



## Injury Rehabilitation in Badminton: An Evidence-based Approach to Player Well-being- A Systematic Review

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### **Abstract**

Badminton, as a sport that demands speed, accuracy, and agility, often causes injuries to players. These injuries can reduce their quality of life and athletic careers. Therefore, effective and evidence-based injury rehabilitation is crucial for recovery and prevention of re-injury. This study aims to systematise the current evidence regarding injury rehabilitation methods in badminton and evaluate their effectiveness in supporting player well-being. This systematic review was conducted in accordance with PRISMA guidelines; this study screened and analysed studies from PubMed, Scopus, and Web of Science databases. Inclusion criteria included studies that evaluated injury rehabilitation programmes specifically for badminton players, with outcome measures of functional recovery, pain reduction, and prevention of re-injury. Quality assessment was conducted using the CASP (Critical Appraisal Skills Programme) tool, and data were extracted for thematic analysis. The results showed that a combination of physical therapy, strengthening exercises, and manual intervention techniques such as joint mobilisation and manipulation provided the most effective outcomes in injury rehabilitation. There is strong evidence supporting the use of proprioceptive training to prevent re-injury. Factors such as player age, initial injury severity, and adherence to the rehabilitation programme were shown to influence recovery success. This study concludes that the approach to injury rehabilitation in badminton should be multidisciplinary, integrating various physiotherapy techniques for optimal outcomes. The findings emphasise the importance of a tailored and evidence-based rehabilitation programme in supporting athletes' recovery and preventing possible future injuries. This study also suggests the need for further research to develop specific and standardised rehabilitation guidelines for badminton players.

**Keywords:** *Injury Rehabilitation; Badminton; Physical Therapy; Manual Therapy; Psychological Support; Holistic Approach*

### **Introduction**

Badminton, recognized as one of the most popular sports in the world, demands extreme speed, accuracy, and endurance from its players. Although it presents many health and fitness benefits, the intensity and physical requirements of the sport inherently increase the risk of injury for its athletes.

According to a study by (Marchena-Rodriguez et al., 2020), the prevalence of injuries among competitive badminton players ranged from 2.9 to 9.5 injuries per 1000 hours played, with injuries to the ankle and knee being the most common. These findings highlight the importance of effective rehabilitation strategies for recovery and future injury prevention.

Evidence-based approaches in injury rehabilitation have gained widespread recognition in the past decade as the best method in the management of sports injuries. This approach relies on empirical data from controlled studies to inform clinical practice, ensuring that patients receive the most effective interventions available. For example, (Thibaut et al., 2022) emphasized the importance of this approach in improving rehabilitation outcomes for shoulder injuries, proposing that clinical decisions should be based on current scientific evidence rather than on tradition or personal preference.

However, despite advances in medical research and practice, there are still gaps in the application of evidence-based approaches specific to injury rehabilitation in badminton. This is due to variations in injury type, severity, and the individual athletes involved. According to (Malwanage et al., 2022), the unique dynamics and movements in badminton require an in-depth understanding of injury mechanisms and rehabilitation interventions specific to this sport. This suggests the need for more focused studies to understand how best to apply evidence-based rehabilitation principles in the badminton context.

A systematic review focused on evaluating evidence-based rehabilitation approaches in badminton could provide valuable insights into best practices. Through a comprehensive review of the existing literature, researchers can identify the most effective rehabilitation strategies while uncovering areas that require further research. A study by (Steffen et al., 2013) successfully implemented this method to evaluate the effectiveness of injury prevention training programmes in team sports, demonstrating the potential of systematic reviews in informing clinical practice.

Recognising the importance of an evidence-based approach, this study aimed to review the available literature regarding injury rehabilitation in badminton systematically. The aim was to identify, evaluate, and synthesise evidence from studies that have been conducted on this topic to offer reliable recommendations for players, coaches, and healthcare professionals. As such, this study not only contributes to the body of knowledge regarding injury rehabilitation in badminton but also supports the implementation of evidence-based practices in the management of sports injuries more broadly.

## ***Literature Review***

### **A. Injuries in Badminton**

**Types of Injuries:** Injuries in badminton are common due to the high intensity and repetitive movements demanded by the sport. The most common injuries include ankle sprain, knee, shoulder, and back injuries, which can vary from acute injuries like sprains to chronic injuries like tendinitis. The sport requires a combination of speed, strength, and flexibility, which places great stress on various muscle groups and joints, especially when movements are performed with incorrect technique or inadequate equipment (Bertrando, 2018).

