

Appraisal

Critically appraised paper: High-intensity interval training after stroke improves some aspects of physical function, but benefits are not sustained

Synopsis

Summary of: Gjellesvik TI, Becker F, Tjønnå AE, Indredavik B, Lundgaard E, Solbakken H, et al. Effects of high-intensity interval training after stroke (The HIIT Stroke Study) on physical and cognitive function: A multicenter randomized controlled trial. *Arch Phys Med Rehabil.* 2021;102:1683–1691.

Question: Does high-intensity interval training improve physical, mental and cognitive function after stroke? **Design:** Randomised controlled trial. **Setting:** Three rehabilitation hospitals in Norway. **Participants:** Adults 3 months to 5 years after stroke, ambulating independently, with modified Rankin Scale score 0 to 3. Exclusion criteria included unstable cardiac conditions, high resting blood pressure and subarachnoid haemorrhage. Randomisation of 70 participants allocated 36 to the experimental group and 34 to the control group. **Interventions:** Both groups received standard care. In addition, the experimental group received high-intensity interval treadmill training three times per week for 8 weeks. Training comprised a 10-minute warm up followed by four 4-minute exercise intervals at 85 to 95% of peak heart rate, with 3-minute reduced intensity breaks at 50 to 70% peak heart rate. The control group received information about the benefits of physical activity. **Outcome measures:** Physical function was assessed using the 6-minute walk test, 10-m walk test, Berg Balance Scale and Timed Up and Go test. Cognition was assessed with the Montreal Cognitive Assessment and Trail Making Test (Parts A and B). Additional outcomes included the Hospital

Anxiety and Depression Scale, Stroke Impact Scale and Functional Independence Measure. Outcomes were assessed at baseline, after intervention and at 12 months. **Results:** Fifty-six participants (n = 28 intervention, n = 28 control) completed the 12-month assessment. Immediately after the intervention, improvements favoured the intervention group in the 6-minute walk test (MD 28 m, 95% CI 3 to 54), Berg Balance Scale (MD 1.27 points, 95% CI 0.17 to 2.38) and Trail Making Test-B (MD -24 s, 95% CI -46 to -2), with no differences in other outcomes. The only between-group differences at 12 months were for Trail Making Test-B (MD -25 s, 95% CI -49 to -2), which favoured intervention, and the Functional Independence Measure (MD -2.37 points, 95% CI -4.30 to -0.44), which favoured control. **Conclusion:** High-intensity interval training produces immediate improvements in walking distance, balance and some aspects of cognition; however, the benefits are generally not sustained.

Provenance: Invited. Not peer reviewed.

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Commentary

Exercise after stroke is not only important to regain function, improve physical activity and cardiorespiratory fitness, but is a key secondary prevention measure.¹ Numerous interventions have been tested with some success.^{2,3} High-intensity interval training (HIIT) may be another potentially effective intervention, as it is effective in healthy populations and those with cardiovascular disease.

This trial showed that HIIT produced greater improvements in walking distance compared to information about physical activity, providing preliminary evidence that HIIT may be a promising intervention for chronic stroke. However, prior to routine clinical implementation, further information on the safety and feasibility of HIIT is required, particularly in the subacute phase of stroke. Additional information on patient acceptability of HIIT is necessary, along with adherence and retention, given that the intervention dropout rate was close to 30%. Further, this study was implemented in a relatively young and high-functioning group, so clinicians also need to know the implications for other patients with stroke who are typically older, less mobile and have multiple comorbidities.

Knowledge of efficacious interventions is a high priority for clinicians, but successful implementation is required for meaningful impact. The challenge for researchers and clinicians is the adoption of an effective intervention into a sustainable lifestyle, particularly

programs that people can perform independently or with little ongoing direction after initial training. Given the prevalence of poor outcomes following stroke,⁴ clinicians need to know what works, but also what ongoing support is required for maintenance of an exercise regimen that confers ongoing health benefits. An understanding of the barriers and facilitators to life-long engagement in activities that improve and maintain health and function is vital and remains the holy grail in long-term stroke management.

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