

# The effects of Exercise Therapy on Heart Rate Variability in individuals with Chronic Musculoskeletal pain: a systematic review

Timo Meus<sup>1,2</sup>, Julie Van Eetvelde<sup>1,2,3</sup>, Iris Meuwissen<sup>1,2,3</sup>, Nathalie Roussel<sup>2,3</sup>, Mira Meeus<sup>2,3</sup>, Daniel Boulosa<sup>4</sup>, Jonas Verbrugghe<sup>1,2</sup>, Annick Timmermans<sup>1</sup>

<sup>1</sup>REVAL—Rehabilitation Research Center, Faculty of Rehabilitation Sciences, Hasselt University, 3590 Diepenbeek, Belgium

<sup>2</sup>Research Group MOVANT, Department of Rehabilitation Sciences and Physiotherapy (REVAKI), University of Antwerp, 2610 Wilrijk, Belgium

<sup>3</sup>Pain in Motion International Research Consortium (PiM), [www.paininmotion.be](http://www.paininmotion.be), Belgium

<sup>4</sup>Faculty of Physical Activity and Sports Sciences (FCAFD), University of León, 24007 León, Spain

## *Background and aims*

Heart rate variability (HRV) is a relevant marker of cardiac autonomic function. Reduced HRV in individuals with chronic musculoskeletal pain (CMP) suggests a potential link between autonomic imbalance and chronic pain pathophysiology. This review explores how various exercise modalities affect HRV parameters in CMP patients.

## *Methods*

This review adhered to PRISMA guidelines, conducting a literature search across PubMed, Scopus, Web of Science, and Cochrane databases. Inclusion criteria encompassed active exercise interventions lasting ≥ 4 weeks for CMP in adults aged 18-65, with HRV assessed pre-and post-intervention. Exclusion criteria encompassed studies exclusively investigating acute exercise effects or non-experimental research designs. Risk of bias was appraised using Cochrane RoB-2 and ROBINS-I tools, and evidence levels were assessed with GRADE.

## *Results*

Ten studies, comprising randomized (n=5) and non-randomized (n=5) controlled trials, met inclusion criteria. Bias assessment indicated a low-to-moderate risk of bias. The studies involved 277 individuals with CMP and 116 controls. HRV measurements and analyses varied across studies. Interventions included resistance, aerobic, or multi-component training regimens. Significant improvements were noted in various HRV metrics, particularly in time and frequency domains associated to vagal modulations.

## *Discussion and Conclusion*

This review highlights the positive impact of diverse exercise interventions on cardiac autonomic function in individuals with CMP, as reflected in HRV changes, particularly vagal modulations. Future studies should adhere to rigorous criteria for reporting exercise interventions and HRV assessments to evaluate exercise effects on cardiac autonomic function accurately. The paucity of comprehensive data on exercise influence on cardiac autonomic function in the CMP population indicates a need for further research to clarify these effects.

*Keywords: chronic pain, musculoskeletal diseases, physical therapy, autonomic nervous system, cardiac autonomic function.*