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

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Abstract

Rheumatoid arthritis (RA) is a chronic inflammatory condition causing joint inflammation and progressive disability. This review evaluates the efficacy of rehabilitation interventions for pain relief and functional improvement in RA patients. A systematic literature searches of PubMed, Google Scholar, Scopus, Web of Science, and Cochrane Library from January 2010 to December 2024 identified six randomized controlled trials (RCTs) meeting inclusion criteria. Interventions included aerobic and strengthening exercises, cognitive-behavioral therapy (CBT), group-based exercise programs, splinting, education, and psychosocial support. Functional ability and pain relief were the main outcomes. Conclusion The results show that exercise, splinting, and CBT are effective in reducing both functions and pain, but the inconsistency among the interventions, small sample samples, and lack of consistent measurements reduce the effectiveness of these interventions. More studies must standardize procedures and ascertain the long-term results in order to achieve optimum RA management.

Keywords: Exercise Therapy, Functional Outcomes, Pain Management, Rheumatoid Arthritis, Rehabilitation, Cognitive-Behavioral Therapy (CBT).

Introduction

Rheumatoid arthritis (RA) is a chronic, autoimmune disease that predominantly affects synovial joints, resulting in global inflammation and functional loss **[1]**. The condition is characterized by an immunological response that attacks connective tissues, particularly the synovial membrane, initiating a cascade of inflammatory reactions that lead to joint destruction, deformities, and functional impairments **[2]**. RA affects approximately 0.5–1% of the global population and is more frequently observed in women and older adults. Due to its chronic and progressive nature, the disease imposes substantial physical, psychological, and economic burdens on affected individuals **[3]**.

The classical clinical features of RA include chronic joint pain, prolonged morning stiffness lasting more than one hour, and symmetrical involvement of small joints, especially the carpal and metacarpophalangeal joints **[4]**. Along with progressive reduction in muscle strength and gradual loss of hand function, these symptoms significantly reduce patients' ability to perform daily activities, maintain professional work, and participate in social interactions **[5]**.

Chronic pain is considered one of the most disabling symptoms reported by individuals with RA. It often persists from the onset of the disease and greatly reduces quality of life **[6]**. The pain associated with RA primarily results from inflammation of the synovial membrane, leading to edema, exudate formation, and restricted range of joint movement. Persistent inflammation may eventually cause joint deformities and damage to surrounding periarticular tissues **[2]**. In addition to physical impairment, RA also carries a considerable psychological burden. Patients frequently experience fatigue, anxiety, and depressive symptoms, which further influence pain perception and functional limitations **[7]**.

Due to the complex nature of RA, comprehensive management strategies are required to address both physical and psychological aspects of the disease. Rehabilitation plays a crucial role in the management of RA by improving quality of life, reducing pain, and enhancing joint function **[8]**. Rehabilitation programs may include various interventions depending on the severity of the disease and joint deformities, such as physical therapy, occupational therapy, and patient education **[9]**.

Exercise therapy is a fundamental component of rehabilitation programs for individuals with RA. These exercises aim to improve joint mobility, increase muscle strength, and maintain functional independence. Research has demonstrated that properly designed exercise programs can reduce pain and improve physical functioning without worsening disease symptoms **[10]**. During acute exacerbations, exercises should be performed under professional supervision, either in hospital settings or outpatient rehabilitation programs. For patients in stable or chronic phases of the disease, home-based exercise programs are often recommended to maintain improvements in joint mobility and overall function **[9]**.

Patient education also plays an important role in rehabilitation. Educational programs emphasize joint protection strategies and safe performance of daily activities in order to reduce excessive stress on joints and prevent further damage **[11]**. Regular adherence to home exercise programs has been shown to maintain improvements in hand function and overall mobility among individuals with RA **[6]**.

Effective management of RA requires a multidisciplinary approach involving physical therapists, occupational therapists, rheumatologists, and mental health professionals. This collaborative approach aims to improve physical function, adapt daily activities, and address psychological challenges associated with chronic illness. Current guidelines from the American College of Rheumatology (ACR) and the European League Against Rheumatism (EULAR) emphasize the importance of individualized treatment plans tailored to the patient's disease severity, lifestyle factors, occupational demands, and personal needs **[6]**.

Although increasing evidence supports the benefits of rehabilitation interventions in RA management, uncertainty still exists regarding which rehabilitation strategies are most effective in reducing pain and improving long-term functional outcomes. Therefore, further investigation is necessary to identify optimal rehabilitation approaches for individuals with RA.

