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REVIEW ARTICLE

Effectiveness of Water-Based Exercise/Aquatic Exercise for Individuals with Low Back Pain: a Literature Review

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ABSTRACT

Background: Low back pain (LBP) is a common complaint that affects many individuals and can significantly reduce quality of life. Water-based exercise has been proposed as an effective therapeutic method to reduce pain and improve physical function in patients with LBP.

Methods: A literature review was conducted by searching for relevant studies in reputable medical databases. Inclusion criteria included studies that compared water-based exercise with land exercise in individuals with LBP.

Results: Studies show that both water-based exercise and land exercise are effective in reducing low back pain. However, water-based exercise tends to overestimate its effect due to publication bias. Nonetheless, water-based exercise provided a significant reduction in VAS scores. Land exercise showed additional benefits with significant improvements in emotional role and physical function on the SF-36, as well as a decrease in the ODI.

Conclusion: Based on a literature review of seven selected articles, water-based exercises have been shown to be effective in reducing pain in cases of low back pain (LBP). However, its application must consider the technical conditions and medical history of the patient.

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Introduction

Indonesia is the fourth country with the highest prevalence of LBP [1]. According to World Health Organization (WHO) data in 2018, the prevalence of musculoskeletal diseases in Indonesia diagnosed by health workers was 11.9%, including LBP estimated between 7.6% and 37% [2]. Low Back Pain (LBP) affects 619 million people worldwide and is expected to increase to 843 million cases by 2050, largely due to population expansion and aging.

Low back pain (LBP), also known as low back pain, is pain felt in the lower back region. This pain can be localized pain, radicular pain, or both Low back pain (LBP) is one of the most common musculoskeletal disorders and can occur in anyone [3]. Risk factors that can cause LBP include individual factors such as age, gender, Body Mass Index (BMI), smoking habits, physical fitness, history of skeletal disease, trauma, and psychological and psychosocial problems. Work-related risk factors such as workload, excessive physical activity, and stress [4]. LBP is categorized into specific or non-specific. Specific LBP is pain caused by a specific disease or structural problem in the spine, or pain radiating from other parts of the body. Whereas, non-specific LBP occurs when a specific disease or structural reason to explain the pain cannot be identified. Non-specific low back pain falls into 3 subtypes: acute, subacute, and chronic low back pain. This division is based on the duration of the back pain. Acute low back pain is an episode of low back pain lasting less than 6 weeks, subacute low back pain between 6 and 12 weeks, and chronic low back pain lasting 12 weeks or more [5].

Physiotherapy plays an important role in the treatment of LBP, especially in healing to overcome the obstacles and limitations of patients to perform daily functional physical activities. Aims to reduce pain in the patient's lower waist and increase muscle strength while restoring the ability of physical activity in patients with LBP. The modalities used are Transcutaneous Electrical Nerve Stimulation (TENS), Extracorporeal Shock Wave Therapy (ESWT), pilates exercise, massage, stretching, line exercise, land exercise, and water-based exercise [6].

Water-based exercise is a water-based therapy that generally helps improve muscle strength, cardiovascular fitness, and balance. Water-based exercise is used as a physical therapy program for NPB cases. The buoyancy effect makes it easier to perform underwater movements that are difficult to do on land, strengthening the muscles of the abdomen, lower back, and pelvis, these muscles are used to contract and regulate the posture of the lumbar spine [7]. Among the many therapeutic exercises available, therapeutic aquatic exercise is often prescribed by doctors for chronic low back pain, and it is becoming increasingly popular for the treatment of chronic low back pain [8]. He drawback of water exercise is that it can only be done underwater. Lack of coordination with the patient causes the intervention to be unsuccessful because the patient is not familiar with the treatment [9]. Therefore, water exercise results in optimal body composition improvement and reduction of low back pain [10].

In this article, we chose to conduct secondary research because we wanted to review the scientific literature on water-based exercise for low back pain. By doing so, readers can more easily find new insights that are broad, evolving and systematic enough to provide a comprehensive overview of the topic. This secondary research also contains strong scientific evidence to support the claims and recommendations about water-based exercise for low back pain. This is important to provide accurate and useful information for readers. The purpose of this study was to determine how effective water-based exercise intervention is in physiotherapy for LBP patients. Researchers concluded that water-based exercise is very effective for reducing pain in patients. In addition, researchers also showed that the water-based exercise program can prevent and reduce the risk of low back pain and can provide knowledge related to the water-based exercise program so that it can be applied to prevent and reduce the risk of low back pain.

Methods

The study design of this research is a meta-analysis. Compared to individual studies that contribute to a combined analysis, a meta-analysis is a quantitative and formal epidemiologic methodology used to systematically assess previous research studies to reach conclusions about the research subject. The results of a meta-analysis may include more precise estimates of the effect of treatment, disease risk factors, or other factors. Literature sources using Google Scholar were used to search for data with keywords such as "low back pain", "water-based exercise", "land exercise", and "hydrotherapy". The journals used were published between 2012 and 2022, and had an RCT (Randomized Controlled Trials) study type.

