VIMS Journal of Physical Therapy

[SYSTEMATIC REVIEW]

Effectiveness of Physiotherapy Interventions for Hand Dysfunction in Rheumatoid Arthritis: A Systematic Review of Randomized Controlled Trials

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ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic inflammatory polyarthritis that commonly affects the hands and wrists, leading to pain, stiffness, and functional impairment. Hand exercises are often prescribed as part of physiotherapy management to enhance mobility, strength, and overall hand function. Various physiotherapeutic approaches have been employed to address hand dysfunction in individuals with RA. In the present study, we conducted a systematic review of randomized controlled trials (RCTs) evaluating the effectiveness of physiotherapy interventions aimed at improving hand function in patients with rheumatoid arthritis.

Method: We conducted a comprehensive literature search in the Medline, CINAHL, Cochrane Library, PubMed, and Google Scholar databases using the keywords "physiotherapy intervention for hand dysfunction" and "rheumatoid arthritis." The search covered studies published between January 2015 and January 2025. Only randomized controlled trials (RCTs) that evaluated physiotherapy interventions for improving hand function in patients with rheumatoid arthritis were included in this review.

Result: This systematic review analyzed data from 10 reliable studies focusing on physiotherapy interventions for hand dysfunction in patients with rheumatoid arthritis (RA). The evidence indicates that strengthening exercises, use of thera-putty, and proprioceptive training are effective in reducing pain and enhancing hand function. Among the interventions studied, the exercising through Care Hand App and Yijinjing exercise emerged as the most effective for improving overall hand function and dexterity in individuals with rheumatic hand involvement.

Conclusion: Physiotherapy interventions are effective in enhancing hand function and strength in individuals with rheumatoid arthritis. Among the various approaches, strengthening exercises combined with joint protection education and activity modification consistently produced the most favorable outcomes.

Keywords: *Rheumatoid Arthritis, Hand Dysfunction, Physiotherapy*

Introduction:

Rheumatoid arthritis (RA) is the most common inflammatory polyarthritis, affecting a significant portion of the global population. The Rheumatoid Arthritis involves the series of immunological events The aetiology is still unclear, but the pathogenesis involves a series of immunological events that result in chronic inflammation[1]. The approximate prevalence of RA (2020) is 0.3 to 1% globally and has an annual incidence rate of 3 per 10,000 adults in India2. RA affects any age but most commonly affects ages between 40 to 50 years [2].

Rheumatoid arthritis is more common in adult age and nearly 80%-90% of RA patients [3]. The most commonly involved joints are the hand joints, as the wrists, the metacarpophalangeal (MCP) joints, and/or the proximal inter-phalangeal (PIP) joints are affected in more than 90% of all patients [4], The most common symptoms are morning stiffness, pain, swelling, stiffness in the carpal and metacarpal joints and later progressively hand deformities develops which affects the patients activities of daily [5]. The

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chronic synovitis leads to joint damage. Nearly 10% of individuals affected with RA develop joint deformities within 2 years of diagnosis if left untreated[6]. The joint damage leads to various deformities, namely, intrinsic plus deformity, swan neck deformity, boutonniere deformity, ulnar deviation, the future loss of function in joints reducing hand movements and grip strength[7].

Chronic synovitis and muscle involvement further contribute to weakness and loss of function in the hand. Muscle atrophy, nodular myositis, and neuromuscular changes in RA are responsible for reduced contractile ability and grip strength. Muscle changes occur in RA due to direct involvement of neuromuscular system and can be due to pathological process occurring in muscle leading to reduction in contractile ability. These impairments contribute substantially to limitations in daily activities and overall quality of lif[8].

Management of RA typically includes pharmacological approaches aimed at reducing inflammation and preventing joint damage. Early medical management is advised to prevent joint and tissue damage[9]. Although medication improves hand symptoms, and tighter disease control may limit deformities in future, muscle function is not regained when disease activity is controlled. Disease-modifying drugs do not reverse muscle wasting and even those with well-controlled RA have less muscle mass than healthy age-matched controls[10,11]. Consequently, physiotherapy interventions, particularly hand-specific exercise programmes, have become an essential part of RA management. These interventions aim to improve range of motion, muscle strength, sensorimotor control, functional ability, and participation in daily activities [12].

