What is the effectiveness of dynamic exercise to increase reduce pain and increase function in adults with Rheumatoid Arthritis?

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CLINICAL SCENARIO

Rheumatoid arthritis (RA) is a chronic systemic disease causing inflammation of a joint or multiple joints (Radomski & Trombly-Latham, 2002). It was observed in Fieldwork that adults with RA often received occupational therapy intervention which recommended daily exercise as a means of maintaining participation in activities in daily living (ADL) and decreasing pain and fatigue levels. As RA affects 40,000 New Zealanders (Arthritis New Zealand, n.d.) there is a need to investigate if participation in various forms of dynamic exercise enhances function and well-being without causing adverse effects on joints.

FOCUSSED CLINICAL QUESTION:

In adults with rheumatoid arthritis is dynamic exercise effective in reducing pain and increasing function?

SUMMARY OF SEARCH, 'BEST' EVIDENCE APPRAISED, AND KEY FINDINGS:

To answer the clinical question, database searching and citation tracking revealed six relevant studies including systematic reviews, meta-analyses and quantitative research. Baillet et al., (2010) and Noreau et al., (1995) were chosen as 'best' evidence. Although the majority of evidence was written from a medical or physical therapy perspective, outcome measures incorporated occupational therapy principals of quality of life and function in ADLs. Both studies concluded that aerobic exercise in stable RA has some positive effect on pain and fatigue. Furthermore, it was established that weight bearing activity with limited ground impact was not detrimental to joint status.

CLINICAL BOTTOM LINE:
Low impact dynamic exercise in adults with stable RA will provide small beneficial effects in reducing pain and increasing function.

Limitation of this CAT: This critical appraisal has been peer reviewed by one lecturer as part of an assignment for Otago Polytechnic, School of Occupational Therapy. The breadth of the review has also been limited by the assignment requirements (ie. 2 articles only were reviewed).

SEARCH STRATEGY:

An electronic search of databases was undertaken including CINAHL, PubMed, OT Seeker, ProQuest Nursing and Allied Health Source, Cochrane Library and Google Scholar via Article Linker. Citation tracking of relevant research articles was also completed.

Terms were chosen using the PICO system:

- P(person) – arthritis, arthritis pain
- I(intervention) – exercise, dynamic exercise, dance
- C(comparison) – nil
- O(outcome) – function, ADLs

Databases and sites searched	Search Terms	Limits	Results
CINAHL	Arthritis pain AND dance* AND function	January 1985-2011 Peer reviewed English	3
PubMed	"systematic review" AND dynamic exercise AND arthritis		3
ProQuest Nursing and Allied Health Source	Rheumatoid arthritis pain AND dance exercise AND "occupational therapy"		38

OT Seeker	"arthritis" AND dance exercise	Intervention; exercise/strength training Rheumatology Systematic review	33
Cochrane Library	Arthritis AND dynamic exercise AND function	NOT osteoarthritis	10

INCLUSION and EXCLUSION CRITERIA

Inclusion:

- A clinical diagnosis of RA
- Adult participants 18 years+
- Research published in English
- Intervention included the aim of improving function and reducing pain through exercise
- Research included an occupational therapy aspect around function for ADLs and/or quality of life

Exclusion:

- Studies involving participants with osteoarthritis
- Studies that measured pharmacology in outcomes

RESULTS OF SEARCH

Six studies were selected as 'best evidence' and are categorised in Table 1. Articles chosen for critical review are indicated by *.

Table 1:

Study Deign/ Methodology of Articles Retrieved	**Level (Based on Taylor, (2007)).**	**Author (Year)**
Systematic review – Meta-analysis*	1	Baillet, Zeboulon, Gossec, Combescure, Bodin, Juvin, Dougados & Gaudin (2010)
Systematic review	1	Cairns & McVeigh (2009)

Quantitative -RCT	2	Callahan, Mielenz, Freburger, Shreffler, Hootman, Brady, Buysse & Schwartz (2008)
Quantitative – Clinical trial	2	Suomi & Collier (2003)
Quantitative – Nonrandomised experimental study*	2	Noreau, Martineau, Roy & Belzile (1995)
Quantitative – Clinical trial	2	Van Deusen & Harlowe (1987)

BEST EVIDENCE

The following studies were chosen as 'best evidence' and were selected for critical appraisal.

