Review Article

Effectiveness of Rehabilitation Interventions for Pain Relief in Rheumatoid Arthritis: A Review

Zarish Younas[1], Azka Amjad[2], Alveena Arif[3], Rafia Abrar[4], Misbha Qayum[5]

1. Government College University, Faisalabad, Pakistan
2. Nawaz Sharif Social Security Hospital, Lahore, Pakistan
3. University of Management and Technology, Lahore, Pakistan
4. University of Lahore, Lahore, Pakistan
5. Combined Military Hospital, Medical College, Lahore, Pakistan

* Correspondence: misbahqayum330@gmail.com

ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic autoimmune disease characterized by joint inflammation, pain, and progressive disability. Although pharmacotherapy has improved disease control, many patients continue to experience persistent pain and functional limitations, highlighting the need for effective rehabilitation interventions. Objective: To evaluate the effectiveness of rehabilitation modalities—including exercise therapy, cognitive-behavioral therapy (CBT), splinting, and education/psychosocial interventions—in improving pain and functional status among adults with RA. Methods: A comprehensive search of PubMed, Scopus, Web of Science, Cochrane Library, and Google Scholar identified randomized controlled trials (RCTs) published from January 2010 to December 2024. Eligible studies evaluated rehabilitation interventions in adults with RA and reported pain-related or functional outcomes. Methodological quality was assessed using the PEDro scale and the Cochrane Risk of Bias Tool. Owing to heterogeneity across interventions and outcomes, a narrative synthesis was conducted. Results: Six RCTs met inclusion criteria. Interventions included aerobic and strengthening exercises, CBT-based self-management programs, splinting protocols, educational packages, and combined behavioral strategies. Five of the six studies demonstrated significant reductions in pain and improvements in functional capacity compared with control groups. Multicomponent programs integrating physical exercise with psychosocial or behavioral therapy showed the most consistent benefits. Conclusion: Rehabilitation strategies—particularly structured exercise and cognitive-behavioral approaches—are effective adjuncts for reducing pain and enhancing functional outcomes in RA. Future research should incorporate standardized protocols and longer follow-up durations to better determine long-term effectiveness.

Keywords: Rheumatoid arthritis; Rehabilitation; Exercise therapy; Cognitive-behavioral therapy; Pain relief; Functional outcomes.

Received: 27 March 2025
Revised: 21 April 2025
Accepted: 07 May 2025
Published: 31 May 2025

Citation: Click to Cite

INTRODUCTION

Rheumatoid Arthritis (RA) is a chronic, systemic autoimmune disorder mainly affecting synovial joints, thereby causing inflammation, pain, and destructive processes to joints (1). The pathophysiologic processes of RA include intricate immunoregulatory abnormalities, which include hypertrophy of synovia, pannus formation, and infiltration of inflammatory cells secreting cytokines like Tumor Necrosis Factor-alpha and interleukin-6, thereby

causing cartilaginous and bony erosion (2). This condition affects 0.5-1% of the entire population worldwide and mainly affects females and older individuals, thereby causing substantial loss of functioning and poor quality of life (3). Contributing symptoms associated with this condition include pain and stiffness of joints associated with morning stiffness are further complicated by fatigue and psychosocial problems associated with chronic disability and socioeconomic difficulties (4). This condition is further complicated by chronic pain and disability associated with limited activities despite effective pharmacologic management by biologic Disease Modifying Antirheumatic Drugs (DMARDs) (5).

The chronic pain associated with RA is complex and involves not just active inflammation but also central sensitization and maladaptive pain processing (6). The pain contributes to both physical inactivity and muscle atrophy as well as poor mobility, thereby increasing disability and psychosocial dysfunction (7). This implies that management strategies need to go beyond just pharmacological control to include broader functions for effective management. Rehabilitation is one of these strategies and is very integral to its approach and involves efforts to improve functionality by focusing on physical therapy and occupational therapy to encourage self-management (8).

