REVIEW ARTICLE

Aquatic Therapy as a Modality for Managing Chronic Athletic Injuries: A Systematic Review

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Abstract

Background: This review will help bridge knowledge gaps by synthesizing the available research and clinical outcomes in order to understand how aquatic therapy works compared to traditional methods in sports injuries. Evidence from such an analysis is relevant for providing evidence-based recommendations. It works toward better integration into the standard rehabilitation protocol, having recovery outcomes and optimized rehabilitation strategies for injured athletes.

Methodology: A literature search on electronic databases including Google Scholar, PubMed, and Cochrane Library has been extended to studies published in English from 2019 to 2024. These databases broadly cover health-related literature for aquatic therapy and athletic injury rehabilitation.

Results: This review analyzed 5 out of 123 studies obtained from various databases, consisting of two high-quality, two moderate-quality, and one low-quality study. The findings of these studies indicated that aquatic therapy is highly effective for rehabilitating chronic athletic injuries, particularly ankle sprains. All the reviewed studies showed a substantial reduction in pain for athletes who underwent aquatic therapy.

Conclusion: Aquatic therapy presents several advantages in rehabilitating chronic athletic injuries. Its unique properties, pain-reducing, function-improving, and physiologically enhancing, make this a holistic approach to injury management.

Keywords
Aquatic Therapy, Hydrotherapy, Rehabilitation, Sport Injuries.

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Introduction

Athletes and active individuals are more susceptible to sports injuries[1]. According to a survey by the National Institute of Physical Education and the Institute of Sports Medicine at Peking University, knee joint injuries are the most prevalent type, accounting for 19.57% of all injuries. This percentage is significantly higher than injuries to other body parts, such as the ankle (9.11%), shoulder (8.61%), wrist (6.21%), elbow (3.81%), and hip joint (0.09%)[2]. Traditional land-based exercises and rehabilitation techniques are often limited by pain, swelling, and the risk of worsening the injury, which can hinder proper recovery and lead to prolonged rehabilitation[3-4].

Aquatic therapy has emerged as an excellent alternative to conventional rehabilitation methods[5]. This therapy utilizes water's buoyancy, resistance, and hydrostatic pressure to aid the healing process[5]. The buoyant force of water reduces the body's effective weight, lessening the mechanical load on injured tissues and allowing patients to exercise with less weight-bearing stress and discomfort[6]. For example, individuals rehabilitating from knee injuries can exercise for range-of-motion and strengthening without experiencing the stress commonly felt on land[7]. Water also provides natural resistance proportional to the speed of movement, supporting muscle strengthening and endurance-building without heavy weights or high-impact activity[8]. Additionally, water's hydrostatic pressure reduces swelling and enhances circulation, promoting faster healing by delivering necessary nutrients to the injured area and removing metabolic by-products[8]. Moreover, temperature variations in water can optimize rehabilitation benefits, with warm water relaxing muscles and cool water lessening inflammation and swelling[9].

One of the critical advantages of aquatic therapy is its low-impact resistance, making it ideal for individuals experiencing pain or discomfort during high-impact activities on land[10]. Despite these advantages, there is a lack of comprehensive research on the effectiveness of aquatic therapy compared to traditional rehabilitation methods[11]. This gap calls for a systematic review to assess aquatic therapy's impact on functional recovery across various injuries. Such a review would provide evidence-based recommendations and improve the integration of aquatic therapy into standard rehabilitation protocols, enhancing recovery outcomes and optimizing rehabilitation strategies for injured individuals[12].

Methodology

This systematic review adhered to the standards of methodology rigour and comprehensiveness set by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[13].

Sources of Information

The research literature published in English between 2019 and 2024 was thoroughly searched using electronic databases, including Google Scholar, PubMed, and Cochrane Library. These databases were selected based on the general literature that covers a broad base related to health and its topics, which are of concern in this study regarding aquatic therapy in the rehabilitation of athletic injuries.

Research Strategy

The literature search was conducted twice, first in January 2024 and then again in April 2024, to get the most recent studies. The following search strings were applied separately: “aquatic therapy” OR “hydrotherapy” AND “athletic injuries” OR “sports injuries” AND “rehabilitation” OR “recovery” OR “functional recovery”. Second, reference lists from retrieved articles snowballed other relevant studies.

