Volume 06 Issue 01 (2025) Pages 11-18

INSPIREE: INDONESIAN SPORT INNOVATION REVIEW

ISSN 2746-6965 (Online), 2774-2520 (Print)
Journal Homepage: https://inspiree.review/index.php/inspiree

ORIGINAL RESEARCH ARTICLES

OPEN ACCESS

Integrating Sports Massage into Pre-training Routines Can Enhance Athletic Preparedness and Performance Capacity in Kabaddi Players

https://doi.org/10.53905/inspiree.v6i01.137

Muhammad Isnandar[1abcde], Farid M. Alhumary[1abd], Krzykarist[2ade], Restin Zega[1abd], Reymond Benedith Hutajulu[1acd], Rachel Junika Abelia Putri[1acd], Martin Hofmeister[3acd]

[1]Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Indonesia.
[2]Physical Activity and Sport Pedagogy, Klaipeda University, Lituania.
[3]Department Food and Nutrition, Consumer Centre of the German Federal State of Bavaria, Munich, Germany.

ABSTRACT

The purpose of the study. The primary objective of this investigation is to assess the efficacy of pre-training sports massage in enhancing warm-up protocols for kabaddi athletes, focusing on its influence on various physiological parameters, performance metrics, and psychological preparedness.

Materials and methods. A quasi-experimental design was employed involving a cohort of 20 elite kabaddi athletes (15 males and 5 females) aged between 18 and 30 years, hailing from professional teams in Medan City. The intervention spanned 8 weeks and consisted of a 15-minute pre-training sports massage regimen administered prior to standard warm-up sessions. Data were collected at baseline, after 4 weeks, and following 8 weeks of intervention, encompassing measurements of muscle temperature, range of motion, reaction time, performance indicators, and perceived readiness, utilizing standardized assessment instruments.

Results. The intervention yielded statistically significant enhancements across multiple evaluated parameters. Muscle temperature exhibited an average increase of 2.3°C, while range of motion demonstrated a 12.5% improvement in hip flexibility; additionally, performance metrics revealed a 22% augmentation in defensive maneuver efficiency. Reaction time was reduced by 0.3 seconds, and participants indicated a decrease in perceived exertion alongside an enhancement in psychological readiness. All observed improvements were statistically significant ($p < 0.001$) and characterized by large effect sizes.

Conclusions. The implementation of pre-training sports massage emerges as a potentially beneficial intervention for the optimization of warm-up protocols among kabaddi athletes. The extensive advantages noted across physiological, biomechanical, and psychological realms imply that the incorporation of sports massage into pre-training routines may significantly bolster athletic preparedness and performance capacity, particularly in high-intensity contact sports such as kabaddi.

Keywords: Sports massage; kabaddi; warm-up optimization; athlete performance; physiological preparation; performance enhancement.

ARTICLE INFO

EDITED BY
Assoc. Prof. Dr. Zulkifli, M.Pd, Universitas Islam Riau, Indonesia.
Prof. Dr. Ilham Kamaruddin, M.Pd Universitas Negeri Makasar, Indonesia.

ARTICLE HISTORY
Received : September 27, 2024
Accepted : December 19, 2025.
Published: January 27, 2025.

CITATION
Isnandar, M., Alhumary, F. M., Krzykarist, Z., Zega, R., Hutajulu, R. B., Putri, R. J. A., & Hofmeister, M. (2025). Integrating sports massage into pre-training routines can enhance athletic preparedness and performance capacity in kabaddi players. *INSPIREE: Indonesian Sport Innovation Review*, 6(1), 11–18. https://doi.org/10.53905/inspiree.v6i01.137

INTRODUCTION

Kabaddi, a traditional sport with origins in South Asian culture, has evolved into a high-intensity, contact-based activity that demands exceptional physical readiness and performance capabilities from its athletes (Singh, 2021). The dynamic nature of the sport, which combines elements of wrestling, athletics, and strategic gameplay, necessitates comprehensive preparation protocols to ensure optimal performance and mitigate injury risk (Ratamess, 2011; Kibler & Chandler, 1994). Conventional warm-up procedures in kabaddi have primarily focused on dynamic movements and stretching exercises (Dahiya & Kumar, 2023). However, the incorporation of advanced preparation techniques, such as sports massage, remains relatively unexplored in this specific sporting context.

Sports massage has been widely recognized as a means of enhancing athletic performance across various disciplines (Mylonas et al., 2021; Brummitt, 2008). Existing research has shown that incorporating massage techniques into pre-training routines can lead to significant enhancements in muscle readiness and blood circulation (Callaghan, 1993). However, the specific application and effectiveness of these techniques in kabaddi athletes, particularly concerning warm-up optimization, represents a notable gap in

[abcde]Authors'Contribution: a-Study design; b-Data collection; c-Statistical analysis; d-Manuscript preparation; e-Funds collection.
Corresponding Author: Muhammad Isnandar, e-mail: muhammadisnandar7@gmail.com

current sports science literature.

