The Effect of *Land-Based Exercise* on Osteoarthritis Knee Patients' Quality of Life: Systematic Review and Meta-analysis

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Abstract. Introduction: Osteoarthritis (OA) is a chronic condition that affects the joints and is the most prevalent type of musculoskeletal ailment worldwide, particularly in Indonesia.

Methods: According to the following inclusion criteria, the study was conducted: Adults between the ages of 45 and 80 who have been given a diagnosis of knee OA or who have reported symptoms such as joint pain, stiffness, dysfunction, and disability, (1) a Randomized Controlled Trial (RCT), (2) the whole article, and (3) in English. Exclusion criteria included people who had undergone surgical intervention to treat symptoms, participated in aquatic therapies, or had otherwise disclosed OA in other joints.

Results: Land-based exercise significantly reduced pain and stiffness, and the effects were statistically significant. However, land-based exercise has a lower impact on function.

Conclusion: It is possible to argue that land-based exercise can enhance a person's quality of life if they have OA Knee.

Keywords: Land-Based Exercise · Osteoarthritis Knee · OA Knee · Quality of Life

1 Introduction

Osteoarthritis (OA) is a chronic condition that affects the joints and is the most prevalent type of musculoskeletal ailment worldwide, particularly in Indonesia. Osteoarthritis is a heterogeneous set of disorders that cause indications and symptoms in the joints, according to the American College of Rheumatology [1]. The slow and cumulative breakdown of the articular cartilage, as well as changes in the subchondral bone, synovium, meniscus, tendons/ligaments, and muscles, are all symptoms of osteoarthritis, a degenerative disease that affects the entire body and is chronic and systemic [2, 3]. More than 250 million people, or 4% of the world's population, have at least been impacted by this condition, which is characterized by discomfort, stiffness, and a reduced range of motion (ROM) [4, 5]. It significantly reduces quality of life, results in pain or aches, impairs muscular function and mobility, limits daily activities, and creates noticeable impairment [6, 7].

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Both globally and in Indonesia, osteoarthritis is still very common. According to estimates from the year 2008, osteoarthritis disables two million senior persons in Indonesia [8]. According to the 2018 Basic Health Research (Riskesdas), the prevalence of joint illness was 7.3% in Indonesia, with 6.1% of males and 8.5% of women being affected. Osteoarthritis is more common in women (8.46%) compared to males (6.13%), and its frequency rises with age, reaching 11.1% in those aged 45 to 54, 15.5% in those aged 55 to 64, 18.6% in those aged 65 to 74, and 18.6% in those aged 75 and above [9]. All residents of Central Java have an OA prevalence of 18.1% [9]. Any joint that frequently undergoes variations in movement, particularly when holding objects or standing on both feet, is susceptible to osteoarthritis [3, 10]. Examples of such joints are the carpometacarpal I, metatarsophalangeal I, apophyseals joints of the spine, hips, knees, and thighs. The knee joint in the lower extremities is most frequently impacted by OA [11]. Compared to other joints, the knee is the one most frequently damaged by osteoarthritis because it serves as a fulcrum to sustain the body's weight [3, 10].

Osteoarthritis is divided into two categories: primary osteoarthritis and secondary osteoarthritis. In primary osteoarthritis of the knee, articular degradation takes place without any obvious underlying pathology. Injury leads to secondary osteoarthritis. Additionally, underlying illnesses and genetic abnormalities such skeletal dysplasia, endocrine issues, and calcium crystal deposition may cause it [4]. Age, gender, race, genetics, congenital, diet, obesity, history of injury or knee surgery, decreased proprioception, sports activities, excessive or insufficient physical activity, mechanical factors, muscle weakness around the knee, and knee misalignment are just a few of the risk factors that can cause OA [12, 13]. The biggest risk factor is getting older. The exact mechanism is yet unknown, although it appears to be strongly tied to biological processes occurring in the joint. For example, as people age, their number of chondrocytes in joint cartilage declines, and this decline is inversely proportional to the degree of cartilage injury [12, 14]. The course of joint cartilage degradation and aberrant bone formation is impacted by these risk factors [13]. Complaints of knee osteoarthritis were discovered in a recent study, including pain while squatting, enlarged bones, crepitus, joint pain, restricted motion, stiffness, and varying degrees of inflammation [4, 15, 16]. The most prevalent complaint among people with OA is pain, which is also the main source of impairment [2]. The capacity to do everyday activities (ADL) is impacted by OA's progressive nature and discomfort in those with knee OA, which lowers quality of life (QOL).

Individuals with knee OA should engage in land-based exercise, which necessitates foot contact with the floor. Examples include walking, tai chi, and muscular strengthening . Physical activity and exercise are strongly advised to enhance joint function, which has declined as a result of degenerative disorders, and to reduce discomfort. Exercises that strengthen the quadriceps (among which the rectus femoris is one) and hamstrings (among others) in the lower leg have been demonstrated to lessen pain and disability in people with knee OA. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores were improved by quadriceps and hamstring strengthening more than by quadriceps alone, according to one study [17].

