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EFFECTIVENESS OF AQUATIC THERAPY ON FOOTBALL PLAYERS' PERFORMANCE: A SYSTEMATIC REVIEW

SKUTECZNOŚĆ ODDZIAŁYWANIA TERAPII W WODZIE NA WYNIKI PIŁKARZY: PRZEGLĄD SYSTEMATYCZNY

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B. Data collection/entry
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C. Data analysis/statistics
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D. Data interpretation
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E. Preparation of manuscript
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Summary

Aquatic therapy involves exercises performed in water, which has a rich historical lineage in therapeutic practices. Ancient cultures recognized the healing properties of water, and in the 20th century, it evolved into the modern aquatic therapy used for movement rehabilitation. The American Physical Therapy Association formally integrated aquatic therapy into physical therapy and rehabilitation in 1992. The unique properties of water, including buoyancy, thermodynamics, hydrostatic pressure, density, and viscosity, make it a safe and effective medium for rehabilitation. Aquatic training reduces tissue impact forces, allowing for increased training without reaching injury thresholds. Despite its potential, the application of aquatic therapy in sports, particularly in football, remains underexplored. The aim of this review was to analyze recent research evidence on the effectiveness of aquatic therapy for improving football players' performance. The systematic review primarily includes randomized controlled trials and experimental studies conducted between 2012 and 2022. Searches were performed using Google Scholar, PubMed, and PEDro databases, employing keywords such as "aquatic therapy approach", "football players", "speed", "agility", "core strength", "power" and "kick velocity". A total of 1,512 articles were initially identified using the specified keywords; however, only 10 articles met the inclusion criteria and were included in the study. The findings indicate that the aquatic therapy approach effectively enhances the performance of football players.

Keywords: core strength, aquatic therapy, agility, speed, power

Streszczenie

Terapia w wodzie to ćwiczenia wykonywane w wodzie, mające bogatą historyczną tradycję w dziedzinie praktyk terapeutycznych. Starożytne kultury doceniały lecznicze właściwości wody, a w XX w. wyewoluowała nowoczesna terapia w wodzie stosowana na potrzeby rehabilitacji ruchowej. W 1992 r. Amerykańskie Towarzystwo Fizjoterapii oficjalnie włączyło terapię w wodzie do dziedziny fizjoterapii i rehabilitacji. Unikalne właściwości wody, w tym wyporność, termodynamika, ciśnienie hydrostatyczne, gęstość i lepkość, sprawiają, że jest ona bezpiecznym i skutecznym środkiem rehabilitacyjnym. Trening w wodzie zmniejsza obciążenia oddziaływujące na tkankę, pozwalając na intensywniejszy trening bez osiągania progów urazów. Mimo istniejącego potencjału terapii w wodzie, jej zastosowanie w sporcie, a w szczególności w piłce nożnej, wciąż nie zostało dostatecznie zbadane. Celem niniejszego przeglądu była analiza najnowszych badań dotyczących skuteczności terapii w wodzie w zakresie poprawy wyników piłkarzy. Przede wszystkim, przegląd systematyczny obejmuje randomizowane badania kontrolowane i badania eksperymentalne przeprowadzone w latach 2012-2022. Przeprowadzono wyszukiwania za pomocą baz danych Google Scholar, PubMed i PEDro, z wykorzystaniem słów kluczowych takich jak „aquatic therapy approach", „football players", „speed", „agility", „core strength", „power" and „kick velocity". Początkowo zidentyfikowano łącznie 1512 artykułów przy użyciu określonych słów kluczowych, jednakże tylko 10 artykułów spełniło kryteria włączenia i zostało uwzględnionych w badaniu. Rezultaty przeglądu wskazują, że terapia w wodzie skutecznie poprawia wyniki piłkarzy.

Słowa kluczowe: siła gorsetu mięśniowego, terapia w wodzie, zwinność, prędkość, moc

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Introduction

Aquatic therapy is a type of exercise that takes place in water. People have been using water for healing purposes for centuries due to its therapeutic properties. However, in the 20th century, aquatic therapy became more popular, especially for movement rehabilitation. The American Physical Therapy Association (APTA) recognized aquatic therapy as a legitimate form of physical therapy and rehabilitation in 1992 [1].