The aim of this literature review is to summarize evidence from randomized controlled trials (RCTs) evaluating the effectiveness of rehabilitation interventions in reducing pain among patients with rheumatoid arthritis. Additionally, this review seeks to provide evidence-based recommendations for physical and occupational therapists involved in the management of RA.

Methodology

Search Strategy

The systematic search of the literature is performed using the period between January 2010 and December 2024 in the PubMed, Google Scholar, Scopus, Web of Science, and Cochrane Library. Keywords were used as Boolean operators and Medical Subject Headings (MeSH): ("rheumatoid arthritis" OR "RA") AND ("rehabilitation" OR "exercise therapy" OR " splinting" OR " cognitive behavioral therapy" OR "education") AND ("pain" OR "pain relief" OR "pain management". Additional articles were screened by the reference list of the relevant studies.

Eligibility Criteria

Inclusion Criteria:

- Participants diagnosed with RA.
- Randomized controlled trials (RCTs).
- Full-text availability.
- Pain relief as an outcome.

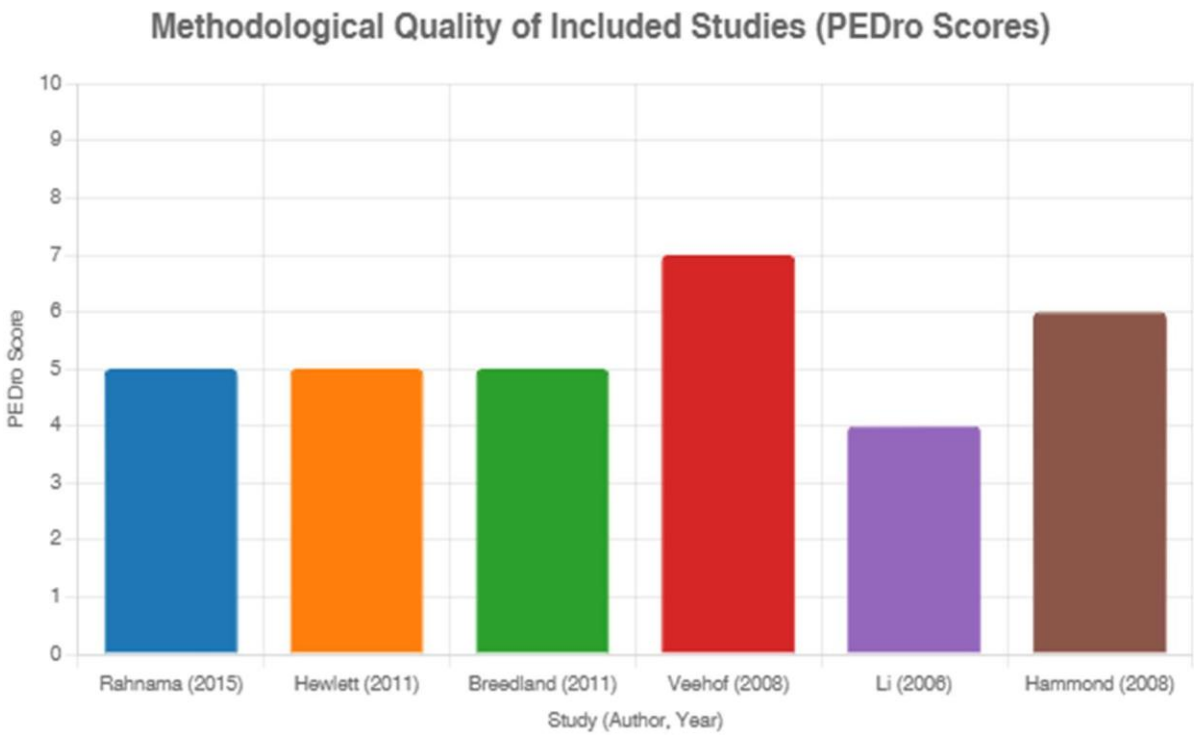
Exclusion Criteria:

- Non-retrievable full texts.
- Non-experimental studies.
- Studies with inadequate methodology.
- Studies on conditions other than RA.

Quality Assessment

The quality of the studies was independently evaluated by two reviewers on the PEDro scale and Cochrane Risk of Bias Tool based on randomization, allocation concealment, blinding, completeness of outcome data, and selective reporting. The cases of discrepancy were handled by either a discussion or another reviewer

Caption: Figure 1. PEDro Scores of Inclusion Studies that Evaluate Methodological Quality. This bar chart demonstrates the quality of the methodology of the six randomized controlled trials with the scores between 4 and 7 on the PEDro scale, which is a moderate and high-quality methodology.