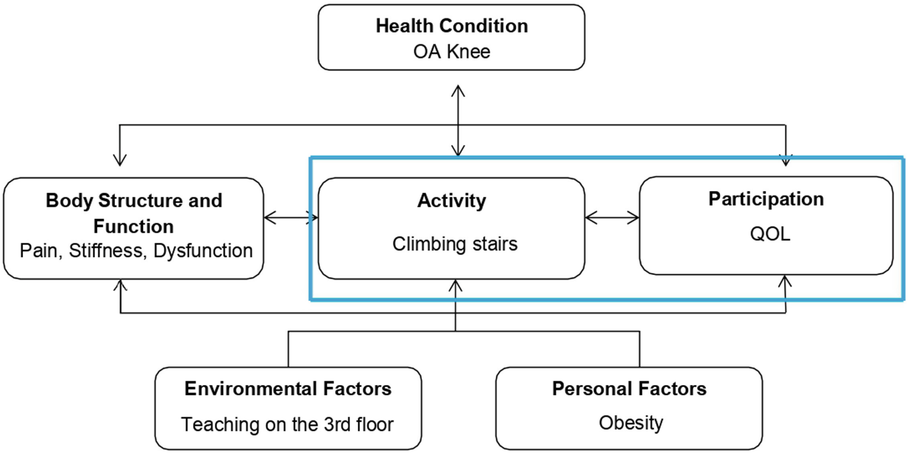

Fig. 1. Adapted ICF model for OA Knee

People who have knee OA symptoms such as joint pain, stiffness, dysfunction, and disability—symptoms for which they have received a diagnosis or who have mentioned them—prefer to avoid physical activity because the pain and discomfort that drives them psychologically will only make their symptoms worse [18]. In fact, as a type of rehabilitation or treatment, the American College of Rheumatology explicitly suggests strengthening exercise regimens. However, the goal of this research was to ascertain whether the functional intervention (ICF activity level) had an effect on each participant's quality of life (ICF participation level). In other words, this evaluation will look at land-based exercise and how it affects people with knee OA's quality of life. Does, for instance, an improvement in walking capacity affect participation (QOL)? In that case, what effect? The impact of ICF activity level on participation rate (QOL) for individuals with knee OA will be highlighted in this review (Fig. 1).

Exercise has been found to have a variety of positive impacts on QOL, including raising psychological well-being, boosting daily activity-related muscle strength, and enhancing or maintaining cartilage integrity. However, there is considerable disagreement over the interventions that will significantly enhance the quality of life for people with knee OA. The purpose of this study was to ascertain if a land-based exercise intervention could enhance the quality of life for those who have been diagnosed with knee OA.

2 Methods

This type of research utilizes a systematic review method based on *Preferred Reporting Items for Systematic Reviews and Meta-Analysis* (PRISMA).

2.1 Search Strategy

This research was conducted systematically searching five databases, namely: PubMed, Science Direct, Google Scholar, and Cochrane. The database search was organized with the publication time span from 1993 to 2022. Search strategies with the keywords "Land-Based exercise or exercise or strength exercise or strength training or strengthening exercise" and "quality of life or QOL" and "osteoarthritis of the knee or knee osteoarthritis or osteoarthritis genu or OA knee or OA genu or OAK or KOA" and "WOMAC".

2.2 Eligibility Criteria

According to the following inclusion criteria, the study was conducted: Adults between the ages of 45 and 80 who have been given a diagnosis of knee OA or who have reported symptoms such as joint pain, stiffness, dysfunction, and disability, (1) a Randomized Controlled Trial (RCT), (2) the whole article, and (3) in English. Exclusion criteria included people who had undergone surgical intervention to treat symptoms, participated in aquatic therapies, or had otherwise disclosed OA in other joints.

2.3 Study Selection

The Mendeley program is used to store search results. In order to screen eligibility studies based on inclusion and exclusion criteria, duplicate articles were first eliminated, and the remaining papers were then manually and independently reviewed for titles, abstracts, and irrelevant articles. Articles that meet the inclusion requirements are kept for later assessment.

2.4 Data Extraction

Author, year, study design, population and sample, intervention, comparison or comparison, outcome measure, and findings are among the data taken from each publication.

Mean, standard deviation and total sample were extracted to calculate how much influence was obtained using the review manager software version 5.4 and reviewed again by 2 reviewers (S.S.P. and A.N.A.).

