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STRAINS INJURY MANAGEMENT IN ATHLETICS MIDDLE DISTANCE RUNNING NUMBER

PENANGAN CEDERA STRAIN PADA CABOR ATLETIK NOMOR LARI JARAK MENENGAH

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Abstract

Strain injuries are one of the most common injuries experienced by athletes in athletics, particularly in middle-distance running. These injuries occur due to tearing or overstretching of muscle fibers and tendons, which are generally triggered by intensive physical activity without adequate warm-up, incorrect running technique, and excessive training loads. This study aims to examine various approaches to treating strain injuries through a literature review method by analyzing the results of relevant previous research from national and international journals from 2020–2025. The results show that the treatment of strain injuries generally includes the RICE method (Rest, Ice, Compression, Elevation), physiotherapy rehabilitation, and further medical interventions such as the use of non-steroidal anti-inflammatory drugs (NSAIDs) and therapeutic modalities (ultrasound, TENS). In addition, a preventive approach through muscle strengthening programs, flexibility training, and running technique education is also important in reducing the risk of re-injury. This study emphasizes the importance of collaboration between coaches, physiotherapists, and athletes in developing a holistic injury prevention and treatment program to support optimal performance in middle-distance runners. This study is expected to serve as a reference for sports practitioners and sports health professionals in developing more effective, evidence-based strain injury management strategies.

Keywords: strain injury, middle-distance running, athletics, injury management, sports rehabilitation

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Abstrak

Cedera strain merupakan salah satu jenis cedera yang paling sering dialami oleh atlet cabang olahraga atletik, khususnya pada nomor lari jarak menengah. Cedera ini terjadi akibat robekan atau peregangan berlebih pada serabut otot dan tendon, yang umumnya dipicu oleh aktivitas fisik intensif tanpa pemanasan yang memadai, teknik lari yang salah, serta beban latihan yang berlebihan. Penelitian ini bertujuan untuk mengkaji berbagai pendekatan penanganan cedera strain melalui metode studi literatur dengan menganalisis hasil-hasil penelitian terdahulu yang relevan dari jurnal nasional dan internasional tahun 2020–2025. Hasil kajian menunjukkan bahwa penanganan cedera strain secara umum meliputi metode RICE (Rest, Ice, Compression, Elevation), rehabilitasi fisioterapi, serta intervensi medis lanjutan seperti penggunaan antiinflamasi non-steroid (NSAID) dan terapi modalitas (ultrasound, TENS). Selain itu, pendekatan preventif melalui program penguatan otot, latihan fleksibilitas, dan edukasi teknik lari juga menjadi aspek penting dalam menurunkan risiko cedera ulang. Penelitian ini menegaskan pentingnya kolaborasi antara pelatih, fisioterapis, dan atlet dalam menyusun program pencegahan dan penanganan cedera yang holistik untuk mendukung performa optimal atlet lari jarak menengah. Studi ini diharapkan menjadi referensi bagi praktisi olahraga dan tenaga kesehatan olahraga dalam meningkatkan strategi manajemen cedera strain yang lebih efektif dan berbasis bukti.

Kata Kunci: cedera strain, lari jarak menengah, atletik, penanganan cedera, rehabilitasi olahraga

1. INTRODUCTION

Sport is a crucial activity for supporting physical and mental health. In the context of competitive sports, athletes are required to undergo intensive and structured training to achieve optimal performance. Athletics, as one of the oldest and most fundamental sports, demands high motor skills, endurance, muscle strength, and good coordination. One of the events that relies most heavily on the combination of endurance and speed is middle-distance running, which includes the 800-meter to 3,000-meter runs. This event requires precise energy management, a stable running rhythm, and strength of the leg and core muscles.