The physiological demands of kabaddi are unique, requiring athletes to maintain high levels of alertness, agility, and explosive power throughout match play (KS et al., 2022). During a typical kabaddi match, players engage in repeated high-intensity efforts, including rapid directional changes, explosive movements, and intense physical contact (Dahiya & Kumar, 2023; Park & Kim, 2020). These demands emphasize the critical importance of proper pre-training preparation to ensure optimal performance and reduce injury risk (Dey et al., 1993). The traditional warm-up protocols currently employed in kabaddi training may not fully address these specific physiological and biomechanical requirements.

The existing body of sports medicine research has highlighted the potential advantages of incorporating pre-training massage into athletic preparation (Warming up for Sport, 2023). Studies have demonstrated that targeted massage techniques can enhance muscle readiness and neuromuscular activation, as evidenced by improvements in muscle temperature, tissue pliability, and proprioceptive awareness (Bell, 1999; Callaghan, 1993). These findings suggest that such physiological enhancements may have valuable applications in the context of kabaddi, a sport characterized by high-intensity effort and physical demands (Ross & Ware, 2013; Safran et al., 1988). However, the specific impact of pre-training massage on the warm-up routines and subsequent performance of kabaddi athletes has not been systematically investigated.

Furthermore, the psychological aspects of pre-training preparation in kabaddi warrant consideration. Previous research has emphasized the importance of mental readiness in contact sports, indicating that pre-training interventions should address both physical and psychological preparation (Gee, 2010; Blumenstein et al., 2005). Sports massage may offer additional benefits in this regard, potentially influencing athletes' perceived readiness and confidence levels before training or competition (Brummitt, 2008; Goodwin et al., 2007).

The environmental conditions prevalent in Southeast Asian regions, particularly the warm and humid climate of cities like Medan, Indonesia, present unique challenges for athlete preparation. These climatic factors can affect muscle preparation and recovery processes, underscoring the critical need for optimizing warm-up protocols for local kabaddi athletes (Thompson et al., 2023; Dahiya & Kumar, 2023). Examining the effectiveness of sports massage in these specific environmental conditions could provide valuable insights for regional training protocols.

This study aims to address these research gaps and provide evidence-based recommendations for the optimization of warm-up procedures in kabaddi athletes. The primary objectives include evaluating the effectiveness of pre-training sports massage in optimizing warm-up, assessing the impact on physiological parameters, measuring changes in performance metrics, analyzing the effects on athletes' perceived readiness and psychological preparation, and determining the practical applicability of incorporating sports massage into regular training routines. The hypotheses are that pre-training sports massage will significantly improve muscle temperature and tissue preparedness, enhance range of motion and performance parameters, positively influence psychological readiness and perceived exertion levels, and provide sustained long-term benefits. The findings of this study may have significant implications for training methodology and performance enhancement in the rapidly evolving sport of kabaddi.

MATERIALS AND METHODS

Study Participants

Twenty elite kabaddi athletes (15 males, 5 females) from Medan City's professional teams participated in this study. The participants were recruited through purposive sampling from three premier kabaddi clubs in Medan City during the 2024 competitive season. The athletes, aged between 18 and 30 years (mean age = 24.5 ± 3.2 years), possessed extensive competitive experience ranging from 3 to 8 years at the national level. Prior to enrollment, all participants underwent comprehensive medical screenings to ensure they were free from any musculoskeletal injuries or chronic medical conditions that could affect their performance. The selected athletes demonstrated consistent attendance in their regular training sessions, with a minimum participation rate of 90% over the previous six months. All participants were actively competing in the Indonesian Kabaddi League and had maintained their elite status for at least two consecutive seasons. The inclusion criteria were: 1) Age range: 18-30 years, 2) Minimum of 3 years competitive experience, 3) No current injuries or medical conditions, 4) Regular participation in team training sessions. All participants rendered their written informed consent, and the research protocol obtained endorsement from the Institutional Review Board of the Bina Guna Medan College of Sports and Health (Research Protocol Decree No. STOK/BG/2024-IRB-712).

Study Organization

This quasi-experimental study employed a pre and post-test design over an 8-week period. Participants were evaluated before and after implementing a standardized pre-training sports massage protocol. The intervention consisted of: 1) 15-minute sports massage sessions before regular warm-up; 2) Specific massage techniques targeting major muscle groups; 3) Standardized pressure and stroke patterns; 4) Implementation by certified sports massage therapists.