2.5 Assessment of Quality Study

Using the PEDro scale, evaluate each study's risk of bias. According to the PEDro scale, study quality is dependent on a number of factors, including eligibility requirements, blinding or ignorance of participants or patients, secret allocation, similar groups at baseline regarding prognostic indicators, therapists, and raters. To assess the caliber of the studies used, the risk of bias was conducted (see Table 2).

3 Results

The findings of the studies that were taken from each unique source are shown in Table 1. 3,712 articles were initially found by the search; after duplicates, titles, and abstracts were removed, 56 articles remained. Out of the 56 papers that were evaluated based on the inclusion criteria, 42 were excluded, including 13 studies that were not randomized, 10 studies that underwent surgery, 8 studies that underwent aquatic therapy, 12 studies of patients with OA knees, and others. Final findings included 13 fixed articles, 8 of which served as systematic reviews, and 5 of which were incorporated in the meta-analysis. Figure 2 displays a flowchart for PRISMA.

3.1 Studi Characteristics

A total of 1,436 participants were involved in the study. The average age ranged from 50 to 71.9 years, and most of the participants were women (see Table 1).

3.2 Risk of Bias

Using the PEDro scale, which ranges from 2 to 11, risk assessment can be done and reviewed by two people (S.S.P. and A.N.A.). Discussions are used to settle disagreements. The common rating is 8.2 (see Table 2). Lack of blinding or assessors' ignorance in all investigations (6 studies) and lack of blinding or assessors' ignorance were the most frequent shortcomings (8 studies).

3.3 Meta-analysis

Figure 3's forest plot demonstrates how land-based exercise might help individuals with knee OA feel less pain. Patients with knee OA who engaged in land-based activity had a statistically significant 1.16 unit lower probability of experiencing pain compared to those who did not (SMD = −1.16; 95% CI = −2.25 to −0.07; p = 0.04). The forest plot also demonstrates significant effect estimate heterogeneity across primary studies, I2 = 94%; p 0.001. As a result, the random effect model approach is used to calculate the average effect estimate. In Fig. 4's funnel plot, the distribution of effect estimates to the right and left of the mean vertical line of estimates is pretty even. Thus, the funnel plot does not indicate publication bias.

Figure 5's forest plot demonstrates how land-based exercise might help individuals with knee OA feel less stiff. The risk of stiffness was 1.17 units lower in knee OA patients who engaged in land-based activity compared to those who did not (SMD = −1.17; 95% CI = −2.18 to −0.15; p = 0.02), and the lower risk was statistically significant. The forest plot also demonstrates significant effect estimate heterogeneity across primary studies, I2 = 94%; p 0.001. As a result, the random effect model approach is used to calculate the average effect estimate. In Fig. 6's funnel plot, the distribution of effect estimates to the right and left of the mean vertical line of estimates is nicely balanced. Thus, the funnel plot does not indicate publication bias.

Table 1. Summary of primary study sources

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
YÂlmaz et al. (2010)	Amerika	RCT	N = 20 Usia = 59.35 (5.61) tahun BMI = 28.15 (32.454.06) kg/m^2	N = 20 Usia = 55.57 (7.17) tahun BMI = 31.26 (4.87) kg/m^2	Sebanyak 40 pasien (5 laki-laki dan 35 perempuan) berusia 45–70 tahun, dengan OA lutut dari klinik rawat jalan Departemen Kedokteran Fisik dan Rehabilitasi	Strengthening exercise group	EMG-biofeedback assisted strengthening exercise group	Pain (WOMAC) Stiffness (WOMAC) Function (WOMAC)	Pain: Pre = 1.43 ± 0.99 Post = 9.3 ± 3.07 Stiffness: Pre = 4.15 ± 1.81 Post = 3.0 ± 8.07 Function: Pre = 47.6 ± 0.07 Post = 32.45 ± 9.08	Pain: Pre = 14.87 ± 4.93 Post = 9.52 ± 4.42 Stiffness Pre = 4.31 ± 1.7 Post = 3.42 ± 1.57 Function: Pre = 49.1 ± 12.44 Post = 33.42 ± 11.74
León-Ballesterosar et al. (2018)	Meksiko	RCT	N = 16 Usia = 56.5 (5.0) tahun BMI = 29.5 (4.1) kg/m^2	N = 16 Usia = 59.6 (5.2) tahun BMI = 29.4 (3.2) kg/m^2	Sebanyak 30 perempuan dengan OA lutut, berusia 50–70 tahun, dengan kelebihan berat badan atau obesitas grade I	Exercise and kinesio taping (KT)	Exercise and placebo technique	Pain (WOMAC) Stiffness (WOMAC) Function (WOMAC)	Pain: Pre = 7.6 ± 2.9 Post = 5.5 ± 1.2 Stiffness: Pre = 2.4 ± 1.4 Post = 2.5 ± 0.8 Function: Pre = 23.0 ± 8.2 Post = 19.6 ± 5.0	Pain: Pre = 9.1 ± 2.6 Post = 5.4 ± 2.6 Stiffness Pre = 4.0 ± 1.4 Post = 2.9 ± 0.9 Function: Pre = 25.7 ± 10.2 Post = 19.0 ± 8.6

