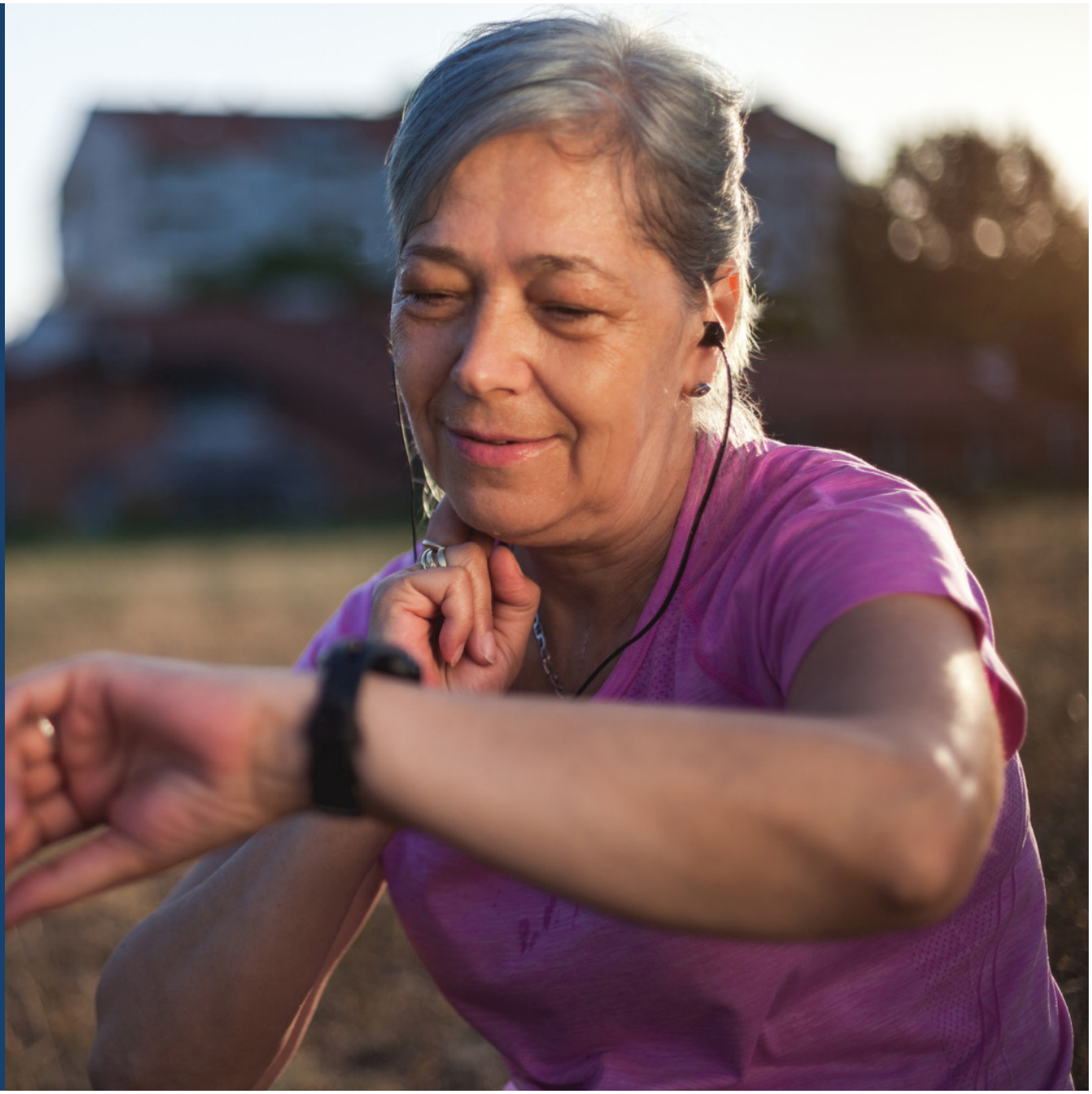
ARTHRITIS AND EXERCISE:
THE ESSENTIALS



Arthritis AUSTRALIA

Arthritis Australia

Arthritis and Exercise: The Essentials

October 2021

The position statement is endorsed by:

- Australian Rheumatology Association
- Australian Physiotherapy Association
- Exercise and Sports Science Association
- Fitness Australia

Put simply, exercise is good for arthritis.

The strength of the evidence varies across different studies but there is no debate that people with arthritis can experience improvements in their condition and overall wellbeing by participating in regular, appropriate exercise.

Yet significant confusion about the benefit and safety of exercise for people with arthritis still exists within the community, reflected in the large number of exercise-related calls to our national Arthritis Infoline.People with arthritis frequently report fear of making symptoms worseand a lack of knowledge about what to do and how to get started, ultimately resulting in sub-optimal physical activity levels. Australian GPs have also told us, via our *Voice of GP* survey[1], that they lack confidence in prescribing the most appropriate exercise for their patients with arthritis. Recognising this uncertainty, Arthritis Australia has worked with a group of experts to bring together this guide for consumers, health professionals and fitness & exercise providers.

Its purpose is to provide clear, evidence-based recommendations about the role of exercise in the prevention of arthritis and ongoing management of individuals with the condition. These recommendations will drive the development of criteria that can be used to evaluate whether current and proposed community exercise programs are suitable for people with arthritis.

We hope that by pulling together this information we can offer a significant opportunity for the fitness industry to link with health sector professionals such as GPs, physiotherapists, and exercise physiologists. For these allied health professionals, we believe that creating and strengthening referral pathways into suitable evidence-based exercise programs will greatly assist the overall objective of preventing and managing arthritis and improving the quality of life for people living with the condition.

ARTHRITIS AND EXERCISE

the essentials

Exercise is recommended for OA and RA, with positive effects on pain, function, fatigue, psychological health, cardiovascular status, obesity and falls.

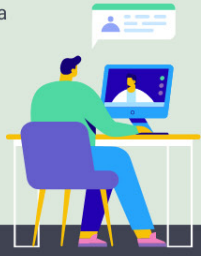
Exercise has relatively few side effects and in the case of OA, provides benefits similar in magnitude to those of common pain-relieving drugs.

A pre-exercise assessment, including use of screening tools for community-based programs, can help determine appropriate exercise prescription.

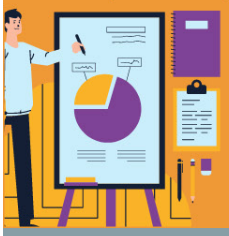
Many types of exercise are suitable such as strengthening, aerobic, stretching, aquatic, Tai Chi and yoga. The person's preferences, goals and lifestyle should be considered when choosing an exercise type.

Exercise can be delivered in different ways including individual, class-based and home-based or combination. A period of supervision can improve outcomes.

Education is important to improve the person's understanding of their condition, address misconceptions and promote self-management. This can occur via discussion, written material, support groups and websites.



Monitoring progress using valid and reliable outcome measures should be performed regularly.



Exercise adherence often declines over time and is associated with poorer exercise outcomes. Individual barriers/facilitators to exercise should be indentified and strategies instigated to encourage longer-term adherance.

Arthritis AUSTRALIA

Contents

1. Arthritis: The magnitude of the problem

Worldwide, arthritis is a major cause of disability and chronic pain. In Australia in 2015 there were an estimated 3.9 million people with arthritis, of which 2.2 million had osteoarthritis (OA) and 0.5 million had rheumatoid arthritis (RA)[2]. This prevalence is predicted to rise substantially, particularly for OA, as the population ages and rates of obesity increase[3]. By 2032 it is projected that 8.7 million Australians will have arthritis and other musculoskeletal conditions, an increase of 43%[3]. Arthritis and musculoskeletal conditions have been identified by the Australian Government as a National Health Priority Area since 2002[3]. Reports such as the *National Osteoarthritis Strategy*[4] and the *National Strategic Action Plan for Arthritis*[5] have been developed to help guide planning and funding in a sustainable, cost-effective manner to improve outcomes for people living with arthritis.

The joints most commonly affected in OA are the knees, hips and hands whilst for RA many upper and lower limb joints can be involved including the hands, wrists, feet, shoulders, elbows, knees and ankles. OA and RA can both be extremely debilitating, with pain and physical dysfunction leading to significant loss of quality of life. People with OA and RA report pain, difficulty performing activities of daily living and occupational tasks, sleep problems and fatigue. They present with a range of physical impairments including joint stiffness, muscle weakness, altered proprioception, reduced balance and gait abnormalities. In addition, psychological impairments such as depression and anxiety are common. There is no cure for OA, and joint replacement surgery is a costly treatment option reserved for severe disease. In 2015-2016, musculoskeletal disorders had the highest health care expenditure costs to the Australian health care system of the 17 identified Australian Burden of Disease groups, at an estimated $14 billion dollars[6]. The health care costs for OA were estimated at over $3.9 billion in 2018-2019, while RA health care costs were estimated at $900 million[6]. In addition to this are the indirect but significant costs of loss of productivity, carer burden, travel and aids[3].

