Scottish Government Health Directorates Chief Scientist Office

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The WATER study: Which AquaTic ExeRcises work best?

Identifying muscle recruitment for aquatic and land exercises used in interventions for core strengthening and rehabilitation from musculoskeletal disorders

Researchers

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Aim

To quantify the activation of the main trunk supporting muscles in both people with chronic low back pain (CLBP) and healthy participants when performing aquatic exercises commonly used in rehabilitation programmes. Moreover, to record perceived exertion, exercise intensity and, for the CLBP group, pain experienced during the exercises. A further aim was to test a range of similar rehabilitative exercises performed on land.

Project Outline/Methodology

Twenty males with non-specific mild to moderate CLBP and 20 males with no musculoskeletal disorders performed 26 rehabilitative exercises in shallow pool water (1.25m depth, 28°C) and 28 similar exercises on land. As the effects of buoyancy and water resistance are nearly impossible to replicate on land, land exercises were simply chosen to either mimic movement patterns of water exercises or because of their similar use in rehabilitation. Exercise pace and instructions were standardised. For all exercises, electromyography was used to measure mean and peak muscle activation for seven trunk supporting muscles on each side of the body (14 in total): erector spinae, multifidus, rectus abdominis, external and internal oblique, gluteus maximus and medius. Perceived exertion (RPE 6-20 Scale), intensity (heart rate) and, for the CLBP group, pain (Visual Analogue Scale) were also recorded.

Key Results

Clear differences in activation of each muscle were found between exercises, providing a useful insight on how each muscle works during water and land exercises. There were almost no differences in muscle activation, exercise intensity and perceived exertion between the CLBP and control groups for any of the exercises. The occurrence of pain in the CLBP group was nearly three times lower in the water (2.8%) than on land (7.5%), while pain intensity when present was similar in water (2.0/10) and on land (2.3/10). For 15 land exercises that had same pace and movements as the 'equivalent' water exercises, although intensity was found to be higher on land, muscle activation and perceived exertion in the water were at least equal to that on land in about two thirds of the cases.

Conclusions

Exercise in the water provided sufficient muscle activation and exertion, which in two thirds of the cases were at least equal to that of similar exercises on land, and had considerably lower occurrence of pain. This suggests that aquatic exercise is beneficial and may be more appropriate than land for CLBP, especially for people with higher levels of disability or at early stages of rehabilitation. CLBP participants had similar muscle activation to healthy participants, perhaps because they were generally physically active and their CLBP was mild to moderate. Further research should explore if the same patterns emerge for CLBP groups with higher levels of disability.

What does this study add to the field?

This study is the first to provide information on activation of the main trunk supporting muscles on both sides of the body when performing these exercises in the water. It is also the first study to examine trunk muscle activation in the water for people with CLBP, and to report the associated pain, intensity, and perceived exertion.

Implications for Practice or Policy

The WATER study provides an evidence base that can be used by health professionals to inform prescription of rehabilitation and strengthening programmes, in particular for people with mild and moderate CLBP. The WATER study was designed as a feasibility study. In view of its findings, appropriate intervention studies should now be designed for people with CLBP with different levels of disability.

Where to next?

An intervention study should quantify and compare the effectiveness of aquatic exercise, land exercise, and non-exercise interventions for people with different levels of CLBP.

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