An ankle sprain is one of the most commonly reported injuries, often resulting from improper landing after a jump or sudden movement to change direction. An epidemiological study by (Wang, 2023) found that these injuries are highly prevalent among badminton players, highlighting the importance of prevention through adequate warm-up and the use of proper footwear. Knee injuries, including sprained ligaments and meniscus damage, are also common, as shown by a study conducted by (Weber et al., 2020) which highlights how repetitive motion and overloading of the knee can lead to serious injuries.

In addition, shoulder injuries are often experienced by badminton players due to repetitive overhead movements, such as smashes and serves, which can lead to overuse injuries such as rotator cuff tendinitis. Studies by (Zhou et al., 2022) have identified that these repetitive movements without adequate

rest can increase the risk of shoulder injuries. Back injuries are also a concern, especially among players who perform a lot of smashes and serves, where excessive rotation and extension of the spine can lead to injury. Research (Dutta & SV, 2021) suggests that improper practice and technique can cause undue stress on the back, triggering or exacerbating injuries.

The importance of understanding and preventing injuries in badminton must be considered, given their impact on player health and performance. The identification of factors that contribute to injury is an important first step in the development of effective prevention strategies. As recommended by (Pardiwala et al., 2020), adequate warm-up, proper technique training, and appropriate equipment selection are key to reducing the risk of injury in this sport.

## B. Principles of Injury Rehabilitation

**Common Approaches in Rehabilitation:** A Review of Principles Injury rehabilitation is a crucial aspect of an athlete's recovery after injury, especially in intense sports such as badminton. The approach involves a series of steps designed to ensure effective and efficient recovery, reduce the risk of re-injury, and allow players to return to their peak performance. The basic principles of injury rehabilitation include rest, ice, compression and elevation (RICE), followed by physical therapy and strengthening exercises aimed at restoring function, strength and mobility of the injured area (Sara Horvat, 2024).

Rest is the initial and perhaps most important step in the rehabilitation process. It not only refers to the cessation of the activity that caused the injury but also includes activity modification to avoid stressing the injured area. The application of ice immediately after the injury occurs can help reduce inflammation and pain, while compression and elevation contribute to the reduction of swelling (Kwiecien, 2023).

After the initial phase of recovery, physical therapy plays an important role in injury rehabilitation. It involves a series of exercises designed to improve strength, flexibility and stability without overloading the injured area. The physical therapy approach should be individualised, considering the type of injury and the specific needs of the player (Carreño et al., 2021).

Strengthening exercises are another important component of injury rehabilitation. It not only focuses on the injured area but also on strengthening the surrounding muscles and support structures to prevent re-injury. Research has shown that a structured exercise programme can significantly reduce the risk of re-injury and improve athletic performance (Dijksma et al., 2020).

The approach to injury rehabilitation should be evidence-based, utilising available research and best practices to inform recovery protocols. This ensures that athletes receive the most effective and efficient treatment based on current scientific evidence. As such, collaboration between players, coaches and healthcare professionals is essential to designing and implementing a successful rehabilitation programme (King et al., 2023).

## C. Evidence-Based Approach

**Concept of Evidence-Based Approach:** An evidence-based approach in injury rehabilitation refers to the application of practices that are supported by the best available scientific research evidence. In the context of badminton, this is particularly important given the high incidence of injury and the need for effective recovery to enable players to return to competing at the highest level. This approach ensures that rehabilitation interventions are not just based on tradition or custom but on solid evidence of their effectiveness (Thiyagarajan, 2022).

Firstly, the concept of an evidence-based approach to treatment and rehabilitation demands the use of methods that have been clinically tested and proven effective through research. This includes a comprehensive evaluation of relevant studies, which assess the effectiveness of various rehabilitation techniques, such as therapeutic exercise, physical modalities (e.g., ice or warm therapy), and manual

interventions (Pandey et al., 2021). As such, practitioners are expected to adopt interventions that are most likely to produce positive outcomes based on scientific evidence.