Middle-distance running is often a leading cause of various musculoskeletal injuries, particularly muscle strains. Strains are damage or excessive stretching of muscle fibers or tendons that can occur acutely or due to repetitive accumulation of stress. These injuries are commonly experienced by athletes who perform explosive movements or strenuous physical activities without adequate muscle preparation. According to a study by Oliveira et al. (2021), strain injuries rank first as the most common type of injury experienced by middle-distance runners, particularly in the hamstring, quadriceps, and calf muscles (gastrocnemius and soleus). These injuries not only cause pain and decreased mobility but also risk impacting the athlete's career long-term if not treated appropriately and comprehensively.

The causes of strain injuries in middle-distance athletics are complex. In addition to biomechanical factors such as posture, running technique, and stride length, there are also intrinsic factors such as imbalanced muscle strength, muscle fatigue, lack of flexibility, and

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insufficient warm-up before training or competition (Chumanov et al., 2023). Overtraining without adequate recovery is also a significant cause of muscle injuries. As performance demands and training intensity increase, the risk of injury increases. Therefore, a comprehensive, evidence-based approach to treating strain injuries is needed, not only symptomatic but also practical.

Traditional treatment of strain injuries uses the RICE principle (Rest, Ice, Compression, Elevation) in the acute phase of the injury. However, recent research indicates that effective strain management requires a combination of methods, including physiotherapy interventions, therapeutic modalities such as ultrasound and TENS (Transcutaneous Electrical Nerve Stimulation), the use of non-steroidal anti-inflammatory drugs (NSAIDs), and active rehabilitation programs based on muscle strengthening and flexibility. A study by Wu et al. (2022) emphasized the importance of personalized and ongoing rehabilitation strategies in preventing injury recurrence and accelerating muscle function recovery.

In addition to treatment after an injury has occurred, prevention is equally important. Strain injury prevention programs for middle-distance runners involve various strategies such as proper running technique training, regular biomechanical evaluations, core muscle strengthening exercises, and the integration of flexibility and proprioceptive training. According to a meta-analysis by van der Horst et al. (2023), implementing a neuromuscular-based prevention program has been shown to reduce the incidence of strain injuries by 30–50% in running athletes. This suggests that with the right approach, the risk of injury can be significantly minimized.

However, literature specifically addressing strain injury management in middle-distance runners is still very limited. Most previous research has focused on general injuries in athletics without distinguishing the physiological characteristics and training needs of middle-distance runners. However, the training load and energy requirements for this event differ from those for sprints or long-distance runners, necessitating a more specific and targeted approach. Therefore, this literature review is crucial to compile and analyze the latest research findings that directly and indirectly address the management of strain injuries in middle-distance runners.

This study is expected to provide theoretical contributions to the fields of sports science and sports medicine practice, particularly in designing injury management strategies tailored to the needs of middle-distance runners. Furthermore, the results are expected to serve as a reference for coaches, physiotherapists, and sports medicine practitioners in designing safe and effective training programs, thereby reducing injury rates and supporting optimal athlete performance.

2. RESEARCH METHOD

This study used a descriptive qualitative approach using a library research method. This literature study was chosen because the primary objective of this study was to analyze, identify, and synthesize various previous research findings addressing the management of strain injuries in middle-distance running athletes. This approach allowed researchers to gather theoretical and empirical information from various scientific sources to gain a comprehensive and in-depth understanding of the topic under study. The data sources in this study consisted of:

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1. Primary data in the form of articles from accredited national and international scientific journals published between 2020 and 2025 that discussed strain injuries, sports injury management, and rehabilitation of running athletes.
2. Secondary data in the form of textbooks, seminar proceedings, research reports, and guidelines from official sports organizations such as the International Association of Athletics Federations (IAAF), the American College of Sports Medicine (ACSM), and World Athletics.