The effectiveness of aquatic therapy can be attributed to several fundamental principles that govern the behavior of water, including buoyancy, thermodynamics, hydrostatic pressure, density, and viscosity. These principles make water a safer and more efficient medium for rehabilitation. Aquatic training significantly reduces the impact forces experienced by bodily tissues during exercise, enabling increased amounts of training before reaching the injury threshold.

Aquatic exercises can significantly reduce peak impact forces (33% to 54%), impulse (19% to 54%), and rate of force development (33% to 62%) compared to land-based exercises. Numerous studies have highlighted the benefits of aquatic therapy in enhancing strength and power following injuries, as well as in sports performance [2-11].

Football is a high-impact contact sport that demands rigorous training regimens involving exercises characterized by substantial intensity and impact forces. The nature of the sport itself, which often includes dynamic movements, sudden changes in direction, and collisions, places football players at an inevitably higher risk of injury during their training sessions.

The training module for football players is designed to enhance all aspects of their physical fitness, which includes strength, speed, agility, and endurance. These exercises often involve dynamic movements, such as sprinting, jumping, and tackling, which impose great stress on the musculoskeletal system. This combination of high-intensity training drills and the repetitive nature of movements can cause overuse injuries that affect joints, muscles, and ligaments.

Aim of the work

The nature of football training demands high-intensity exercises and physical contact that heightens the risk of injuries for players. Therefore, it is of utmost importance to acknowledge these risks, and the implementation of comprehensive injury prevention measures is an integral aspect of ensuring the health and well-being of football athletes throughout their training regimens. This systematic review aims to examine studies conducted within the last decade to assess the effects of aquatic therapy exercise programs on key components of football players' fitness, including speed, agility, and lower limb power.

Methods

This review study is performed following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [12].

To conduct this review, comprehensive searches were carried out across multiple databases, namely PubMed, Google Scholar, and PEDro. The chosen keywords encompassed terms such as "aquatic therapy", "sports players", "football players", "speed", "agility", "power", "core strength", and "kick velocity". Boolean operators "AND" and "OR" were strategically employed to refine search queries, and the search scope was confined to articles published in English within the timeframe of 2012 to 2022. The screening process involved a meticulous examination of titles and abstracts for adherence to predetermined inclusion and exclusion criteria, followed by a thorough assessment of the full texts of potentially eligible articles by two independent reviewers.

Inclusion criteria

- Male football players;
- Studies published in English;
- Studies aimed at determining the effects of the aquatic therapy approach on player performance.

Exclusion criteria

- Studies conducted on post-injury football players.

To evaluate the quality of selected articles, the researchers used the PEDro scale [13,14], which comprises 11 questions and evaluates internal validity and statistical information. Articles that scored ≥5 out of 10 were considered to be of high methodological quality. The studies were analyzed independently by two investigators using the PEDro scale.

Screening and data extraction were conducted independently by two investigators. Data included year of authorship, study subjects, age, interventions, study duration, outcome measures, and results. Discrepancies between investigators were resolved through discussion.

Literature review results

The inclusion and exclusion criteria led to the retrieval of articles from various databases: Google Scholar (1,440 articles), PubMed (69 articles), and PEDro (3 articles). Of these, 1,050 articles were repeated, therefore 460 abstracts were screened. Subsequently, 450 articles were excluded due to reasons such as unavailability in full text, lack of objectivity failure to meet inclusion criteria, or absence of a control group or non-aquatic therapy intervention. Finally, 10 articles were selected for quality assessment as seen in Figure 1.