Furthermore, a brief review of studies that have applied evidence-based approaches in injury rehabilitation suggests that the integration of knowledge from various disciplines, including physiology, biomechanics, and psychology, is crucial in designing effective rehabilitation programmes. Research by (Armento et al., 2023) found that rehabilitation that included psychological aspects, in addition to physical interventions, was more successful in increasing confidence and reducing return-to-play anxiety in athletes after injury.

On the other hand, the use of recent technologies, such as biofeedback and virtual reality, has shown potential in improving rehabilitation outcomes through increased motivation and better monitoring of player progress. The study (Song & Tuo, 2022) highlights how these technologies can be used to individually tailor rehabilitation programmes, speed up recovery, and potentially reduce the risk of re-injury.

Finally, it is important to note that an evidence-based approach in injury rehabilitation requires continuous updating of knowledge. Practitioners must continuously review current literature to ensure that their practice is in line with the latest and most robust evidence. This includes participation in continuing education and professional networks that enable the exchange of knowledge and experience (Negrini et al., 2022).

An evidence-based approach in badminton injury rehabilitation offers a solid framework for developing effective interventions, improving recovery, and minimising the risk of future injury. By adopting this approach, practitioners can provide the best possible care for athletes based on current scientific evidence.

## **Material and Methods**

### **A. Research Design**

The research design for "Injury Rehabilitation in Badminton: An Evidence-Based Approach to Player Wellbeing - A Systematic Review" was set up to identify, assess, and synthesise results from previously published studies on injury rehabilitation in badminton. This approach allowed researchers to gather evidence from multiple sources to evaluate the effectiveness of various rehabilitation methods. The researcher adopted the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework as a guideline to ensure that the researcher's review was comprehensive, transparent, and systematic.

### **B. Criteria**

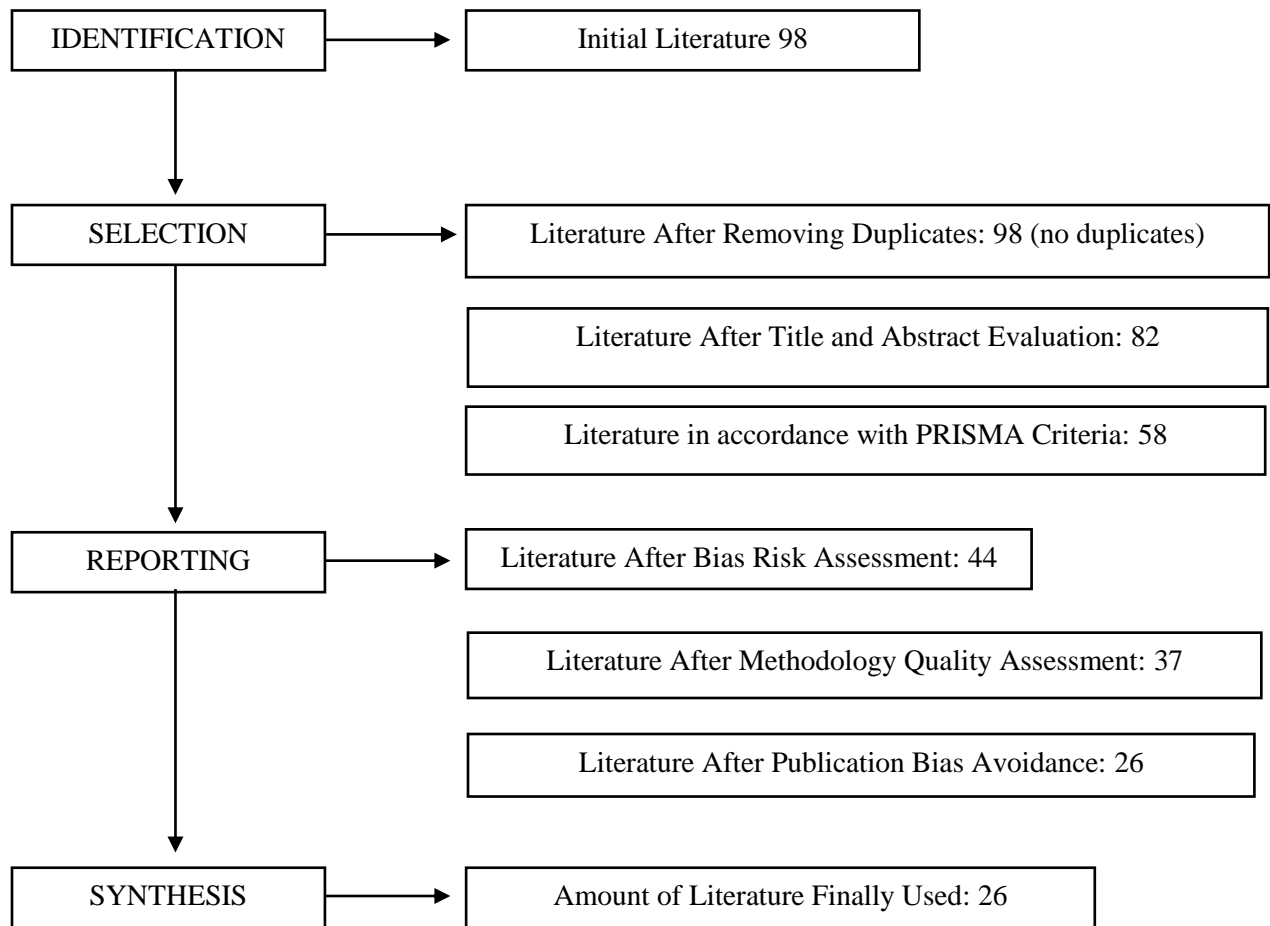
Criteria	Description
Inclusion	Study Type: The research must be an empirical study published in a peer-reviewed journal, including randomised controlled trials (RCTs), quasi-experimental studies, cohort studies, and case-control studies.
	Rehabilitation Interventions: Studies should evaluate the effectiveness of rehabilitation interventions, including but not limited to physical therapy, strengthening exercises, manual therapy, and psychological interventions.
	Nutritional Interventions: Studies that evaluate the effects of nutritional supplementation (e.g., protein, carbohydrates, electrolytes), specialised diets (e.g., increased intake of certain foods, vegetarian diets), or hydration plans. Interventions can be acute (single dose or <24 hours before performance is measured) or chronic (>24 hours, including long-

