2
Passive rest without additional intervention	7	19.4
Direct massage of the injured area	5	13.9
Application of heat balm or heat rub	4	11.1
Continuing to play without rest	3	8.3

Note. f = frequency; % = percentage of all respondents (N = 36); PRICE = protection, rest, ice, compression, elevation. Clinically contraindicated practices (direct massage, heat application, and continuing to play) total 12 respondents (33.3%).

4. Discussion

Injury prevalence and recurrence

The present study identified a substantial 12-month injury prevalence among student futsal athletes at the Faculty of Sports Science and Health (FIKK), Universitas Negeri Makassar, with 30 of 36 participants (83.3%) reporting at least one sports-related injury. This proportion appears higher than those reported in previous epidemiological investigations involving collegiate and elite futsal populations. For instance, Haryono et al. (2019) found that 76% of university students participating in various sports reported at least one injury, while prospective studies among elite futsal players reported injury proportions of 67.6% in male athletes and 60.6% in female athletes (Lopes et al., 2023). Although these findings indicate that sports injuries represent a considerable burden across different athletic populations, the higher proportion observed in the present study should be interpreted cautiously because of differences in study populations, injury definitions, observation periods, and data collection procedures.

One possible explanation for this difference relates to the specific characteristics of the student-athlete population. Unlike professional futsal players, who generally participate in structured training and competition schedules, student-athletes may experience overlapping physical demands arising from academic practical sessions, independent training, and competitive activities. At FIKK UNM, students are required to participate in practical coursework, which may be followed by additional

afternoon training sessions. This arrangement potentially increases cumulative physical exposure and reduces recovery opportunities, particularly when training intensity and recovery are not systematically monitored. Previous research has identified training exposure and workload as important considerations in sports injury epidemiology (Frisch et al., 2009). Nevertheless, because the present study did not directly measure training volume, intensity, or recovery status, this explanation should be regarded as a plausible contextual interpretation rather than an established causal mechanism.

The difference between the present findings and those of Lopes et al. (2023) also requires consideration of the epidemiological indicators employed. Their prospective cohort study documented that 67.6% of elite male futsal players sustained at least one time-loss injury during a competitive season, with injury incidence reaching 25.9 per 1,000 hours during matches compared with 3.0 per 1,000 hours during training. In contrast, the present study employed a retrospective 12-month self-report approach and included injuries that were not necessarily associated with time loss. Consequently, the higher proportion observed among FIKK UNM students does not necessarily indicate that their actual injury risk is greater than that of professional players. Rather, differences in injury ascertainment and exposure measurement may account for part of the observed variation. This distinction is important because prevalence describes the proportion of individuals reporting an injury within a specified period, whereas incidence based on exposure hours provides a measure of injury occurrence relative to participation time.

Regarding injury recurrence, the findings also highlight the importance of distinguishing multiple injury reports from recurrent injuries. The occurrence of several injury types among individual participants may indicate a considerable cumulative injury burden; however, it does not independently establish that the same injury has recurred following recovery. Hägglund et al. (2013) emphasized the importance of recurrent injuries in sports injury surveillance, particularly because previous injury is an important consideration in subsequent injury risk. Nevertheless, without information concerning the anatomical site, injury diagnosis, recovery status, and time interval between successive injuries, the recurrence pattern in the present population cannot be conclusively established. Future studies should therefore incorporate standardized recurrence classifications and longitudinal injury surveillance to distinguish new injuries, recurrent injuries, and exacerbations of existing conditions.

Taken together, the findings suggest that student futsal athletes represent a population requiring greater attention to injury surveillance and prevention. However, the observed prevalence should be interpreted within the specific academic and sporting context of the participants rather than generalized directly to professional futsal populations. Establishing the relationship between academic physical activity, extracurricular training exposure, recovery, and recurrent injury will require prospective investigations incorporating systematic exposure monitoring and clinical injury verification.

Injury types and locations

The distribution of injury types and anatomical locations in the present study indicates that the ankle and foot were the most frequently affected regions, accounting for 23 reports (63.9%), while sprains represented the most frequently reported injury type, with 21 reports (58.3%). This pattern is consistent with previous research identifying the lower extremities, particularly the ankle, as important anatomical regions affected by futsal-related injuries. Haryono et al. (2019), for example, reported that ankle injuries accounted for 34.6% of reported injuries among university students participating in several sports, with sprains representing 56% of injury types. Similarly, Lopes et al. (2023) identified sprains and ligament injuries as a substantial component of the injury profile among elite male futsal players, accounting for 29% of recorded injuries.

Although these findings demonstrate similarities in the predominance of ankle-related injuries and sprains, the magnitude of the proportions differs considerably. The higher proportion observed in the present study may partly reflect differences in the characteristics of the study populations and the distribution of sports-related exposure. Student futsal athletes may participate in practical physical

education activities and independent training outside their formal futsal sessions, potentially increasing exposure to multidirectional movements and repeated loading of the ankle joint. However, this interpretation remains hypothetical because the present study did not quantify sport-specific exposure or biomechanical risk factors.

