Abstract: P270

Exercise intensity and volume differentially impact on innate and adaptive immunity in patients with metabolic syndrome

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Topic(s):
Rehabilitation: Exercise Programmes

Citation:

Funding Acknowledgements:
DZHK (German Centre for Cardiovascular Research)

Background: Moderate continuous exercise training – the standard of care - reduces systemic and vascular inflammation in patients with cardiometabolic diseases. Alternative exercise protocols with higher volume, and/or intensity may modulate the type of immune response, especially in patients with metabolic diseases, which may have an impact on clinical outcome.

Methods: 29 patients with metabolic syndrome (MetS)(9 females/20 males, median age: 67.0 y, median BMI 30.7 kg/m2) were randomized 1:1:1 to one of three exercise regimens with a duration of 16 weeks: (1) moderate continuous training (MCT) with high volume, (2) high-intensity interval training (HIIT) with low volume and (3) HIIT with high volume. Leukocyte counts and morphology, leukocyte-platelet aggregates, endothelial- and leukocyte-derived microvesicles as a measure of cell activation, and cytokines were quantified at baseline and upon completion of the exercise programme.

Results: Peak oxygen uptake (VO2peak) improved from baseline to follow-up (median 21.3 to 23.1) in all regimens. MCT resulted in a relative increase of alternatively activated monocytes and a decrease of neutrophils and T cells – mainly CD4+ effector and regulatory subsets. T-cell-platelet and monocyte-platelet-aggregates were decreased in MCT, while neutrophil-platelet-aggregates were slightly increased. Low volume-HIIT reduced monocytes – mainly classical and intermediate subsets –, NK cells, CD8+ and regulatory CD4+ T cells, as well as monocyte-platelet-aggregates. High-volume HIIT increased the proportion of the alternatively activated monocyte subset, CD8+ and naïve/central memory CD4+ T cells, and decreased the proportion neutrophils among all leukocytes. Monocyte-platelet- as well as T-cell-platelet-aggregates were reduced in high-volume HIIT, while neutrophil-platelet-aggregates were increased. No changes in leukocyte size and granularity were observed in any exercise programme. Both, MCT and HIIT, at high volumes reduced endothelial microvesicle counts and increased interleukin-10 levels. High-volume HIIT reduced overall leukocyte microvesicle counts, increased the relative representation of T-cell microvesicles among all leukocyte-derived microvesicles and increased IL-6 levels. MCT moreover led to increased levels of IL-8, and IL-13, while only low volume-HIIT reduced interleukin-1 beta levels.

Conclusion: In patients with MetS, exercise volume and intensity differentially affected release and activation of leukocytes of the innate versus the adaptive immunity. Based on these findings, future studies need to establish how exercise volume and intensity can be adjusted in personalized exercise programmes in order to optimize metabo-inflammatory cardiovascular outcome parameters.