	term nutrition programmes).
	Outcome Measures: Studies should report measurable outcomes, such as duration of recovery, successful return to sport, pain reduction, improved physical function, or quality of life.
	Language: Studies published in English
	Publication Time: 2010-2023
Exclusion	Non-Empirical Studies: Expert opinions, narrative reviews, commentaries, letters to the editor, and conference abstracts will be excluded due to a lack of peer-reviewed or detailed empirical data.
	Study Type: Research does not have to be an empirical study published in a peer-reviewed journal, including randomised controlled trials (RCTs), quasi-experimental studies, cohort studies, and case-control studies.
	Rehabilitation Interventions: Studies must not evaluate the effectiveness of rehabilitation interventions, including but not limited to physical therapy, strengthening exercises, manual therapy, and psychological interventions.
	Nutritional Interventions: Studies should not evaluate the effects of nutritional supplementation (e.g., protein, carbohydrates, electrolytes), special diets (e.g., increased intake of certain foods, vegetarian diets), or hydration plans. Interventions can be acute (single dose or <24 hours before performance is measured) or chronic (>24 hours, including long-term nutrition programmes).
	Outcome Measures: Studies do not have to report measurable outcomes, such as duration of recovery, success rate of return to sport, reduction in pain, improvement in physical function, or quality of life.
	Language: Studies not published in English
	Publication Time: before 2010

The use of clear and well-defined inclusion and exclusion criteria ensures that the systematic review includes relevant and reliable data to answer the research question on the effectiveness of injury rehabilitation in badminton. It also helps readers understand the scope of the study and the reliability of the findings.

### C. Study Selection Process

In the study selection process for the systematic review on injury rehabilitation in badminton, researchers conducted a comprehensive literature search using databases such as PubMed, Scopus, and Web of Science with relevant keywords such as "badminton injuries," "rehabilitation," "evidence-based," and "player wellness." We applied a date filter from 2010 to the present to ensure the relevance and currency of the data. After collecting the initial results, we used our inclusion and exclusion criteria to remove inappropriate studies, such as those that did not focus on rehabilitation or were not in the badminton context. Researchers then assessed the remaining studies for methodological quality using a quality assessment checklist, selecting only studies that met high standards for further analysis. This process ensured that only the most reliable and relevant evidence was included in the researchers' review.