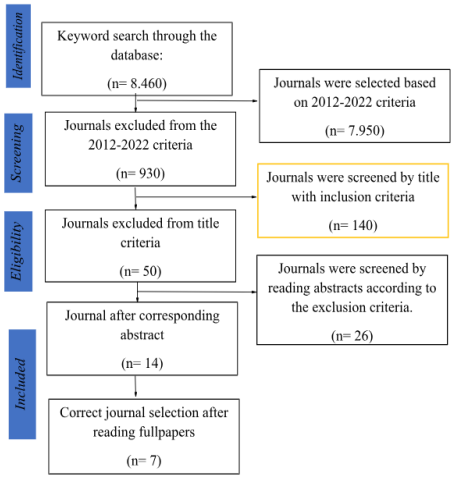

Figure 1 Prisma Flow Chart

After finding relevant journals, a valid measurement of the quality of the clinical trial methodology was conducted in the form of a PEDro scale to obtain a total score, which can be used as an interval level measurement and subjected to parametric statistical analysis. The PICO standards used were (P) low back pain patient, (I) aquatic/water-based exercise, (C) land exercise, (O) pain reduction.

Table 1 Pedro Analysis

PEDro Scale	Mauri´cio Antoˆnio da Luz Jr, et al., (2014)	Tomislav Nemčić *et al.*, (2013)	Hend M.T, Nasar, M.Sc *et al.*, (2021)	Nilay Çömük *et al.*, (2020)	Meng-Si Peng, MSc *et al.*, (2022)	Suttinee Phattharasupharerk *et al.*, (2018)	A. I. Cuesta-Vargas *et al.*, (2012)
Eligibility	yes	yes	yes	yes	yes	yes	yes
Random allocated	1	1	1	1	1	1	1
Concealed allocation	1	1	1	1	1	1	1
Baseline Comparability	1	1	1	1	1	1	1
Blinding all subjects	1	1	0	0	1	1	1
Blinding all therapist	1	0	0	0	1	1	0
Blinding all assessors	1	0	0	0	1	0	0
Adequate follow-up	1	1	1	1	1	1	1
Intention-to-treat analysis	1	1	1	1	1	1	1
Between-group comparisons	1	1	1	1	1	1	1
Point estimated variability	1	1	1	1	1	1	1
Score	10/10	8/10	7/10	7/10	10/10	9/10	8/10
Quality	Excellent	Good	Good	Good	Excellent	Good	Good

Results

The search results obtained six articles where four articles had a low risk of bias and two articles with a moderate risk of bias. The results and discussions in the articles used as the basis for this research study can be accounted for. The PICO appraisal of the articles can be seen in Figure 2 Forest plot.

The results of the analysis in this study, showed a decrease in pain in patients with LBP who were given Aquatic Based Exercise by -1.22 units compared to patients given Land Based Exercise (SMD = -1.22; 95% CI = -3.35 to 0.90) and the results were statistically significant

(p<0.00001). Heterogeneity of the study data showed I2= 97% (random effects model).

The funnel plot shows that the distribution of effect estimates from primary studies with this RCT meta-analysis design lies more to the right of the mean vertical line of the estimate than to the left, indicating publication bias. Because the publication bias tends to be to the right of the mean vertical line which is different in direction from the location of the diamond shape in the forest plot, the publication bias tends to overestimate the effect of Aquatic Based Exercise on pain reduction in Low Back Pain patients (overestimate).

To see the level of effectiveness of the aquatic/water-based exercise program as a Physiotherapy service in LBP cases can be reviewed through many things such as patient conditions, adequate place facilities, patient age criteria and congenital disease factors suffered. The characteristics of respondents in the research articles reviewed can be seen in Table 2 Literature review.

Table 2 Literature Review

Title & Author	Background	Method	Result
Effectiveness of Mat Pilates or Equipment-Based Pilates Exercises in Patients With Chronic Nonspecific Low Back Pain: A Randomized Controlled Trial **(da Luz Jr M. A et al, 2014)**	The Pilates method is widely used for patients with chronic low back pain. Pilates can be done in 2 ways: with specific equipment or without equipment (also known as mat Pilates).	The patients were randomly allocated to 1 of 2 groups: mat Pilates group (n=43) and equipment Pilates group (n=43). Both groups attended 12 Pilates sessions over 6 weeks.	Equipment-based Pilates was superior to mat-based Pilates in the 6-month follow-up for disability and kinesiophobia outcomes. These benefits were not observed for pain intensity and globally perceived effects in patients with chronic non-specific low back pain.
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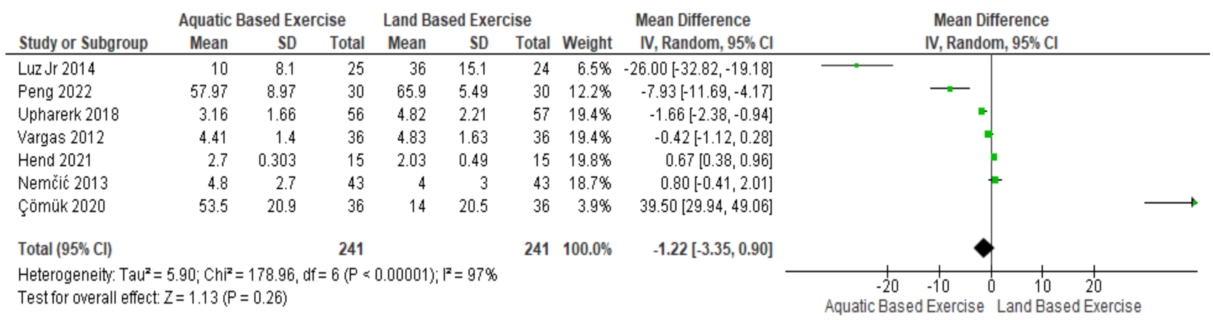