Table 1. Experimental Design and Intervention Protocol

Phase	Duration	Activities	Measurements
Pre-intervention Assessment	Week 0	-Baseline measurements - Physical examination- Performance testing	- Muscle temperature- Range of motion- Reaction time- Performance metrics
Adaptation Period	Week 1	- Introduction to massage techniques- Therapist familiarization- Protocol adjustment	- Comfort assessment- Technique verification- Initial response monitoring
Early Intervention	Weeks 2-3	- Standard massage protocol- Basic warm-up integration-Technique refinement	- Weekly progress tracking-Adjustment documentation-Compliance monitoring
Mid-intervention	Weeks 4-5	- Full protocol implementation- Intermediate assessment- Protocol optimization	- Mid-point measurements-Progress evaluation-Technique consistency check

Late Intervention	Weeks 6-7	- Maintained protocol- Performance integration- Routine stabilization	- Continuous monitoring- Performance tracking- Protocol adherence check
Final Assessment	Week 8	- Post-intervention testing- Data collection completion- Exit interviews	- Final measurements- Comparative analysis - Participant feedback

Test and Measurement Procedures

The subsequent variables were evaluated at the initial baseline, along with the intervals of four weeks and eight weeks throughout the intervention phase occurring in September and October of the year 2024:

Table 2. Test and Measurement Protocol Details

Parameter	Equipment/Method	Measurement Protocol	Reliability (ICC)	Assessment Points
Muscle Temperature	FLIR E75 Infrared Thermography Camera	- 3 measurements per muscle group 30cm distance from skin surface- Room temperature maintained at 22°C ± 1°C- Major muscle groups: quadriceps, hamstrings, calves	0.95	- Pre-massage- Immediately post-massage- Post warm-up
Range of Motion	Digital Goniometer (Lafayette Instrument)	- Hip flexion/extension- Shoulder internal/external rotation- Ankle dorsi/plantar flexion- 3 trials per movement	0.92	- Pre-massage- 5 min post-massage- Post warm-up
Reaction Time	Fitlight Trainer™ System	- Visual stimulus response- 10 trials per test- Random stimulus intervals- Both dominant/non-dominant sides	0.88	- Pre-massage- Post-massage- During specific drills
Performance Indicators	Standardized Kabaddi Drills	- Raid speed (20m sprint)- Defensive agility course- Hand-touch accuracy test- Multi-direction movement test	0.90	- After complete warm-up- During training sessions
Perceived Readiness	Modified POMS Questionnaire & RPE Scale	- 6 subscales of mood state- 0-10 readiness scale- Muscle tension assessment- Physical readiness evaluation	0.87	- Pre-session- Post-massage- End of warm-up

All measurements were conducted by certified sports science professionals following standardized protocols. Environmental conditions were strictly controlled during testing sessions. Data collection was performed at consistent times of day to minimize circadian variations in performance measures.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Prior to the main analyses, data were screened for normality using the Shapiro-Wilk test and for homogeneity of variance using Levene's test. Descriptive statistics were calculated for all variables and presented as means ± standard deviations (SD). To evaluate the effectiveness of the pre-training sports massage intervention, paired t-tests were conducted to compare pre- and post-intervention measurements for each dependent variable. Repeated measures ANOVA was employed to analyze changes across the three time points (baseline, 4 weeks, and 8 weeks), with Bonferroni corrections applied for multiple comparisons. Effect sizes were calculated using Cohen's d, where values of 0.2, 0.5, and 0.8 were considered small, medium, and large effects, respectively. The relationships between different performance parameters were examined using Pearson's correlation coefficients. Missing data (< 5%) were handled using multiple imputation techniques to maintain statistical power. Statistical significance was set at $p < 0.05$, and 95% confidence intervals were calculated for all primary outcomes. Power analysis using G*Power 3.1 indicated that a sample size of 20 participants would provide 80% power to detect medium effect sizes ($d = 0.5$) at an alpha level of 0.05.

RESULTS

The implementation of pre-training sports massage showed significant improvements across multiple parameters:

Table 3. Changes in Physiological and Performance Parameters Following Pre-training Sports Massage Intervention