Based on this bar chart the Veehof et al. (2008) has highest PEDro score (7) indicating superiority of the methodology used and Li et al. (2006) has lowest score (4). The bulk of the studies are of moderate (4-6) rating, and, therefore, there is a chance to improve the rigor of the study design.

Data Extraction

Among the identified articles (n=151), a three-phase screening procedure took place to identify six RCTs, 97 articles were eliminated with titles, 20 articles were eliminated with abstracts, and six articles met the inclusion criteria. The identified data were author/year, sample size, participants characteristics, intervention form, frequency, duration, comparator, outcomes measures and findings. Extraction was performed by two reviewers who were cross known to be right.

Results

The six RCTs evaluated different interventions in order to ease pain and enhance the functionality of patients with RA. The following table has presented the summaries of the studies.

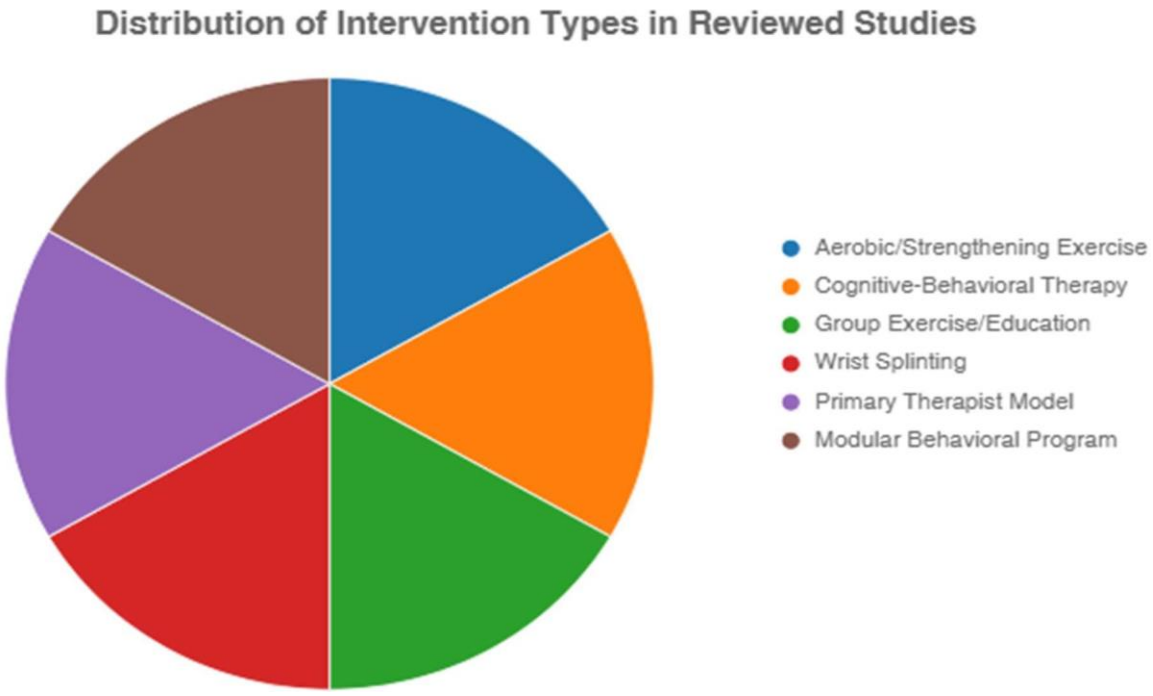
Sr.	Author/Year	PEDro Score	Interventions	Comparison	Outcome Measures	Results
1	Rahnama et al., 2015	5	Aerobic and strengthening exercise, 30–45 min, 3 days/week, 8 weeks	No intervention	VAS (pain), WOMAC (function)	Improved pain relief and function

2	Hewlett et al., 2011	5	CBT for fatigue self-management, 6×2 h sessions for 6 weeks, one h consolidation for 14 weeks	Fatigue self-management, one h sessions	MAF (fatigue), VAS (pain)	Improved fatigue and pain relief
3	Breedland et al., 2011	5	Group-based exercise and education, 60 min, 8 weeks	No intervention	AIMS-2 (health status), ASES (pain)	No significant differences
4	Veehof et al., 2008	7	Prefabricated wrist splint, 4 weeks	Usual care	VAS, DASH (pain), grip strength, SODA-S (function)	Improved pain, grip strength, and function
5	Li et al., 2006	4	Primary therapist model (education, splints, foot orthosis, psychosocial support), 6 weeks	Traditional treatment model	HAQ (function), VAS (pain)	Improved function and pain relief
6	Hammond et al., 2008	6	Modular behavioral program, 2.5 h, four sessions/week, 18 months	Standard education program, two h, five sessions/week	RASE (psychology), VAS (pain), HAQ (function)	Improved psychology, pain, and function

Discussion

The six RCTs analyzed provide a comprehensive perspective of the rehabilitation interventions in RA in alleviating pain using physical, psychological and educational methods.