Guidelines recommend that adults with RA have ongoing access to multidisciplinary team members for rehabilitation and advice. This includes support for and prescription of exercises to improve fitness, enhance the range of movement, strengthen and maintain or restore function. However, access to exercise interventions is highly variable, in part owing to social, environmental and/or health-related factors. Addressing systematic inequities in access to suitable services is a public health priority[13,14].

For many years, the recommendations were that the exercise regimes for patients with RA should be conservative, consisting of gentle concentric exercises aimed at increasing range of motion. The hypothesis was that intensive exercises against resistance would increase or prolong the inflammation in the joints, with a potential increased risk of damage of cartilage and bone, and development of deformities[15]. During recent years, however, a number of studies have shown that intensive programmes, consisting of dynamic and strengthening upper and lower limb exercises, are well tolerated and safe for patients with active disease, with regard to disease activity and radiological damage to the hands and feet[6].

The rehabilitation of individual with rheumatoid arthritis requires intense and coordinated efforts of variety of health professionals including physiotherapist. The overall rehabilitation goals in rheumatoid arthritis are specific to the three stages of inflammation: acute, sub-acute, and chronic[16]. There is a variation in treatment of the rheumatoid arthritis as per the therapist decision. The therapist decides the treatment on their basis, the common protocols used for the treatment of the hand dysfunction include for the treatment of the Rheumatoid arthritis are strengthening, stretching, taping, muscle energy technique, splint and other protocol[7]. As there are no specific guidelines for the management of the hand dysfunction, it is essential to find out the effectiveness of the different management techniques. Thus, we have aimed to do a systematic review of to find out the Effectiveness of Physiotherapy Interventions for Hand Dysfunction on Rheumatoid Arthritis. There is previous literature on systematic review of home exercise[8] and other but no literature on specifically hand dysfunction.

Aim of the Review

This systematic review aims to critically evaluate and synthesize evidence from randomized controlled trials (RCTs) regarding the effectiveness of physiotherapy interventions for hand dysfunction in individuals with rheumatoid arthritis.

Methodology:

The PRISMA guidelines were followed in conducting the systematic review[17].

Search strategy

We searched electronic databases from inception from January 2015 – January 2025: MEDLINE; CINAHL (Cumulative Index to Nursing and Allied

Health Literature); Pubmed, Google Scholar, Cochrane Library. The search terms included were rheumatoid arthritis or rheumatic hand dysfunction rehabilitation; therapy; Physical Therapy Modalities, Exercise Therapy, exercise; randomized controlled trial.

Eligibility criteria:

The PICOS (Participant, Intervention, Comparator, Outcomes, Study design approach) was used to formulate the study question and eligibility requirements[18].

Studies had to be a randomized control trials describing the physiotherapy interventions for hand dysfunction in rheumatoid arthritis patients provided by health professionals as part of conservative management; to adults with RA diagnosed by a physician, recruited from either in- or out-patient or community settings; and at least one of the following outcomes were measured: hand function, pain, grip strength and/ or RoM.

The pilot study, case study, and clinical trials, literature review were excluded.

Data Collection and Analysis

Independent of one another, two reviewer pairs went through the titles and abstract that were found through the searches and evaluated their eligibility in the light of the preset inclusion criteria. To achieve consensus at this point in the process, reviewers met on regular basis. Full text was retrieved for all titles and abstract that satisfied the inclusion criteria.

Study selection and assessment of study quality

After removing duplicates, we independently screened titles and abstracts using these criteria. If met, we retrieved full-text articles, re-checked for eligibility and assessed methodological quality using the PEDro scale [19], resolving disagreements when necessary. This is a reliable, valid scale assessing 11 criteria (see Table 1). As it is difficult to blind therapists and/or participants in most rehabilitation trials, most cannot obtain the maximum score: high-quality trials with low risk of bias score 9 or more and low-quality trials with high risk of bias score 5 or less.

To evaluate effectiveness of physical therapy on hand dysfunction in Rheumatoid Arthritis patients, trials were excluded if they were not randomized; had a control group of people without arthritis; compared hand exercise regimens without a control group; or did not include physiotherapeutic approaches. To investigate different treatment regimens, adherence strategies and safety additional trials were reviewed if these had a comparator group of people with RA (receiving usual care or an alternate exercise regimen) and had moderate risk of bias.