Parameter	Baseline (T0)-Mean ± SD	4 Weeks (T1)-Mean ± SD	8 Weeks (T2)-Mean ± SD	Mean Change-(T_0 to T2)	Effect Size-(Cohen's d)	p-value
Muscle Temperature (°C)						
- Quadriceps	33.2 ± 0.5	34.8 ± 0.4	35.5 ± 0.3	+2.3 ± 0.4	1.82	<0.001
- Hamstrings	32.8 ± 0.6	34.5 ± 0.5	35.1 ± 0.4	+2.3 ± 0.5	1.75	<0.001
- Calves	32.5 ± 0.4	34.2 ± 0.3	34.8 ± 0.3	+2.3 ± 0.3	1.89	<0.001
Range of Motion (degrees)						
- Hip Flexibility	85.3 ± 4.2	92.4 ± 3.8	95.9 ± 3.5	+10.6 ± 2.1	1.45	<0.001
- Shoulder Mobility	165.2 ± 5.1	174.8 ± 4.6	179.5 ± 4.2	+14.3 ± 2.8	1.56	<0.001
- Ankle Dorsiflexion	18.5 ± 2.1	20.6 ± 1.8	21.3 ± 1.6	+2.8 ± 0.9	1.32	<0.001
Performance Metrics						
- Reaction Time (s)	0.95 ± 0.08	0.75 ± 0.06	0.65 ± 0.05	-0.30 ± 0.05	1.68	<0.001
- Raid Speed (m/s)	4.8 ± 0.3	5.4 ± 0.2	5.7 ± 0.2	+0.9 ± 0.2	1.72	<0.001
- Defense Efficiency (%)	65.3 ± 4.2	78.6 ± 3.8	87.3 ± 3.5	+22.0 ± 3.2	1.85	<0.001
Perceived Readiness						
- POMS Score	12.4 ± 2.1	8.2 ± 1.8	6.5 ± 1.5	-5.9 ± 1.2	1.42	<0.001
- RPE Score	14.2 ± 1.2	11.8 ± 1.0	10.3 ± 0.8	-3.9 ± 0.7	1.38	<0.001

Note: T_0 = Baseline; T1 = 4 weeks; T2 = 8 weeks; SD = Standard Deviation; POMS = Profile of Mood States; RPE = Rating of Perceived Exertion

1. Muscle Temperature: Mean increase of 2.3°C (±0.4°C) in target muscle groups; Sustained elevation throughout warm-up period ($p < 0.001$).
2. Range of Motion: 12.5% improvement in hip flexibility; 8.7% increase in shoulder mobility; 15.3% enhancement in ankle dorsiflexion.
3. Performance Metrics: Reaction time improved by 0.3 seconds (±0.05s); 18% increase in speed during raid attempts; 22% enhancement in defensive maneuver efficiency.

DISCUSSION

The findings of this study provide compelling evidence supporting the effectiveness of implementing pre-training sports massage to optimize warm-up protocols for kabaddi athletes. The significant improvements observed across multiple physiological and performance metrics suggest a synergistic relationship between the massage intervention and traditional warm-up routines (Hendrawan et all, 2024; Ahmed et all, 2024; Boguszewski, 2014) . The observed significant increase in target muscle temperature, particularly in the lower limbs, is consistent with previous research demonstrating enhanced tissue perfusion following therapeutic massage interventions among contact sports participants (Hamada et al., 2023; Warneke et al., 2024). However, the current study extends these findings specifically to kabaddi players, where the demands of the unique sports require rapid transitions between offensive and defensive movements (Asha & N, 2022; De et al., 1982).

The substantial enhancements in range of motion, especially in hip flexibility and shoulder mobility, merit particular attention. These improvements are especially relevant for kabaddi athletes, as the sport requires explosive movements and rapid directional changes during both raiding and defensive plays (Utama et al., 2022; KS et al., 2022). The observed 12.5% enhancement in hip flexibility may be attributed to the mechanical effects of massage on muscle tissue properties, as well as the influence of massage on neuromuscular responses, as supported by previous research (Huang et al., 2010; Hamada et al., 2023). The massage intervention likely altered the viscoelastic and rheological characteristics of the target musculature, leading to an increased range of motion (Huang et al., 2010). Additionally, the manual therapy techniques may have elicited specific neurophysiological responses that contributed to the improved flexibility (Hamada et al., 2023). Furthermore, the maintained elevation in muscle temperature throughout the warm-up period indicates a prolonged physiological response that may contribute to injury prevention, although this relationship requires further investigation in longitudinal studies (Safran et al., 1988; Nobre et al., 2020).

The performance metrics demonstrated particularly encouraging results, with a 22% enhancement in defensive maneuver efficiency representing a practically significant improvement for competitive kabaddi play. This finding is noteworthy when compared to traditional warm-up protocols, which typically showed improvements of 8-12% in similar performance parameters, as reported by (Dakić, 2023) . Additionally, the reduction in reaction time by 0.3 seconds could provide a crucial advantage in match situations, particularly during raid attempts where milliseconds can determine success or failure. These improvements may be attributed to enhanced neuromuscular activation and proprioceptive awareness following the massage intervention, as supported by current literature on sports-specific preparation techniques (Arroyo-Morales et al., 2011; Bell, 1999; Moran et al., 2017).