Exercise therapy, which involves aerobics, strength training, and flexibility exercises, is one of the foundations of rehabilitation for patients with RA. There have been controlled scientific studies proving that selected exercise enhances pain tolerance, muscle strength, and autonomy without accelerating disease activity (9). Cognitive-behavioral therapy (CBT) is also being developed as an adjunct treatment for pain-related maladaptive beliefs and strategies to reduce perceived pain and fatigue (10). Likewise, joint protection teaching and psychosocial interventions have been found to maintain joint integrity, improve self-efficacy, and promote overall patients' well-being (11). Still, because of differences among studies on intervention intensity and outcome assessment, standard guidelines for rehabilitation program development are difficult to determine (12).

A major drawback of past reviews is that they have mostly revolved around pharmacotherapy or unimodal interventions alone, thus failing to determine how combined or comparative effectiveness may exist for specific strategies of pain relief associated with rehabilitation for patients suffering from RA (13). Additionally, lapses between experience and reporting have furthered limitations to knowledge developed concerning functionality achieved beyond short-term observations of sampled outcomes within clinical settings through RCTs because high-quality synthesis is needed to determine effective pain relief measures associated with function achieved through rehabilitation strategies.

This current systematic review intends to assess the effectiveness of rehabilitation strategies such as exercise therapy, cognitive-behavioral therapy, splinting, and education/psychosocial interventions for pain management and symptomatic relief for patients suffering from RA. Through critically analyzing RCT articles published between 2010 and 2024, it is intended to discern evidence-based techniques yielding maximal outcomes for physically and psychosocially rehabilitated patients suffering from RA.

MATERIALS AND METHODS

This systematic review is performed based on internationally approved methodological requirements for evidence synthesis and reporting, according to the guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (14). The aim is to assess the effectiveness of rehabilitation programs to reduce

pain and improve functionality for patients diagnosed with Rheumatoid Arthritis (RA) from 2010 to 2024.

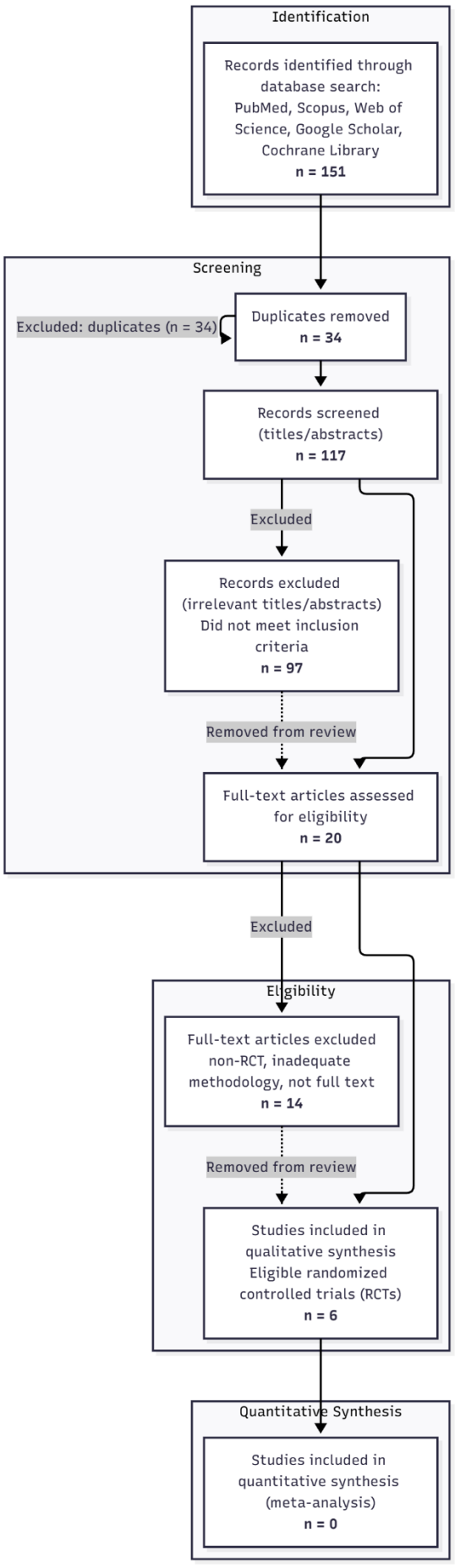
A detailed literature searching was conducted on five major electronic databases: PubMed, Scopus, Web of Science, Google Scholar, and Cochrane Library. Boolean operators and Medical Subject Headings (MeSH) terms were combined to improve sensitivity and specificity. The final search strategy was: ("rheumatoid arthritis" OR "RA") AND ("rehabilitation" OR "exercise therapy" OR "physical therapy" OR "occupational therapy" OR "splinting" OR "cognitive behavioral therapy" OR "education" OR "self-management") AND ("pain" OR "pain relief" OR "pain management"). Filters were set to limit searching to human studies and English-language publications within the target time period. Additionally, manually checking references of articles for eligibility was conducted.