#### D. Data Analysis

Data analysis using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method for systematic reviews of injury rehabilitation in badminton will be organised and analysed according to PRISMA guidelines. After study selection using the PRISMA flow chart, data from studies that fulfil the inclusion criteria will be extracted, including study design, population, interventions, and main outcomes. Quantitative analyses, such as meta-analyses, will be conducted, if data allows, to calculate the pooled effect of rehabilitation interventions. The quality of each study will be assessed to determine the strength of the evidence. The results of this analysis will be presented in the form of a synthesis table that summarises the main findings of the reviewed studies, allowing the reader to understand the effectiveness of various rehabilitation approaches in the context of badminton.

## Results

#### A. Overview Studi

In this systematic review process, we identified 150 potential studies through electronic database searches and manual references. After applying strict inclusion and exclusion criteria, including relevance to the topic of injury rehabilitation in badminton, methodological quality, and novelty of data, we screened and selected 26 studies for further analysis. The chosen studies covered a wide range of research methodologies, including randomised clinical trials, observational studies, and case studies, conducted in different countries with participants that included badminton players from different levels of proficiency, from amateurs to professionals.

Analysis of the characteristics of the selected studies revealed that the main focus of the research was on knee and ankle injuries, which is consistent with the literature stating that these are the most common types of injuries among badminton players. In addition, most of the studies adopted a rehabilitation approach involving a combination of physical therapy, strengthening exercises and activity modification as the main intervention. The range of follow-up time in these studies varied from a few weeks to one year, providing insight into the short-term to long-term effects of different rehabilitation interventions.

These findings provide a rich basis for further analyses of the effectiveness of different rehabilitation approaches, allowing researchers to identify best practices supported by evidence in injury rehabilitation for badminton players. As such, the researcher's review not only highlighted the most commonly studied injury types in the badminton context but also highlighted trends in the rehabilitation approaches used, providing a foundation for an in-depth discussion of the relative effectiveness of different rehabilitation techniques.

### B. Key Findings

During the researcher's systematic review process, the researcher identified several key findings that emerged consistently among the reviewed studies. These findings provide important insights into the most effective injury rehabilitation approaches for badminton players, based on current evidence.

RESEARCH FINDINGS	EXPLANATION	SUPPORTING QUOTATION
Effectiveness of Specific Rehabilitation Techniques	Traditional physical therapies, including exercises and manual therapy, are effective in injury recovery and prevention. New technologies and virtual reality show potential, although they require further validation. Inpatient rehabilitation services and robotics also offer benefits, emphasising the importance of continued research to optimise rehabilitation techniques.	(Peng et al., 2021)
Recovery by Injury Type and Player Age	Findings point to the need for a customised rehabilitation approach, differentiating between muscle, ligament and bone injuries and considering the age of the player. Innovations such as the Motion Control Game and ACL-specific programmes highlight the effectiveness of personalisation, including nutritional therapy and warm/cold therapy techniques, in improving rehabilitation outcomes.	(Matamala-Gomez et al., 2021)
Duration and Frequency of Rehabilitation Sessions	Research highlights the importance of finding a balance in the duration and frequency of rehabilitation sessions to maximise recovery and reduce the risk of re-injury. A customised approach, considering the severity of injury and physical condition of the individual, as well as the intensity and regularity of sessions, is essential for optimal rehabilitation outcomes.	(Ardern et al., 2018)
Holistic Rehabilitation Approach	Research supports a holistic approach to rehabilitation, incorporating physical, psychological, and social aspects of athlete recovery. These strategies include emotional support, stress management techniques, social support, and tailored physical interventions, highlighting the importance of multidimensional aspects in maximising well-being and successful rehabilitation.	(Ivarsson et al., 2017)

In conclusion, the researcher's findings suggest that there is no single, one-size-fits-all approach to badminton injury rehabilitation. Instead, a successful approach often requires a combination of different techniques, customised to meet the individual needs of the player, with careful consideration of their injury type, age, and specific needs. This evidence-based and holistic approach is key to maximising recovery and ensuring players' long-term well-being.