From a biomechanical perspective, the predominance of ankle sprains is consistent with the movement demands of futsal, which involve repeated acceleration, deceleration, pivoting, cutting, and rapid changes of direction. These movements require effective dynamic stabilization of the ankle joint, particularly when athletes perform rapid directional transitions or land under conditions of reduced postural control. Consequently, inadequate neuromuscular control, previous ankle injury, and insufficient recovery may contribute to the vulnerability of the ankle ligament complex. Nevertheless, the present study did not include biomechanical assessments or clinical examinations; therefore, these mechanisms provide a physiological explanation for the observed injury pattern rather than direct evidence of the mechanisms responsible for the reported injuries.

An important consideration is that the anatomical distribution observed in this study differs from the injury profile reported by Lopes et al. (2023), in which muscle injuries constituted the largest category (32%), followed by sprains or ligament injuries (29%). This difference may reflect variations in the level of competition, training exposure, injury classification, and reporting procedures. Elite players are generally exposed to more structured and intensive competitive demands, which may increase opportunities for muscle-related injuries during high-intensity actions. Conversely, the high proportion of ankle and foot injuries among the present student population suggests that joint-related injuries deserve particular attention in university-level futsal injury prevention. Therefore, injury prevention strategies should be adapted to the specific injury distribution of each athletic population rather than adopting an identical approach across professional and student settings.

These findings support the importance of incorporating ankle stabilization, balance training, proprioceptive exercises, and neuromuscular conditioning into futsal training programmes. Nevertheless, such interventions should be considered preventive recommendations derived from the observed injury profile and established biomechanical principles, rather than interventions whose effectiveness was directly tested in the present study.

Causative factors

The findings regarding injury mechanisms indicate that non-contact events represented the most frequently reported mechanism (27.8%), followed by direct contact and inadequate warm-up, each accounting for 25.0% of reported responses. The relatively close distribution among these categories suggests that injury occurrence among student futsal athletes cannot be attributed to a single dominant mechanism. Although non-contact events represented the largest individual category, their proportion did not constitute a majority of reported responses. This distinction is important because it indicates that both intrinsic movement-related factors and external physical exposure may contribute to the injury burden in this population.

The proportion of non-contact injuries is biomechanically relevant because futsal involves frequent acceleration, deceleration, changes of direction, and rapid transitions between offensive and defensive movements. During these activities, the lower extremities are exposed to substantial mechanical demands, particularly when athletes perform sudden directional changes or land with inadequate postural control. Lopes et al. (2023) also documented non-contact mechanisms as an important component of futsal injury epidemiology. However, similarities in injury mechanisms should not be interpreted as evidence that the same biomechanical factors were responsible for injuries in both populations, particularly because the present study did not include video analysis or direct biomechanical measurements.

The proportion of injuries associated with inadequate warm-up (25.0%) also deserves attention. Warm-up activities are intended to prepare the neuromuscular and musculoskeletal systems for subsequent physical demands by progressively increasing physiological readiness and incorporating

movement-specific activities. Nevertheless, the association between inadequate warm-up and reported injury in the present study should be interpreted as a self-reported mechanism or perceived contributing factor rather than proof of a direct causal relationship. Differences in warm-up duration, intensity, exercise selection, and supervision were not objectively evaluated.

The relatively similar proportions of non-contact mechanisms, direct contact, and inadequate warm-up further indicate that injury prevention should not focus exclusively on movement technique. Instead, preventive approaches should combine neuromuscular conditioning, appropriate warm-up procedures, technical skill development, and strategies to reduce hazardous contact situations during play. Such a multifactorial approach is particularly relevant for student-athletes whose physical activities may extend beyond formal team training. Future investigations should examine these mechanisms through prospective surveillance and standardized injury classification to determine their relative contribution to injury occurrence.

Initial injury management

The findings concerning initial injury management reveal differences in the injury response practices adopted by student futsal athletes. Although some participants reported using ice application or PRICE, based management, others relied on passive rest, massage, heat application, or continued participation following injury. This variation suggests that knowledge and implementation of immediate injury management principles may not be uniform among student-athletes.

The use of cold application and protective measures is consistent with commonly recognized approaches to the initial management of acute musculoskeletal injuries. However, it is important to distinguish between familiarity with an injury management protocol and the appropriate application of that protocol in clinical practice. The present study recorded participants' self-reported management choices but did not evaluate the timing, duration, frequency, or clinical appropriateness of each intervention. Therefore, the findings cannot establish whether participants who reported using ice or PRICE achieved better recovery outcomes than those who adopted other approaches.

Of particular concern is the reported use of massage and heat application immediately following injury. Although these practices may be perceived by athletes as effective methods for reducing discomfort, their appropriateness depends on the injury type, severity, and stage of tissue recovery. Applying aggressive massage or excessive heat to an acutely injured and swollen region may aggravate symptoms and interfere with appropriate early management. Nevertheless, it would be inappropriate to conclude that these practices necessarily increased tissue damage among the respondents because the present study did not assess subsequent clinical outcomes.

