Does aquatic exercise relieve pain in adults with neurologic or musculoskeletal disease: a systematic review and meta-analysis of randomized controlled trials

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CRD summary
This review assessed the effectiveness of aquatic exercise in relieving pain, mostly in patients with musculoskeletal disease. The authors concluded that there was a small improvement in pain with aquatic exercise compared to no treatment, but no difference between aquatic exercise and land exercise. There was insufficient evidence to confidently conclude that aquatic exercise was better than no treatment. Overall, the authors' conclusions were likely to be reliable.

Authors' objectives
To assess the effectiveness of aquatic exercise in relieving pain in adults with neurologic or musculoskeletal disease.

Searching
Fourteen databases including MEDLINE, AMED, EMBASE, SportDiscus, PEDro, CINAHL, ASSIA and The Cochrane Library were searched for the period January 1980 to June 2006 for English-language articles (search terms were reported). The reference lists of retrieved articles and relevant reviews were also searched.

Study selection
Randomised controlled trials (RCTs) comparing the effect of aquatic exercise to no treatment or other interventions on subjective pain experience were eligible for inclusion. The participants of interest were adults with any neurologic or musculoskeletal pathology.

Three main types of aquatic therapy were investigated in the included studies: general exercise, aerobic exercise and strengthening exercise. Therapy was conducted predominantly in hospital or clinic pools. Duration of treatment ranged from approximately six to 12 weeks. Where reported, the average water temperature was 32.4°C (range 28 to 36). Control groups received land exercise, immersion or no treatment. Most participants in the included studies were women. Most had rheumatology conditions (fibromyalgia, chronic low back pain and osteoarthritis or rheumatoid arthritis). The age of participants ranged from 25 to 81 years. Mean duration of symptoms was 10 years (SD 5.5). The most commonly used pain outcome measure was the 10 cm visual analogue scale; a range of other instruments were also used.

Two reviewers independently selected studies for inclusion and disagreements were resolved by discussion and consensus.

Assessment of study quality
Two reviewers independently assessed study quality using the criteria for RCTs recommended by the Scottish Intercollegiate Guidelines Network (SIGN 50). Criteria assessed included randomisation, allocation concealment, blinding and similarity of groups at baseline. Studies were given an overall rating for risk of bias as low, moderate or high.

Data extraction
The standardised mean difference (SMD) was calculated for subjective pain outcome. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Studies were subgrouped for synthesis based on the comparator. Aquatic exercise was compared to no treatment, land exercise and immersion. Studies were pooled in a random-effects meta-analysis, Statistical heterogeneity was assessed using the $I^2$ statistic. Only studies of high to moderate quality (low or moderate risk of bias) were included in the quantitative synthesis. The remaining studies were examined for consistency of results.
Results of the review

Nineteen studies (717 participants) were included. Sample sizes ranged from 14 to 312. Five studies were classified as high quality, three of moderate quality and 11 of low quality.

Nine studies compared aquatic exercise to no treatment. Three studies were of sufficient quality and had appropriate data to include in the meta-analysis. There was a small but statistically significant reduction in pain levels in favour of aquatic exercise (SMD -0.17; 95% CI, -0.33, 0.01, p=0.04). Overall results of the nine studies were not consistent.

Ten studies compared aquatic exercise to land exercise. Two studies were of sufficient quality and had appropriate data to included in the meta-analysis. There was no difference between the two interventions in pain outcome (SMD 0.11; 95% CI, -0.27, 0.50, p=0.56); all but one of the remaining studies were consistent with this finding. The authors stated that the statistical tests for heterogeneity were not significant for these analyses.

Two studies compared aquatic exercise to immersion (one study was low quality). Neither study found a difference between the two interventions in pain outcome.

Authors’ conclusions

Aquatic exercise had a small pain-relieving effect compared to no treatment, but there was insufficient evidence to draw firm conclusions. There was sound evidence that there are no differences in the pain-relieving effects of aquatic versus land exercise.

CRD commentary

This review had a clearly stated review question and searched an appropriate range of databases, although the inclusion of only non-English language papers introduces the risk of publication bias. Study quality was assessed. Appropriate measures were used to minimise the risk of error and bias in study selection and quality assessment, although it was unclear whether this was also the case for data extraction. Appropriate details from the included studies were reported. Differences between studies were discussed. The synthesis was appropriate, but the exclusion of studies based on quality means that only a small proportion of the available studies were included in the quantitative synthesis. There was no evidence of statistical heterogeneity, but the authors appropriately highlighted the clinical variability in the studies. Overall the authors’ conclusions were appropriate and likely to be reliable, but given that the comparison of aquatic and land exercise is based on only two studies in a meta-analysis the conclusion regarding this comparator is arguably overstated.

Implications of the review for practice and research

Practice: the authors did not state any implications for practice.

Research: good quality RCTs were required to establish optimal combinations of exercise type and duration, water temperature and depth, and service delivery for diverse populations. Future systematic reviews should consider incorporating evaluations of pain behaviour and cognitive coping strategies.

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