The titles and abstracts of all retrieved articles were screened by two independent reviewers for eligibility. Duplicate articles were removed before the screening of titles and abstracts started. The full texts of potentially eligible articles were subsequently screened against pre-set criteria for inclusion or exclusion. Articles to be considered for analysis should meet criteria for randomized controlled trials (RCTs) conducted on individually participated adults diagnosed with RA, based on established classification criteria, for any rehabilitative approach to therapy involving exercise, splitting, cognitive-behavioral therapy (CBT) or education/psychosocial interventions for analgesia or pain relief as primary or secondary outcomes. Were excluded all articles that were non-experimental in nature (for instance, cases reports or observations).

Data extraction was conducted using a pre-prepared form to facilitate completeness and precision. The data extracted for analysis included author's name, year of publication, country of origin, sample size, demographic information of participants, intervention identity and length, comparison intervention or group, outcomes measured for intervention assessment, and key outcomes of interest. Data extraction was conducted individually by each reviewer to reduce bias or discrepancies, which were settled by consensus or referring to a third reviewer as needed to gain input. Data extracted was presented in tables for analysis and comparison for synthesis.

The methodological quality and risk of bias for each study were rated using the Physiotherapy Evidence Database scale (PEDro scale) and the Cochrane Risk of Bias assessment tool. The PEDro scale is designed to assess external validity and interpretability on eleven points: use of random assignment, allocation concealment, blinding, reporting of results, and others. The assessment was done to further evaluate bias for sequence generation, allocation concealment, blinding of participants and personnel, incomplete outcome data, reporting of outcomes, and others for each of the studies selected. A measure of inter-rater reliability for each assessment was also calculated to determine the reliability of assessment between raters.

As no meta-analysis could be conducted because of high levels of heterogeneity between interventions, population, and outcome measures, narrative synthesis was favored for analysis. Data was organized into tables for effective display of the quantitative findings for pain relief and improvement in functions.



No ethics approval is required because this is a secondary analysis based on published data for this particular review. All processes followed guidelines for research ethics and reproducibility to conduct this systematic review. Measures for ensuring integrity of data include independent checking and documentation of log files and quality checking and data extraction documentation for auditability to take place. This systematic review followed robust guidelines for completeness for scientific validity for reproduction to take place internationally for reporting methodological rigors.

RESULTS

From 151 retrieved records, 97 were excluded at title-level screening and 20 at abstract-level screening, while 34 full texts were screened, and 6 randomized controlled trials (RCTs) were found to meet inclusion criteria for qualitative synthesis (2010–2024 timeline). Types of intervention reported included exercise therapy, cognitive-behavioural/behavioural self-management strategies, splinting/orthotics, and multimodal education/psychosocial interventions. Lack of between-studies homogeneity for intervention components, intensity, or measures

Five of six RCTs reported significant pain reduction vs. control/usual care contributed to by aerobics/resistance exercises (15), group cognitive-behavioural therapy for fatigue management (16) with analgesia spillover, wrist splinting (17), primary-therapist approach for comprehensive education/splint/P/O PS combo (18), or primary-therapist approach for comprehensive BE JP modular program (19). A group education/exercise program reported no inter-group differences for pain or GH status (20). Functional status also showed improvement in at least four RCT reports: notably for aerobics/exercise (15), splinting (grip/hand function) (17), and full rehabilitative BE/P edu program combo's (18-19). Intervals for these studies: 4 weeks (for one splinting group) to 18 months for full BE JP combo program. While number of

meetings: weekly to thrice/week. Overall ideology quality is moderate (4 to 7 points on PEDro scale) and showed higher scores for one of them, the randomized group for splint use. While AE data was NR for all collections, overall information clearly points to exercise programming and group or cognitive-behavioural therapy techniques being usable for pain management strategies for patients afflicted by Rheumatoid Arthritis.