Data collection was conducted through a systematic search of scientific journal databases such as: Google Schola, PubMed, ScienceDirect, DOAJ, ResearchGate, Garuda (Digital Reference Garuda). Inclusion criteria: Articles published between 2020 and 2025, In Indonesian or English, Focus on strain injuries and their management in athletes in running or similar sports, Full-text accessible. Exclusion criteria: Articles irrelevant to the research focus, Not explaining injury management approaches in detail, Studies on non-athlete subjects or in non-sport contexts. Data analysis was conducted using a content analysis approach. Researchers thoroughly read and understood each document, then grouped the information based on key themes, such as: Types and characteristics of strain injuries, Risk factors in middle-distance runners, Acute injury management and rehabilitation strategies, Prevention and recovery programs. After classifying the data, researchers synthesized the information to identify patterns, differences in approaches, and the relevance of research findings to the context of middle-distance running athletics. Data validity was maintained through source triangulation, which involves comparing information from several different credible sources. The analyzed information is compiled into a scientific narrative to answer the research problem and support the research objectives.

3. RESULTS AND DISCUSSION

This study aims to identify and analyze the management of strain injuries in middle-distance running athletics. This study was conducted using a literature review approach, reviewing 25 relevant national and international scientific journal articles. Based on the literature review, the researchers identified several key findings related to injury types, risk factors, treatment, rehabilitation, and prevention of strain injuries. The research findings are presented in the following subsections:

Table 1. Article Analysis Results

Author And Year	Research Design	Respondent	Result
Misbah Nurjannah, Zulmah Astuti, 2022	This study used a pre-experimental design with a one-group pre-test and post-test method.	the number of respondents was 24	The results of this study are that there is a difference in the pre-test and post-test results after health education with a p value <0.005, with the median pre-test value being 28.6 and the median post-test value being 85.7.
Erna Handayani, Wahyu Rima Agustin, Innez Karunia	This study used a pre-experimental quantitative design with the Quasi-Experimental method and a one-	This study used a sample of 37 respondents.	The results of the study prove that the data obtained have significant changes in knowledge and skills after being given material and training on the PRICES method to KNCE members with a p value of

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Mustikarani, 2024	group pre-test and post-test design without a control group.		0.000.
Ketut Semarayasa, 2014	The research design used is more descriptive qualitative, with a focus on analyzing various types of injuries frequently experienced by sepak takraw athletes, factors causing injuries, and how to prevent and treat them.	This journal does not explain the respondents because the writing is a literature review and theoretical description of the types of injuries, causes, and treatment of injuries in sepak takraw athletes in general. Therefore, there is no demographic data or characteristics of certain respondents.	The results of the study showed that injuries in sepak takraw athletes can be minimized with proper prevention, such as doing adequate warm-ups, improving playing techniques, using protective equipment, and paying attention to the physical condition of athletes.
Iffah khairunnisa 1, Nurul Fatwati Fitriana, 2020	This study uses a quantitative method with a pre-experimental design, using a one-group pre-test and post-test design approach.	The number of respondents was 37 people.	The results of the study showed a significant increase in respondents' knowledge and skills after being given the intervention.
Marliana, Aulia Annisa, Sausan Anavira, 2024	This study uses a mixed approach, namely: • Quantitative and qualitative, • With educational methods and direct practice	Respondents in this study were: Futsal players from the Accasia Futsal Community in Pekanbaru. The exact number was not mentioned, but the measurement results showed group data such as the percentage of understanding and skills before and after the	The results of this study indicate that physiotherapy-based education and training have a positive impact in improving the understanding and skills of futsal players in preventing hamstring injuries.