These findings highlight a distinction between the availability of injury management knowledge and its practical application. Athletes may have some familiarity with commonly recommended management approaches while continuing to adopt traditional or self-directed practices when injuries occur. This observation is particularly relevant in university sporting environments, where students may have access to sports science knowledge but not necessarily to immediate professional injury assessment. The findings are consistent with concerns regarding sports injury management literacy among young athletes discussed by Nurrokhmah & Anggita (2024) and Putri et al. (2024). However, differences in the populations and assessment instruments used in those studies should be considered when interpreting the similarity of findings.

Accordingly, improving initial injury management requires more than introducing athletes to a single treatment acronym. Educational interventions should emphasize injury recognition, appropriate protection, decisions regarding activity cessation, and timely referral to qualified healthcare professionals. This approach may help reduce inappropriate self-management practices and ensure that potentially serious injuries receive appropriate clinical assessment.

Practical implications

The findings of this study have several practical implications for injury prevention and management within university sporting environments. First, the high proportion of students reporting injuries, particularly those involving the ankle and foot, indicates the need to strengthen structured injury prevention programmes. Neuromuscular training incorporating balance exercises, proprioceptive activities, lower-limb strengthening, and movement technique correction may be particularly relevant to the injury profile identified in this population. These interventions should be integrated into regular futsal training rather than implemented only after an injury has occurred.

Second, the reported contribution of inadequate warm-up highlights the importance of establishing standardized, progressive, and sport-specific warm-up routines. Such programmes should include dynamic mobility, neuromuscular activation, balance, and movement preparation appropriate to the demands of futsal. Coaches and physical education instructors should ensure that warm-up activities are consistently implemented and adapted to athletes' physical condition and training objectives.

Third, the variation in initial injury management practices indicates the need for continuous sports injury education. Educational programmes should address injury recognition, immediate protection, appropriate activity modification, and indications for professional medical referral. Particular attention should be given to correcting inappropriate self-treatment practices and improving athletes' ability to recognize injuries that require clinical evaluation.

Fourth, higher education institutions should strengthen access to qualified sports healthcare personnel, including sports physiotherapists and athletic trainers, to support early injury assessment, rehabilitation, and return-to-sport decisions. This provision is particularly relevant for institutions where students undertake multiple practical physical activities alongside extracurricular sports participation. Furthermore, systematic monitoring of training exposure, injury history, and recovery status could provide valuable information for identifying athletes who may require additional preventive support.

Finally, injury rehabilitation should consider both physical and psychological dimensions. Athletes recovering from sports injuries may experience reduced confidence, fear of reinjury, and concerns regarding their ability to return to previous performance levels. Therefore, integrating psychological support and progressive return-to-sport strategies into rehabilitation programmes may contribute to a more comprehensive recovery process (Husain et al., 2024).

Overall, these recommendations should be understood as practical responses to the injury patterns and management practices identified in the present study. Their effectiveness, however, requires further evaluation through intervention-based research involving student futsal populations.

Strengths and limitations

The primary strengths of this study lie in the implementation of a total sampling technique, which ensures a comprehensive representation of the target population, alongside the utilization of a content-validated and reliable questionnaire. Nevertheless, several methodological limitations must be acknowledged. First, the cross-sectional descriptive design precludes the establishment of causal inferences. Second, the retrospective self-report methodology remains susceptible to recall bias, particularly for injuries sustained beyond six months prior. Third, the relatively small sample size (n=36) constrains the broader generalizability of the findings. Finally, the absence of direct clinical assessments to validate the reported diagnoses constitutes an additional limitation that warrants consideration in future investigations.

5. Conclusion

This study underscores the high injury burden among student-athletes in futsal at FIKK UNM, with ankle sprains representing the most predominant injury type and anatomical site. Non-contact mechanisms and inadequate warm-up protocols emerged as the primary modifiable risk factors.

Crucially, the persistent use of initial injury management practices that deviate from evidence-based clinical guidelines highlights an urgent need for multidimensional prevention strategies, enhanced health literacy, and institutionalized medical support within university athletic frameworks. To advance these findings, future research should implement prospective longitudinal designs utilizing larger cohorts and direct clinical diagnostic procedures to precisely evaluate the efficacy of targeted injury prevention interventions among student futsal athletes in Indonesia.

6. Author Contributions

Andi W. Fajriansyah Al-Ghifari: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing, Project Administration.

7. Acknowledgements

The authors express their gratitude to all student futsal athletes at FIKK UNM who generously volunteered to participate as respondents in this study. Appreciation is also extended to the leadership and academic community of the Faculty of Sports Science and Health, Universitas Negeri Makassar, for their support and the facilities provided throughout the data collection process.

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P-ISSN: 3123-9544 | E-ISSN: 3124-3649
Journal of Physical Education, Sport, and Human Performance (JPESHP)
Journal Homepage: https://lenteracendekia.co.id/jpeshp

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