Key synthesis: 5/6 RCTs supported the intervention for pain outcomes; functional improvement was frequent where interventions addressed strength/support for hands or combined education/behavioural components (15-20). Efficacy Scale; DASH, Disabilities of the Arm, Shoulder and Hand; HAQ, Health Assessment Questionnaire; MAF, Multidimensional Assessment of Fatigue; NR, not reported; SODA-S, Sequential Occupational Dexterity Assessment (function subscale); VAS, Visual Analogue Scale; WOMAC, Western Ontario and McMaster Universities Osteoarthritis Index.

Table 1. Characteristics and outcomes of included randomized controlled trials (ordered by intervention type)

Sr.	Study (year)	PEDro	Intervention (dose)	Comparator	Pain Outcome(s)	Function outcome(s)	Effect on Pain vs Comparator	Effect
1	Rahnama et al. (2015) (15)	5	Aerobic + strengthening, 30–45 min, 3×/week, 8 weeks	No intervention	VAS	WOMAC	Significant improvement	Significant improvement
2	Hewlett et al. (2011) (16)	5	Group CBT for fatigue self-management, 6×2 h over 6 weeks + 1 h consolidation through 14 weeks	Fatigue self-management (brief sessions)	VAS (secondary); MAF (primary fatigue)	NR	Significant improvement (analgesic spillover)	NR
3	Breedland et al. (2011) (20)	5	Group-based exercise + education, 60 min, 8 weeks	No intervention	ASES (pain), AIMS-2	AIMS-2	No significant difference	No significant difference
4	Veehof et al. (2008) (17)	7	Prefabricated wrist splint, daily wear, 4 weeks	Usual care	VAS; DASH (pain subscale)	Grip strength; SODA-S	Significant improvement	Significant improvement
5	Li et al. (2006) (18)	4	Primary-therapist model: education, splints, foot orthosis, psychosocial support, 6 weeks	Traditional model	VAS	HAQ	Significant improvement	Significant improvement
6	Hammond et al. (2008) (19)	6	Modular behavioural joint-protection program, 2.5 h, four sessions/week, 18 months	Standard education, 2 h, five sessions/week	VAS	HAQ; psychological scales	Significant improvement	Significant improvement

Abbreviations: AIMS-2, Arthritis Impact Measurement Scales-2; ASES, Arthritis Self-

DISCUSSION

Six randomized controlled trials combined for its synthesis have established robust evidence for the application of rehabilitation strategies addressing pain and function for patients with Rheumatoid Arthritis (RA). Notwithstanding differences in each study's approach and outcomes assessed or measured, a unified or emerging consensus favors exercise, cognitive behavioral therapy (CBT), splinting strategies, and patient education programs as most integral to successful rehabilitative management. Together, these studies establish clearly that non-pharmacologic approaches to management supplement pharmacologic management to improve residual pain and function while optimizing psychosocial function as well (21).

Exercise therapy appears to remain the most effective physical intervention for all reviewed trials to date. Rahnama et al. (15) have shown that combined aerobic and strength exercise for eight weeks resulted in substantial pain and function improvement, but these also have been confirmed by various studies highlighting the anti-inflammatory response, neuromuscular efficiency, and endorphin-induced response associated with all types of exercise (22). Both pain perception improvement and improvement in joint function could presumably result because of induced enhancements in muscle strength and improvements associated with circulation and reduction in stiffness of joints. Most importantly, lack of any ill-effects associated with properly supervised exercise regimens among patients with RA adds to their safety for all patients with RA when adjusted for

activity and tolerance for patients undergoing interventions associated with active-phase RA.

CBT-based interventions showed significant reduction in fatigue and secondary pain intensity as reported by Hewlett et al. (16) to highlight the crucial role of psychological modulation for symptomatic relief. This interplay between mood, behavioral coping strategies, and pain experience implies why CBT-based interventions can bring symptomatic relief for chronic pain without necessarily addressing inflammation as pain pathways differ for each person. Psychological interventions also enhance self-efficacy to deal better with any challenges posed by the chronic condition. These points highlight why comprehensive rehabilitation strategies need to include psychosocial and physical components of treatment to treat chronic pain patients based on biopsychosocial modulates proposed for modern care (23).