2. The role of exercise for arthritis

Exercise: *any physical activity that is planned, structured, repetitive, and purposeful in the sense that the improvement or maintenance of one or more components of physical fitness is the objective. This activity can be supervised or unsupervised, as well as prescribed, advised or self-initiated.*[7]

National and international clinical guidelines[8-13] recommend exercise for the management of OA, irrespective of patient age, joint involved, radiographic disease severity, pain intensity,

Box 1 : About quality of research evidence

Evidence-based medicine uses hierarchical systems to assess the quality and strength of the evidence generated by research studies. The quality of evidence can be evaluated at both the individual study level or for the body of evidence as a whole using a variety of different methods/scales. Randomised controlled trials (RCT), in which research participants are randomly allocated to different treatments or interventions to compare outcomes, usually provide the highest level of evidence for individual studies. Systematic reviews of RCTs, which combine and analyse data from multiple studies to summarise the clinical research that exists on a certain topic, are classified at an even higher level. Case studies are classified as the lowest level of evidence.[14]

In this document we focus on evidence from RCTs and systematic reviews wherever possible.

Even though RCTs are considered the gold standard for research evidence, they can vary in quality in terms of methodology, design and reporting, and it is not always possible to eliminate the potential for bias in the design. In particular for exercise trials, most use a no-treatment or education control comparator with participants who are not blinded to the intervention due to the difficulty in designing a realistic sham for exercise therapy. This is likely to over-estimate the effects, particularly for patient-reported outcomes such as pain and function.

Results of several systematic reviews evaluating the effects of exercise are shown in Table 1. One found that as of 2002, sufficient evidence had already been accrued to show the significant benefits of exercise interventions over no exercise control for lower limb OA[15]. However, most of the evidence about the effects of exercise relates to OA at the knee with fewer trials investigating OA at the hip. A Cochrane systematic review of exercise for OA of the hip did report a slight reduction in pain and improved physical function immediately after intervention, and 3-6 months later[16].

While disease-modifying anti-rheumatic therapy, including biologic drugs, can successfully suppress the disease, there is no cure for RA. Clinical guidelines recommend regular participation in exercise alongside pharmacological treatments[17, 18]. Exercise therapy is likely to have a role in combating the adverse effects of RA on muscle strength, endurance, aerobic capacity, fatigue and cardiovascular function[18-20]. However, although exercise is recommended for RA, the evidence base is still relatively limited (Table 1) with much of the RA literature focused on the effects of drug therapy in reducing disease activity and pain. A recent umbrella review of the effectiveness of a variety of non-surgical and non-pharmacological interventions in RA found that exercise/physical activity interventions were effective in improving pain, functional disability, quality of life and fatigue[21].

The main goals of exercise in people with OA and with RA are to reduce pain, improve physical function and optimize participation in social, domestic, occupational and recreational pursuits[8, 19]. Regular exercise can improve physical impairments associated with arthritis including muscle strength, joint range of motion, proprioception, balance and cardiovascular fitness[15, 22-25]. Other potential benefits of exercise reported in both populations include improvements in mobility, falls risk, body weight, psychological state, fatigue and cardiometabolic risk factors[26-30]. Although the magnitude of treatment benefits of exercise may be considered small to moderate, exercise of all types is associated with relatively few side effects[31]. Furthermore, in the case of OA, exercise provides benefits that are similar in magnitude to those of commonly used pain-relieving drugs[32, 33].

Despite the evidence and clinical guideline recommendations, exercise levels in populations with arthritis have been reported to be well below optimal[34, 35]. This highlights the need for strategies to increase the uptake of exercise in people with arthritis (see section 4.5).

Table 1: Summary of results of several systematic reviews investigating the effects of exercise, including effect sizes (95% confidence intervals) for pain and physical function

Study	Type of exercise	Site of arthritis	Effect size for pain*	Effect size for self-reported physical function *
Goh et al 2019[36]	All	Knee and Hip OA	77 RCTs with 6,472 participants 0.56 (0.44, 0.68)	77 RCTs with 6,472 participants 0.50 (0.38-0.63)
Fransen et al 2015[37]	Land based	Knee OA	44 RCTs with 3,537 participants 0.49 (0.39, 0.59)	44 RCTs with 3,913 participants 0.52 (0.39, 0.64)
Juhl et al 2014[38]	All	Knee OA	47 RCTs with 4,028 participants 0.50 (0.39, 0.62)	35 RCTs with 2,732 participants 0.49 (0.35, 0.63)
Fransen et al 2014[16]	Land based	Hip OA	9 RCTs with 549 participants 0.38 (-0.55, -0.20)	9 RCTs with 549 participants -0.38 (0.54, -0.05)
Moseng et al 2017[39, 40]	Land based supervised exercise	Hip OA	12 RCTs with 567 participants -0.28 (0.45, 0.10)	12 RCTs with 555 participants -0.34 (-0.50, -0.18)
Hurley et al 2018[29]	Land or Water Based	Hip, Knee or Hip and Knee OA	19 RCTs (23 comparisons) -0.20 (-0.28, -0.11)	13 RCTs (16 comparisons) with 1599 participants) -0.27 (-0.37, -0.17)
Bartels et al 2016[41]	Water Based	Knee and Hip OA	12 RCTs with 539 participants -0.31 (-0.47, -0.15)	-12 RCTs with 529 participants -0.32 (-0.47, -0.17)
Williams et al 2018[42]	Hand exercise	RA	2 RCTs with 124 participants SMD not able to be calculated	2 RCTs with 120 participants 0.79 (0.42, 1.17)
Baillet et al 2012[43]	Land based resistance exercise	RA	5 RCTs with 144 participants	Not assessed

RCT=randomised controlled trials

* Effect sizes can be interpreted as 44:0.20= Small effect size; 0.50 = Medium effect size; 0.80= Large effect size

3. Core principles of exercise prescription

Four core principles guide the prescription and progression of effective exercise programs[45].

Appropriateness - the suitability of the exercise prescription to the individual. A key component is a pre-exercise checklist aimed at identifying any underlying factors or contraindications to exercise[46]. Pre exercise screening is covered in more detail in section 4.1.

Specificity - exercise prescription must be relevant to the outcomes the individual is pursuing in order to produce a training effect[45] such as improving general fitness or reducing the likelihood of falling. A thorough baseline assessment in combination with the individual's short- and long-term goals enables the exercise prescription to be specific to the patient's needs, functional goals and preferences.

Exercise load - refers to the total volume of exercise completed. Parameters that can be varied to alter exercise load include exercise intensity, training frequency, and training duration. These are determined by the baseline assessment and adjusted periodically according to findings on re-assessment.

Progressive overload - the gradual increase of stress placed upon the body during exercise. An overload is an intensity greater than that encountered on a regular daily basis. Physiological changes can only occur from exercise when an overload is applied. Overload must be progressive to allow optimal adaptation and ongoing functional gains to occur[45].

4. Core components of exercise prescription

4.1 Assessment

Pre-exercise screening for community-based exercise programs

When recommending exercise to assist with the management of arthritis, the potential benefits of the treatment must outweigh any possible risks. Exercise prescription must consider co-morbidities. Arthritic conditions, particularly OA, are more prevalent in older adults, who are also the group most likely to have co-morbidities. These co-morbidities may include obesity, mental health conditions, asthma, diabetes, cardiovascular disease and osteoporosis[47-49]. Given that RA increases the risk of cardiovascular disease[18] and that some medications such as glucocorticoids used in its treatment can predispose to osteoporosis, younger people with RA may also present with co-morbidities.

Before starting supervised exercise in a community-based program, it may be appropriate for participants to undertake a comprehensive health and injury assessment conducted by a registered exercise or health professional. Sports Medicine Australia, in collaboration with Exercise & Sports Science Australia and Fitness Australia, has developed an Adult Pre-Exercise Screening System (Figure 1) which includes a screening tool and user guide available from the websites of these organisations (eg. https://www.essa.org.au/Public/ABOUT_ESSA/Pre-Exercise_Screening_Systems.aspx).

The Adult Pre-Exercise Screening System (APSS) is designed to:

- Identify existing medical conditions that may be exacerbated by exercise.
- Risk-stratify an individual based on their existing cardiometabolic risk factors.
- Determine the requirement for a referral to a general practitioner or to a physiotherapist or accredited exercise physiologist.
- Establish the recommended exercise intensity for an individual starting exercise.

The exercise specialist, in consultation with the general practitioner as required, will then undertake additional pre-exercise screening to identify any absolute or relative contraindications for exercise, and develop an individualised exercise prescription to optimise outcomes while minimising the risk of any potential adverse events.