Selection of Studies

Two reviewers independently screened the identified article titles and abstracts. Any disagreement was solved by consulting a third reviewer to reach a consensus finally. Studies were appraised for eligibility according to the following criteria:

- The study involved chronic athletic injuries and looked at the role of aquatic therapy in the rehabilitation and recovery processes.
- The study used standard tools for measuring injury recovery and functional outcomes.
- English language publications.
- Studies focusing on acute injuries and specific subpopulations, non-comparative studies and studies addressing non-athletic injuries were excluded.

Data Extraction

The relevant studies provided information using a standard data extraction form. This form included sample size, demographic information, sample characteristics, and the instruments or measures used to assess rehabilitation. The measurements used to report the effects of aquatic therapy on functional recovery and essential outcomes were also documented in this context.

Quality Assessment

The EPHPP tool was utilized to assess the quality of the literature considered for this review. It involves rating each aspect of every study, including "selection bias," study design, confounding variables, "blinding," "data collection methods," and "withdrawals" or "dropouts." This rating system categorized each research paper as strong, moderate, or poor based on these aspects. All systematic approaches were used to ensure a comprehensive evaluation of evidence on the effectiveness of aquatic therapy in managing chronic athletic injuries.

Results

An extensive search was conducted across multiple electronic databases for studies published between 2019 and 2024 in English. A total of 123 studies were found: 75 in Google Scholar, 25 in PubMed, and 25 in the Cochrane Library. Five studies met our inclusion criteria and were relevant to support the review on the effectiveness of aquatic therapy on chronic athletic injury. This rigorous approach ensured that we included the most eligible and highest-quality studies for our review, allowing meaningful conclusions to be drawn, as shown in Figure-1.

