



# Best practice evidence for warm water exercise for people with musculoskeletal conditions

A systematic review of the literature – 2014  
Executive summary

## Acknowledgements

This literature review represents a collaboration between Arthritis and Osteoporosis Victoria<sup>^</sup> and the Falls and Bone Health team within the Health Services Research Unit at Monash University\*. Funding to undertake this work was provided by Arthritis and Osteoporosis Victoria.

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## EXECUTIVE SUMMARY

This paper seeks to inform Arthritis and Osteoporosis Victoria about the evidence relating to the benefits of warm water exercise for people with arthritis or related musculoskeletal conditions. It also aims to provide an overview of the characteristics of effective warm water exercise programs for this group.

This work draws on a literature review undertaken in 2013 as a collaboration between Arthritis and Osteoporosis Victoria and the Falls and Bone Health team within the Health Services Research Unit at Monash University.

### What do we know from past literature reviews?

A number of studies have sought to establish the effectiveness of warm water exercise in the treatment of musculoskeletal conditions. Despite the increasing number of studies being undertaken, systematic reviews completed on the effects of warm water exercise for people with osteoarthritis<sup>1,2</sup>, fibromyalgia<sup>3,4</sup> and low-back pain<sup>5</sup> have reported positive impacts but issued caution in their conclusions due to a lack of high quality studies.

### How does this review build on those completed previously?

Additional studies have been published since these prior reviews highlighting the need for an updated review. In addition to including new evidence, we also sought to extend on previously completed reviews by pooling information from studies across different types of musculoskeletal conditions and to explore the effect of excluding low quality studies from the analysis. A pooled approach across a suite of musculoskeletal health conditions is important since the warm water exercise programs provided by Arthritis and Osteoporosis Victoria (including the 'Waves' warm water exercise program (<http://www.arthritisvic.org.au/Useful-Information/Our-Services/Waves-Warm-Water-Exercise-Program>) and warm water exercise classes conducted by Arthritis and Osteoporosis Victoria peer support groups) service people with a range of musculoskeletal health conditions. We also aimed to identify the characteristics of effective warm water exercise programs to specifically inform the review of the Arthritis and Osteoporosis Victoria programs.

### About the literature review conducted

We undertook a systematic review of studies on warm water exercise published in peer-reviewed journals from Australia and overseas. Robust research methods were applied to synthesise findings from the highest quality studies—randomised controlled trials and quasi-randomised controlled trials—about the effects of warm water exercise in people with arthritis and other musculoskeletal conditions. Each identified study that met the predetermined inclusion criteria was reviewed and summarised in terms of: (i) participant characteristics; (ii) warm water exercise program characteristics (including frequency, duration and use of co-interventions such as education); (iii) exercise characteristics; (iv) outcomes; and (v) research methodology.

The review explored the impacts of warm water exercise on pain, physical function and quality of life, or 'intervention effects', using meta-analysis—a statistical technique that combines results from different studies to identify consistent patterns among study results. Information on the characteristics of effective programs was obtained by systematic analysis of high quality studies in which positive effects were reported and that were included in the meta-analysis.

### What types of studies were included in the review?

Over 1,000 articles were found from the initial electronic search and were screened for inclusion in this review. 28 randomised controlled trials and 2 quasi-randomised controlled trials were identified as being relevant to this review. The quality of studies included in the review was variable, with many including only

a small number of participants. The majority of studies were conducted in people with osteoarthritis (53%; 16 studies) and reported on pain and physical function outcomes.

**Summary of studies included in the review**

	Number of studies		Pain		Physical function		Quality of life	
	All	Meta-analysis	All	Meta-analysis	All	Meta-analysis	All	Meta-analysis
Osteoarthritis	16	14	15	14	16	11	11	9
Rheumatoid Arthritis	2	2	2	2	1	2	2	2
Osteoarthritis or Rheumatoid Arthritis	2	2	2	-	2	1	-	-
Fibromyalgia	6	5	6	3	6	4	3	-
Low Back Pain	3	2	3	2	2	1	1	-
Osteoporosis	1	1	0	-	1	1	1	1
<b>TOTAL</b>	<b>30</b>	<b>26</b>	<b>28</b>	<b>21</b>	<b>28</b>	<b>20</b>	<b>18</b>	<b>12</b>

## What does the evidence tell us?

There was considerable variability across the 30 included studies regarding the target population, key program characteristics, outcomes assessed, outcome measures used and the methodological quality of studies. Overall, there were many benefits of warm water exercise demonstrated by prior studies for a range of musculoskeletal conditions. Importantly, no harmful effects of warm water exercise were reported. Also of interest, five studies reported on participation outcomes (e.g. % of sessions attended). In these studies, participation in warm water exercise sessions was greater than participation in land based exercise sessions. This highlights that warm water exercise is a safe and effective form of exercise that is appealing to people with arthritis and other musculoskeletal conditions.