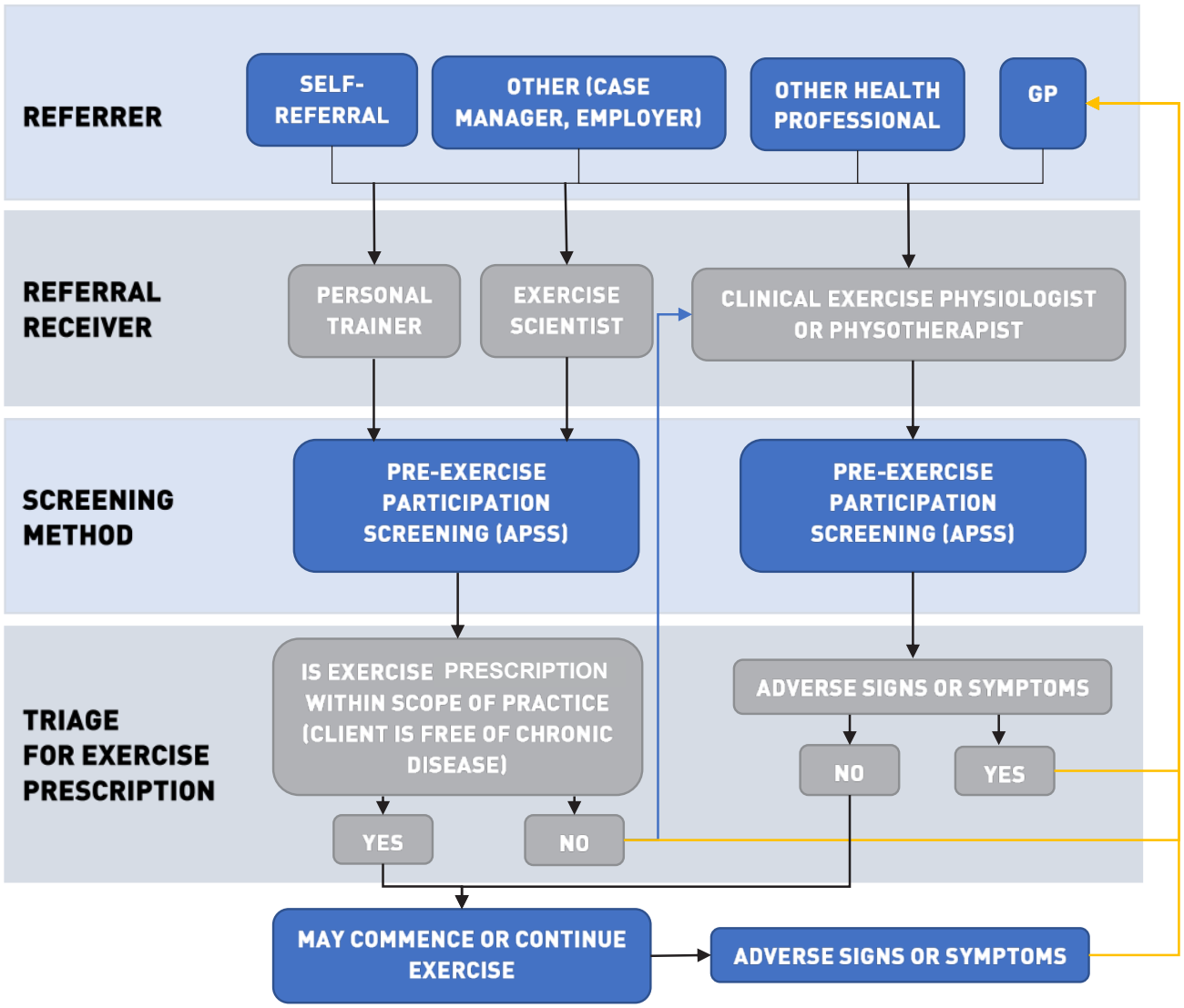


Figure 1: Pathways for exercise and arthritis programs[50]

Outcome measures

The effectiveness of an exercise program should be assessed using person-relevant, valid, reliable and responsive outcome measures that are appropriate to the health professional and the environment. Sample outcome measures are included in Appendix A. The timeframe for re-assessment will vary but generally an interval of 8 to12 weeks should provide adequate time for changes to occur, with further re-assessment performed at 6 and 12 months if possible[12, 17]. It is useful to include both self-reported and performance-based outcome measures to gain an overall picture of any change. Other person-relevant outcomes can also be motivating factors and may in turn aid adherence to exercise programs.

Patient reported outcome measures:
A number of organisations have developed recommendations around core domains of measurement for people with OA and RA. The International Consortium for Health Outcomes Measurement (ICHOM) defines a minimum "standard set" of outcome measures for both hip and knee OA[51], and inflammatory arthritis[52], with a focus on those outcomes that matter most to patients. These are freely available from the ICHOM website (ichom.org).

For people with hip and knee OA, ICHOM recommends measurement of pain, physical functioning and health-related quality of life. Numeric rating scales (NRS) and visual analogue scales (VAS) are simple and reliable self-report measures of pain that have been validated and are recommended for use in clinical practice[53, 54]. In general, changes of at least 2 cm (on a 10cm scale) or 2 units (on a 0 – 10 scale) are needed to represent a clinically relevant amount of change with treatment[55]. To track physical function, ICHOM recommends using the Physical Function Shortform versions of the Knee Injury and Osteoarthritis Outcome Score (KOOS-PS) and the Hip Disability and Osteoarthritis Outcome Score (HOOS-PS). These are free, valid instruments that have been translated into 19 and 11 languages, respectively [54, 56, 57].

In terms of patient reported outcomes in RA, ICHOM recommends tracking pain, fatigue, activity limitation and overall emotional and physical health impact. There are multiple validated questionnaires suggested for use. Those that are free to use and quick to administer can be appealing for busy health professionals and patients. Pain and fatigue can be measured using a VAS or NRS (see Appendix A). Activity limitation can be measured using the Disability Index component of the Health Assessment Questionnaire (HAQ-DI). This is a valid and reliable outcome measure where a change of -0.22 units (out of 3) is considered to be the minimum amount perceived by patients to be an important improvement[58]. Overall emotional

and physical health impact can be tracked using a simple NRS (see Appendix A) or one of the longer, validated instruments recommended by ICHOM.

For both OA and RA, a global rating of change scale can also be administered following the exercise program to measure patient-perceived overall change in symptoms and function[56, 59] as well as overall satisfaction with treatment using a Likert Scale (eg. 1=very satisfied, 2=satisfied, 3=neither satisfied nor dissatisfied, 4=dissatisfied, 5=very dissatisfied).

Physical performance measures:
In comparison to self-report measures, physical performance measures assess what individuals can actually do rather than what they perceive they can do. Physical performance measures can also determine if the objectives of the prescribed exercise program are being achieved, such as increases in muscle strength, joint mobility or other functional improvements. Physical perfomance measures provide separate information about a person's physical status than self-reported measures and are seen as complementary.

Based upon an international modified Delphi exercise led by a multidisciplinary team that considered the evidence, the Osteoarthritis Research Society International (OARSI) recommended a core set of physical performance measures for use in people with hip and knee OA, including following joint replacement[60, 61]. The set comprises the 30-second chair stand test, 40 metre fast-paced walk test and a stair climb test, with additional tests including the timed up and go (TUG) and the 6-minute walk (Appendix B).

The 6-minute walk test to measure aerobic capacity, and hand-held dynamometer measurement of muscle strength, are recommended for use with people with RA[62]. The TUG test has recently been shown to have a strong association with a self-reported measure of physical function in both RA and OA and is suitable for the older population[63].

4.2 Education

Patient education is an integral part of the overall management of people with arthritis. Health professionals should provide evidence-based information about the disease, its management and self-care strategies using language that promotes hope, optimism, and a positive expectation of treatment benefit[8,12]. Patients can also be referred to websites that contain high-quality, unbiased evidence-based information such as Arthritis Australia's MyJointPain.org.au for OA, MyRA.org.au for RA, or the Western Australian Government's painHEALTH site applicable to both OA and RA.

Those seeking more information can be offered opportunities to take part in educational activities such as self-management programs. Despite evidence showing that educational programs in isolation might have negligible benefits on pain and function[64], educating patients about their disease, pain mechanisms and treatment options has been shown to improve participants' self-efficacy[65]. According to Bandura (1982), self-efficacy is a self-judgement of one's ability to perform a task within a specific domain and it affects some of the factors that predict motivation. As such, improving self-efficacy is important in helping to promote exercise adherence.

Education can be delivered in various ways, including formal or informal discussion with a health professional supplemented by written materials, support groups or web-based programs. When held in a group setting, education sessions may also bring the benefits of peer support, providing social interaction with others with arthritis.