- Baillet et al. (2010): This systematic review – meta-analysis was chosen as it sits within the highest level of the medical hierarchy of evidence (Taylor, 2007). Being a recent study, the findings are applicable to current practice.
- Noreau, Martineau, Roy & Belzile (1995): Despite its age and not being of the highest standard in quantitative evidence, this study was chosen because it addresses the clinical question well and has a distinct occupational therapy flavour of using dance-based exercise, including functional performance measures in ADLs.

SUMMARY OF BEST EVIDENCE

Study 1: Baillet, A., Zeboulon, N., Gossec, L., Combescure, C., Bodin, L., Juvin, R., Dougados, M., & Gaudin, P. (2010). Efficacy of cardiorespiratory aerobic exercise in rheumatoid arthritis: Meta-analysis of randomized controlled trials. *Arthritis Care & Research, 62*(7), 984-992.

Aim/objective: To "evaluate the efficacy of aerobic exercises in RA on quality of life, function, and clinical and radiological outcomes by a systematic literature review and a meta-analysis" (pp. 984). Previous systematic literature reviews supported the efficacy of physical exercises in RA on aerobic capacity, muscle strength and safety, but other outcomes were unclear.

Study design: Systematic review – meta-analysis.

Search strategy: An extensive search of PubMed, EM-Base and the Cochrane Central Register of RCT databases was completed by two reviewers. Search terms used for database screening included: ("Arthritis, Rheumatoid" [medical subject headings (MeSH)]) AND ("Exercise

Therapy" [MeSH] OR "Activities of Daily Living" [MeSH] OR "Physical Education and Training" [MeSH]). "Clinical trial" was used as a limit. Authors hand searched references from relevant articles and from abstracts presented at various Rheumatology meetings. The ClinicalTrials.gov website was searched to identify any randomized studies that were yet to be published (pp. 985).

Inclusion/Exclusion criteria: 513 abstracts were identified from the searches. Eighty-one full text reports were analysed and 67 were dismissed due to exclusion criteria. Fourteen RCT articles met the inclusion criteria and were entered into the analysis on the basis that they evaluated cardiorespiratory aerobic exercises performed at 50-90% of the maximal heart rate in comparison with non-aerobic rehabilitation in adults with RA. Exclusion criteria included post-surgery rehabilitation, participants <18, trials with aerobic exercise in the control group, and articles written in a language other than English, French or German (pp. 986).

Participants: 1,040 patients were included; 510 in the intervention group and 530 in the control group. Both groups were comparable in terms of age, disease duration, sex ratio, compliance, RF indicator and pharmaceutical treatments.

Method of review: Study design, patient characteristics and intervention parameter data was extracted by one author using a predetermined form. The same author assessed the methodological quality of the 14 studies using the Jadad scale and the CLEAR-NPT checklist. The Cochrane Musculoskeletal Group recommendations were used to extract the following outcome measures for comparison:

- Quality of life
- Function
- Disease activity score in 28 joints
- Joint count
- Pain on a visual analogue scale (VAS)
- Radiologic evaluation
- Exercise tolerance

Using the data, the standardized mean difference (SMD) and 95% confidence interval were calculated to assess the efficacy of aerobic exercise on outcomes. The standardized mean difference is the difference in mean outcome variation, divided by a standard deviation at baseline. It is used to convert all outcomes to a common scale, measured in units of standard deviations (The Cochrane Collaboration, 2002). SMD's between 0.2 and 0.5 indicated a small effect, 0.5-0.8 a medium effect and >0.8 indicated a large effect (pp. 986).