The psychological aspects of performance, as reflected in the POMS and RPE scores, suggest that pre-training massage may also contribute to mental preparation and reduced perceived effort during training. This psychological benefit adds another dimension to the intervention's effectiveness, potentially enhancing athletes' confidence and readiness for competition (Faubert & Barthes, 2018; Goodwin et al., 2007; Brummitt, 2008). The relationship between the enhanced subjective assessments and objective performance metrics underscores the value of a comprehensive approach to athlete preparation, as highlighted by the research on performance optimization strategies in kabaddi (Thakur, 2010).

Several mechanisms may underlie the observed improvements. First, the mechanical action of massage likely enhances blood flow and tissue mobility, promoting optimal muscle function during subsequent activities (Kalsina, 2022). Second, the neurological effects of massage may improve muscle activation patterns and motor unit recruitment, leading to more efficient movement execution (Mylonas et al., 2021; Weerapong et al., 2005). Third, the temperature increases observed in target muscle groups may facilitate enzyme activity and metabolic processes, potentially enhancing energy system efficiency during high-intensity activities (Nobre et al., 2020; Chen, 2023). Notwithstanding, certain constraints must be acknowledged. The reasonably small sample size, while offering satisfactory statistical power, may restrict the generalizability of the findings to more expansive athlete populations. Furthermore, the 8-week study duration, though demonstrating significant improvements, may not fully capture long-term adaptations or maintenance effects. Future research should explore longer intervention periods and larger sample sizes to validate these findings across diverse competitive levels and age groups.

The practical implications of these results hold substantial significance for coaches and sports medicine professionals working with kabaddi athletes. The implementation of pre-training sports massage protocols could be particularly valuable during competitive seasons when optimal performance is paramount (Warneke et al., 2024). However, the resource requirements, including trained massage therapists and additional preparation time, necessitate careful consideration within the context of team logistics and training schedules.

CONCLUSION

This study provides strong empirical evidence supporting the effectiveness of pre-training sports massage in optimizing warm-up procedures for kabaddi athletes in Medan City. The significant improvements observed across physiological parameters (mean muscle temperature increase of 2.3°C), biomechanical measures (12.5% improvement in hip flexibility), and performance metrics (22% enhancement in defensive efficiency) demonstrate the comprehensive benefits of this intervention. The consistent positive outcomes across both objective and subjective measurements suggest that integrating sports massage into pre-training routines can substantially enhance athletic preparedness and performance potential in kabaddi players.

The findings have particular relevance for the development of sport-specific preparation protocols in kabaddi, especially in

the context of Southeast Asian competitive environments where traditional warm-up methods predominate. The observed improvements in reaction time (-0.3 seconds) and raid speed (+0.9 m/s) are especially pertinent to the high-intensity, intermittent nature of kabaddi competition. Furthermore, the sustained benefits throughout the 8-week intervention period suggest that this approach could be valuable for long-term athlete development programs.

While these results are promising, future research should focus on: (1) investigating the long-term effects of sustained massage intervention on athletic performance, (2) examining potential variations in massage techniques for different playing positions, and (3) evaluating the cost-effectiveness of implementing such programs at various competitive levels. Additionally, studies with larger sample sizes and diverse athlete populations would help establish the generalizability of these findings across different competitive contexts.

Based on these findings, we recommend that sports medicine practitioners and coaching staff consider incorporating pre-training sports massage into the regular preparation routines of kabaddi athletes, particularly during competitive seasons where optimal performance is crucial. However, implementation should be tailored to individual athlete needs and team resources, with careful consideration given to the timing and intensity of massage interventions within the overall training structure..

ACKNOWLEDGEMENTS

We wish to convey our profound appreciation to the esteemed chairman of the Bina Guna Sports and Health College (STOK Bina Guna) for his exceptional contributions and support, which have been instrumental in the successful execution of this research endeavor.

CONFLICT OF INTEREST

The authors assert that, following meticulous evaluation, no identifiable conflict of interest threatens the integrity of their research or its findings.

REFERENCES

Ahmed, S., Jakaria, G.M., Islam, M.S. et al. (2024). The comparison of the effects of percussive massage therapy, foam rolling and hamstring stretching on flexibility, knee range of motion, and jumping performance in junior athlete: a randomized controlled trial. Bulletin of Faculty of Physical Therapy 29, 44. https://doi.org/10.1186/s43161-024-00211-9

Arroyo-Morales, M., Fernández-Lao, C., Ariza-García, A., Toro-Velasco, C., Winters, M., Díaz-Rodríguez, L., Cantarero-Villanueva, I., Huijbregts, P. A., & Fernández-de-las-Peñas, C. (2011). Psychophysiological Effects of Preperformance Massage Before Isokinetic Exercise. In The Journal of Strength and Conditioning Research (Vol. 25, Issue 2, p. 481). Lippincott Williams & Wilkins. https://doi.org/10.1519/jsc.0b013e3181e83a47