(*continued*)

Table 1. (*continued*)

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
Foley et al. (2003)	Amerika	RCT	N = 35 L/P = 15/17 Usia = 69.8 (9.2) tahun	N = 35 L/P = 15/20 Usia = 69.8 (9.0) tahun (6.16) kg/m^2	Sebanyak 105 subjek yang tinggal di komunitas berusia 50 tahun ke atas dengan OA klinis pinggul atau lutut	Gym	Control group with no intervention	Pain (WOMAC) Stiffness (WOMAC) Function (WOMAC)	Pain: Pre = 8.0 ± 4.0 Post = 8.0 ± 5.0 Stiffness: Pre = 4.0 ± 2.0 Post = 4.0 ± 3.9 Function: Pre = 28.0 ± 13.0 Post = 37.0 ± 17.0	Pain: Pre = 10.0 ± 4.0 Post = 10.0 ± 4.0 Stiffness Pre = 4.0 ± 2.0 Post = 4.0 ± 2.0 Function: Pre = 27.0 ± 12.0 Post = 27.0 ± 13.0
Cheung et al. (2014)	Amerika	RCT	N = 18 Usia = 71.9 tahun BMI = 29.1 (5.3) kg/m^2	N = 18 Usia: 71.9 tahun BMI = 28.8 (5.3) kg/m^2	Sebanyak 36 subjek berusia rata-rata 72 tahun) secara acak ditugaskan untuk program yoga 8 minggu	Yoga	Control group with no intervention	Pain (WOMAC) Stiffness (WOMAC) Function (WOMAC)	Pain: Pre = 9.3 ± 4.0 Post = 5.8 ± 0.67 Stiffness: Pre = 5.2 ± 1.4 Post = 3.4 ± 0.28 Function: Pre = 35.0 ± 11.8 Post = 22.0 ± 2.3	Pain: Pre = 7.7 ± 4.2 Post = 8.3 ± 0.67 Stiffness Pre = 4.3 ± 2.0 Post = 4.7 ± 0.28 Function: Pre = 27.1 ± 15.2 Post = 26.2 ± 2.3

(*continued*)

Table 1. (*continued*)

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
Coleman et al. (2012)	Australia	RCT	N = 73 L/P = 23/52 Usia = 65 (8.7) tahun	N = 73 L/P = 14/57 Usia = 65 (7.9) tahun	Sebanyak 146 dengan OA lutut	The Osteoarthritis of the Knee Self-Management Program (OAK)	Control group with no intervention	Pain (WOMAC) Stiffness (WOMAC) Function (WOMAC)	Pain: Pre = 5.5 ± 0.3 Post = 6.1 ± 0.3 Stiffness: Pre = 3.1 ± 0.2 Post = 3.1 ± 0.2 Function: Pre = 19.1 ± 0.7 Post = 19.9 ± 1.0	Pain: Pre = 7,0 ± 0.3 Post = 6.7 ± 0.3 Stiffness Pre = 3.6 ± 0.1 Post = 3.4 ± 0.2 Function: Pre = 24.4 ± 0.7 Post = 23.4 ± 0.9
Hall et al. (2017)	Australia	RCT	N = 49 Usia = 65.7 (8.2) tahun BB = 79.4 (13.5) kg BMI = 28.6 (4.4) kg/m^2	N = 48 Usia = 63.8 (9.1) tahun BB = 78.6 (15.1) kg BMI = 29.1 (5.2) kg/m^2	Sebanyak 40 perempuan dengan *knee osteoarthritis* dari Poliklinik Rawat Jalan Fakultas Terapi Fisik dengan usia rata-rata (49 ± 5.82) tahun	Knee extensor strengthenung exercise program	Control group with no intervention	Strength (WOMAC)	Pre = 1.35 ± 0.52 Post = 1.70 ± 0.60	Pre = 1.32 ± 0.55 Post = 1.35 ± 0.57

(*continued*)

Table 1. (*continued*)