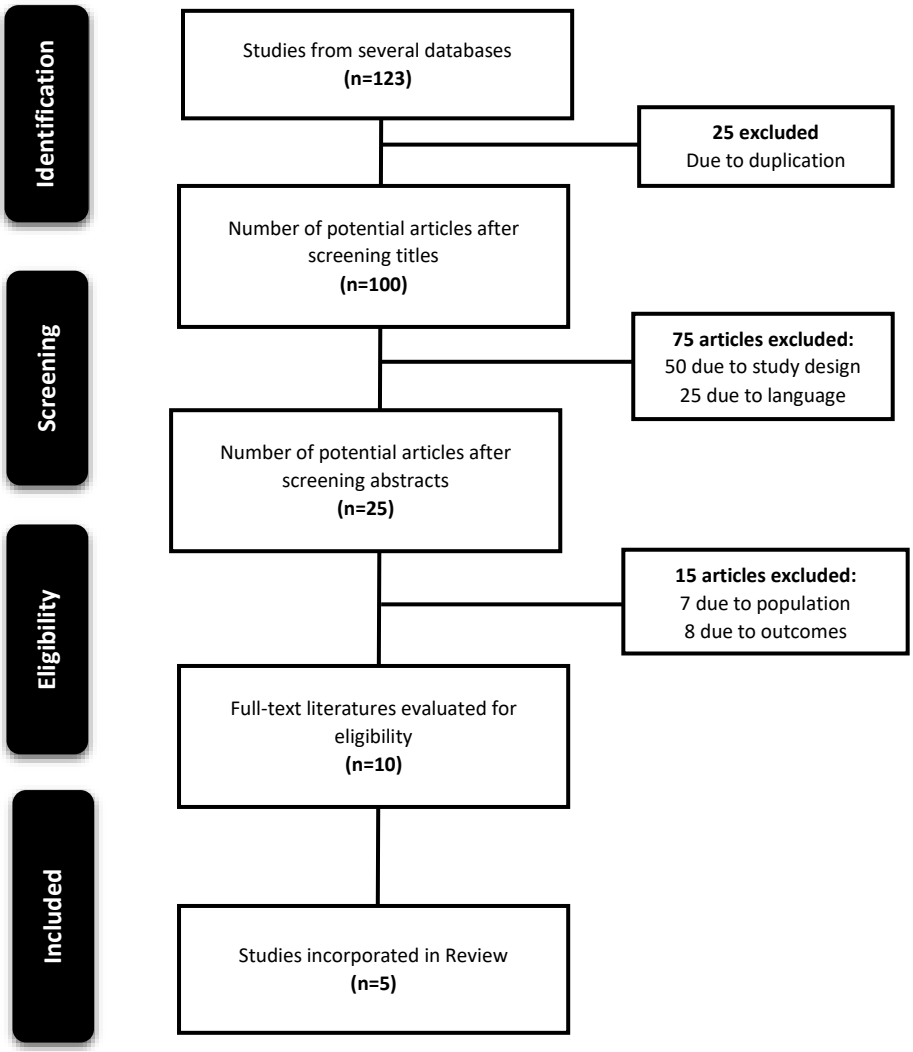

Figure-1 PRISMA Flowchart of Studies Selection

Characteristics of Studies

Following studies have shown aquatic therapy to help fight several chronic athletic injuries by reducing pain, recovering function, and improving muscular and articular strength and mobility.

- Sadaak et al.[14] included 30 volleyball and basketball players of either sex, between 18-30, who were diagnosed with an ankle sprain. The experimental group included 15 participants who received aquatic therapy and 15 others with conventional land-based therapy as the control group. The aquatic therapy group revealed notable improvements in pain intensity ($p<0.001$), dynamic balance, and athletic performance compared to the control group.
- Abbasi et al.[15] conducted a study in which they randomly divided 30 soccer players suffering from ankle sprains into two groups: one received water therapy and the other

underwent land-based training. Both groups saw a considerable decrease in clinical pain and an improvement in the range of motion (ROM) of the ankle. However, the group that underwent water therapy experienced significantly more pain relief, with a 62% reduction in pain compared to a 50% reduction in the land-based group.

- Haider and Al-Mnshdawi[16] included 8 Jiu-Jitsu players who suffered from grade III ankle sprains and were between the ages of 16 and 18. The experimental group was given aquatic therapy in the swimming pool for eight continuous weeks, while the control group was treated with land-based exercises. In such a case, the result showed improved blood variables and kinetic balance in the aquatic therapy group.

- Ragab[17] treated an ankle sprain in 40 football players between the ages of 18 and 35. The experimental group underwent hydrotherapy, while the control group was treated with combined hydrotherapy and land-based exercises for eight sessions a week. There were significant improvements in pain, functional ability of the ankle, and satisfaction in both groups without any significant intergroup difference.

- Javorac et al.[18] performed a case study on a 29-year-old male football player with a grade II ankle sprain. The participant underwent hydrotherapy with supersaturated hydrogen-rich water as the sole treatment. The pain was considerably reduced within 24 hours of treatment.

Table-1 Characteristics of Included Studies

Author	Design	Sample Size	Age	Target Population	Intervention	Outcome Measures	Result	Quality
Sadaak et al.2024[14]	RCT	30	18-30 years	Volleyball, basketball players with ankle sprain	Group-I (Control): 15 patients received a conventional physical therapy program including structured therapeutic exercises, manual therapy, land-based exercises, and external support. Group-II (Aquatic): 15 patients	Pain Intensity (VAS), Dynamic Balance (Star Excursion Balance Test), Athletic Performance (HOP Tests: Single, Triple, 6-m, Cross-over hops), Agility (ATT, IAT), Muscle Power (Single Leg Press)	Significant interaction effect of aquatic therapy and time for VAS, single hop, triple hop, cross-over hop, IAT, and ATT in both affected and non-affected legs ($p<0.001$)	High

					received aquatic therapy.			
Abbasi et al. 2023[15]	RCT	30	-	Soccer players with ankle sprain	Experimental Group (EG): Aquatic therapy. Control Group (CG): Land-based exercises for 8 weeks.	Pain (VAS), Ankle ROM (universal goniometer)	Both groups showed significant improvement in pain and ankle ROM, while improvement rate for pain was higher in the aquatic group (62%) compared to the land-based group (50%)	Moderate
Haider and Al-Mnshdawi, 2022[16]	RCT	8	16-18 years	Jiu-Jitsu players with severe ankle sprain	EG: Exercises with training aids in the swimming pool, 8-week rehabilitation program (24 sessions, 3 sessions/week, 25-30 minutes/session) CG: Land-based exercises for 8 weeks	White Blood Cell Count (WBC), Hemoglobin (HB), Static and Dynamic Balance	Water exercises significantly improved blood variables and kinetic balance in Jiu-Jitsu players with severe ankle sprains	Moderate
Ragab, 2020[17]	RCT	40	18-35 years	Football players with ankle sprain	Group A: Hydrotherapy (lateral step ups, squats, wobble exercises) Group B (Control): Hydrotherapy plus land-based exercises (isometric, active assisted, free, resisted, pain-free active ROM, towel scrunch, biking, open chain	Pain (VAS), Ankle Function (functional scale), Ankle Inversion and Eversion	Both groups showed improvements in pain, ankle functional ability, ROM, and satisfaction, with no significant difference between groups ($p > 0.05$).	High