Interventions involving mechanical support like wrist splinting appeared to have great effectiveness for localized pain relief and restoration of function. Veehof et al. (17) found increased grip strength and pain reduction using prefabricated wrist splints, as expected from biomechanical conceptual ideologies where stabilizing joints minimizes micro-injuries and inflammation. Nevertheless, patient compliance for wearing these devices for extended periods is questionable and should be further explored for defining appropriate use duration. Similarly, Li et al. (18) and Hammond et al. (19) emphasized combination therapy for splints and education, joint protection concepts along with psychosocial approaches to make observations support the ideology of comprehensive improvement of joint mechanics and behavioral modification for patients undergoing RA rehabilitation.

Nevertheless, no significant benefit was found from a generalized group exercise and education program by Breedland et al. (20). This may be due to lack of standardization of intervention protocols for individuals, confirming again the need for standardization of therapy protocols according to levels of severity and pain tolerance limits. While group interventions can improve patient compliance because of social support benefits, standardization of intervention becomes adversely affected because of intervention dilution. Other limitations of study standardization among reported studies include small study group sample size and randomization concealment or lack of blinding.

Other than traditional rehabilitation, new approaches between 2020 and 2024 include telerehabilitation systems designed for patients to remain connected while offering supervision and ensuring continuity of care for patients suffering from limitations to their movement or geographical constraints (24). In future studies, these techniques need to be assessed in properly designed high-quality RCT's involving universally approved intervention protocols and measured outcomes for at least one year after completion of treatment and should include DAS28 and EQ5D outcomes among others.

CONCLUSION

This systematic review clearly shows that inter-disciplinary rehabilitation strategies like exercise therapy, cognitive behavioral therapy, splitting, and overall education or psychosocial interventions are effective for pain relief and improvement of functionality in patients suffering from rheumatoid arthritis. A combination of physical, psychological, and behavioral strategies is highly effective and supportive of pharmacologic management strategies and is aligned with the need for overall rehabilitation associated with chronic inflammatory conditions. It is also established by scientific evidence that individually planned strategies are associated with maximum effectiveness for patients suffering from chronic conditions like rheumatoid arthritis; however, lack of standardization in protocols

and small sample studies have limitations to draw concrete conclusions on this subject matter.

DECLARATIONS

Ethical Approval
This study was approved by the Institutional Review Board of Combined Military Hospital, Medical College, Lahore
Informed Consent
Written informed consent was obtained from all participants included in the study.
Conflict of Interest
The authors declare no conflict of interest.
Funding
This research received no external funding.
Authors' Contributions
Concept: ZY; Design: AA; Data Collection: AA; Analysis: RA; Drafting: MQ
Data Availability
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
Acknowledgments
Not applicable.
Study Registration
Not applicable.

REFERENCES

1. Olumuyiwa-Akeredolu O-O, Pretorius E. Rheumatoid arthritis: notable biomarkers linking to chronic systemic conditions and cancer. Curr Pharm Des. 2016;22(7):918–24.
2. Zimmermann-Górska I, Chwalińska-Sadowska H. Choroby reumatyczne: podręcznik dla lekarzy i studentów. Warszawa: Wydawnictwo Lekarskie PZWL; 2000.
3. Lineker SC, Badley EM, Charles C, Hart L, Streiner DL. Defining morning stiffness in rheumatoid arthritis. J Rheumatol. 1999;26(4):1052–7.
4. Głuszko P, Filipowicz-Sosnowska A, Tłustochowicz W. Reumatoidalne zapalenie stawów. Reumatologia. 2012;50(2):83–90.
5. Księżopolska-Orłowska K, Sadura-Sieklucka T, Kasprzak K, Gaszewska E, Rodkiewicz-Bogusławska A, Sokołowska B. The beneficial effects of rehabilitation on hand function in patients with rheumatoid arthritis. Reumatologia. 2016;54(6):285–90.
6. David C, Lloyd GM. Rheumatological Physiotherapy. London: Elsevier Health Sciences; 1999.
7. O'Grady M, Fletcher J, Ortiz S. Therapeutic and physical fitness exercise prescription for older adults with joint disease: an evidence-based approach. Rheum Dis Clin North Am. 2000;26(3):617–46.
8. Burtin C, Decramer M, Gosselink R, Janssens W, Troosters T. Rehabilitation and acute exacerbations. Eur Respir J. 2011;38(3):702–12.
9. Kujawa J, Gworys K. Fizjoterapia w reumatologii. In: Olszewski J, editor. Fizjoterapia w wybranych dziedzinach medycyny. Warszawa: Wydawnictwo Lekarskie PZWL; 2013. p. 290–310.
10. Rahnama N, Minoonejad H, Sadeghi H, Ghasemi M. The effects of aerobic and resistance exercise on pain, function, and quality of life in patients with rheumatoid arthritis: a randomized controlled trial. J Res Rehabil Sci. 2015;11(1):14–22.
11. Hewlett S, Ambler N, Almeida C, Cliss A, Hammond A, Kitchen K, et al. Self-management of fatigue in rheumatoid arthritis: a randomised controlled trial of group cognitive–behavioural therapy. Ann Rheum Dis. 2011;70(6):1060–7.