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
Bennel et al. (2004)	Australia	RCT	N = 73 L/P = 23/50 Usia = 67.4 (8.6) tahun BB = 78.0 (12.1) kg BMI = 29.3 (4.3) kg/m^2	N = 67 L/P = 23/44 Usia = 69.8 (7.5) tahun BB = 78.9 (12.7) kg BMI = 28.9 (3.9) kg/m^2	Sebanyak 140 sukarelawan dengan osteoarthritis lutut	Physiotherapy	Control group with no intervention	Pain (WOMAC) Function (WOMAC)	Pain Mean (95% CI) Pre = 8.2 (7.5 to 8.9) Post = 5.8 (5.1 to 6.5) Function Mean (95% CI) Pre = 27.6 (25.2 to 29.9) Post = 20.0 (17.4 to 22.6)	Pain Mean (95% CI) Pre = 8.0 (7.3 to 8.6) Post = 6.0 (5.2 to 6.8) Function Mean (95% CI) Pre = 28.4 (26.0 to 30.7) Post = 21.7 (19.0 to 24.4)
Baker et al. (2001)	Amerika Serikat	RCT	N = 73 L/P = 23/50 Usia = 67.4 (8.6) tahun BB = 78.0 (12.1) kg BMI = 29.3 (4.3) kg/m^2	N = 67 L/P = 23/44 Usia = 69.8 (7.5) tahun BB = 78.9 (12.7) kg BMI = 28.9 (3.9) kg/m^2	Sebanyak 46 pasien yang tinggal di komunitas, berusia 55 tahun atau lebih tua dengan nyeri lutut dan bukti radiografi OA lutut	strength training	Control group with no intervention	Pain (WOMAC) Function (WOMAC	Pain Mean (95% CI) Pre = 209 (168 to 250) Post = 189 (141 to 238) Function Mean (95% CI) Pre = 783 (640 to 926) Post = 664 (482 to 847)	Pain Mean (95% CI) Pre = 207 (168 to 169) Post = 128 (86 to 169) Function Mean (95% CI) Pre = 734 (603 to 864) Post = 462 (301 to 623)

(*continued*)

Table 1. (*continued*)

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
Xie et al. (2018)	Cina	RCT	N = 40 Usia = 50 tahun	N = 40 Usia = 50 tahun	Sebanyak 80 pasien dengan KOA simtomatik	Quadriceps-plus-hip-abductor-strengthening	Quadriceps-strengthening	Schedules for pain and function	-	-
Coleman et al. (2008)	Australia	RCT	N = 73 Usia = 18 tahun	N = 73 Usia = 18 tahun	Sebanyak 146 perempuan dengan OA lutut	The osteoarthritis of the knee program (OAK)	Control group with no intervention	-	-	-
Mikesky et al. (2006)	Australia	RCT	Strength training N = 113 Usia = 69.4 (8.0) tahun BMI = 29.6 (5.6) kg/m^2 Range of motion N = 108 Usia = 68.6 (7.5) tahun BMI = 29.0 (5.4) kg/m^2	-	Sebanyak 221 orang dewasa yang lebih tua (usia rata-rata 69 tahun) dikelompokkan berdasarkan jenis kelamin, adanya OA lutut radiografi, dan tingkat keparahan nyeri lutut	Strength training	Range of motion	Pain (WOMAC) Function (WOMAC	Strength training (Pain): K/L grade 2–4 OA = 0.9 ± 0.4 K/L grade 0–1 OA = 0.8 ± 0.3 Strength training (Functional): Month 12 = 4.6 ± 1.0 Month 18 = 3.7 ± 1.0 Month 24 = 3.7 ± 1.0 Month 30 = 1.7 ± 0.9 Range of motion (Pain): K/L grade 2–4 OA = 1.1 ± 0.3 K/L grade 0–1 OA = 1.2 ± 0.3 Range of motion (Functional) Month 12 = 3.0 ± 0.9 Month 18 = 4.4 ± 0.9 Month 24 = 5.6 ± 1.0 Month 30 = 3.9 ± 0.9	-

(*continued*)

Table 1. (*continued*)

Penulis (Tahun)	Negara	Desain Studi	Jumlah sampel		*Population*	*Intervention*	*Comparison*	*Outcome*	Mean ± SD	
			Landbased exercise	*Control*					Land based exercise	Control
Vuorenmaa et al. (2014)	Finlandia	RCT	N = 55 L/P = 30/25 Usia = 69 (8) tahun BMI = 31 (5) kg/m^2	N = 53 L/P = 36/17 Usia = 69 (9) tahun BMI = 31 (6) kg/m^2	Sebanyak 108 peserta (61% perempuan, usia rata-rata 69 tahun [standar deviasi 8,7]), diacak ke kelompok latihan berbasis rumah (EG, n = 53) atau ke kelompok kontrol (CG, n = 55)	Exercise group	No Exercise	Isometric strength of operated knee, kg (Extension and Flexion)	Extension Post = 18.2 ± 8.9 Flexion Post = 10.3 ± 4.7	Extension Post = 14.8 ± 7.8 Flexion Post = 10.1 ± 5.1
Wang et al., (2014)	Australia	RCT	N = 180 (keseluruhan), dengan usia rata-rata 40 tahun		Sebanyak 180 orang dewasa 40 tahun dengan gejala dan radiografi OA lutut (kriteria American College of Rheumatology)	Thai Chi	The standardized physical-therapy regimen	Pain (WOMAC)	-	-