Results:

Study selection:

The search resulted in 899 articles after duplicates were removed (see Fig. 1). Following title/abstract review, articles were removed as either not specifically about hand exercises in RA; protocol articles; pilot study, clinical trials; commentaries on hand exercise trials; or systematic or narrative reviews of hand exercises., Twenty-five articles were selected for full-text review, of which fifteen were excluded because they evaluated general exercise programmes or a combined therapy intervention. Ten articles were assessed using the PEDRo scale, designed to assess rehabilitation trials (table). Vivien P. et al. focused on evaluating adherence to a prescribed hand exercise program in individuals with rheumatoid arthritis. While the study provided a detailed description of the exercise regimen, the primary outcome reported was adherence to the exercises rather than the clinical effectiveness of the interventions in improving hand function[13]. Rajendra et al. compared the effectiveness of hydrotherapy versus land-based exercise in reducing pain levels in individuals with chronic RA, study provided useful insights into general pain management, the primary outcome was pain reduction, and the interventions were not specifically designed to target hand dysfunction[1]. One more trial was excluded as they didn't include the control group [3]. Sarah Roberts conducted a study in 2016 to find a effectiveness of K tape on pain and hand function, the study excluded from the present systematic review due risk of bias score of 3 [20]. The remaining twelve studies were excluded because risk of bias score of 3, four of which did not include hand dysfunction as an outcome measure.

Fig. 1 Flow diagram of the results of the study selection procedure, in accordance with Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines.

