

2-2023

Influence of Physical Activity on Heart Rate Variability in Physically Inactive Adults: A Meta-Analysis

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Recommended Citation

Kong, Lingsong and Yang, Qin (2023) "Influence of Physical Activity on Heart Rate Variability in Physically Inactive Adults: A Meta-Analysis," *International Journal of Physical Activity and Health*: Vol. 2: Iss. 1, Article 21.

DOI: <https://doi.org/10.18122/ijpah.020121.boisestate>

Available at: <https://scholarworks.boisestate.edu/ijpah/vol2/iss1/21>

Influence of Physical Activity on Heart Rate Variability in Physically Inactive Adults: A Meta-Analysis

Abstract

This meta-analysis aimed to examine the influences of physical activity (PA) interventions on heart rate variability (HRV) among healthy but physically inactive adults aged 18 to 65 years old. PubMed, SPORTDiscus and Web of Science online databases were searched in September 2021. The eligibility criteria were: (1) peer-reviewed articles in English; (2) randomized controlled trials; (3) healthy but physically inactive adults aged 18 to 65 years; (4) at least two-week PA intervention; (5) available frequency domain result. The data were extracted to a pre-designed form. The primary outcome of this study was the frequency domain of HRV, which included natural log-transformed total power, low frequency and high frequency (lnTP, lnLF and lnHF), normalized units of LF and HF (LFnu and HFnu), and LF/HF ratio. Pooled estimates of differences and 95% confidence intervals (CI) between the PA intervention group (IG) and control group (CG) were obtained using random-effects models. Six studies were identified in the meta-analysis. There was no significant difference between IG and CG in lnTP (SMD: 0.16, 95% CI: [-0.28, 0.60], $p = 0.48$), lnLF (SMD: -0.04, 95% CI: [-0.34, 0.42], $p = 0.84$), lnHF (SMD: 0.03, 95% CI: [-0.23, 0.29], $p = 0.81$) and LF/HF ratio (MD: -0.21, 95% CI: [-0.48, 0.07], $p = 0.14$). The results indicated that the LFnu in IG was significantly lower than that in CG (MD: -3.41, 95% CI: [-5.09, -1.73], $p < 0.01$) while HFnu in IG was significantly higher than that in CG (MD: 3.39, 95% CI: 1.72, 5.07], $p < 0.01$). The increased HFnu and decreased LFnu after PA interventions indicated a more balanced autonomic nervous system. HRV may be a mediator between PA intervention and other health benefits. The measurements of HRV were inconsistent and increased the variation between studies. The sample sizes of IG or CG in the included studies were small (range from 9 to 26), which limited the power to detect significant differences. This study did not analyze the influence of dose-response and different types of PA interventions due to the limited number of eligible studies. The current evidence suggested that PA interventions benefit HRV in healthy but physically inactive adults aged 18 to 65 years old. Future research with a larger sample size is needed to confirm our findings.

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Keywords: physical activity, heart rate variability, meta-analysis, dose-response, interventions