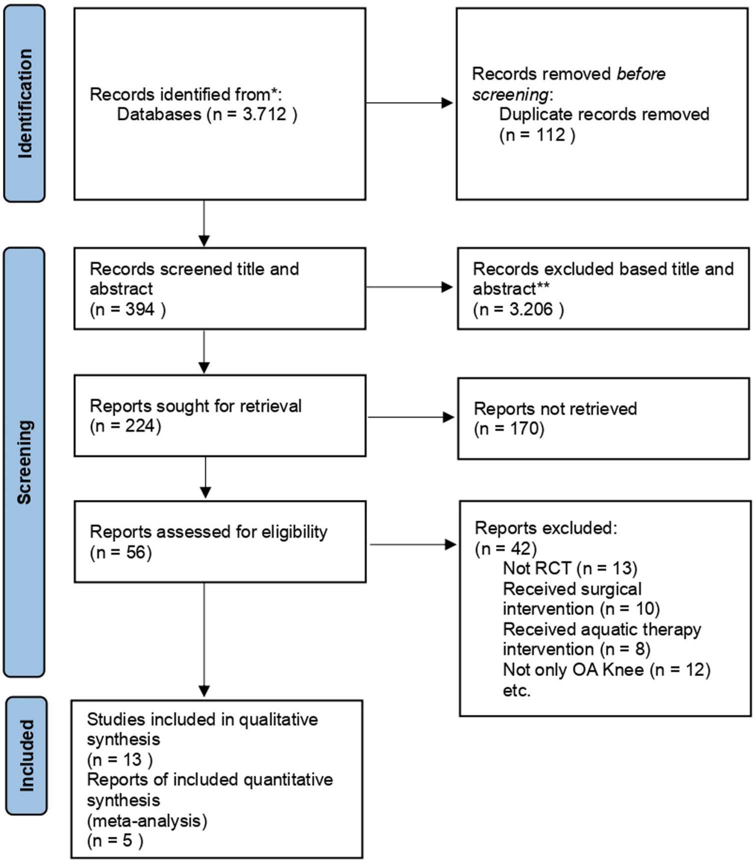

Fig. 2. PRISMA

Figure 7's forest plot demonstrates that land-based exercise had less of an impact on patients with knee OA in terms of improving function. While the lowered risk was statistically significant (SMD = −0.96; 95% CI = −2.68 to 0.76; (p = 0.27)), knee OA patients who engaged in land-based exercise had a 0.96-unit lower risk of suffering function than those who did not. The forest plot also exhibits significant I2 = 98%; p 0.001 heterogeneity of effect estimates between primary studies. As a result, the random effect model approach is used to calculate the average effect estimate. The funnel plot in Fig. 8 shows a fairly balanced distribution of effect estimates to the right and left of the average vertical line of estimates. Thus, the funnel plot does not indicate publication bias.

Table 2. Risk of Bias

Author	Item											
	1	2	3	4	5	6	7	8	9	10	11	Total
(Sophie Coleman et al., 2012)	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	10
Yilmaz OO. et al. (2010)	Y	Y	N	Y	Y	N	N	Y	Y	Y	Y	8
(Mikesky et al., 2006)	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	9
(Bennell et al., 2005)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	11
(Xie et al., 2018)	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	9
(Baker et al., 2001)	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	9
(Cheung et al., 2014)	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	9
(Hall et al., 2018)	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	8
(León-ballesteros et al., 2018)	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	9
(S Coleman et al., 2008)	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	8
(Vuorenmaa et al., 2014)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	9
(Wang et al., 2014)	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	8
Foley A, et al. (2003)	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	10

Y: yes; N: no.
*1. Eligibility criteria; 2. Random allocation; 3. Concealed allocation; 4. Baseline comparability; 5. Blinding subject; 6. Blinding therapist; 7. Blinding assessors; 8. Outcome data obtained more than 85%; 9. Intention to treat; 10. Comparisons group result; 11. Point measures
**Total 10 point PEDro scale score (items 2 through 11); 0–3 "poor", 4–5 "fair", 6–8 "good", 9–10 "excellent"

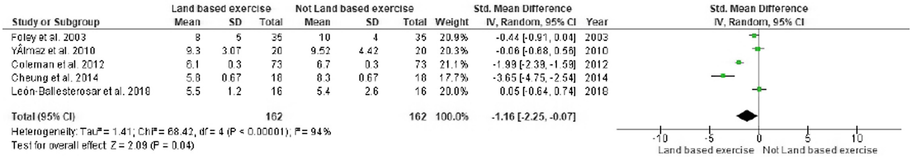

Fig. 3. *Forest plot* the effect of land-based exercise on pain in patients with OA Knee

The results of this study were statistically significant and showed that land-based exercise was useful in reducing pain and stiffness. However, boosting function is less successful with land-based exercise. This is demonstrated by the results of the p-value in Fig. 7, which indicate a decreased risk but do not reach statistical significance.