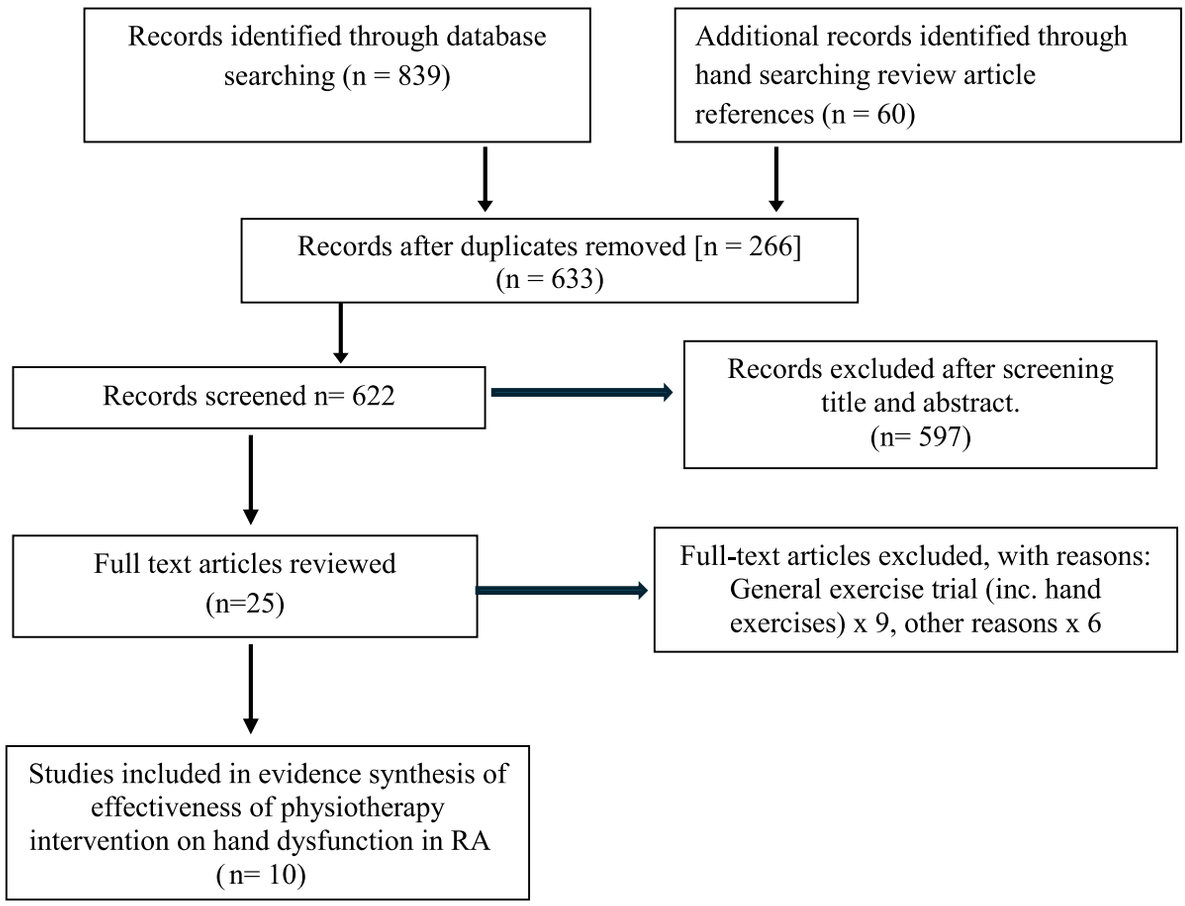

Table 1: Quality ratings of evaluated studies according to the PEDro methodology scoring system

	1	2	3	4	5	6	7	8	9	10	11	Pedro Score	Risk of Bias
Dimple et al.	✓	✓	✓	✓	✓	*	*	✓	✓	✓	✓	9	Low
Pablo et. al.	✓	✓	✓	✓	✓	*	*	✓	✓	✓	✓	9	Low
Esther et.al	✓	✓	✓	✓	✓	*	*	✓	✓	✓	✓	9	Low
Bikash et.al.	✓	✓	✓	✓	*	*	✓	✓	✓	✓	✓	9	Low
Karen Ellegaard et. al.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	*	10	Low
Sarah E Lamb et. al.	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	✓	10	Low
Tian Chang et. al.	✓	✓	✓	✓	✓	✓	✓	*	✓	✓	✓	10	Low
Hakki et. al	✓	✓	✓	✓	*	*	*	*	✓	✓	✓	7	Moderate
Adrian Levitsky et.al	*	✓	✓	✓	✓	✓	✓	✓	*	*	*	7	Moderate
Deniz et.al.	*	*	*	✓	*	*	*	✓	✓	✓	✓	5	High

Key: 1 = PEDro Scale criteria; External validity: 1 = eligibility criteria were specified*; Internal validity: 2 = random allocation; 3 = concealed allocation; 4 = similarity at baseline; 5 = blinding of participants; 6 = blinding of therapists; 7 = blinding of assessors; 8 = measures of at least one key outcome from at least 85% of participants initially allocated to groups; 9 = intention to treat principle; 10 = results of between group comparisons; 11 = point measures and measures of variability reported. Maximum score = 11.

Table no. 2: Summary of Physiotherapy Intervention (RCT) for Hand Dysfunction in patients with RA

Author	Intervention Group	Exercise Regimen	Outcome	Results
Dimple et. al (2024)	Group A- Control Group (n= 103) Group B – Experimental Group (n= 103)	Group A- Joint Protection, counselling, splinting,20-min hot water fomentation therapy, and active hand (five times per week, repeating each activity 10 times with increasing repetition counts of 10–15 (every 4 weeks) Group B- Joint protection, counselling, active exercises, and splinting + strengthening exercises for the hand muscles using therapeutic putty (5 times a week hold time of 5–10 s, with rest periods of 30–60 s between sets, 2–3 sets of 8–12 repetitions for each exercise)	1.Grip strength 2.Key pinch strength, 3.SF-SACRAH 4.WHO-BREF	*Grip strength:* At 0 week the grip strength was comparable. The group B showed significant increase in grip strength at 8th and 12th week of both the hands. *Key pinch strength*: At 8th and 12th highly, significant difference was observed with a p value of 0.00. *SF- SACRAH and WHO- BREF* At 8th and 12th highly, significant difference was observed with a p value of 0.00.
Pablo (2022)	Group A- (n=26) CareHand Group. Group B- (n=32) Control Group	Both the group were asked to perform exercises at home. 4 times a week for 3 months, with each training session programmed to last approximately 15 to 20 minutes.	1.Michigan Hand Outcome Questionnaire (MHQ). 2. VAS 3.Self-reported pain and morning stiffness. 4.Grip Strength 5. Pinch strength 6.QuickDASH	Significant improvement in the hand Function was observed at 3 and 6th months. No effect of any of the interventions on self-reported pain or morning stiffness was observed.
Esther et. al (2017)	Group A- SARAH group (n=224) Group B- Control Group (n=228)	Group A- Conventional physiotherapy Group B – Conventional + SARAH protocol	1.Michigan Hand Outcome Questionnaire 2. pain 3.Troublesomeness, 4. Arthritis Self-efficacy Scale,	The usual care resulted in small but statistically significant improvements in hand function at 4 and 12 months. There were no observable within-group differences or between-group differences at any follow-up time.