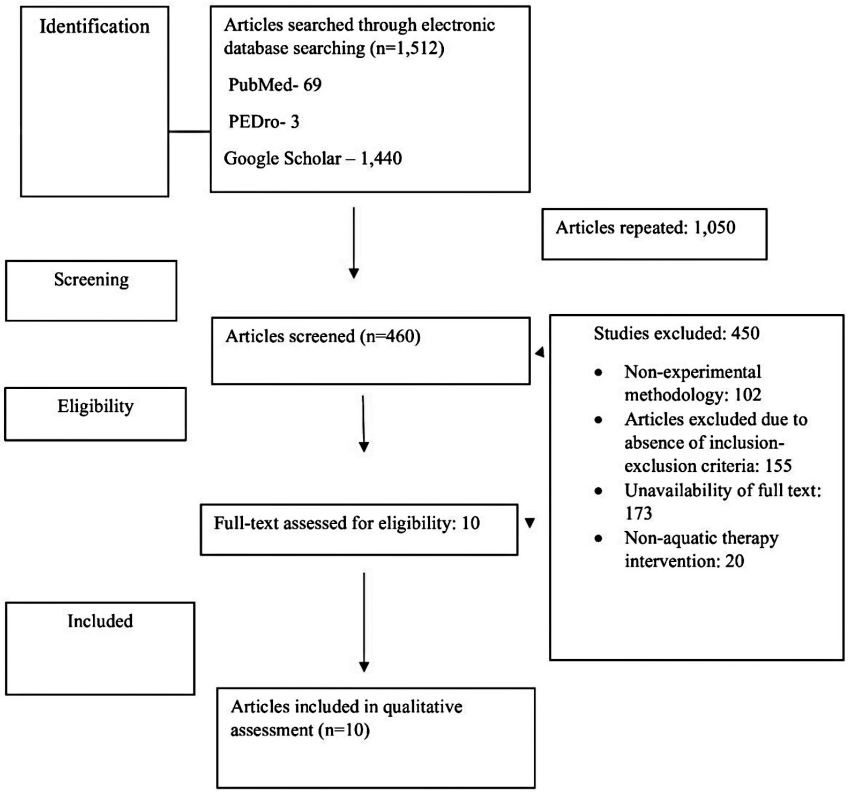

Figure 1. Flow diagram showing the screening and selection of articles

Quality assessment of the study

As shown below in Tables 1 and 2, seven selected articles scored 8/10 [2-4,6,9-11] one scored 7/10 [7], and one scored 6/10 [5] on the PEDro scale. The studies were found to be of high methodological quality when they scored ≥5. One article with a moderate risk of bias had unclear allocation concealment and failed to meet blinding criteria [5].

Table 1. Quality assessment of articles included in systematic review

Authors/ /Criteria	Murugave et al. [2]	Gokul et al. [3]	Ajayaghosh et al. [4]	Roopchand et al. [5]	Daniel et al. [6]	Kate et al. [7]	Jurado Lavanant et al. [8]	Chomani et al. [9]	Esayas Hailu et al. [10]	Poonyanat Nualona et al. [11]
Article No.	1	2	3	4	5	6	7	8	9	10
Random allocation?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Concealed allocation?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Baseline comparability?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blind participants?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Blind therapists?	No	No	No	No	No	No	No	No	No	No
Blind assessors?	No	No	No	No	No	No	No	No	No	No
Follow-up?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Intentiontotreat analysis?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group comparisons?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Point and variability measures?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cumulative score	8	8	8	6	8	7	8	8	8	8

Table 2. Risk of bias assessment table

Article No.	Adequate sequence generation	Allocation concealment	Blinding	Incomplete outcome data addressed	Free of selective reporting	Conclusion
1	Yes	Yes	Yes	Yes	Yes	Low risk of bias
2	Yes	Yes	Yes	Yes	Yes	Low risk of bias
3	Yes	Yes	Yes	Yes	Yes	Low risk of bias
4	Yes	Unclear	No	Yes	Yes	Moderate risk of bias
5	Yes	Yes	Yes	Yes	Yes	Low risk of bias
6	Yes	Yes	Unclear	Yes	Yes	Low risk of bias
7	Yes	Yes	Yes	Yes	Yes	Low risk of bias
8	Yes	Yes	Yes	Yes	Yes	Low Risk of bias
9	Yes	Yes	Yes	Yes	Yes	Low risk of bias

Article No.	Adequate sequence generation	Allocation concealment	Blinding	Incomplete outcome data addressed	Free of selective reporting	Conclusion
10	Yes	Yes	Yes	Yes	Yes	Low risk of bias

General data of included studies

Table 3 gives a summary of all the articles included in this systematic review. The selected articles, published between 2012 and 2022, included male football players with ages ranging from 12 to 30. Total subjects (n) in the studies varied from 18 to 65. The intervention duration ranged from one-time studies to three months. The outcome measures included lower limb power, strength, endurance, speed, agility, and cardiovascular endurance.