					strengthening, proprioceptive training) for 8 sessions over one week Both groups had 45-minute sessions with 10 minutes warm-up, 20 minutes exercises, and 10 minutes cool-down.			
Javorac et al. 2020[18]	Case study	1	29 years	Football player with ankle sprain	Hydrotherapy with super-saturated hydrogen-rich water (6 sessions, 30-min ankle baths over 24 hours, starting ~60 minutes post-injury)	Pain (VAS), Ankle Circumference	VAS pain score dropped to 20 points (mild pain) at the 24-hour follow-up	Low

Discussion

This comprehensive analysis emphasizes the significant advantages of water treatment as a rehabilitation method for chronic athletic injuries, particularly ankle sprains. Current literature indicates that the unique properties of water, such as buoyancy, resistance, and hydrostatic pressure, contribute to the healing process. All the studies reviewed showed notable pain reduction among athletes receiving aquatic therapy. Sadaak et al.[14] discovered that volleyball and basketball players experienced a significant decrease in pain as their athletic performance factors improved, including dynamic balance and agility. On the other hand, Abbasi et al.[15] found that pain reduction in the aquatic therapy group was significantly higher than in the land-based exercise group. This highlights the pain-relieving effects of aquatic intervention. The buoyancy of water reduces mechanical pressure on injured tissues, easing discomfort and improving mobility. This is beneficial for injured athletes, as it allows them to exercise with a lower risk of exacerbating their injuries.

Furthermore, the resistance provided by water aids in the development of muscles and joint stability, which contributes to better functional outcomes. There were also critical physiological advantages to aquatic therapy. Haider and Al-Mnshdawi[16] confirmed that Jiu-Jitsu players showed enhanced improvements in blood variables and kinetic balance. These results suggest that such aquatic exercises can improve general physical health and performance, which is

significant for the athlete trying to work his or her way back to the average activity level before the injury. In a study, Ragab[17] reported that hydrotherapy and hydrotherapy combined with land-based exercises considerably improved pain, functional ability, range of motion, and satisfaction in football players. These effects prove that aquatic short-term interventions act as powerful after-processes that may be capable of shortening the window of rehabilitation time. Javorac et al.[18] recently added such positive evidence with a case study on aquatic therapy.

A rapid reduction in pain within the first 24 hours post-treatment could indicate immediate benefits from hydrotherapy, particularly in conjunction with novel approaches such as supersaturated hydrogen-rich water. This may indicate that aquatic therapy is beneficial during the acute phase of injury management and provides quick relief while mitigating inflammation. Such consistency across these studies shows that aquatic therapy should be examined as a mainstream rehabilitation modality for chronic athletic injuries. Hydrotherapy is valuable to traditional rehabilitation programs because it helps decrease pain, improve functional outcomes, and enhance physiological health. Other psychological benefits of exercising in the water, such as decreased stress and anxiety levels, also support this modality for rehabilitating athletes with injuries. Despite these results, several areas need further study. Increasing the sample size and extending the duration of follow-up periods yield more detailed insights into the enduring advantages of aquatic therapy. Another exciting area to be explored is the impacts of different kinds of aquatic exercises or intensities, which may help generate tailored rehabilitation protocols for certain kinds of injuries or populations.

Conclusion

Aquatic therapy has manifold benefits in rehabilitation after chronic athletic injuries because its properties assist in pain minimization, improved functional outcomes, and enhanced physiological health. As it is a holistic and effective strategy in managing injuries, what would happen is that, as the evidence base grows, integrating aquatic therapy into standard rehabilitation practices would significantly enhance the recovery outcomes of athletes.

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Conflict of Interest
None.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

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Acquisition, Analysis or Interpretation of Data: Mangi S, Saima R, Zehra W

Manuscript Writing & Approval: Naz S, Saima R

All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.