Information about local community-based arthritis education is available by calling the Arthritis Infoline: 1800 011 041

Qualitative research has found that many people with arthritis have concerns about possible detrimental effects of exercise and perceive these to be specific barriers to uptake and participation[66-70]. Furthermore, due to uncertainty about which exercises to choose and how to do them without causing harm, many people feel they are unable to exercise at all[71]. A study in people with knee OA found that many described their condition as "bone on bone" believing that "wear and tear" was the cause. These beliefs appeared to negatively influence the person's acceptance of nonsurgical, evidence-based treatment such as exercise and led to disregard for these types of interventions[66]. These results highlight the importance of education and information provision as well as attention to the language used by health professionals.

Common misconceptions/questions about arthritis and exercise and corresponding evidence-based statements to refute these are found in Table 2 for OA and Table 3 for RA.

Table 2: Common consumer statements and questions about OA, and the corresponding evidence-based statement[72-74]

Statement / question about OA	Evidence-based statement
OA is just part of getting older.	OA is not an inevitable part of getting older.
OA is "bone wearing" and exercise is not going to help that.	OA is not just a disease of the cartilage but affects your whole joint including muscles and ligaments.
My x-ray shows severe joint damage therefore I must need a joint replacement.	Joint damage on an x-ray does not indicate how much your OA will affect you.
My joint pain is much worse than my neighbours, and he had severe damage on x-ray, so mine must be terrible.	The symptoms of OA can vary greatly from person to person.
I am too old and my pain is very severe and limiting. Any exercise will make me worse.	Prescribed exercise programs have been shown to be beneficial no matter what your age, joint involved, radiographic severity, pain intensity or functional level.
I do my exercises once a week, so why am I not getting any better?	Exercises have greater benefits if you do them regularly (at least 3 times per week according to evidence).
I don't have time to do all of these exercises each day.	Linking your exercises to your other daily activities is a useful way to become more active. Small amounts of individualized exercise undertaken frequently can be beneficial for your OA.
Can I not just manage my pain with pills?	Non-drug treatments have similar benefits for your osteoarthritis symptoms to pain-relieving drugs, but with few unwanted side effects.
I need to rest as much as I can for my joints.	Living a sedentary life could worsen your OA, and also increases your risk of other lifestyle-related diseases such as diabetes and cardiovascular disease.
I need a joint replacement, so there is no point in doing exercises.	Maintaining sufficient muscle strength around the joints is important in reducing pain and maintaining function, and if you require an operation you will benefit from both pre- and post-operative periods of treatment.
I don't have access to the expensive gym and exercise equipment I will need.	Exercises to improve your movement and strength do not require specialised equipment and can be done at home.
I don't like doing exercises with weights, as I will hurt myself.	Your exercise need not include weights. Many different physical activities can be beneficial, including water-based exercise, walking, and group classes.

Table 3: Identified consumer views and queries regarding the effects of exercise on joint health in RA, and corresponding evidence-based statement [26, 71,72, 75]

Statement about RA and exercise	Evidence-based statement
My RA has caused damage to my joints, and I worry that exercise will cause more damage.	Exercise has been shown to benefit joint health and may decrease joint inflammation and pain.
What do they mean by exercise and what is safe for me to do?	Exercise encompasses a range of activities; what is suitable for each person must be assessed on an individual basis.
It hurts when I exercise so I have to stop and rest.	Some pain is to be expected with exercise. Working with your health professional to monitor this is the best plan.
What do I do in a 'flare'?	Knowing how to identify a flare, and changing exercise accordingly, is best achieved through education.
It is not just my RA; I have heart problems as well. I am scared I will make that worse.	Exercise is particularly important and can be beneficial for those at risk of cardiovascular disease. Before starting exercise you should consult with your doctor.
I am too old and my pain is very severe and limiting. Any exercise will make me worse.	Prescribed exercise programs have been shown to be beneficial no matter what your age, pain intensity or functional level. Use of simple analgesics can give pain relief, to allow you to exercise.
I do my exercises once a week, so why am I not getting any better?	Exercises have the most benefits if you do them regularly and more frequently. Guidelines recommend 3 or more times each week.
I don't have time to do all of these exercises each day.	Linking your exercises to your other daily activities is a useful way to become more active.
Can I not just manage my pain with pills?	Exercise has additional benefits for RA symptoms. Increasing strength and mobility improves not only pain but function as well.
Resting all day will help my joints.	Living a sedentary life could worsen your RA, and also increases your risk of other lifestyle-related diseases such as diabetes and cardiovascular disease.
I don't have access to the expensive gym and exercise equipment I will need	Exercises to improve your movement and strength do not require specialised equipment and can be done at home.
I find that I am too tired to exercise, and exercising may make my RA worse.	Exercise can help improve your fitness and endurance and may help to reduce your fatigue.

4.3 Exercise prescription

Type of exercise

There are many types of exercise that can be suitable for people with arthritis including muscle strengthening/resistance training, stretching/range of motion, cardiovascular/aerobic conditioning, neuromuscular (weight-bearing, functional) exercise, balance training, yoga, aquatic exercise and Tai Chi. Systematic reviews suggest benefits can be gained from a range of exercise types although the strength of the evidence is often deemed low to very low in quality[15, 37, 76, 77] (Tables 4 and 5).

Few studies have directly compared the effects of different types of exercise. While there is indirect evidence suggesting that the benefits of exercise may vary according to type and combination, agreement on which type and combination is most beneficial, is lacking. Uthman et al[15] found a combination of strengthening with flexibility and aerobic exercise (either land- or water-based) to be the most effective exercise in lower limb OA (predominantly knee OA studies). They found it was the only exercise intervention significantly more effective for both pain and function than the 'no exercise' control. In contrast, Juhl et al[38] found comparable benefits from a range of exercise types, although single-type exercise programs were more effective than programs that included different exercise types. The authors suggested that different exercise types could be performed in an overall program but that each session should focus on one type of exercise to maximise benefits. This concurs with the review by Goh et al[77] where mixed exercise programs were least effective for all outcomes measured (pain, function, performance and quality of life) in people with hip and knee OA. This review also found that aerobic exercise and mind-body exercises such as Tai Chi and yoga were equally beneficial for pain on their own while strengthening and flexibility/skill exercises had a moderate effect in improving multiple outcomes[77]. Discrepancies in reporting of exercise program contents may partly explain the difficulties in reporting on these study findings[78, 79].

Both land- and water-based exercises have been used for people with arthritis. Aquatic exercise (or hydrotherapy), which takes place in warm water (typically 32º to 36º Celsius)[41], gives the additional benefit of buoyancy and decreased joint impact. A number of trials have evaluated land and aquatic exercise in both RA and OA groups. Systematic reviews of

these trials report comparable positive results for pain and function[41, 80-82], making personal preference and availability of a suitably heated pool the deciding factors when choosing which to use.

Balance exercises have not been demonstrated to improve pain and function in people with arthritis, however there is strong evidence for their role in reducing falls[83, 84], making their inclusion logical when an increased falls risk is identified.

Mind-body exercises such as Tai Chi and yoga are gaining popularity and have been recommended in recent clinical guidelines for people with knee/hip OA, although the evidence is still relatively limited[8, 12, 85]. A network meta-analysis of nonpharmacologic interventions in women with OA found yoga to be the most effective intervention for reducing pain followed by strengthening exercise and Tai Chi[86]. Uncertainity remains around the benefit of Tai Chi for people with RA for improving outcomes such as pain and physical function given that there are only few studies that are of low quality[87].

Given the fact that benefits seem to be obtained from a range of different exercise types, choosing exercise that suits a person's preferences and addresses identified impairments and functional goals is important. Given that OA and RA are chronic conditions and that exercise is recommended to be performed throughout life, trying different exercise types might also have the advantage of maintaining interest and facilitating adherence.

Table 4 outlines various types of exercise evaluated in clinical trials, and the evidence for the use of different exercise types in people with OA.