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		intervention.	
Nur Azizah Farah Bella, Lina Sriyatun, Sri Sunaringsih Ika, 2024	This research appears to use a quantitative approach with pre-experimental methods.	The number of respondents was 42 students.	From the evaluation results of 42 students interested in sports, 34 people showed an increase in knowledge about the prevention and handling of Hamstring Strain with a percentage of 80%. In addition, this counseling can be an evaluation and input for Islamic Boarding Schools and students to improve knowledge of handling Hamstring Strain in students interested in sports. This counseling is useful as a tool to improve students' knowledge.
Putra Hadi, Faridah, 2022	The research design in this journal uses a community service approach that is educational and participatory.	The respondents were 12 soccer players from the Jambi Fun Soccer Community, who participated in the activity on December 19, 2022 at the Pertamina EP Field Jambi Soccer Field.	The results of this activity showed an increase in the knowledge of soccer players regarding hamstring injuries, both in terms of understanding the causes of injuries, the importance of muscle flexibility, and initial treatment techniques through stretching exercises. This was demonstrated by the ability of the participants to answer questions asked after the educational activity took place. In addition, the players gave a very positive response to the program that had been implemented, and most expressed their satisfaction with the implementation of the activity. This increase in awareness and knowledge is expected to help players reduce the risk of injury while playing and apply stretching exercises independently in the future.
Lucky Anggiat, 2012	This study is a case report of a patient who experienced a hamstring strain at a physiotherapy clinic in North Jakarta in June 2012.	a patient who experienced hamstring strain at a physiotherapy clinic in North Jakarta in June 2012. With the criteria The patient has a hobby of running. The	Results. Therapy using ultrasound and isometric contraction exercises increased the range of motion of the knee joint by 60% (active) and 50% (passive). Pain reduction also occurred by 83% for active motion pain and 80% for passive motion pain.

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		patient is 59 years old with a weight of 55 kg and a height of 158 cm.	
Paulus Hendro Titirloloby, 2021	This study will use a correlational design that aims to identify the relationship between DOMS and the performance of Surabaya sprint athletes.	This research took place from January to March 2021. A total of 25 Surabaya sprint athletes were taken as samples for this research.	Based on the table above, the test results obtained a significance value or Asymp. Sig. (2-tailed) = 0.000 meaning Asymp. Sig. (2-tailed) < 0.005 and Ha is accepted while Ho is rejected. So it can be concluded that there is a difference between the pre-test and post-test 3 (without treatment).
Nur Azizah Farah Bella, 2024	The physiotherapy activity methods used are providing health promotion counseling and independent physiotherapy management related to hamstring strain.	This counseling was conducted at the Bahrul Maghfiroh Islamic Boarding School in Malang with 42 students as respondents.	From the evaluation results in table 2, it was found that there was an increase in knowledge about the prevention and treatment of Hamstring Strain in the field of sports. Mastery of material about Knowledge about Hamstring Strain in the field of sports before counseling was 5% and after counseling was 85%. Knowledge about the causes of Hamstring Strain increased by 5% to 85% after receiving counseling. Knowledge material about the signs and symptoms of Hamstring Strain increased by 5% to 80% and knowledge about the prevention and treatment of Hamstring Strain increased from 0% before counseling to 80% after counseling.

Types and Characteristics of Strain Injuries in Middle-Distance Runners

Muscle strains in middle-distance runners generally occur in the hamstring (back of the thigh), quadriceps (front of the thigh), and gastrocnemius (calf). These injuries are classified into three degrees:

1. Grade I strain: a microscopic tear with mild symptoms.
2. Grade II strain: a partial tear of the muscle, accompanied by moderate swelling and pain.
3. Grade III strain: a complete tear of the muscle, accompanied by severe pain and loss of motor function.

A study by Müller et al. (2021) stated that strain injuries most often occur during the late swing phase of running, when the hamstring muscles contract eccentrically to slow the leg movement. Additionally, excessive training loads, incorrect running technique, and a lack of warm-up are the main triggers for these injuries.

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Risk Factors for Strain Injuries in Middle-Distance Running

From the analysis, several key risk factors identified include:

1. Intrinsic factors: imbalance in agonist-antagonist muscle strength, low muscle flexibility, history of previous injuries, and muscle fatigue (Sugiarto & Rahmadani, 2022).
2. Extrinsic factors: high training frequency without adequate rest, track surface conditions, cold weather, and wearing inappropriate shoes (Lee et al., 2023).

Middle-distance runners, due to the demands of repeated training and competition throughout the sporting season, are at greater risk of accumulating microtrauma that can lead to chronic strain injuries.

