

Impact of Submaximal versus Supramaximal High-Intensity Interval Training on Blood Glucose Regulation in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis

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ABSTRACT

High-intensity interval training (HIIT) is an efficient form of exercise that can potentially induce significant and clinically meaningful blood glucose improvements in patients with Type 2 diabetes mellitus (T2DM). It is unknown whether certain HIIT interval intensities may be more effective than others in combating hyperglycemia in T2DM. **PURPOSE:** The purpose of this study was to determine if submaximal or supramaximal HIIT reduces blood glucose or improves markers of insulin resistance more than the other in T2DM patients using a systematic review and meta-analytical approach. **METHODS:** Three databases (Embase/MEDLINE, CENTRAL, and PubMed) were systematically searched in July 2021 and again in April 2022 to identify studies that used submaximal or supramaximal HIIT interventions on T2DM patients. Seventy-eight articles were compared to the defined inclusion and exclusion criteria, with a total of twenty-one selected for this meta-analysis. Six glycemic control outcome variables were analyzed, including HbA1c, FBG, and HOMA-IR. Pre- and post-HIIT means and SDs were used to calculate effect sizes, which were corrected and weighted to produce Hedges' g values. 95% confidence intervals and p values were also reported. **RESULTS:** Multivariate meta-analytical analysis found that submaximal HIIT produces an effect size of -0.399 (95% CI [-0.916, -0.226], p = 0.000) in blood glucose metrics, while supramaximal HIIT produces a similar, but non-significant, effect size of -0.366 (95% CI [-0.916, 0.184], p = 0.192). Across five of six outcome variables, submaximal HIIT had a significant small to medium effect, while supramaximal HIIT had a negligible to medium effect. For both HbA1c (%) and fasting blood glucose (FBG), supramaximal HIIT produced effect size values 48% and 67.4% larger, respectively, when compared to submaximal HIIT. Graphing HIIT intensity and training load against HbA1c effect size revealed R² values of 0.08 and 0.2, respectively. **CONCLUSION:** Submaximal HIIT effectively reduces markers of blood glucose in T2DM patients. Supramaximal HIIT may induce greater and more clinically meaningful improvements in hyperglycemia, but more research is needed. Neither exercise intensity nor training load alone explain improvements to blood glucose homeostasis as measured by HbA1c.