Type of exercise	Evidence for people with hip and/or knee OA
Muscle strengthening	• Meta-analyses show benefits for improving both pain and physical function in knee OA [15, 37, 38, 81, 88] • For knee OA, programs that were compliant with the American College of Sports Medicince (ACSM) exercise dosage recommendations showed a significant improvement in knee extensor strength but no difference in pain or disability compared to non-compliant programs[89] • For hip OA, programs that were compliant with ACSM exercise dosage recommendations showed significantly greater beneficial effects for pain compared with those programs with uncertain compliance[39] • Conflicting evidence in hip OA[90-92] • Evidence suggests that the specific type of strengthening exercise does not significantly influence outcome. Similar benefits found with isotonic (through range), isometric (without movement) and isokinetic (performed on specific machines) strengthening exercise[93] as well as with strengthening exercise performed in weight bearing or non-weight bearing positions[81, 94] • Muscle strengthening exercise was shown in a meta-analysis to improve quadriceps strength in hip/knee OA[19] • In a meta-analysis, adding hip exercises to quadriceps exercises was more effective than quadriceps exercises alone for improving walking function, but not pain or patient reported function in knee OA[95]
Aerobic exercise	• Meta-analyses show benefits for improved both pain and physical function in knee OA[15, 38, 81, 88] • Shown in other populations to have positive effects on psychological impairments such as depressive symptoms[32], which are common in people with OA • Meta-analysis found both land- and water-based aerobic exercise are effective compared to no exercise control[15] • Significant improvements in pain, quality of life and functional status found in knee OA with aerobic walking[96] • Aerobic walking needs to be at a level more intense than normal activities for optimal benefit, and for at least 30 minutes, ≥3 times each week[96] • Aerobic exercise in isolation for hip OA has only been investigated in one RCT, which showed that Nordic Walking produced greater improvements in functional performance and mental health than strengthening exercise or home-based exercise program but no difference in pain[97]
Stretching and range of motion	• Stretching in isolation has not been studied; these exercises generally form part of an overall exercise program for OA • In a meta-analysis in hip/knee OA, three RCT's examining stretching combined with strength or aerobic exercises found no effect on flexibility[19]
Aquatic exercise	• Meta-analysis showed small short-term benefits on pain and physical function and minor effects on quality of life in hip and knee OA[41]
Balance exercise	• No trials specifically addressing balance alone in people with hip or knee OA • In older people living in the community, there is strong evidence that balance exercises reduce falls[84]
Tai Chi	• Meta-analyses found Tai Chi had significant moderate effects on pain, physical function and stiffness[98-100]
Yoga	• Meta-analysis found very low quality evidence that yoga had beneficial effects on pain, physical function and stiffness compared to exercise and non-exercise controls[101]

Table 5 outlines various types of exercise evaluated in clinical trials, and the evidence for the use of different exercise types in people with RA.

Type of exercise	Evidence for people with rheumatoid arthritis
Muscle strengthening exercises	• Systematic reviews, including a Cochrane review, showed positive effects of dynamic exercises (strengthening combined with aerobic exercise) on muscle strength[43, 76] • Meta-analysis found a moderate effect on quadriceps strength[19] • A recent randomised controlled trial in older adults with RA found that moderate-to-high intensity resistance and aerobic exercise in a gym was more effective in improving aerobic capacity, endurance, strength, fatigue and depression, but not disability, than home-based exercise of light intensity[102, 103]
Aerobic exercises	• In a Cochrane review, studies of short-term, land-based aerobic capacity training, showed a positive effect on aerobic capacity with no deleterious effects reported[19] • A meta-analysis showed a short-term benefit of reducing fatigue with land-based aerobic exercise programs[20] • A recent randomised controlled trial in older adults with RA found that moderate-to-high intensity resistance and aerobic exercise in a gym was more effective in improving aerobic capacity, endurance, strength, fatigue and depression, but not disability, than home-based exercise of light intensity[102, 103]
Stretching and range of motion exercises	• A systematic review reported positive effects on joint range of motion, pain and joint count when used in combination with aerobic and strengthening exercises[22] • An RCT comparing a combination of strengthening and stretching of the hand with usual care found significant improvement for overall hand function but no difference in pain troublesomeness, range of motion measures, or adverse events. Dexterity was significantly improved in the exercise group at 12 months[104]
Aquatic exercise	• In a systematic review, aquatic exercise was found to improve aerobic capacity, muscle strength and psychological status when compared to no exercise intervention[105] • In a Cochrane review, studies of short-term, water-based aerobic capacity training show limited evidence for a positive effect on functional ability and aerobic capacity[76]
Balance exercises	• Cochrane review inconclusive as no studies met inclusion criteria[24] • In older people living in the community, there is strong evidence that balance exercises reduce falls[84]
Walking	• A systematic review found no randomised controlled trials using walking alone with RA participants[105] • A feasibility RCT concluded that walking appears to be a feasible, acceptable and safe intervention for people with RA[106] • A study piloting a 10-week high-intensity interval walking training program demonstrated increased cardiorespiratory fitness and reduced disease activity, but no change in self-reported pain or disability[107]
Tai Chi	• A Cochrane review concluded it was uncertain whether Tai Chi improves pain, function, or disease activity and important effects cannot be confirmed or excluded due to low quality evidence[87]
Cycling	• A systematic review found that trials using a cycling intervention reported both increased aerobic capacity, and decreased disease activity after 8 – 12 weeks compared to no exercise intervention[105]
Hand exercises	• In a Cochrane review, studies comparing hand exercises with no-exercise therapies reported uncertainty of short-term improvement in hand function or pain due to very low-quality evidence. There was evidence from one study for improvement in medium- and long-term hand function and no adverse events were found in the one study that reported on them[42]
Yoga	• A systematic review included two trials with very low evidence for effects on pain and concluded that only a weak recommendation can be made for the use of yoga in RA[108]

Mode of delivery

Exercise can be broadly categorized into three different delivery modes: individual (one-on-one) treatments; class-based (group) programs; and home-based programs. Other common mixed-mode alternatives include combining individual treatment sessions with home-based exercise, and augmenting home exercise with either a class-based program or supervised home visits by a trained health care or exercise professional. The effects of mode of delivery have been investigated in OA more than in RA.

A Cochrane systematic review that included 44 trials (3537 participants)[37] showed that both individual class-based and home-based programs achieved beneficial treatment effects in terms of reduced self-reported pain and improved self-reported physical function in people with OA. Group programs supervised by health professionals have the advantages of incorporating social interaction, which may facilitate exercise adherence, and lower cost delivery than individualised care. Both individual and group programs have been shown to be more effective than no treatment or unsupervised programs. Examples of OA group programs that have emerged around the world include Better management of patients with OsteoArthritis (BOA)[109], ESCAPE-pain in the United Kingdom[110] and Good Life with osteoArthritis-Denmark (GLA:D)®[111]. GLA:D® is now being delivered by trained physiotherapists across Australia. It is an 8-week group program involving evidence-based education and exercise therapy for people with hip or knee OA.

Supervision, particularly in the initial stages of a class-based or home-based exercise program, can help promote safe and correct exercise technique, and ensure the dosage of the exercise is appropriate for the patient's physical ability and overall goals of the program. Results from one study[112] showed that augmentation of a home program with an initial 8-week physiotherapist-supervised class exercise program in people with knee OA led to greater improvements in pain and walking function at 12 months follow-up, demonstrating that the short-term addition of exercise classes results in significant symptomatic benefits in the longer term. In a systematic review, Juhl et al[38] found a significant relationship between the number of supervised sessions and the pain-relieving benefits of aerobic exercise (but not resistance exercise) for people with knee OA. Indeed for every 10 supervised sessions, the pain relieving benefits increased by an amount comparable with the pain relief obtained with simple analgesia[38].

Supervision does not necessarily require the in-person presence of a health professional, as emerging e-health technologies such as telehealth, mobile health (m-health), and movement

sensors (such as wearable technology) are becoming more widely available. These types of technologies may facilitate implementation of clinical practice guidelines and models of care for musculoskeletal conditions such as RA and OA[113]. Real-time monitoring can be conducted in a variety of settings to help clinicians provide patients with feedback regarding exercise performance. Several recent clinical trials have delivered exercise interventions for knee OA via videoconferencing software[114, 115]. Qualitative research investigating patients' and clinicians' perceptions and experiences with remotely-delivered interventions reports themes such as convenience, flexibility, and empowerment to self-manage, demonstrating that this delivery method is becoming more feasible and acceptable[116]. Remote delivery could also allow for greater opportunity for people to engage with exercise practitioners, especially in regional and remote Australia where fewer services are available.

Exercise load

Exercise programs can differ greatly in terms of their dosage or load by varying the parameters that underlie their design. The parameters that can be varied within the exercise prescription include the exercise intensity, the training frequency, and the training duration, which when combined make up the weekly training load. Regular progressive overload is important to training progression[45]. From a clinical perspective, the optimal dosage of exercise for people with arthritis is unclear as very few studies have directly compared different exercise loads, and loading varies markedly between studies[23]. In a study of OA patients, both high- and low-intensity strength training matched for total workload produced similar improvements in pain and function[117]. A Cochrane review found low quality evidence that high-intensity exercise may lead to slightly larger improvements in pain and function compared with low-intensity exercise but not enough for important clinical benefit in individuals with knee OA[118]. Other systematic reviews have also found no impact of intensity or duration of individual sessions on patient outcomes[38]. Exercising three times per week was found to be optimal[38]. There is limited research in RA although an older study found that a high intensity program which included weight bearing exercise and stationary cycling was more effective in increasing aerobic capacity, joint mobility and muscle strength than range of motion exercises and isometric training[119].