			5. EuroQol (SF-12	No statistically significant between-group difference in pain and troublesomeness scores at any follow-up time point. There was no difference in change in hand function scores between the two groups at extended follow-up. However, exercise group participants were still significantly improved compared with baseline.
Hakki et. al (2023)	Group A- Classic exercises (n= 30) Group B- Intense exercise (n= 30)	Group A- Squeezing and releasing an object. Performing resistance exercises for 5 seconds while s upinating and pronating the hand and forearm, picking up and releasing small objects. Group- B- Fist clenches and releases, thumb-finger opposition, wrist flexion (bending the wrist downwards), wrist extension (bending the wrist upwards), forearm rotation towards the palm (pronation), and forearm rotation away from the palm (supination). Both exercise programs were performed three times a day, with 30 repetitions for each exercise, five days a week.	1. Duruöz hand index. 2.Goniometry 3.Grip Strength 4. Pinch strength 5.Visual Analog Scale	Significant reduction in VAS score of IE group was observed at 8th week. (p-0.05). Both groups showed an increase in grip strength values on the right and left sides, no statistically significant difference was observed between the groups (p>0.05).
Bikash et. al. (2018)	Group A- Proprioceptive Retraining (PRt) (n=20) Group B- Home Exercise (HE) (n=20)	Group A- grip exercise activity, weighted pulley activity for fingers, lifting dumbbells with hand, wrist roller activity and stretch and hold of bilateral counterpart finger. Group B- Simple movements of wrist, and finger joints, thumb movement performed against resistance, touching the base of each finger, volar and dorsal flexion of wrist, pronation and supination of forearm, and tendon gliding exercises.	1. brief Michigan Hand outcomes Questionnaire 2.Jebsen Hand Function Test (JHFT).	The hand functions in the PRt group improved significantly as compared to the HE group. Patients under both the programs showed significant improvement of hand functions after 8 weeks of intervention.

		For both the groups, exercise program was performed 3 times a week for 8 weeks. Each task was repeated 10 times and the position of maximal effort was held for 3-5 seconds with a 10 seconds rest between repetitions. All activities were performed in sitting position.		
Adrian Levitsky et. al. 2019	Patients with RA (n= 12)	Weekly low-grade (I-II) Kaltenborn manual mobilization, using passive sustained stretch of the metacarpophalangeal (MCP) joints II to V.	1. VAS 2.Musculoskeletal ultrasound 3.short form-36.	In the RA group, both the initially randomized treated hand and the contralateral hand improved significantly from baseline to crossover to follow-up at 2 months
Karen Ellegaard et. al. (2019)	Group A- Compensatory intervention program + exercise (CIPEXERCISE) (intervention) (n=28) Group B - Compensatory Intervention Program only (control) (n= 27)	Group A- Joint protection (JP), assistive devices, and alternative methods of performing ADL warm-up/mobility (10 min), (2) muscle strength training (20 min), and (3) cool-down (5min). Group B- Joint protection (JP), assistive devices, and alternative methods of performing ADL.	1.Grip strength 2.VAS 3. Assessment of Motor and Process Skills. 4.Self-reported ADL ability 5.HAQ-DI 6. DAS28	Improvements in ADL motor ability in CIPEXERCISE and CIPCONTROL were statistically significant, with no differences between groups
Sarah E Lamb et.al	Group A – Exercise Program (n= 246) Group B- Usual Care (n= 244)	Group A- A tailored exercise program was given to participants for 4 months. Group B- Usual Care	1. Michigan Hand Outcome Questionnaire 2. Arthritis Self-effi cacy scale 3.Troublesomeness	The exercise group's improvement was more than double that of the usual care group. The difference between groups was 4·3.
Tian Chang e.al.	Group A- Yijinjing exercise (n= 33) Group B- Usual Care (n= 33)	Yijinjing exercise group (YJJG) with sessions conducted three times per week over a 12-week period or the control group.	1. Michigan Hand Outcomes Questionnaire. 2.Grip strength 3.Flexibility. 4.VAS	At the end of the 12 weeks, the Yijinjing exercise demonstrated significant improvements in MHQ scores compared to the CG ($p < 0.05$).