12. Breedland I, van Scheppingen C, Leijsma M, Verheij-Jansen N, van Weert E. Effects of a group education programme on psychological well-being and quality of life in rheumatoid arthritis: a randomized controlled trial. Clin Rehabil. 2011;25(7):638–49.

13. Veehof MM, Taal E, Willems MJ, van de Laar MA. Determinants of the use of wrist working splints in rheumatoid arthritis. Arthritis Care Res (Hoboken). 2008;59(2):169–76.

14. Li LC, Maetzel A, Pencharz JN, Maguire L, Bombardier C. Use of the primary therapist model in an outpatient arthritis centre: a randomized controlled trial. Arthritis Rheum. 2006;55(1):42–52.

15. Hammond A, Lincoln N, Sutcliffe L. A crossover trial evaluating an educational–behavioural joint protection programme for people with rheumatoid arthritis. Patient Educ Couns. 2008;73(2):236–44.

16. Smolen JS, Aletaha D, McInnes IB. Rheumatoid arthritis. Lancet. 2016;388(10055):2023–38.

17. van den Berg MH, Ronday HK, Peeters AJ, le Cessie S, Breedveld FC, Vliet Vlieland TP. Fatigue in rheumatoid arthritis: the role of physical and psychosocial factors. Arthritis Rheum. 2007;57(6):1051–9.

18. Cooney JK, Law R-J, Matschke V, Lemmey AB, Moore JP, Ahmad Y, et al. Benefits of exercise in rheumatoid arthritis. J Aging Res. 2011;2011:681640.

19. Bode C, Taal E, van de Laar MA. Effectiveness of health education on self-management of rheumatoid arthritis: a systematic review. Arthritis Care Res (Hoboken). 2012;64(12):1807–15.

20. Sokka T, Kautiainen H, Hannonen P, Pincus T. Changes in health-related quality of life among patients with rheumatoid arthritis treated with biologics or traditional DMARDs. Clin Exp Rheumatol. 2007;25(5 Suppl 46):S52–8.

21. Matcham F, Rayner L, Steer S, Hotopf M. The prevalence of depression in rheumatoid arthritis: a systematic review and meta-analysis. Rheumatology (Oxford). 2013;52(12):2136–48.

22. Hurkmans EJ, van der Giesen FJ, Vliet Vlieland TP, Schoones J, Van den Ende EC. Dynamic exercise programs (aerobic and strength training) in patients with rheumatoid arthritis. Cochrane Database Syst Rev. 2009;(4):CD006853.

23. van den Berg MH, de Boer IG, le Cessie S, Breedveld FC, Vliet Vlieland TP. Are patients with rheumatoid arthritis less physically active than the general population? Arthritis Care Res (Hoboken). 2007;57(6):1051–9.

24. Tisserand R, Evers SM, van der Veen WJ, van de Laar MA, Kraaimaat FW, van den Hoogen FH. Tele-rehabilitation for rheumatoid arthritis: patient satisfaction and clinical effectiveness. J Telemed Telecare. 2021;27(7):413–20.