A pre-exercise assessment should identify the priorities and any relative contra-indications to the initial exercise prescription and determine the components of fitness that require attention for each person. These factors will determine for each individual the mode of exercise recommended, the emphasis for the specific components of the exercise prescription, and the initial exercise loading (intensity, duration and frequency).

The specific guidelines for exercise dosage for strength and aerobic training and flexibility exercise in people with arthritis can be derived from evidence in the existing literature on healthy adults, and by consensus statements such as those from the American Geriatrics Society[120] and the American College of Sports Medicine (ACSM) criteria[121-123]. Indeed, systematic reviews have highlighted better exercise outcomes for people with OA when exercise dosage was compliant with ACSM criteria[39, 89]. Exercise prescription must also consider any limitations placed on specific individuals by current disease activity. The training guidelines outlined below are provided as a basis for prescription for otherwise healthy individuals.

a. Aerobic training guidelines

Improving aerobic or cardiovascular endurance is an essential component of fitness to reduce cardiovascular strain when performing any continuous activity, such as routine daily tasks, and to improve cardiovascular health. Aerobic physical conditioning activities include brisk walking, aquatic activities, cycling and dance.

When prescribing aerobic exercise, prolonged continuous sub-maximal activities for a total of at least 30 minutes are recommended. This may be broken up into a number of shorter intervals with short rest periods depending on an individual's fitness level, cardiovascular health status or, for patients with arthritic conditions, any limitations due to joint pain[10, 122, 124]. The goal should be to accumulate 150 to 300 minutes of moderate-intensity exercise over the week[125]. For healthy adults, the exercise intensity should be equivalent to a brisk walking pace, but not exceeding a pace that allows the conducting of a normal conversation (this is often referred to as "talking pace"). The Borg Relative Perceived Exertion (RPE) scale[126] can also be used to assess exercise intensity, with a target RPE of between 3-5 being desirable. This can be described as moderate-hard exercise. For individuals starting an aerobic exercise program, an RPE of 3 is desirable and then increasing over a period of months to an RPE of 4-5 (Appendix C). Heart rate during exercise, including use of a portable heart rate monitor, can also be used to determine the appropriate exercise intensity. Of note is that some drugs (eg beta blockers) may invalidate the use of heart rate to assess exercise intensity. A steady heart rate during continuous exercise of between 60-80% age-predicted maximal heart rate (Max HR) is appropriate[121]. The Max HR can be estimated by the following formula: 220 minus age in years.

b. Strength training guidelines

Based on the basic principles of strength training, if the desired outcome is to increase muscle strength the exercise loading should be of moderate to high intensity, 2 to 3 times per week for at least 8-12 weeks and incorporate regular progressive overload[10, 123].

The development of strength in a specific muscle group requires the muscle to be placed under increasing load by working against an external resistance. This may include moving a weight or a pin-loaded exercise machine through a range of movement, pulling against an exercise band, using body weight, or pushing/pulling against the resistance of water in a hydrotherapy class. Pushing or pulling against an immovable object where the muscle length does not change is called isometric exercise, which may be a suitable form of exercise for arthritic patients where joint movement increases pain. A strength training program generally consists of 6-12 exercises for different muscle groups, where each exercise is repeated for 8-15 times (called repetitions), being repeated 2-3 times (called sets), with a rest period between each set of 30-180 seconds. When designing a strength-training program for individuals with arthritic joints the focus of the exercises should be on those muscles that cross the joint in which pain is experienced. Thus for lower limb joints, major muscles include the quadriceps, hamstrings, hip abductors, hip extensors and calf muscles.

To develop strength effectively, the loading for each exercise should be in the 4-7 range ("moderately strong" to "strong" – Appendix C) on the Modified Borg Scale for resistance exercise. As an individual's strength increases the resistance must be progressively increased to ensure that the intensity is kept within this desired range. Individuals with OA or RA who experience increased joint pain with higher exercise loadings, should discuss with their health professional whether the exercises or resistance should be changed, although it should be noted that it is normal to feel some discomfort/pain in the joint during exercise (see section 4.4).

4.4 Monitoring and reporting

Monitoring of participants throughout an exercise program ensures that any symptom changes, increases in pain, or adverse events can be dealt with immediately and appropriately. Of importance for RA patients when exercising is understanding and appropriately managing fluctuating disease symptoms (flare). Patient education plays a vital role, as flares are common and reflect episodes of increased disease activity beyond normal day-to-day variation. Recently, the Outcome Measures in Rheumatology (OMERACT) Flare group have developed

a consensus-based definition for RA flares as “episodes of increased RA disease activity accompanied by worsening symptoms, functional impacts, and clinical indicators of worse sufficient magnitude and duration to place individuals at greater risk of joint damage and poorer outcomes when left untreated”[127]. From this, an RA Flare Questionnaire was developed which shows early evidence of reliability, responsiveness, and validity[128]. Identification of flares may help clinicians modify exercise programs accordingly.

Although experiences of pain when exercising may assist decisions about exercise dosage, patients should be advised that it is normal to feel some discomfort or pain during exercise and that this does not mean that the joint is being damaged[31]. Indeed, a systematic review in 2017 found that in patients with chronic musculoskeletal conditions, exercising into pain resulted in significantly greater benefit for pain reduction in the short term than pain-free exercise[129]. If necessary, pain medication can be taken 20 minutes prior to undertaking exercise and/or ice packs applied to the joint for 15-20 minutes following exercise. However, if pain from exercise persists for more than a few hours, increases night pain or leads to increased swelling in the joint, this can suggest that modifications to the exercise program are needed. Prior to commencing any exercise program, a system should be established for recording and managing any adverse events that may occur, both during a class program and if participants are exercising at home.

4.5 Participation and adherence

Despite the significant body of evidence to support the use of exercise in managing both RA and lower limb OA, reported long-term benefits have been poor due to rapidly declining patient adherence. In a longitudinal study with participants with hip and knee OA, Pisters et al[130] reported 53% adherence at best, dropping to 36% by 60 months. However, there is considerable individual variation. For example, a study of patients with knee OA found three main trajectories of self-reported exercise adherence with 47% of participants having rapidly-declining adherence, 45% having gradually-declining adherence and 6% whose adherence was poor throughout[131]. However, it was difficult to predict which exercise adherence trajectory an individual was likely to follow.

Adherence to exercise is important. Research in populations with lower limb OA shows that those with higher exercise adherence rates and a higher number of exercise sessions attended, experience greater improvements than those who exhibit poor exercise

adherence[132]. Similarly a RCT of exercise in people with RA found that aerobic capacity and strength gains made during the 12-week program were lost within 12 weeks of the intervention when patients did not continue the exercises[119].

Exercise adherence in people with arthritis is influenced by a complex array of factors, both intrinsic, such as personal experience and individual attributes, and extrinsic, such as social or physical environment (Appendix D)[35, 132-134]. Given that the barriers to exercise adherence are complex, vary across individuals, and may change over time for a given individual, a flexible, individualized and proactive approach to exercise prescription by health professionals is required. No single strategy to promote exercise adherence will suffice across all people with OA or RA. Health professionals should consider and identify the barriers/facilitators to exercise adherence when recommending or prescribing exercise for people with arthritis. This information can then be used to tailor exercise recommendations and implement strategies to maximise adherence[135]. When barriers to exercise adherence are identified, Appendix F outlines a range of potential strategies that health professionals may consider implementing in discussion with the patient. These can include the use of goal setting[136], monitoring (use of a diary or exercise app)[137] and providing feedback[138].

5. Conclusion / Summary

Exercise is good for arthritis.

The strength of the evidence varies but there is no debate that people with arthritis can experience improvements in their pain, physical performance and overall wellbeing by participating in regular, appropriate exercise. When used as directed, exercise is a ‘drug’ with virtually no costs or contra-indications.

Just as clearly however there has been a degree of uncertainty among professionals in health care and associated therapeutic fitness and exercise professionals as to how exercise should be prescribed. And Australians with arthritis often show reluctance to exercise, perhaps based on concerns that using a joint will worsen their arthritis symptoms.

As the country’s peak arthritis body Arthritis Australia has a responsibility to take the lead in education and dissemination of the latest findings on such issues.

In publishing this guide, which brings together evidence-based recommendations on exercise and arthritis, we are providing what we believe will be an invaluable national resource for the fitness industry, health sector professionals and people living with arthritis to link together and ultimately ensure more effective management of arthritis.

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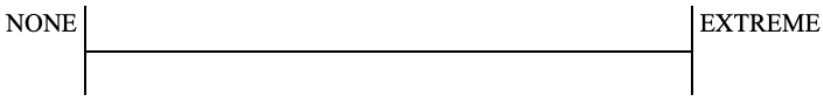
Appendices

Appendix A - Outcome measures

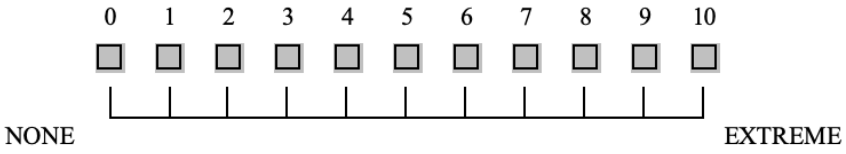
(a) Visual Analogue Scale (VAS) - Pain

Place a mark on the following scale to show what best describes the pain you felt due to your arthritis during the last week.