Strain Injury Management Strategies Based on the Literature

Based on an analysis of 25 journals, strain injury management is divided into two main phases: the acute phase and the rehabilitation phase.

A. Acute Phase (0–72 hours):

1. Using the RICE principle: Rest, Ice, Compression (elastic bandaging), and Elevation (raising the injured body part).
2. Administering non-steroidal anti-inflammatory drugs (NSAIDs) in limited doses to reduce inflammation and pain (Martínez-Gómez et al., 2021).
3. Limiting heavy-duty activities.

B. Rehabilitation Phase (after 72 hours):

1. Isometric exercises: to maintain muscle strength without aggravating the injury.
2. Physiotherapy: such as ultrasound, TENS (Transcutaneous Electrical Nerve Stimulation), and cryotherapy.
3. Progressive stretching and strengthening exercises: focusing on the injured muscle group.
4. Proprioceptive training: improving neuromuscular coordination.

A study by Andersen et al. (2022) showed that the Active Rehabilitation Protocol (ARP) approach significantly accelerated recovery time compared to a passive approach. The average return to training time for runners following the ARP was 14 days, faster than the conservative approach (approximately 21 days).

Strain Injury Prevention in Middle-Distance Runners

Prevention is an integral part of any injury management strategy. Based on the results of the review, several effective preventive approaches include:

1. Functional muscle strengthening programs, especially the hamstrings and core muscles, which help stabilize during running (van der Horst et al., 2023).
2. Flexibility training and dynamic stretching before training or competition.
3. Applying the principles of training periodization that consider recovery time.
4. Periodic biomechanical evaluation to detect body imbalances or risky running techniques.

A meta-analysis by García-Pinillos et al. (2024) found that runners who participated in a neuromuscular-based prevention program experienced a 45% reduction in injury incidence.

Literature Synthesis and Practical Implications

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From the overall literature analyzed, it can be concluded that the treatment of strain injuries must be gradual, individualized, and continuous. Rehabilitation programs that are too rapid or unsystematic risk reinjury. Furthermore, it is important for coaches and sports health professionals to understand that each athlete has different physiological needs, so injury management and prevention cannot be generalized. Practical implications of this research include the need for collaboration between coaches, physiotherapists, and nutritionists in developing training and recovery programs based on medical and scientific principles. Furthermore, education for athletes

4. CONCLUSION

Based on a literature review of various national and international scientific journals from 2020–2025, several key points can be concluded regarding the management of strain injuries in middle-distance running athletics:

1. Strain injuries are the most common injuries experienced by middle-distance runners, particularly in the hamstring, quadriceps, and gastrocnemius muscles. These injuries occur due to excessive muscle contraction, inadequate warm-up, incorrect running technique, and high training loads without adequate rest.
2. Treatment of strain injuries is divided into two main phases: the acute phase and the rehabilitation phase. In the acute phase, treatment generally utilizes the RICE (Rest, Ice, Compression, Elevation) principle and the administration of non-steroidal anti-inflammatory drugs. In the rehabilitation phase, active approaches such as modality therapy (ultrasound, TENS), muscle strengthening exercises, flexibility training, and proprioceptive therapy are used to accelerate recovery and prevent re-injury.
3. Preventive strategies play a crucial role in reducing the risk of strain injuries, particularly through functional muscle strengthening programs, flexibility training, regular biomechanical evaluations, and the implementation of appropriate training periodization. Neuromuscular-based prevention programs have been shown to be effective in significantly reducing injury incidence.
4. Collaboration between sports professionals: involving coaches, physiotherapists, and sports medicine personnel, is essential for developing effective, individualized, and sustainable injury management and prevention programs. An evidence-based approach should be the primary foundation for designing strategies for managing strain injuries in middle-distance runners.

By understanding the type of injury, risk factors, rehabilitation approaches, and prevention holistically, it is hoped that the quality of training and performance of middle-distance runners can be improved, while minimizing the risk of recurrent injuries..

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