Results: Results were summarised according to the efficacy of aerobic exercise on each outcome measure, and plotted on a blobbogram:

- Quality of life: small beneficial effect shown (SMD 0.39, *P* <0.0001)
- Function, as assessed by the Health Status Questionnaire (HAQ): small positive effect (SMD 0.24, *P*=0.0009)
- Pain, as measured by the VAS: small beneficial effect (SMD 0.31, *P*=0.02)
- Joint count: small positive effect, but statistically insignificant (SMD 0.14, *P*=0.14)
- Radiologic evaluation: small beneficial effect i.e. a decrease in joint damage (SMD 0.36, *P* =0.0005)
- Disease activity, as measured by the DAS28: no deterioration, but the difference was statistically insignificant (SMD 0.08, *P*=0.34)

Original author's conclusions: The authors conclude that cardiorespiratory aerobic exercise for patients with RA improves outcomes of quality of life, function and pain. The authors suggest that aerobic exercise is safe to undertake in stable RA due to the decrease in radiologic damage and pain experienced by intervention groups. Further investigation into the place of aerobic exercise in RA is recommended, but the review supports more frequent recommendation of exercise to RA patients by health professionals.

Critical Appraisal:

Validity/trustworthiness: Based on the guidelines provided by Taylor (2007).

Are the results valid?

The review has a clear focus: "to evaluate the efficacy of aerobic exercises in RA on quality of life, function, and clinical and radiological outcomes" (pp. 984). Previously exercise therapy in RA was prescribed for maintaining joint mobility and muscle strength and patients were often discouraged from exercising. Previous systematic reviews do not address pain, functional ability and quality of life, therefore the review aims to determine the efficacy of exercise on these unexplored parameters.

The relevant studies were included in the review; the authors completed an extensive search of data bases, a hand search of relevant references (citation tracking) and identified any unpublished randomized trials. Grey literature was not searched, however, so potentially useful material may have been missed.

The methodological quality of each study was analysed using the Jadad scale and the Checklist to Evaluate a Report of a Non-Pharmacological Trial (CLEAR-NPT). Each study's Jadad score is presented within Table 1 but no CLEAR-NPT figures are provided. The authors state the mean Jadad score was 2.4±0.6, seven of fourteen trials displayed a Jadad score <3 and only 2 trials validated 7 CLEAR-NPT items. As the scoring ranges from 0–5 (Jadad) and 0-14 (CLEAR-NPT) where a high score indicates high quality, we can assume that a majority of the studies were not high quality. Methodological quality was assessed by a single author, potentially creating a bias.

What are the results?

The efficacy of aerobic exercise on each outcome is clearly stated using the SMD, confidence interval and probability(P) values. The authors state that no heterogeneity was detected within the outcome measures following an assessment using sub grouping and the chi-square test, therefore data can be compared in a blobbogram graph. Due to the relatively low quality of studies and low statistical significance of the results, it is difficult to conclude whether the evidence is high enough to support the intervention.

How will these results help me work with my clients?

The authors state that "this systematic review supports a more frequent recommendation of exercise to RA patients" (pp. 991). Despite the study being completed by medical doctors, themes such as pain, quality of life and function are applicable to occupational therapy principals. To successfully apply these results, it is the responsibility of the therapist to draw information from the study that is relevant to their practice.

Summary/conclusion: This study presents a valid argument that aerobic exercise in RA improves outcomes of life quality, function, and clinical and radiological parameters. However, its clinical utility can be questioned due to low methodological quality of some studies, the small beneficial effects and possible bias. The authors note that further investigation needs to occur to more clearly define the role of aerobic exercise in RA management (pp. 991).

Study 2: Noreau, L., Martineau, H., Roy, L., & Belzile, M. (1995). Effects of a modified dance-based exercise on cardiorespiratory fitness, psychological state and health status of persons with rheumatoid arthritis. *American Journal of Physical Medicine and Rehabilitation, 74*(1), 19-27.

Aim/objective: "To demonstrate that a dance based exercise program is a safe and efficient activity to improve physical fitness and psychological state in persons with RA (functional classes I and II)" (pp. 19).

Study Design: Quantitative – non-randomized experimental study.

Setting: Metropolitan community in Quebec.