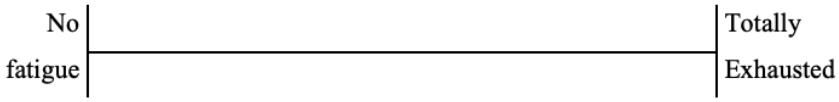
(b) Numeric Rating Scale (NRS) - Pain

Tick the number that best describes the pain you felt due to your arthritis during the last week.



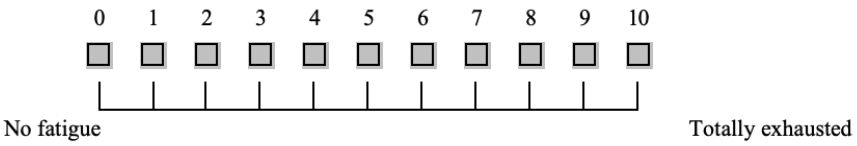
(c) Visual Analogue Scale (VAS) - Fatigue

Place a mark on the following scale to show what best describes the fatigue you felt due to your arthritis during the last week.



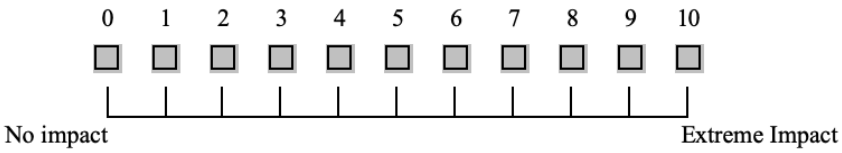
(d) Numeric Rating Scale (NRS) - Fatigue

Tick the number that best describes the fatigue you felt due to your arthritis during the last week.



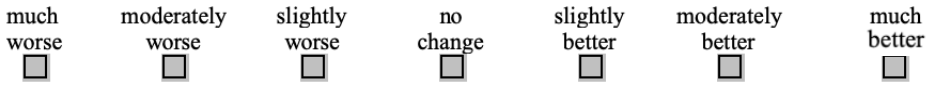
(e) Numeric Rating Scale (NRS) - Overall Emotional and Physical Health Impact

Tick the number that best describes how your arthritis has affected you overall during the last week



(f) Global Rating of Change scale (GROC)

Place an "X" in the box that best represents the overall change in your 'knee' since you began the exercise program.



Appendix B – Core set of physical performance measures for hip and knee OA

Description of the core set of physical performance measures for hip and knee osteoarthritis as recommended by the Osteoarthritis Research Society International[60]

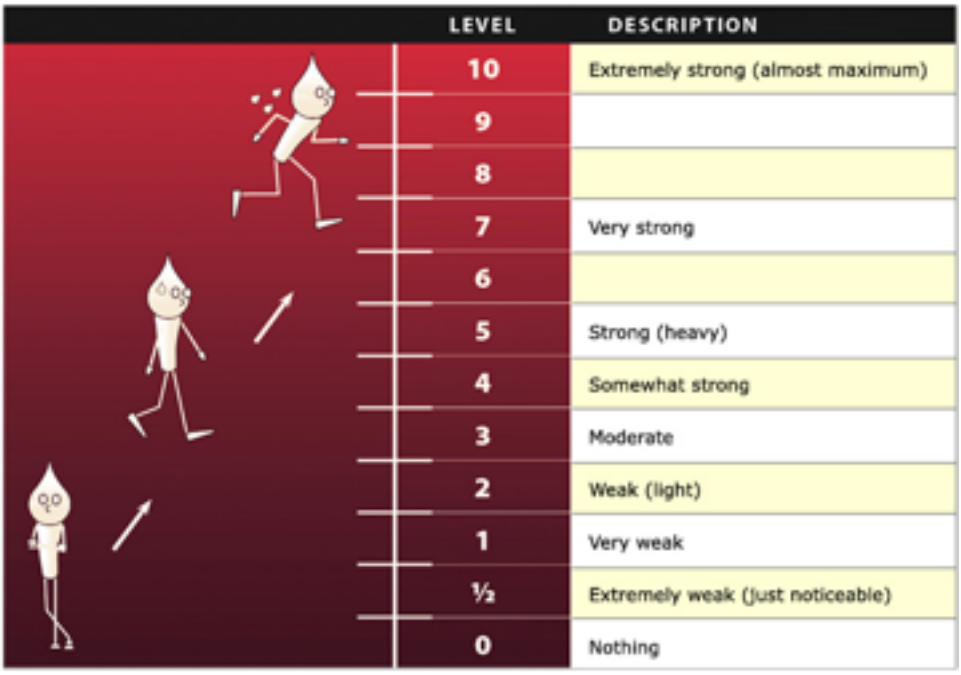
Test	Equipment needed	Description
30-second chair stand test	• Timer/stopwatch • Straight back chair with a 44cm (17 inch) seat height, preferably without arms	Maximum number of chair stand repetitions possible in 30 seconds
40m fast-paced walk test	• Timer/stopwatch • 10m marked walkway with space to safely turn around at each end • 2 cones placed approximately 2m beyond each end of the walkway • Calculator to convert time to speed	A fast-paced walking test that is timed over 4 x 10m for a total of 40m. Performed in comfortable footwear
Stair climb test	• Timer/stopwatch • Set of stairs	Time in seconds it takes to ascend and descend a flight of stairs. The number of stairs will depend on individual availability.
Timed up and go	• Stopwatch • Standard chair with armrests (approx. 46cm (18 inch) • seat height with 65 cm (26 inch) arm rest height) • Marked 3m (10 ft) walkway with turn point at end	Time to rise from a standard armchair, walk as quickly but as safely as possible, a distance of 3m, turn, walk back to the chair and sit down
6-minute walk test	• Stopwatch • Flat, hard-surfaced indoor walkway • (approx. 30 - 50m) marked with 3m intervals	The maximum distance that can be walked over a 6-min interval is recorded. Rest periods are allowed but are included in the time.

Appendix C – Borg Ratings of Relative Perceived Exertion

Borg Rating of Relative Perceived Exertion for aerobic exercise[126]

1 - 10 Borg Rating of Perceived Exertion Scale	
0	Rest
1	Really Easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really, Hard
10	Maximal: Just like my hardest race

Modified Borg Rating of Relative Perceived Exertion for resistance exercise[126]



LEVEL	DESCRIPTION
10	Extremely strong (almost maximum)
9	
8	
7	Very strong
6	
5	Strong (heavy)
4	Somewhat strong
3	Moderate
2	Weak (light)
1	Very weak
½	Extremely weak (just noticeable)
0	Nothing

Appendix D – American College of Sports Medicine (ACSM) guidelines

Aerobic Training Guidelines

- **Frequency**: ≥5 or more days/week of moderate exercise or ≥3 days/week of vigorous exercise or a combination of moderate and vigorous exercise on ≥3–5 days/week
- **Intensity:** Moderate and/or vigorous intensity is recommended for most adults. Light to moderate intensity exercise may be beneficial in deconditioned persons.
- **Time:** 30–60 min/day (150 min/week) of purposeful moderate exercise or 20–60 min/day (75 min/week) of vigorous exercise or a combination of moderate and vigorous exercise per day is recommended for most adults. ≥20 min/day (150 min/week) of exercise can be beneficial, especially in previously sedentary persons.
- **Pattern:** Exercise may be performed in one (continuous) session per day or in multiple sessions to accumulate the desired duration and volume of exercise per day. Exercise bouts of ≥10 min may yield favourable adaptations in very deconditioned individuals. Interval training can be effective in adults.
- **Progression:** A gradual progression of exercise volume by adjusting exercise duration, frequency and/or intensity is reasonable until the desired exercise goal (maintenance) is attained. This approach may enhance adherence and reduce risks of musculoskeletal injury and adverse coronary heart disease events

