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Effect of aquatic-treadmill training on cerebrovascular function and gait in community-dwelling stroke survivors: A pilot study

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Exercise-induced increases in brain blood flow, is a key mechanistic pathway for improved brain function. Water-based exercise augments this response so may target this mediator of improved brain health, in stroke survivors. Aquatic treadmill exercise has shown to improve gait re-education post stroke; however, no research has assessed cerebrovascular function. Aim of this study was to examine the effect of a four-week aquatic treadmill (ATM) intervention on cerebrovascular responsiveness and gait function in community-dwelling stroke survivors. Six community-dwelling stroke survivors (58 ± 11 years) were recruited, with chronic stroke (>6 months). Participants completed a four-week ATM intervention of thirty minutes duration, three times per week. Pre-and post intervention measures were taken of cerebrovascular reactivity (CVR), as indexed from change in middle cerebral artery blood flow velocity (MCAv) to a hypercapnic (5% CO₂ in air) stimulus, and gait speed and distance outcome measures using 6-minute walk, Timed-Up-And-Go and 10-metre walk tests. Paired t-tests and ANOVA statistical models compared outcome measures between pre-and post-intervention measures. MCAv-CO₂ responsiveness (CVR) increased, showing a trend, although this did not reach statistical significance ($p=0.079$). MCAv-CO₂ responsiveness increased by 40% in the affected hemisphere and 64.6% in the unaffected hemisphere. Within-group gait improvements were seen in speed and distance, although not uniformly evident. This study established ATM training as a feasible option in stroke rehabilitation, also demonstrating possible gait improvements leading to more efficient community ambulation and better quality of life.

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