

A COMPARISON OF CARDIORESPIRATORY RESPONSES TO WATER AND LAND TREADMILL WALKING IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Hydrotherapy is popular with patients with rheumatoid arthritis (RA). Its efficacy as an aerobic conditioning aid is equivocal. Patients with RA have reduced muscle strength and may be unable to achieve a walking speed commensurate with an aerobic training effect because the resistance to movement increases with speed in water. The primary purpose of this study was to compare the relationships between heart rate (HR), oxygen consumption ($\dot{V}O_2$) and ratings of perceived exertion (RPE), with speed during land and water treadmill walking in patients with RA to determine if the intensity of walking in water was sufficient to stimulate an aerobic training effect.

Methods

Fifteen females with RA (47 ± 8 SD years) completed two exercise tests, which consisted of three consecutive bouts of walking for five minutes at 2.5, 3.5 and 4.5 $\text{km}\cdot\text{h}^{-1}$, on land and water treadmills. Expired gas, collected via open-circuit spirometry, HR and RPE were measured. A two-way ANOVA with repeated measures was used to detect differences.

Results

The $\dot{V}O_2$, HR and RPE increased with speed on land and in water. $\dot{V}O_2$ was significantly lower in water (W) than on land (L) at speeds $\leq 3.5 \text{ km}\cdot\text{h}^{-1}$ ($X \pm \text{SD}$: W : 0.49 ± 0.1 ; L : $0.63 \pm 0.2 \text{ l}\cdot\text{min}^{-1}$). HR was significantly lower (W : 94.7 ± 10 ; L : 102.5 ± 10), unchanged and significantly higher (W : 129.5 ± 13 ; L : 118.6 ± 15) at 2.5, 3.5 and 4.5 $\text{km}\cdot\text{h}^{-1}$ in water than on land. At walking speeds $\geq 3.5 \text{ km}\cdot\text{h}^{-1}$ RPE was significantly higher in water than on land (W : 13 ± 1.7 ; L : 11.5 ± 2). The $\dot{V}O_2$ was approximately 60% of predicted $\dot{V}O_{2\text{max}}$ during the fast walking speed in water. For a given $\dot{V}O_2$, HR was approximately 9 $\text{beats}\cdot\text{min}^{-1}$ and RPE 1-2 points on the 6-20 Borg scale, higher in water than on land.

Conclusion

This study showed that the metabolic demand of walking at 4.5 $\text{km}\cdot\text{h}^{-1}$ was sufficient to stimulate an increase in aerobic capacity. The use of land-based prescriptive norms would underestimate the metabolic cost in water. Therefore, in water HR should be increased by approximately 9 $\text{beats}\cdot\text{min}^{-1}$ to achieve similar energy demands to land treadmill walking. Further studies are required to examine the ability of RA patients to maintain an appropriate intensity for a duration sufficient to stimulate an aerobic training effect.