Resistance Training Guidelines

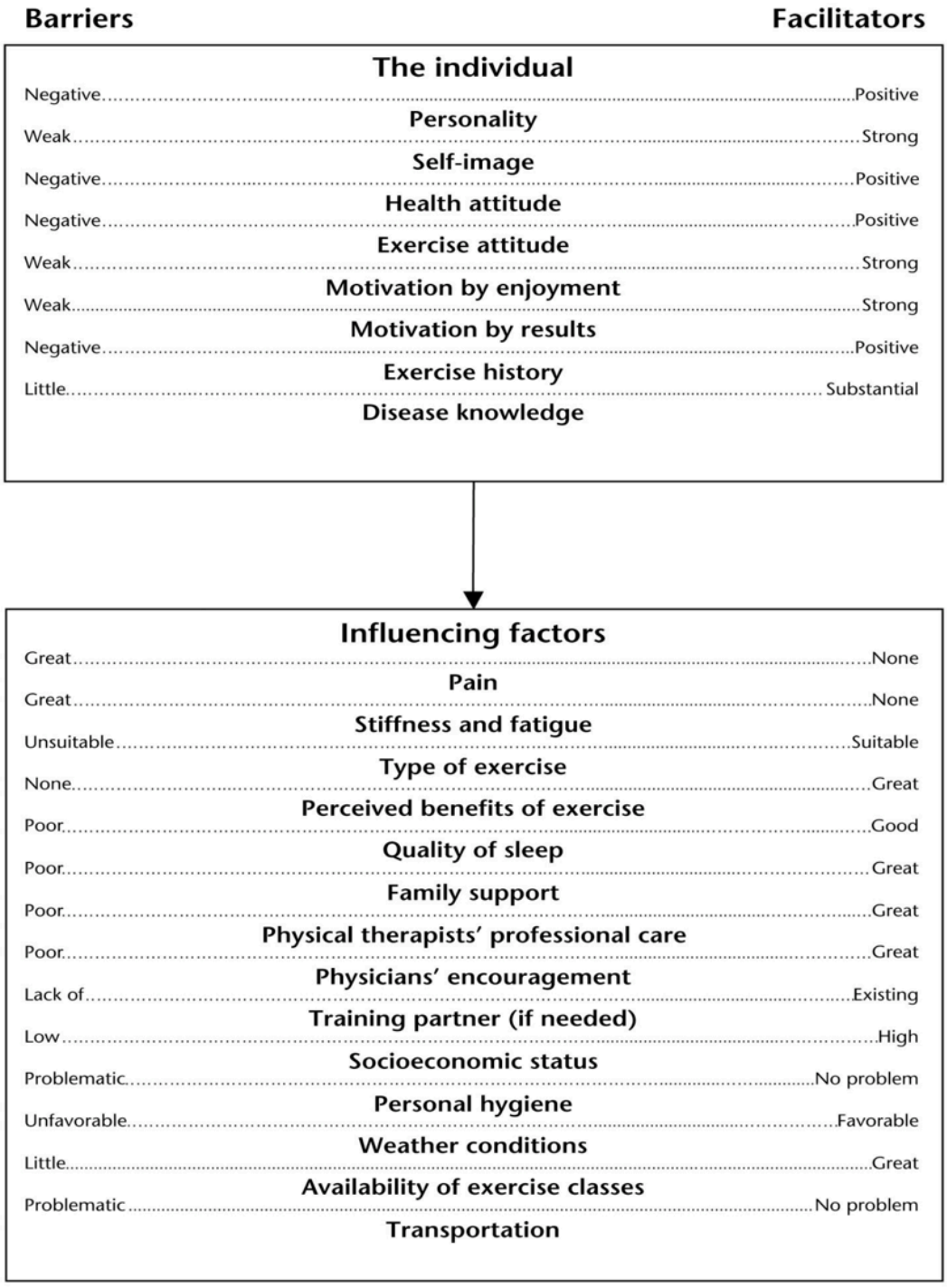
- **Frequency:** 2–3 days/week
- **Intensity:**
  - 60%–70% of 1 repetition maximum (moderate to hard intensity) for novice to intermediate exercisers to improve strength.
  - ≥80% of 1 repetition maximum (hard to very hard intensity) for experienced strength trainers to improve strength.
  - 40%–50% of 1 repetition maximum (very light to light intensity) for older persons beginning exercise to improve strength.
  - 40%–50% of 1 repetition maximum (very light to light intensity) may be beneficial for improving strength in sedentary persons beginning a resistance training programme.
- **Repetitions:** 8–12 repetitions are recommended to improve strength in most adults. 10–15 repetitions are effective in improving strength in middle aged and older persons starting exercise 15–20 repetitions are recommended to improve muscular endurance.
- **Sets:** Two to four sets are the recommended for most adults to improve strength. A single set of resistance exercise can be effective especially among older and novice exercisers. ≤2 sets are effective in improving muscular endurance.
- **Pattern:** Rest intervals of 2–3min between each set of repetitions are effective. A rest of

≥48 hours between sessions for any single muscle group is recommended.

- **Progression:** A gradual progression of greater resistance and/or more repetitions per set and/or increasing frequency is recommended.

Appendix E – Facilitators and barriers

Checklist of facilitators and barriers influencing exercise behaviour among people with arthritis that may be useful for clinicians to complete during an assessment of patients, prior to prescribing an exercise program[133]



Appendix F - Strategies that may be useful in overcoming barriers to exercise in people with arthritis[139]

Barrier	Strategies to consider
Perception that exercise is ineffective or will worsen arthritis	• Education regarding the benefits of exercise, using scientific evidence delivered in a language that the patient can easily understand • Provide educational support materials (website links, written handouts) that describe the pathology of arthritis. Encourage use of educational resources provided by national arthritis and exercise organisations. • Provide tailored exercise advice with specific individualized exercise prescription and dosage, rather than generic exercise recommendations • Referral to commence exercise under the supervision of a physical therapist initially.
	• Encourage incorporation of exercise into daily routines. For example, walking to work or the shops, taking the stairs instead of the elevator, walking the dog, exercising while watching the news on TV etc.
	• Recommend exercises that are time-efficient and do not require complicated set up of equipment. Aim for home- or work-based exercise programs rather than those that require additional travel to get to a gym or scheduled class.
Lack of motivation	Encourage your patient to plan exercise sessions for the week ahead, and to make "appointments" for exercise in their weekly schedule. Write the "exercise appointments" in a diary or on a calendar.
	Discuss the benefits of exercise, and set short- and long-term goals that are tailored to the patient.
	Discuss the importance of exercise with your patient's friends and/or family members and encourage them to participate in the exercise as well.
	Recommend participation in an exercise group or class. Provide referrals to appropriate group classes in the community.
Lack of access to exercise facilities, transportation	Recommend exercises that require no travel to specialized facilities. Recommend home-based exercises that can make use of body weight for resistance, or prescribe aerobic exercises such as walking programs.
	Identify inexpensive and convenient facilities available in the local community (such as arthritis exercise groups, walking groups, local swimming pools etc.). Provide your patient with written material including the contact details for these services.
Weather conditions	Provide a range of exercise options that will be possible irrespective of weather conditions (e.g. indoor cycling, water aerobics, indoor swimming, etc.)
Lack of enjoyment	• Discuss with the patient their preferred exercise options. Tailor the exercise program to the patient's personal preferences and according to past exercise strategies that have been successful for them. • Regularly change the exercise program to minimize boredom. • Listen to music or watch television whilst exercising. • Discuss reward systems, where the patient rewards themselves at regular intervals for ongoing exercise participation or for achieving pre-determined exercise goals.
Other health problems	• Tailor the exercise program to consider the impact of other co-morbid conditions, rather than use generic exercise recommendations. Refer the patient to commence exercise under the supervision of a physiotherapist initially. • Ensure other medical conditions are adequately and appropriately managed.

Forgetfulness	Discuss strategies to help the patient to remember. For example, cue cards around the house; schedule exercise appointments into the calendar or diary; set reminders via email alerts or reminders on smart phones or computers; place exercise sheets in visible locations.
Lack of energy	Reinforce that regular exercise will increase energy over the longer term. While they might feel tired initially, continued exercise will increase energy. Sleep quality will also improve with ongoing exercise, and improved sleep will also result in reduced tiredness. Discuss the vicious cycle of feeling tired, leading to less physical activity, leading to feeling more tired.
Exercise causes pain	• Conduct a comprehensive physical assessment to determine the body positions, movements and activities that aggravate pain, and use this information to tailor the exercise program. • Supervised exercise sessions initially, with regular monitoring by the patients and clinician regarding changes in pain • Reassure the patient that it is normal and safe to sometimes feel pain with arthritis exercise. Explain this does not mean that exercise is harming the joint. • Modify exercise program or modify the dosage in a timely manner to remove any exercises that excessively increase pain. • Smaller durations of exercise with greater frequency may be appropriate. • Consider exercise in aquatic environments rather than land-based.
Lack of confidence in exercise ability	• Referral to a physical therapist in the early stages of exercise • Supervised exercise sessions or group classes rather than unsupervised exercise • Provide written exercise handouts and instructions. Video clips or DVDs or photos of the patient performing the exercise with the clinician can be useful. • Spend sufficient time demonstrating the exercises and watching the patient perform the exercises to ensure correct technique and to provide feedback. • More regular monitoring may be required, especially when the exercise program is being progressed or the dosage being increased.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