Table 3. Summary of all articles included in the systematic review

Article No./Year	Study design	Subjects/ age	Intervention	Study duration	Outcome measure	Result
1/Feb 2022	Experimental study	n=40 Age: 20-23 years	Group 1: Aqua aerobics Group 2: Control group	12 weeks	Strength endurance-Burpee test, leg explosive power-standing broad jump test	Improvement – strength endurance and leg explosive power – Group 1.
2/2022	Experimental study	n=60 Age: 18-25 years	Group 1: Aquatic training Group 2: Nonaquatic training Group 3: Control group	8 weeks	Speed and agility	Aquatic group showed improvement.
3/2017	Experimental study	n=30 Age: 20-25 years	Group 1: Aquatic plyometric training Group 2: Control group	12 weeks	Speed and explosive leg power by 50 meters, Dash and Sargent Jump	Aquatic plyometric training showed improvement.
4/2018	Experimental study	n=18 Mean age: 20.89 years ± 1.78 years	Aquatic plyometric training	6 weeks	Agility – Illinois Agility Test, lower limb power – vertical jump test	Significant improvement

Article No./Year	Study design	Subjects/ age	Intervention	Study duration	Outcome measure	Result
5/2018	Experimental study	n=20 Age: 18-30 years	Group 1: Aquatic training Group 2: Control group	8 weeks	Vertical stiffness-unilateral hop test, jump performance-jump test, and athletic performance-sprint test	Improvement – jump performance and athletic performance in group 1.
6/2013	RCT	n=29 Age: Adult Club team	Group 1: Aquatic exercise Group 2: Contrast therapy shallow water treadmill running	One time study	Vertical jump height, visual analog scale (VAS), squeeze test for adductor strength, sit and reach test, ankle and hip range of movement.	AE program is effective in improving the parameters.
7/2014	Experimental study	n=65 Age: Adult Club team	Group A: Aquatic plyometric training Group B: Land plyometric training Group C: Control group	10 weeks	Drop Jump test and Repeated Jump test	APT showed improvement.
8/2020	Experimental study	n=40 Age: Adult Club team	Group 1: Aquatic therapy Group 2: Control group	2 months	Agility test, 30 m speed test, vertical jump test, wide jump test	Aquatic plyometric training – significant improvement.
9/2015	Experimental study	n=24 Age: Adult Club team	Group 1: Land-based exercises Group 2: Water-based exercises	3 months	600-yard running, barbell squat, 12 mins running	Water-based exercise group showed better improvement.
10/2013	RCT	n=47 Age: Adult Club team	Group 1: Hydrotherapy group Group 2: Land group	6 weeks	Single leg hopping test	Hydrotherapy showed greater improvement.

Notes: RCT – Randomized Control Trial, AE – aquatic exercise, APT – aquatic plyometric training.

Outcome measures

Speed was assessed using various sprint tests, agility using the Illinois agility and T-test, lower limb power through vertical jump tests, and cardiovascular endurance using a 12-minute running test and Burpee test for strength-endurance [2-6,9-11]. One of the articles assessed pain using the visual analogue scale (VAS), adductor strength by squeeze test, flexibility using the sit-and-reach test, and range of movement in the ankle and hip [7].

Discussion of the review results

This systematic review aimed to evaluate the effectiveness of aquatic therapy on football players' performance. It included 10 articles, consisting of eight experimental studies and two Randomized Control Trials (RCTs), all rated high in methodological quality. The studies explored different aquatic training protocols and their effects on football players' performance parameters, such as speed, agility, leg power, and endurance.

Three studies showed significant improvements in speed and agility following aquatic therapy [3-5,9,10], while five studies reported significant enhancements in leg power [2,4-7]. An RCT conducted as a one-time study concluded that aquatic exercises improve leg strength and flexibility compared to a control group undergoing contrast therapy with shallow water treadmill running [7]. Another RCT showed that six weeks of hydrotherapy significantly improved single-leg tests [11].

Various intervention protocols were employed across the studies, which included aqua aerobics, aqua plyometrics, and aquatic exercises, all of which resulted in performance measure improvements. The variability in sample sizes, ranging from 18 to 60 subjects, as well as the wide array of outcome measures, highlighted the diversity in study design.

Despite variations in methodology, most studies demonstrated significant improvements in football player performance parameters after aquatic therapy, reinforcing its effectiveness as an intervention protocol.