Participants: Twenty nine participants with RA were recruited as a convenient sample. Eligibility criteria included a confirmed diagnosis of RA (functional class I or II), free of unstable cardiopulmonary disease, no acute joint symptoms and ability to perform a graded test on a bicycle ergometer.

Table 2: Key demographics of participants

Demographic	Intervention group(19)	Control group(10)
Mean age(years)	49.3 ±13	49.4 ±11.9
Disease duration(years)	8.1 ±8.2	11.0 ±5.1
Functional class	I=9, II=10	I=7, II=3
Sex (*n* and % of females)	*n*=12, 63%	*n*=8, 80%

There were non-significant differences between the groups in demographics, medications, swollen joints or aerobic power.

Method: Substantial baseline assessments were conducted followed by the twelve week EDUCIZE programme for the intervention group. Twice weekly exercise sessions were conducted by a trained physiotherapist and occupational therapist (OT), plus weekly group counselling by a psychologist accompanied by other specialist clinicians. Post-testing was conducted at twelve weeks and six months using the Systat 5.2 statistical analysis programme to compare the data, with statistical significance fixed at 0.05.

Outcome measures: Standardised assessments with rigorous reliability and validity were used to measure cardiorespiratory fitness, ADLs, pain and psychological status. These were:

- Arthritis Impact Measurement Scale (AIMS)
- Profile of Mood States (POMS)
- dynamic strength of knee flexion/extension
- walking speed (50 feet)
- cardiorespiratory fitness (bicycle ergometer)
- blood tests measuring haemoglobin and erythrocyte

Results: Results revealed statistically significant improvement for the intervention group in cardiorespiratory fitness, muscular strength in knee flexion, vigour, fatigue and walking speed without adverse effects on joint status. Joint pain, perception of pain, mobility and function in household tasks showed improvement but were statistically non-significant across the groups. The authors suggested that AIMS and POMS may not be sufficiently sensitive to measure improvements. Large variation in cardiorespiratory fitness was attributed to inherited human trainability variations.

There were unexpected improvements in mood and muscular strength in the control group. Researchers suggested seasonal timing could have influenced mood and that the assessment for knee flexion/extension may not be reliable for people with RA, nor was the procedure carried out correctly. Participation was high, with few dropouts suggesting that participants found the programme purposeful. At six month follow-up, most parameters had returned to baseline due to participants discontinuing training. Therefore it was identified the programme was not sufficient to modify behaviours around exercising.

Original author's conclusions: The authors concluded that there was some evidence that aerobic exercise was beneficial for individuals with RA. Conclusions were consistent with a previous study (Perlman et al., 1990) in that there were no adverse effects on joints in the short term, following weight bearing exercise with limited ground impacts. The authors determined that further studies were required on long term effects of exercise.

Critical Appraisal:

Validity: Based on guidelines from Law et al., (1998).

Study purpose: The research objectives and hypothesis were clearly stated, specifying that the twelve week EDUCIZE programme would significantly improve physical fitness, mood and functional status, without adverse effects on joint pain and swelling in people with RA. Despite the broad nature of the study, the positive changes identified in the abstract indicated potential useful information for OTs working with people with RA.

Literature: The authors provided a clear background and synthesis of relevant outcomes of five previous exercise-based studies, one of which had investigated the EDUCIZE programme using similar outcome measures. Furthermore, a knowledge gap was identified regarding no consensus within the medical community regarding aerobic exercise for people with RA.

Study design: This research was a non-randomized experimental study with the authors acknowledging the inability to "use a rigorous random sampling procedure" (pp. 20) due to the context, as a limitation. However the pre/post-test design with follow-up, using rigorous assessment tools was effective in measuring a wide range of variables. This allowed outcomes to be easily quantified and comparisons made to previous studies.

Ethics: Approval was gained from the University ethics committee and all participants signed an informed consent form. The authors, however, do not indicate if the control group was offered a similar intervention following completion of the study. Taylor (2007) refers to this as "ethically problematic" (pp. 45).