Deniz et. al.	Group A- Electrotherapy+ CEP. (n=16) Group B- Control (CEP only) (n=14)	1.5 mA galvanic electrotherapy. In addition, the patients were administered CEP.	1.VAS 2.Grip and pinch strength. 3.Health Assessment Questionnaire (HAQ)	The VAS scores did not significantly differ between the groups. Significant increase was noted in the grip strength of the right and left hand between the first and second measurement (p=0.011 and p=0.025) of Group A. Significant differences in the HAQ scores were recorded between first and subsequent measurements (p=0.001 and p=0.007) of Group A.

Study features and methodological quality:

Ten RCTs were included, with PEDro scores of more than 5. All had external validity and their methodological limitations were due to the lack of blinding of therapists and participants (see Table 1).

Demographic data:

The total number of participants was 1353 (range 30–490), with a higher ratio of women. The age of the participants ranged from 18-75 years, disease duration of 3.6 years. All the studies included RA patients with no deformity, one trail also included the OA patient[21].

Control groups: The most common treatment used in control group was joint protection and usual care.

Intervention groups: The trials included the following interventions:

Tailored exercises program, Intensive exercise training, Proprioceptive neuromuscular training, Use of Care hand App, Galvanic stimulation, Yijinjing exercise, joint mobilization, theraputty exercise, SARAH (Strengthening And stretching for Rheumatoid Arthritis of the Hand) protocol. (see Table 2).

Follow-up:

Follow-up also varied with short-term assessments at 2 weeks, 4 weeks and 8 weeks[6] and long-term assessments at 3 and 12 months[22].

Outcome measures:

Pooling of data was not possible as outcome measures usually differed between studies (see Table 2).

VAS, Michigan Hand Outcome questionnaire, pinch strength and Grip strength were the primary common outcome measure in most of the trials, 3 studies included quality of life scale as a secondary outcome measure[23]. Karen Ellegaard et included ADL motor ability measured by Assessment of Motor and Process Skills, self-reported ADL ability, HAQ-DI, DAS28 in addition to VAS and Grip Strength. Grip strength was assessed using handheld dynamometer.

Objective hand function: this was measured using the Jebsen Hand Function Test [24].

In the short term, 6 trials s showed significantly improved dominant and one non-dominant hand grip strength. In the long term, grip strength improvements were maintained and better than the control groups but not significantly so. Only on trials assessed for the ROM using Goniometer[6], measurements were taken for supination, pronation, wrist flexion, wrist extension, MCP flexion, MCP extension, PIP flexion, thumb flexion, thumb abduction, ulnar and radial deviation of the wrist. Except for the left hand MCP extension degrees, At the end of 8 weeks of exercise, no significant increase was observed in the measurement values.

Hand pain: This was measured in 5 studies, using a 100 mm VAS. Significant improvements were identified in all the studies in the short term where the when compared control group the difference was found to be not significant.

Other symptoms: These were also measured differently: troublesomeness and morning stiffness. No intervention was found to be effective to treat morning stiffness.

Disease activity: DAS2817 and C-reactive protein levels were used in 2 studies [21,23]. It was assessed to match the baseline parameter of the patients.

Health: Esther et. al measured health-related quality using EuroQol (SF-12), there was no significant difference between the SARAH and control group, but the improvement in QOL was seen in both the group.

Effectiveness of different physiotherapy intervention:

A wider range of trials were included to review the effectiveness of different types of physiotherapy intervention.

Grip Strength:

Improvement in grip strength was a common outcome measure and was significantly enhanced in studies that incorporated strengthening exercises. Dimple et al. (2024) found statistically significant improvements in grip strength in the experimental group receiving therapeutic putty exercises ($p < 0.001$ at 8 and 12 weeks)[25]. Similarly, Deniz et al. (2022) observed a significant increase in grip strength in the group receiving electrotherapy combined with conventional exercises ($p = 0.011$ and $p = 0.025$ for right and left hands, respectively)[26]. However, Hakki et al. (2023) reported no statistically significant difference in grip strength between groups despite overall improvement within groups.