Conclusions

In summary, the examination of aquatic therapy exercises has demonstrated a notable improvement in leg power, speed, and agility among football players. Nevertheless, it is noteworthy to mention that the review of the literature did not identify any studies exploring the impact of aquatic therapy on core strength and kick velocity in football players. Kick velocity is an important component in football that influences the effectiveness of goal scoring, passes, and overall performance. The presence of a research gap in the relationship between kick velocity and aquatic therapy and core strength and aquatic therapy leaves scope for future research to explore its potential impact. Addressing these concerns will help to understand the benefits and applications of aquatic therapy in the field of football training.

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References:

1. www.aquaticpt.org [Internet]. Alexandria, VA: APTA Academy of Aquatic Physical Therapy [access 2023 Jan]. Available from: https://aquaticpt.org/
2. Murugavel K, Kodeeswaran N, Prabakaran G, Udhayakumar P. Footballer's corporeal capability as a result of aqua aerobic exercises: an experimental study. International Research Journal of Modernization in Engineering Technology and Science. 2022; 4(2): 883-889.
3. Ajayaghosh MV. Training sequel of aquatic plyometric training on selected physical parameters among male soccer players. Training. 2017; 2(6).
4. Roopchand-Martin S, Gayle B, Evelyn D, Creary-Yan S. The effects of aquatic plyometric training on lower limb power and agility of university rugby and soccer athletes. West Ind Med Journal. 2018; 1-13.
5. Sporri D, Ditroilo M, Pickering Rodriguez EC, Johnston RJ, Sheehan WB, Watsford ML. The effect of water-based plyometric training on vertical stiffness and athletic performance. PLoS One. 2018; 13(12): e0208439. https://doi.org/10.1371/journal.pone.0208439
6. Hoskin K, Dodd K, Chan SP, Rosengarten S, Heywood S. Aquatic exercise compared to contrast therapy with shallow water treadmill running to assist recovery in elite Australian rules footballers. International Journal of Aquatic Research and Education. 2013; 7(4): 5. https://doi.org/10.25035/ijare.07.04.05
7. Chomani SH, Dzai AM, Khoshnaw KK, Joksimovic M, Lilic A, Mahmood A. Effect of aquatic plyometric training on motor ability in youth football players. Health, Sport, Rehabilitation. 2021; 7(1): 66-76. https://doi.org/10.34142/HSR.2021.07.01.06
8. Jurado-Lavanant A, Alvero-Cruz JR, Pareja-Blanco F, Melero-Romero C, Rodríguez-Rosell D, Fernandez-Garcia JC. The effects of aquatic plyometric training on repeated jumps, drop jumps and muscle damage. International Journal of Sports Medicine. 2018; 39(10): 764-72. https://doi.org/10.1055/s-0034-1398574
9. Chomani SH, Dzai AM, Khoshnaw KK, Joksimovic M, Lilic A, Mahmood A. Effect of aquatic plyometric training on motor ability in youth football players. Health, Sport, Rehabilitation. 2021; 7(1): 66-76. https://doi.org/10.34142/HSR.2021.07.01.06
10. Hailu E, Sangeeta RA, Deyou M. Effects of land versus water based fitness program in improving aerobic fitness, muscular strength and speed among young male beginner soccer players. Turkish Journal of Kinesiology. 2015; 1(1): 15-9.
11. Nualona P, Piriyaprasartha P, Yuktanandanab P. The role of 6-week hydrotherapy and land-based therapy plus ankle taping in a preseason rehabilitation program for athletes with chronic ankle instability. Asian Biomed. 2013; 7(4): 553-559.
12. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of Internal Medicine. 2009; 151(4): 264-269. https://doi.org/10.7326/0003-4819-151-4-200908180-00135
13. Maher CG, Sherrington C, Herbert RD, Moseley AM, Elkins M. Reliability of the PEDro scale for rating quality of randomized controlled trials. Physical Therapy. 2003; 83(8): 713-721. https://doi.org/10.1093/ptj/83.8.713
14. Moseley AM, Herbert RD, Sherrington C, Maher CG. Evidence for physiotherapy practice: a survey of the Physiotherapy Evidence Database (PEDro). Australian Journal of Physiotherapy. 2002; 48(1): 43-9. https://doi.org/10.1016/S0004-9514(14)60281-6