Biases: Information regarding sample selection was not provided, although as volunteers, bias favours the treatment group "as volunteers tend to be more motivated and concerned about their health" (Law et al., 1998, pp. 6). The researchers detected a possible seasonal bias (Law et al., 1998) with an unexpected improved mood status in the control group at post-test. Furthermore, the significant improvement in mood and perception of pain in the intervention group could also be influenced by the social aspect and attention gained from the therapists, which is known as attention bias (Law et al., 1998). These were recognised as limitations by the authors. Self-report assessment tools can create bias however this was managed by using AIMS and POMS which are both standardised with robust

reliability and validity (Haythornthwaite & Edwards, n.d.; APN Data Collection Toolkit, 2011). It is also interesting to note that the researchers aim was to demonstrate that the programme was effective, rather than being open to any results.

Sample: The authors did not justify the small sample size, the reason for the 1(control):2(intervention) split or the recruitment procedure. The inclusion criteria was specific to ensure safety of the participants and yet broad enough to provide useful information for the realities of practice.

Outcomes: It appears the assessment tools were chosen for rigour and re-testability to meet the author's objective of "demonstrating" positive outcomes with reliable information for the medical community. The wide range of measured outcomes and detailed data collection procedure provide valuable information for practitioners working with people with RA despite some areas only providing a snapshot, such as occupational performance in household tasks. Additionally, a follow-up at six months provided information on long term motivation and implications of exercise.

Intervention: This was described in detail which would allow replication of the study.

Results: The results were subjected to appropriate statistical analysis, comparing the mean values ±1SD or probability (*p*) between baseline and post-test measures. Visual data was provided by graphs and tables with written explanations. Some of the visual data was difficult to interpret without sophisticated statistical knowledge. The researchers discussed possible explanations for unexpected results, noted limitations and made suggestions for future research. Although some results showed improvement without being deemed significant, the researchers identified this information as useful for clinical practice.

Conclusion: The most significant findings were the improved mood, vigour and reduction of pain due to exercise, coupled with no short term adverse effects on joints. From an OT perspective, this gives confidence in encouraging people with RA to engage in purposeful low impact exercise. However, as most of the participants discontinued their training regime at the completion of the study, further consideration of meaningfulness is required.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH:

Traditionally patients with active RA have been advised by health professionals to passively manage symptoms, including rest from active exercise. In the last two decades, increasing numbers of health professionals are recommending active exercise, supported by a number of studies looking at the effects on a diverse range of outcome measures including function (Cairns & McVeigh, 2009). The articles reviewed within this critical appraisal support the use of dynamic exercise in reducing pain and increasing function in adults with RA.
The evidence compounded by Baillet et al. (2010) in the systematic review concluded that aerobic exercise is effective in improving life quality, function, and clinical and radiological outcomes in RA. Whether this conclusion is trustworthy and reliable can be questioned due to the relatively low quality of studies reviewed, the small and often statistically insignificant results and potential bias. The review did not involve OTs therefore professional judgement would be required to extract the relevant data to implement it into clinical practice. Noreau et al.'s (1995) quantitative study found that exercise improved fitness, mood and vigour, without any short term adverse effects on joints. However as this study does not measure function as an outcome in great detail, clinical knowledge of the context should be applied if this study is used as the rationale for improving function.

Both studies indicate that further research is required to define the place of aerobic exercise with RA patients. From an occupational perspective, investigation of meaningful exercise in RA would be beneficial, as we require evidence to reinforce the principals which guide our practice. Additionally, it may be beneficial for future research to clearly indicate adverse cardiorespiratory effects of exercise in RA. This was only briefly addressed in one study and it is imperative that OTs are well informed of the risks prior to prescribing aerobic exercise. OTs can use these studies when working with middle aged RA patients, but the results should not be generalized to other populations due to safety considerations. Noreau et al. (1995) also suggests that studies involving longer exercise programmes to measure adverse effects of aerobic exercise over time would be beneficial for patient safety.

These two articles have very different strengths to offer an OT working within an evidence based practice (EBP) framework. Their recommendations should be applied with care and in combination with client evidence and professional expertise.

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