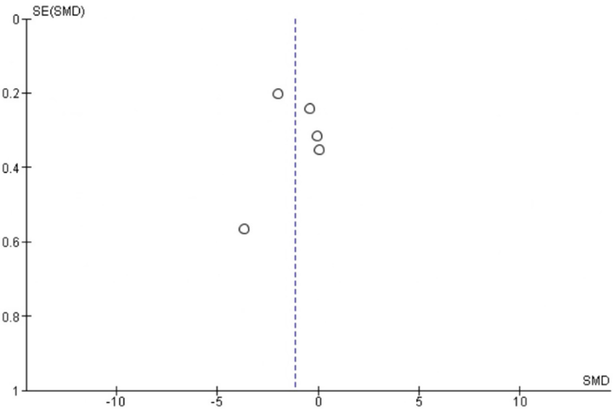

Fig. 4. *Funnel plot* the effect of land-based exercise on pain in patients with OA Knee

	Land based exercise			Not Land based exercise				Std. Mean Difference	
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	Year
Foley et al. 2003	4	3.9	35	4	2	35	21.1%	0.00 [-0.47, 0.47]	2003
YÂlmaz et al. 2010	3	8.07	30	3.42	1.57	30	21.0%	-0.07 [-0.58, 0.43]	2010
Coleman et al. 2012	3.1	0.2	73	3.4	0.2	73	21.5%	-1.49 [-1.86, -1.12]	2012
Cheung et al. 2014	3.4	0.28	18	4.7	0.28	18	16.3%	-4.54 [-5.83, -3.25]	2014
León-Ballesterosar et al. 2018	2.5	0.8	16	2.9	0.9	16	20.0%	-0.46 [-1.16, 0.25]	2018
Total (95% CI)			**172**			**172**	**100.0%**	**-1.17 [-2.18, -0.15]**	

Heterogeneity: $Tau^2 = 1.21$; $Chi^2 = 65.99$, df = 4 ($P < 0.00001$); $I^2 = 94\%$
Test for overall effect: Z = 2.26 (P = 0.02)

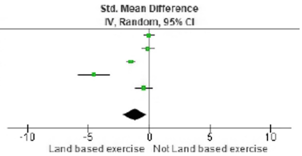

Fig. 5. *Forest plot* the effect of land-based exercise on *stiffness* in patients with OA Knee

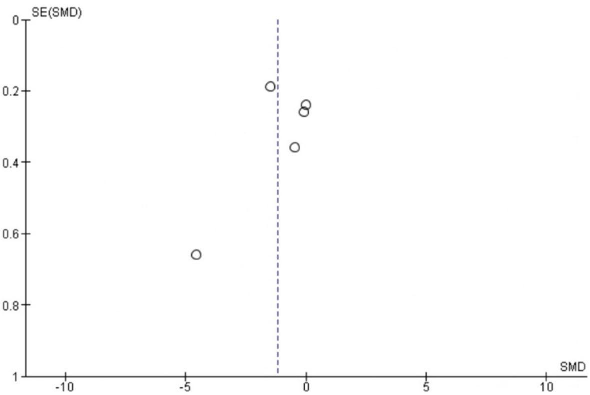

Fig. 6. *Funnel plot* the effect of land-based exercise on *stiffness* in patients with OA Knee

Study or Subgroup	Land based exercise Mean	SD	Total	Not Land based exercise Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Year
Foley et al. 2003	37	17	35	27	13	35	20.2%	0.65 [0.17, 1.14]	2003
YÂlmaz et al. 2010	32.45	9.08	20	33.42	11.47	20	20.0%	-0.09 [-0.71, 0.53]	2010
Coleman et al. 2012	19.9	1	73	23.4	0.9	73	20.2%	-3.66 [-4.20, -3.12]	2012
Cheung et al. 2014	22	2.3	18	26.2	2.3	18	19.7%	-1.79 [-2.57, -1.00]	2014
León-Ballesterosar et al. 2018	19.6	5	16	19	8.6	16	19.9%	0.08 [-0.61, 0.78]	2018
Total (95% CI)			162			162	100.0%	-0.96 [-2.68, 0.76]	

Heterogeneity: Tau² = 3.74; Chi² = 161.27, df = 4 (P < 0.00001); I² = 98%
Test for overall effect: Z = 1.09 (P = 0.27)

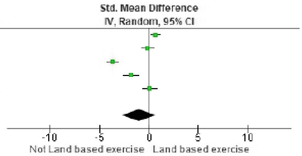

Fig. 7. *Forest plot* the effect of land-based exercise on *function* in patients with OA Knee