### *Warm water exercise intervention effects*

The meta-analysis included 26 studies that measured the effect of warm water exercise compared to either land based exercise or non-active activities such as relaxation or no exercise using valid outcome measures. Key findings of the meta-analysis were:

- Compared to non-active controls, warm water exercise was associated with a:
  - Moderate reduction in pain (Standardised mean difference: -0.37, 95% CI -0.56 to -0.18; 15 studies);
  - Moderate improvement in physical function (Standardised mean difference: 0.32, 95% CI 0.13 to 0.51; 14 studies); and
  - Moderate improvement in quality of life (Standardised mean difference: 0.39, 95% CI 0.06 to 0.73; 11 studies).
- Compared to land based exercise, warm water exercise was associated with a:
  - Small non-significant reduction in pain (Standardised mean difference: -0.11, 95% CI -0.27 to 0.04; 10 studies);
  - Comparable effect on physical function (Standardised mean difference: -0.03, 95% CI -0.19 to 0.12; 10 studies); and
  - Comparable effect on quality of life (Standardised mean difference: -0.10, 95% CI -0.29 to 0.09; 7 studies).

When the analysis was repeated after removing low quality studies these findings persisted. The findings were also mostly consistent across the different musculoskeletal conditions studied. Some differences were noted for rheumatoid arthritis and osteoporosis populations with somewhat smaller benefits noted. However, there were only two studies in people with rheumatoid arthritis and one in people with

osteoporosis suggesting further studies are required to more accurately identify effects of warm water exercise in these populations. Therefore, on the basis of available evidence, warm water exercise offers benefits to people with different musculoskeletal health conditions compared to not undertaking some form of exercise.

Of note, despite the difference in pain and quality of life outcomes not being statistically significant between warm water exercise and land exercise participants, results of the meta-analysis consistently favoured warm water exercise over land based exercise for these outcomes.

### *Characteristics of effective warm water exercise programs*

There was considerable variability between studies in key program characteristics such as duration of programs and the exercises included. Unfortunately, many studies did not provide adequate descriptions of the exercises included. However, when the characteristics of the programs and exercises of the highest quality effective programs were reviewed, some common characteristics were evident:

- Warm water exercise programs were commonly performed two or more times per week and were of 60 minutes in duration;
- Programs ran for at least 6 weeks (range: 6 to 52 weeks);
- Lower-limb strengthening exercises and equipment such as floats, weights, paddles or elastic tubing were often used to increase the load during strengthening exercises;
- Squats, step-ups or other exercises that focused on hip and knee extension were commonly included in programs; and
- Aerobic activities such as running and cycling were also commonly used with a target of >65% of maximum heart rate.

There is some evidence from a small number of studies that suggest that the inclusion of education and balance exercises may provide additional benefits, consistent with contemporary models of care for people living with chronic musculoskeletal health conditions.

### **Key learnings and insights**

The key messages that emerged from this review are:

- The evidence suggests warm water exercise has beneficial effects on pain, physical function and quality of life in adults with musculoskeletal conditions. These benefits appear comparable to those achieved with land based exercise.
- Gaps remain in our understanding of the characteristics (e.g. frequency, duration, intensity and exercises) of warm water exercise programs that provide the most benefit. However, based on the current evidence, successful programs appear to include two sessions of 60 minute duration per week, run for at least 6 weeks, target strengthening of hip and knee extensors using resistance and weight-bearing exercises, and include moderate intensity aerobic exercise.

Considerations arising from a small number of studies or the broader musculoskeletal and preventative healthcare evidence base include:

- **The addition of an education component may add value to the Arthritis and Osteoporosis Victoria warm water exercise programs**

Education could be provided by Arthritis and Osteoporosis Victoria staff in a once-off session for participants on enrolment to Waves classes and augmented by information leaflets and follow-up face-to-face sessions following enrolment. Education could include information on the benefits of exercise and behaviour change strategies such as goal setting within a self-management framework. Information leaflets that are developed could also be distributed by the peer support groups to their warm water exercise participants.

- **The inclusion of balance exercises in warm water exercise classes has potential to provide wider health benefits in terms of falls prevention to warm water exercise participants**

A simple way to include balance exercises would be to integrate these into the walking and lower-limb exercises that are already performed in many sessions. Balance exercises require moving the body over a narrow base of support without hand support. Examples of balance exercises include toe, heel or heel-toe walking and hip ROM exercises performed without holding onto a rail or the side of the pool.

## Summing it up

The academic literature should be considered an important input into overall service planning and improvement. This is the first meta-analysis that has assessed the effectiveness of warm water exercise programs across different musculoskeletal conditions. The evidence suggests warm water exercise has beneficial short-term effects on pain, physical function and quality of life in adults with arthritis and musculoskeletal conditions. Outcomes for adults with musculoskeletal conditions following warm water exercise appear comparable to land based exercise, suggesting that when people are unable to exercise on land, or find land based exercise difficult, warm water exercise programs provide an effective alternative strategy.

There is further need for high-quality, large scale studies of sufficient duration and an adequate follow-up period to validate the long-term effects of warm water exercise. To improve practice and decision making, further studies are needed that examine different modes, frequency and intensity of warm water exercise programs so the characteristics of programs that achieve maximum benefits are well understood. It is also not known whether warm water exercise improves the progression of conditions such as osteoarthritis or osteoporosis. Further studies should aim to investigate this and also to explore patient preferences for warm water exercise compared to land based exercise.



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