Asha, D., & Chandrappa, N. (2022). Analytic approach to video analysis on skill performance of Pro Kabaddi matches. In International Journal of Physiology Nutrition and Physical Education (Vol. 7, Issue 2, p. 89). https://doi.org/10.22271/journalofsport.2022.v7.i2b.2563

Bell, G. W. (1999). Aquatic Sports Massage Therapy [Review of Aquatic Sports Massage Therapy]. Clinics in Sports Medicine, 18(2), 427. Elsevier BV. https://doi.org/10.1016/s0278-5919(05)70156-3

Blumenstein, B., Lidor, R., & Tenenbaum, G. (2005). Periodization and planning of psychological preparation in elite combat sport programs: The case of judo. In International Journal of Sport and Exercise Psychology (Vol. 3, Issue 1, p. 7). Taylor & Francis. https://doi.org/10.1080/1612197x.2005.9671755

Boguszewski, D., Kowalska, S., Adamczyk, J. G., & Białoszewski, D. (2014). ASSESSMENT OF EFFECTIVENESS OF SPORTS MASSAGE IN SUPPORTING OF WARM-UP. Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports, 18(10), 67-71. https://sportpedagogy.org.ua/index.php/PPS/article/view/655

Brummitt, J. (2008). The role of massage in sports performance and rehabilitation: current evidence and future direction. In PubMed. National Institutes of Health. https://pubmed.ncbi.nlm.nih.gov/21509135

Callaghan, M. J. (1993). The role of massage in the management of the athlete: a review. [Review of The role of massage in the management of the athlete: a review.]. British Journal of Sports Medicine, 27(1), 28. BMJ. https://doi.org/10.1136/bjsm.27.1.28

Chen, D. (2023). Temperature Regulation During Exercise and the Individual Differences. In SHS Web of Conferences (Vol. 174, p. 3013). EDP Sciences. https://doi.org/10.1051/shsconf/202317403013

Dahiya, S., & Kumar, D. (2023). A literature review study on kabaddi injuries [Review of A literature review study on kabaddi injuries]. International Journal of Physical Education Sports and Health, 10(3), 226. AkiNik Publications. https://doi.org/10.22271/kheljournal.2023.v10.i3d.2949

Dakić, M., Toskić, L., Ilić, V., Đurić, S., Dopsaj, M., & Šimenko, J. (2023). The Effects of Massage Therapy on Sport and Exercise Performance: A Systematic Review. Sports (Basel, Switzerland), 11(6), 110. https://doi.org/10.3390/sports11060110

De, A. K., Dasgupta, P., Panda, B. K., & Bhattacharya, A. (1982). Physical efficiency tests on Indian male “Kabaddi” inter-university players. In British Journal of Sports Medicine (Vol. 16, Issue 1, p. 33). BMJ. https://doi.org/10.1136/bjsm.16.1.33

Dey, S. K., Khanna, G. L., & Batra, M. (1993). Morphological and physiological studies on Indian national kabaddi players. In British Journal of Sports Medicine (Vol. 27, Issue 4, p. 237). BMJ. https://doi.org/10.1136/bjsm.27.4.237

Faubert, J., & Barthes, S. (2018). Prior Perceptual-Cognitive Training Builds Mental Resistance During Acute Physical Fatigue In Professional Rugby Athletes. In bioRxiv (Cold Spring Harbor Laboratory). Cold Spring Harbor Laboratory. https://doi.org/10.1101/505313

Gee, C. J. (2010). How Does Sport Psychology Actually Improve Athletic Performance? A Framework to Facilitate Athletes' and Coaches' Understanding. In Behavior Modification (Vol. 34, Issue 5, p. 386). SAGE Publishing. https://doi.org/10.1177/0145445510383525

Goodwin, J. E., Glaister, M., Howatson, G., Lockey, R. A., & McInnes, G. (2007). Effect of Preperformance Lower-Limb Massage on Thirty-Meter Sprint Running. In The Journal of Strength and Conditioning Research (Vol. 21, Issue 4, p. 1028). Lippincott Williams & Wilkins. https://doi.org/10.1519/r-20275.1

Hamada, Y., Akasaka, K., Otsudo, T., Sawada, Y., Hattori, H., Hasebe, Y., Kikuchi, Y., & Hall, T. (2023). Immediate Effects of Foam Roller and Stretching to the Lead Hip on Golfers Swing: A Randomized Crossover Trial. In Healthcare (Vol. 11, Issue 14, p. 2001). Multidisciplinary Digital Publishing Institute. https://doi.org/10.3390/healthcare11142001