Caption: Figure 2. Rehabilitation Intervention Distribution in study reviews. This pie chart shows that there were six types of interventions with the same number of represented randomized controlled trials which proves that there are many approaches to pain relief in rheumatoid arthritis.



This pie chart illustrates an even allocation of all types of interventions (that is, it is an equal proportion of all six studies), representing the diversity of rehabilitation techniques studied. Depending on the strategy people use to treat RA pain, there is a wide variety of options, as shown by each slice.

The findings point to the uncertain nature of rheumatoid arthritis (RA) management and show that several types of interventions may help reduce pain and improve function. Nonetheless, inconsistency of intervention procedures, outcome measures and study designs indicate that there are significant gaps on this area which require further exploration.

According to Rahnama et al. (2015), the aerobic and strengthening exercises resulted in higher pain reduction and improved functional outcomes, which were measured in VAS and WOMAC scores. These findings are consistent with previous studies that have established that exercise aids in joint mobility, enhancing muscle strength, and reducing inflammation. These improvements were probably contributed by the structured program, which was introduced three times a week and lasted eight weeks. Nevertheless, the lack of the long-term follow-up prevents the knowledge of whether these benefits last long.

Hewlett et al. (2011) demonstrated that cognitive-behavioral therapy (CBT) is useful in relieving fatigue, pain, and this means that psychological treatment can alleviate pain by influencing the perception of pain and emotional suffering in patients. The six weeks plan including the continued contact probably assisted the changes of behavior to become permanent and showed the interaction between mental and physical symptoms of RA and how they impacted each other.

Breedland et al. (2011) indicated that there was no significant difference in the pain between group-based exercise and education because the standardized protocols applied failed to consider the differences in the presentation of the disease in patients. The individual-oriented treatment can be more effective in pain reduction, though it is possible that group sessions promote adherence and provide social support.

Veehof et al. (2008) have discovered that prefabricated wrist splints decrease pain and improve grip and overall functionality by stabilizing the joints and decreasing the mechanical stress. The research has a good methodology (PEDro score of 7) and this research indicates the reliability of such findings, but the briefness of the intervention makes it unclear whether these can be effective

in the long run and whether they will be adhered to. Whole-person interventions, education, splinting, and psychosocial support, as described in the literature by Li et al. (2006) and Hammond et al. (2008), yielded greater physical and psychological results. These results indicate the value of multidisciplinary interventions in accordance with EULAR and ACR recommendations.

This heterogeneity between studies did not allow the meta-analysis, which also indicates the necessity of standardized procedures and research in different centers involving a heterogeneous population to reinforce the external validity. A more comprehensive scale of assessing the effects of interventions on patients should also consider a broader range of outcomes like DAS28, SF-36, EQ-5D and rate of returning to work. New measures, such as tele-rehabilitation, wearable joint-assistive, and high-intensity interval training have a potential to enhance accessibility and efficacy of RA care in 2020-2024, but require additional research to be executed.

Multidisciplinary care consisting of physical therapy, occupational therapy, psychosocial support, and patient education, is also necessary to deal with the complexity of RA. Several observations of disease activity permit the management of the treatment, and future research ought to examine the best mixes of interventions with regard to their efficacy, practicability, and preference of patients to enhance the quality of life and decrease pain.

Conclusion

Exercise, cognitive-behavioral therapy, splinting, and patient education are some of the rehabilitation strategies that can be used to decrease pain and improve the functioning of people with rheumatoid arthritis (RA). Outcomes are further enhanced when care is multidisciplinary, follows EULAR and ACR guidelines, and is tailored to the needs of each patient. To sustain these benefits, therapists should focus on educating patients about joint protection, safe home activities, and the use of adaptive equipment. Future research should aim to standardize protocols, include larger and more diverse patient groups, and evaluate long-term effects to further refine RA rehabilitation strategies.

Limitations

- Heterogeneity: Study interventions and outcome measures varied among studies, thus making the studies unable to be compared directly.
    - Sample Size: The sample size in some of the studies was small and therefore limited generalizability.
    - Follow-up period: Randomized long-term effects.
    - Outcome Focus: The emphasis on pain relief did not consider the functioning of the joints, quality of life, and the disease development.
    - Language Bias: English-language studies have only been used, so that the possible relevant studies were overlooked.
    - Publication Bias: Not every study and grey literature is going to be included which will give biased results.

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