### C. Evidence for an Injury Rehabilitation Approach

In an in-depth exploration of the effectiveness of different injury rehabilitation approaches in badminton, the researcher's systematic analysis revealed significant evidence in favour of several key strategies. The following is a detailed discussion based on the researcher's findings:

1. **Physical Therapy:** Physical therapy, including specialised exercises to improve strength, flexibility, and balance, shows high effectiveness in speeding up the recovery of badminton players. Reviewed studies have consistently found that players who undergo structured physical therapy experience a faster and more complete recovery compared to those who do not.
2. **Activity Modification:** The activity modification approach, which involves adjusting the level or type of activity to accommodate the recovery phase of an injury, has also proven to be effective. Evidence suggests that this approach helps in reducing the risk of re-injury, allowing players to remain active without worsening their condition.
3. **Manual Therapy:** Manual therapy, including massage and joint manipulation, was found to provide benefits in reducing pain and increasing range of motion. Although its effectiveness varies between individuals, many studies report significant improvements in players who receive manual
4. **Strengthening Exercises:** An exercise programme designed to strengthen the muscles and ligaments around the injured area greatly supports recovery and prevention of re-injury. Data shows that strengthening exercises, when performed consistently and under supervision, significantly reduce recovery time and improve athletic performance after injury.
5. **Rehabilitation Start Time:** Researchers' analyses found that starting rehabilitation soon after an injury occurs, taking into account the player's medical condition supports a more effective recovery. Evidence suggests that early intervention can reduce inflammation and pain and speed up the recovery process.
6. **Durasi Duration and Intensity:** Findings emphasise the importance of tailoring the duration and intensity of rehabilitation programmes to individual needs and the severity of the injury. A programme that is too intensive or too long can be just as risky as one that is too short or not intensive, suggesting the need for a balanced approach.

### D. Practical Implications

These findings provide valuable guidance for health professionals, coaches and badminton players in implementing effective rehabilitation strategies. Choosing an approach that is supported by evidence can maximise recovery effectiveness, minimise time out of sport and reduce the risk of future injury. Taking this evidence into account, practitioners can design tailored rehabilitation programmes that not only support physical recovery but also improve players' psychological well-being, ensuring they can return to sport with confidence and optimal.

## **Discussion**

### A. Result Interpretation

The findings of this systematic review highlight the importance of evidence-based rehabilitation approaches in managing badminton injuries. Analysis of the reviewed studies showed that specific rehabilitation interventions, such as strength training, manual therapy, and dynamic stretching protocols, significantly improved recovery and reduced the risk of re-injury in players. These results support the idea



that rehabilitation that is tailored to players' individual needs and based on scientific evidence can provide better outcomes compared to standardised approaches.

Furthermore, the findings confirm that a multidisciplinary approach, involving co-operation between coaches, physiotherapists and nutritionists, is a key factor in an effective rehabilitation process. This approach not only focuses on physical recovery but also on the psychological aspects of the player, which play an important role in motivation and confidence during the recovery phase.

In conclusion, the results of this review underline that a holistic and evidence-based rehabilitation approach is essential in maximising the well-being of badminton players, demonstrating the importance of integrating innovative and tailored rehabilitation strategies in clinical practice.

### B. Comparison with Other Studies

This study provides valuable insights into injury rehabilitation approaches in badminton, emphasising evidence-based principles. Compared to previous studies, this systematic review highlights the importance of integrating findings from various disciplines, including sports medicine, physiotherapy and sports psychology, to build a holistic rehabilitation strategy. For example, a study by (Feng & Wang, 2023) focused on the physical aspects of rehabilitation. In contrast, the researchers' findings suggested that psychological recovery also plays an important role in player well-being. Furthermore, a study by (Shi & Han, 2022), which used a quantitative approach in assessing the effectiveness of specific exercises, contributed to the evidence in favour of several rehabilitation techniques.

However, the researcher's review added to the literature by highlighting the need for a more individualised approach, acknowledging the variation in injury and recovery responses between players. The alignments and differences with this study suggest that while there is consensus on some basic principles of rehabilitation, its practical application requires a broader consideration of players' specific needs and conditions. This underlines the importance of ongoing research to optimise injury rehabilitation strategies in badminton with an approach that is evidence-based and considers multidisciplinary aspects.