Hendrawan, D., Karo Karo, A., Sari, D. M., & Sari, L. P. (2024). Analyzing Sports Injuries of Kabaddi Players: A Systematic Review. Physical Education Theory and Methodology, 24(3), 480-485. https://doi.org/10.17309/tmfv.2024.3.18

Huang, S., Santo, M. D., Wadden, K. P., Cappa, D. F., Alkanani, T., & Behm, D. G. (2010). Short-Duration Massage at the Hamstrings Musculotendinous Junction Induces Greater Range of Motion. In The Journal of Strength and Conditioning Research (Vol. 24, Issue 7, p. 1917). Lippincott Williams & Wilkins. https://doi.org/10.1519/jsc.0b013e3181e06e0c

Kalsina, V. V. (2022). Effect Of Restorative Massage On Regional Blood Flow In Paralympic Athletes. In Russian Open Medical Journal (Vol. 11, Issue 2). Limited liability company «Science and Innovations» (Saratov). https://doi.org/10.15275/rusomj.2022.0215

Kibler, W. B., & Chandler, T. J. (1994). Sport-Specific Conditioning [Review of Sport-Specific Conditioning]. The American Journal of Sports Medicine, 22(3), 424. SAGE Publishing. https://doi.org/10.1177/036354659402200321

Moran, R., Hauth, J. M., & Rabena, R. (2017). The effect of massage on acceleration and sprint performance in track & field athletes. In Complementary Therapies in Clinical Practice (Vol. 30, p. 1). Elsevier BV. https://doi.org/10.1016/j.ctcp.2017.10.010

Mylonas, K. S., Angelopoulos, P., Tsepis, E., Billis, E., & Fousekis, K. (2021). Soft-Tissue Techniques in Sports Injuries Prevention and Rehabilitation. In IntechOpen eBooks. IntechOpen. https://doi.org/10.5772/intechopen.96480

Neethu, K. S., Madhu, G. R., Radhakrishna, H. B. (2022). Analysis of the range of motion with respect to selected joints among female Kabaddi players. In International Journal of Physiology Nutrition and Physical Education (Vol. 7, Issue 2, p. 98). https://doi.org/10.22271/journalofsport.2022.v7.i2b.2565

Nobre, T. L., Rocha, L. Y., Ramos, C. C., Mazuchi, F. de A. e S., Carbone, P. O., Madureira, D., Rodrigues, B., & Caperuto, É. C. (2020). THE USE OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION FOR INCREASING THROWING PERFORMANCE. In Revista Brasileira de Medicina do Esporte (Vol. 26, Issue 4, p. 332). Sociedade Brasileira de Medicina do Esporte. https://doi.org/10.1590/1517-869220202604185184

Park, K., & Kim, C.-W. (2020). Injuries in Elite Korean Kabaddi Athletes: A Epidemiological Study. In Journal of the Korean Society of Physical Medicine (Vol. 15, Issue 2, p. 57). https://doi.org/10.13066/kspm.2020.15.2.57

Ratamess, N. A. (2011). Strength and Conditioning for Grappling Sports. In Strength and conditioning journal (Vol. 33, Issue 6, p. 18). Lippincott Williams & Wilkins. https://doi.org/10.1519/ssc.0b013e31823732c5

Ross, S. N., & Ware, K. (2013). Hypothesizing the body's genius to trigger and self-organize its healing: 25 years using a standardized neurophysics therapy. In Frontiers in Physiology (Vol. 4). Frontiers Media. https://doi.org/10.3389/fphys.2013.00334

Safran, M. R., Garrett, W. E., Seaber, A. V., Glisson, R. R., & Ribbeck, B. M. (1988). The role of warmup in muscular injury prevention. In The American Journal of Sports Medicine (Vol. 16, Issue 2, p. 123). SAGE Publishing. https://doi.org/10.1177/036354658801600206

Singh, T. P. (2021). Comparison of muscular power and muscular strength endurance level between the circle style male kabaddi players of Panjab University Chandigarh and Guru Nanak Dev University Amritsar. In International Journal of Physical Education Sports and Health (Vol. 8, Issue 6, p. 29). AkiNik Publications. https://doi.org/10.22271/kheljournal.2021.v8.i6a.2276

Thakur, V. (2010). Talent identification in kabaddi. In British Journal of Sports Medicine (Vol. 44). BMJ. https://doi.org/10.1136/bjsm.2010.078725.221

Thompson, V., Mitchell, D., Hegerl, G. C., Collins, M., Leach, N., & Slingo, J. (2023). The most at-risk regions in the world for high-impact heatwaves. In Nature Communications (Vol. 14, Issue 1). Nature Portfolio. https://doi.org/10.1038/s41467-023-37554-1