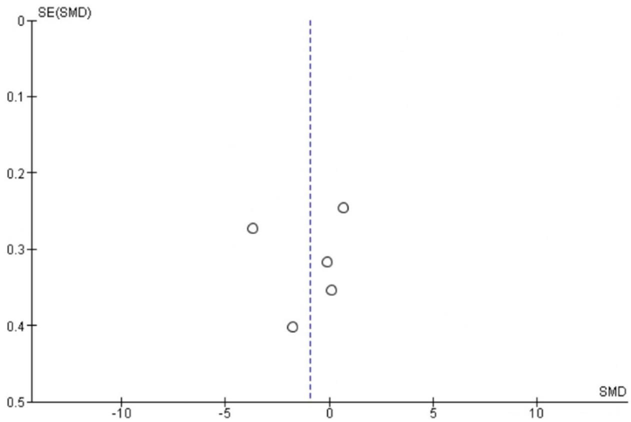

Fig. 8. *Funnel plot* the effect of land-based exercise on *function* in patients with OA Knee

4 Discussion

In order to generalize the findings and draw firm conclusions from the findings of related research, a systematic review and meta-analysis were undertaken in this study with the goal of examining the impact of land-based exercise programs on improving the quality of life for persons with knee OA. The research suggests that mobility and physical activity improve the quality of life for people with knee OA symptoms.

Land-based activities, such as thigh muscle strengthening, mobilizing, and physical activity, use the floor as a base and call for the feet to be in contact with the ground. In contrast to aquatic therapy, which uses water as a medium to make it easier to do exercises because of its characteristics, which include differences in pressure and temperature [19]. A study showed that aquatic therapy is beneficial to reduce leg fatigue and enhance general health and energy. While, land-based exercise to improve cardiorespiratory endurance and quality of life [20]. A study also showed that there was no significant difference between AQE and LBE for pain relief, physical function, and improvement in the quality of life, for both short- and long-term interventions, in patients with knee OA [21]. Therefore, aquatic therapy was not included in this study. 13 publications with RCT studies in all demonstrate that land-based exercise is efficient in lowering pain and stiffness levels. However, it has less impact on improving physical performance. According to the analysis of the data, it seems that ICF activity level-focused therapies (such as yoga, tai chi, strengthening exercise, or progressive resistive exercise, and gym) may have a favorable effect on participation rates (e.g., quality of life) for patients with

OA of the knee. This shows that land-based exercise is vital for enhancing wellbeing and has a favorable effect on patients with knee OA symptoms' quality of life.

Although physiotherapists concur that knee OA cannot be treated, they are responsible for delaying the disease's progression, lowering pain levels, reducing joint stiffness, and improving functional abilities in knee OA patients. They will be better able to carry out daily tasks as a result, which will improve their quality of life [22]. Numerous studies that have examined the effects of strengthening activities on pain, function, muscle strength, and quality of life in patients with knee osteoarthritis provide evidence in favor of this. Exercise for quadriceps strength is preferable to hydrotherapy, according to other studies [23]. Exercises for strengthening the quadriceps, such as those using kinesiotape, are more effective when combined with other exercises. Kinesiotape, however, did not significantly reduce discomfort when compared to quadriceps strengthening alone, according to studies [24]. Strengthening the knee extensors can help persons with knee OA with their pain, stiffness, and function [25]. People with knee OA have been proven to achieve statistically significant improvements in pain, quality of life, and function when undergoing the Osteoarthritis of the Knee Self-Management Program (OAK) [26]. Patients with OA Knee can benefit from high-intensity, at-home progressive strength exercise that increases strength and physical function while reducing pain [1, 27]. Exercises to strengthen the thigh muscles help lessen discomfort because OA affects how well the knee can support the body as a fulcrum. Pain is brought on by friction between joints as a result of the pathophysiology of OA, and the more body weight is carried by the knee, the more painful the condition becomes. The knee's ability to support the body will be aided and possibly even replaced by the thigh muscles as their power grows. so that the patient's pain will lessen and the OA knee's overall progression will be slowed. A person with knee OA will be more able to function if their pain is reduced. Pain is a contributing factor in sufferers' decreased functional abilities in addition to structural alterations. Due to the psychological effects of pain, sufferers may find it difficult to move their knees fully. Hal ini sejalan dengan penelitian Cheung et al. (2014) This is consistent with the study by Cheung et al. (2014), which found that yoga is beneficial and safe for elderly women with knee OA [28]. The findings of this study suggest that land-based exercise can reduce pain, stiffness, and boost functionality, according to the ICF model in Fig. 1. In order to improve the quality of life for those with OA Knee and to boost ICF participation. However, further research is needed regarding the effectiveness of land-based exercise in function.

5 Conclusion

It can be concluded that persons with OA Knee can live better quality of lives by engaging in land-based activity, which can reduce pain, stiffness, and enhance function although not significant in increasing function.

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