Figure 2 Forest Plot

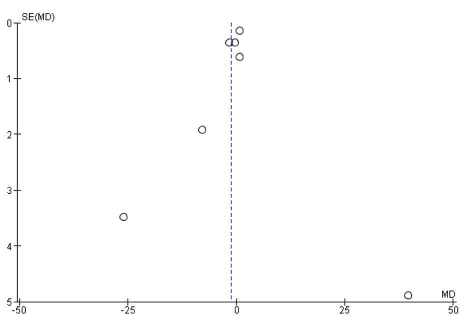

Figure 3 Funnel Plot

Discussion

In the seven selected articles that became the basis of the research, there were four articles that used a comparison intervention between water-based exercise and land exercise in Low Back Pain (LBP) cases. Four journals used water-based exercise and land exercise as a comparison of interventions in low back pain (LBP) cases. One article only used water-based exercise, while the

other two articles only used land exercise as an intervention. The analysis showed that water-based exercise was significantly more effective in reducing pain in LBP patients than land exercise.

The age of the participants in these seven articles ranged from 20 to 50 years old, taking into account inclusion and exclusion criteria and specific characteristics associated with Low Back Pain (LBP). Each article drew participants from their own local population, reflecting geographical diversity from America, Croatia, Egypt, Turkey, China, Thailand and Spain. Although the results did not show significant differences between these studies, the overall research confirmed that water-based exercise is effective as part of physical therapy to reduce pain in LBP.

Compared to land exercise, water-based exercise has been shown to reduce pain intensity, increase lumbar range of motion, and reduce the level of functional disability in patients with chronic mechanical low back pain. Water-based exercise lowers the load on the spine and joints, allowing for more free and comfortable movement. In addition, the therapeutic properties of water can reduce inflammation and promote muscle relaxation. Therefore, aquatic therapy can be a better and safer option for patients with this condition, especially for those who may experience problems or discomfort when performing exercises on land [11].

Patients with chronic low back pain who underwent water-based exercise showed greater improvements in function, pain reduction, quality of life, sleep quality, and mental state compared to those who used conventional physical therapy [12]. Water-based exercise was shown to be a safe treatment for chronic low back pain, and most participants undergoing this therapy were willing to recommend it to other patients with similar conditions [8].

In the research of Balci et al. (2020) in 15 patients given aquatic exercise in an indoor swimming pool with a water temperature of 36°C [11]. There are results that show differences between aquatic therapy exercise and land exercise in reducing pain during activity after treatment. This may be due to the type of exercise and environmental factors in the water that make a difference in aquatic exercise [12]. In the aquatic exercise group, the whole body participates in the therapy session and perhaps the mobility and strength of the whole body has increased which is concluded as a decrease in pain during activity [13].

In line with the research of Balci et al., (2020), aquatic exercise is also proven to be more effective than land exercise in reducing pain severity, reducing the level of functional disability, and increasing lumbar range of motion in patients with chronic low back pain. In this study, the exercises used consisted of stretching and strengthening exercises [14].

The effectiveness of aquatic exercise has been tested on participants using the Visual Analog Scale (VAS), Physical Disability Index (PDI), and Oswestry Disability Index (ODI), as well as follow-up for 1-12 months after the program is completed. The results showed that this exercise is effective in reducing pain in individuals with low back pain (LBP). Aquatic exercise offers a low-impact, supportive environment that reduces stress on the spine and joints, making it especially suitable for individuals with musculoskeletal pain. The buoyancy of water helps to offload body weight, allowing patients to perform movements that might be difficult or painful on land. In addition to pain reduction, aquatic therapy has been associated with improvements in physical function, range of motion, and overall quality of life. These benefits make it a valuable component in the multidisciplinary management of chronic low back pain [15-16].

Conclusion

Based on a literature review of seven selected articles, water-based exercise has been shown to be an effective and safe exercise in reducing pain in low back pain (LBP) patients. Water-based exercise offers several advantages over land-based exercise, including greater pain reduction, improved physical function, and fewer side effects. The researchers found that water-based exercise was able to reduce pain levels faster in their study sample than land-based exercise.

Conflict of Interest

No conflict of interest in this study

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