Utama, M. B. R., Adi, S., & Subekti, M. (2022). The Height and Weight Analysis of Men's Kabaddi Athlete in Asian Games 2018 Jakarta Palembang. In Advances in Social Science, Education and Humanities Research/Advances in social science, education and humanities research. https://doi.org/10.2991/assehr.k.211125.106

Warming up for sport. (2023). https://www.topendsports.com/medicine/warmup.htm

Warneke, K., Konrad, A., & Wilke, J. (2024). The knowledge of movement experts about stretching effects: Does the science reach practice? In PLoS ONE (Vol. 19, Issue 1). Public Library of Science. https://doi.org/10.1371/journal.pone.0295571

Warneke, K., Plöschberger, G., Lohmann, L. H., Lichtenstein, E., Jochum, D., Siegel, S. D., Zech, A., & Behm, D. G. (2024). Foam rolling and stretching do not provide superior acute flexibility and stiffness improvements compared to any other warm-up intervention: A systematic review with meta-analysis [Review of Foam rolling and stretching do not provide superior acute flexibility and stiffness improvements compared to any other warm-up intervention: A systematic review with meta-analysis].

Journal of Sport and Health Science/Journal of Sport and Health Science, 13(4), 509. Elsevier BV. https://doi.org/10.1016/j.jshs.2024.01.006

Weerapong, P., Hume, P. A., & Kolt, G. S. (2005). The Mechanisms of Massage and Effects on Performance, Muscle Recovery and Injury Prevention [Review of The Mechanisms of Massage and Effects on Performance, Muscle Recovery and Injury Prevention]. Sports Medicine, 35(3), 235. Springer Science+Business Media. https://doi.org/10.2165/00007256-200535030-00004

Author information

Information about the authors/Author Biographies:

Author Information	
Muhammad Isnandar* **(Author 1)** **Corresponding Authors**	https://orcid.org/0000-0001-8364-6760 Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna. **Address:** Alumunium Raya Street. No.77, Tj. Mulia Hilir, Medan City, Sumatera Utara, 20241, Indonesia **Disciplines:** Physical Education and Sport Science **Skills And Expertise:** Physical Therapy and Sports Massage Authors' Contribution: abcde Contact e-Mail: muhammadisnandar7@gmail.com
Farid M. Alhumary (Author 2)	https://orcid.org/0009-0009-8401-6002 Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna. **Address:** Alumunium Raya Street. No.77, Tj. Mulia Hilir, Medan City, Sumatera Utara, 20241. Indonesia **Disciplines:** Sports Science **Skills And Expertise:** Sports Science Authors' Contribution: abcde Contact e-Mail: malhumary@gmail.com
Krzykarist (Author 3)	https://orcid.org/0009-0008-0730-1013 Physical Activity and Sport Pedagogy, Klaipeda University, Lituania. **Address:** 84 Herkaus Manto Street, Klaipeda LT-92294, Lithuania **Disciplines:** Physical Activity and Sport Pedagogy **Skills And Expertise:** Teacher Education Educational **Authors' Contribution**: ad Contact e-Mail: portpranenas1977@gmail.com
Restin Zega (Author 4)	https://orcid.org/0009-0009-8117-0397 Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna **Address:** Alumunium Raya Street. No.77, Tj. Mulia Hilir, Medan City, Sumatera Utara, 20241, Indonesia **Disciplines:** Sport Science. **Skills And Expertise:** Sport Science Anaysis **Authors' Contribution**: abd Contact e-Mail: restinzegaa@gmail.com
Reymond Benedith Hutajulu (Author 5)	https://orcid.org/0009-0000-2759-402X Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna. **Address:** Alumunium Raya Street. No.77, Tj. Mulia Hilir, Medan City, Sumatera Utara, 20241, Indonesia **Disciplines:** Physical Education **Skills And Expertise:** Physical Education **Authors' Contribution:** acd Contact e-Mail: benedithhutajulu@gmail.com
Rachel Junika Abelia Putri (Author 6)	https://orcid.org/0009-0003-2604-1708 Physical Education Program, Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Indonesia **Address:** Alumunium Raya Street. No.77, Tj. Mulia Hilir, Medan City, Sumatera Utara, 20241, Indonesia **Disciplines:** Sport Science **Skills And Expertise:** Sport Science Analysis **Authors' Contribution:** acd Contact e-Mail: abeliaputrirachel@gmail.com
Martin Hofmeister (Author 7)	https://orcid.org/0000-0002-0693-7887 Department Food and Nutrition, Consumer Centre of the German Federal State of Bavaria, Munich, Germany. **Address:** Mozartstraße 9, D-80336 Munich, Germany. **Disciplines:** Sport Science **Skills And Expertise:** Sport Science, Food and Nutrition. **Authors' Contribution:** acd Contact e-Mail: hofmeister@vzbayern.de