Hand Function:

Eight studies utilized validated hand function measures (e.g., MHQ, QuickDASH, JHFT). Pablo (2022) reported significant improvements in MHQ total ($p < 0.05$)[26]. Similarly, Bikash et al. (2018) found significant improvements in hand function in the proprioceptive retraining group compared to home exercises [24]. The SARAH protocol (Esther et al., 2017) showed significant improvement at 4 and 12 months ($p = 0.0014$), although differences between groups were modest and not maintained at extended follow-up[23]. Yijinjing exercise (Tian Chang et al.) significantly improved MHQ scores ($p < 0.05$)[28], while the combination of compensatory strategies with exercises (Karen Ellegaard et al.) improved motor ability, though group differences were not statistically significant[29].

Pain and Stiffness:

VAS scores improved significantly only in select studies. Hakki et al. observed a greater reduction in pain in the intensive exercise group compared to the control ($p < 0.05$). Conversely, Pablo (2022) and Esther et al. found no significant between-group differences in self-reported pain.

Electrotherapy (Deniz et al.) did not significantly reduce pain but improved functional outcomes.

Discussion:

To the best of our comprehension, this is the first systematic review to find out the intervention used to treat specifically hand dysfunction in RA patients. This study evaluates effectiveness of different intervention when compared to the usual care.

The present systematic review evidence supports the effectiveness of physiotherapy interventions in improving hand function and strength in individuals with Rheumatic hand dysfunction, although the degree of benefit and consistency across studies varies based on intervention type and study quality.

Exercise-Based Interventions:

Structured hand exercises, particularly those involving resistance training with putty or dynamic exercises, consistently improved grip and pinch strength (Dimple et al., Deniz et al.). These improvements are likely due to enhanced muscle activation and neuromuscular control. However, the intensity and frequency of interventions varied significantly, which may contribute to mixed results across trials.

The tailored protocol (SARAH) showed improvement in hand function though when assessed at 12th month there is no statistically significant difference in the hand dysfunction when compared to usual care group, indicating the effect of the programme had diminished over time.

The CareHand App (digital solution has been developed under the guidance of health care professionals), adults with RA of the hands who used the CareHand app reported better results in the short and medium term for overall hand function, work performance, pain, and satisfaction, compared with usual care. As RA need long term physiotherapy intervention, CareHand app is a promising tool for delivering exercise therapy and self-management

recommendations.

Pain Management:

While improvements in strength and function were consistently reported, reductions in pain and morning stiffness were less conclusive. This may reflect the multifactorial nature of RA pain, influenced by inflammation, joint damage, and psychosocial factors, which may not be fully addressed by physical therapy alone. The adjunct therapy like mobilization help to improve joint space and reduce pain. In the present systematic reveiw we found that manual mobilization of the hands of patients with RA is a feasible, safe, and effective intervention.

Yijinjing exercise have shown improvement in hand function and enhance handgrip strength and flexibility in RA patients with low disease activity, also it is was found beneficial for mind body function of RA patients.

Limitations and Future Scope:

Variability in outcome measures, intervention duration, and reporting standards limited direct comparisons across studies. Some trials lacked long-term follow-up, blinding, or adequately powered sample sizes, thereby affecting the strength of conclusions. All the studies in present systematic review included patients with Class I and II rheumatoid arthritis who were receiving disease-modifying antirheumatic drugs (DMARDs). Future research should focus on identifying safe and effective exercise protocols for individuals with more advanced disease.

Conclusion:

Among the various physiotherapy approaches, strengthening exercises combined with joint protection education and activity modification consistently produced the most favorable outcomes. Therapeutic-Putty exercises demonstrated the greatest improvement in grip and pinch strength. Proprioceptive neuromuscular facilitation (PNF), Care Hand App and Yijinjing exercises were particularly effective in improving overall hand function. Additionally, intensive exercise protocols and low-grade manual therapy were found to be both safe and beneficial in managing hand dysfunction associated with rheumatoid arthritis.

Acknowledgement:

I wish to thank all the participants for their cooperation towards this study.

Conflict of Interest: No conflict of interest

Funding: None

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