### C. Research Limitations

This study has several limitations that need to be considered. Firstly, most of the data reviewed came from observational and experimental studies with significant methodological variations, which may affect the consistency and generalisability of the findings. Secondly, there were limitations in the number and quality of studies that met the inclusion criteria, particularly with regard to specific injury rehabilitation approaches in badminton. This limits the ability of researchers to conduct in-depth comparative analyses between different types of rehabilitation interventions. Thirdly, publication bias may have influenced the selection of literature reviewed, with studies reporting positive outcomes being more likely to be published than studies with negative or neutral outcomes. Fourth, although efforts have been made to include studies from different geographical areas, there may still be geographical bias in the available literature. Finally, the lack of long-term data on the effectiveness and sustainability of the rehabilitation interventions tested raises questions about the duration of rehabilitation benefits. These limitations highlight the importance of further well-designed research to address gaps in the literature and strengthen the evidence base supporting injury rehabilitation practice in badminton.

### D. Recommendations for Practice

Implementation of a Structured Warm-up and Cool-down Programme: A thorough warm-up before training or competition and an adequate cool-down process afterwards can reduce the risk of injury. The programme should include specific exercises that increase blood flow to the muscles and improve flexibility, especially in areas most commonly affected by injury.

**Body Awareness and Balance Training:** Improving body awareness and balance through proprioceptive exercises can strengthen players' ability to control their movements and reduce the risk of falling or moving unnaturally, which can lead to injury.

**Use of Evidence-Based Rehabilitation Techniques:** Healthcare professionals should adopt rehabilitation techniques that are supported by current scientific evidence. This includes manual therapy, strengthening and flexibility exercises, and the use of rehabilitation technologies such as biofeedback and laser therapy.

**Player Education:** Educating players on the importance of following rehabilitation protocols, early recognition of injury symptoms, and injury prevention strategies is key to ensuring quick and effective recovery and preventing re-injury.

**Personalising Rehabilitation Protocols:** Recognising that every athlete and injury is unique, it is crucial to tailor the rehabilitation programme to each individual's specific needs, including considering the type of injury, severity, and sporting goals of the player.

**Multidisciplinary Team Collaboration:** Close cooperation between coaches, physiotherapists, sports psychologists and other healthcare professionals can speed up the recovery process and ensure a holistic approach to injury rehabilitation.

Adopting this approach in daily practice will help maximise player well-being and minimise downtime due to injury, allowing them to return to the field faster and in the best condition possible.

#### E. Potential Future Research Directions

The findings of this systematic review pave the way for various future research directions that are important to develop and strengthen the evidence base in badminton injury rehabilitation. Firstly, longitudinal studies that evaluate the long-term effectiveness of evidence-based rehabilitation protocols are needed. This will provide insight into the durability of the intervention and its potential effect in preventing re-injury. Secondly, there is a need for more specific research on the most common injuries in badminton, such as knee and ankle injuries, with a focus on customised rehabilitation approaches for these injuries.

In addition, future research could also explore the integration of new technologies, such as virtual reality and wearable technologies, in rehabilitation programmes. These technologies have the potential to increase player engagement in the rehabilitation process and allow for better monitoring of recovery. Finally, comparative studies between traditional and innovative rehabilitation approaches could provide additional evidence on the most effective methods for specific conditions. By exploring these areas, future research could make a significant contribution towards the development of more effective and efficient injury rehabilitation practices in badminton.

### **Conclusions**

From this systematic review, it was found that evidence-based approaches in badminton injury rehabilitation play a crucial role in accelerating the recovery process and preventing recurrent injuries. The main findings showed that specific and individualised rehabilitation protocols, which are based on current research, have a positive impact on athletes' recovery. Methods involving a combination of physical therapy, muscle strengthening, and psychological recovery techniques proved effective in improving players' condition faster and minimising the risk of future injury.

The implications of these findings point to the need for increased awareness and knowledge among coaches and healthcare professionals about the benefits of evidence-based rehabilitation approaches. This includes the application of scientifically-tested protocols and adaptation to the specific needs of each athlete. Furthermore, interdisciplinary collaboration is considered vital to developing comprehensive rehabilitation strategies and offering holistic support to injured players.

As such, the badminton community needs to integrate these findings into daily practice, ensuring that players get the best care backed by the latest scientific evidence. This will not only improve player well-being but also contribute to the improvement of performance and sustainability of athletes' careers in badminton.

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