JOURNAL ARTICLE CORRECTED PROOF

# A comprehensive analysis of the impact of high-intensity interval vs. moderate-intensity continuous training on global and regional myocardial function in patients early after acute myocardial infarction: the STRAICT randomized controlled trial



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## Abstract

### Aims

This study aims to compare the effect of moderate-intensity continuous training (MICT) vs. isovolumic high-intensity interval training (HIIT) on left ventricular (LV) myocardial function early post-acute myocardial infarction (AMI). Training-induced changes were analysed at both global and segmental levels using advanced deformation echocardiographic imaging techniques.

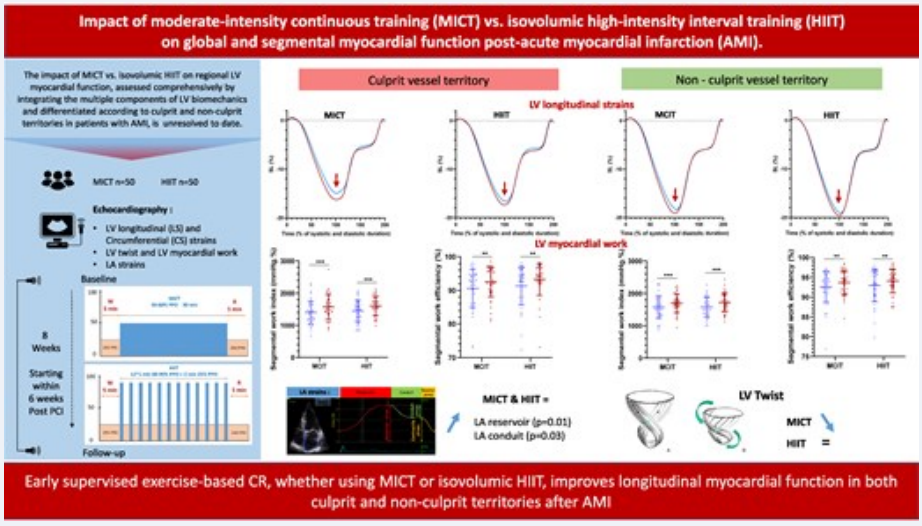
### Methods and results

One hundred AMI patients were randomly assigned to participate in an 8-week training programme comprising either MICT ($n$ = 50) or isovolumic HIIT ($n$ = 50), starting within 6 weeks post-AMI. Before and after cardiac rehabilitation (CR), we carried out a comprehensive and detailed evaluation of myocardial function, including measurements of LV longitudinal strain (LS) and circumferential strain and torsional mechanics, LV myocardial work (MW) and mechanical dispersion [post-systolic shortenings (PSS)] indexes, and atrial strains. Mixed models were used to evaluate the effect of MICT and HIIT on speckle-

tracking echocardiography parameter. Both MICT and HIIT resulted in a similar improvement in the amplitude and timing of LV LS (time effect $P < 0.001$ in each case), as depicted by the comparable increase in global LS [HIIT: -0.82%, 95% confidence interval (CI): -0.19/-61; MICT: -1.11%, 95% CI: -1.17/-0.51; time * group $P = 0.71$], MW index and efficiency, constructive MW, and reduction in the number of PSS and wasted MW (time * group $P > 0.12$ in each case) in the two groups. These improvements were observed in all myocardial territories, regardless of previous ischaemic risk status (culprit vessel-by-time-by-group interactions, $P > 0.60$ in each case). Circumferential strains remained unchanged in both groups while there was a trend (time * group $P = 0.04$) for LV torsion to decrease for MICT ($P = 0.06$) and increase for HIIT ($P = 0.36$) after CR. Left atrial strains during the reservoir and conduit phases improved (time effect $P < 0.05$) similarly in MICT vs. HIIT (time * group $P > 0.54$). $\dot{V}O_{2peak}$ ($P < 0.001$) and quality of life ($P < 0.001$) improved equally in MICT and HIIT after CR.

## Conclusion

Early supervised exercise-based CR, whether using MICT or isovolumic HIIT, improves longitudinal myocardial function in both culprit and non-culprit territories after AMI.




## Graphical Abstract

**Keywords:** Strain, Myocardial work, Atrial function, Acute myocardial infraction, Cardiac rehabilitation, Segmental analysis

**Topic:** myocardial infarction, acute, myocardial infarction, myocardium, echocardiography, cardiac rehabilitation, left ventricle, exercise, diagnostic imaging, quality of life, interval training, high-intensity

**Issue Section:** Full Research Paper > Cardiac rehabilitation

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## Lay Summary

Exercise-based cardiac rehabilitation (CR) is an effective strategy for reducing cardiovascular morbidity and mortality in patients after a myocardial infarction (MI). While moderate-intensity continuous training (MICT) has been the traditional form of aerobic exercise in CR, high-intensity interval training (HIIT) is gaining popularity due to its demonstrated feasibility, safety, and potential superiority in improving physical fitness. The impact of CR on heart function after MI is not well understood. It is still unclear whether HIIT is more effective than MICT for improving heart function. This uncertainty is due to limitations in previous studies, such as differences in total workload realized, which is an important factor in CR. It is also unclear whether different types of exercise training have different effects on parts of the heart that were damaged due to reduced blood flow during the heart attack compared with the areas that were not affected. This study aims to fill these gaps by comparing HIIT and equal-volume MICT using advanced echocardiographic imaging techniques to evaluate overall and regional heart function, focusing on both affected and unaffected areas of the heart. We found that

- Exercise-based CR initiated early after the heart attack effectively improves cardiac function, with HIIT as effective as isovolumic MICT.

- These improvements were observed equally with both MICT and HIIT across all areas of the heart, confirming its ability to functionally recover even in regions previously impacted by reduced blood flow.



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