

Differential Patterns of Impaired Cardiorespiratory Fitness and Cardiac Autonomic Dysfunction in Recently Diagnosed Type 1 and Type 2 Diabetes

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Abstract

Objective Both impaired cardiorespiratory fitness (CRF) and heart rate variability (HRV) are predictors of mortality, but their relative roles in recent-onset diabetes are unknown. We determined to which extent CRF and HRV are reduced and interrelated in recent-onset diabetes.

Research design and methods Participants from the German Diabetes Study with type 1 (n=163) or type 2 diabetes (n=188) with known diabetes duration <1 year and two age-matched glucose-tolerant control groups (n=40 each) underwent spiroergometry and HRV assessment during a hyperinsulinemic-euglycemic clamp.

Results Compared to controls, patients with type 2 diabetes showed reduced maximal oxidative capacity (median [1st-3rd quartiles] VO₂max: 19.3 [16.5-22.9] vs 25.6 [20.7-29.9] ml*min⁻¹*kg⁻¹; P<0.05), diminished maximal carbon dioxide production (VCO₂max: 23.0 [19.1-26.8] vs 30.9 [24.5-34.4] ml*min⁻¹ *kg⁻¹; P<0.05), blunted heart rate recovery after 2 min (-29.0 [-35.0 to -23.0] vs -36.0 [-42.8 to -28.0] bpm; P<0.05) as well as reduced HRV in 4 out of 9 indices, whereas type 1 diabetes individuals had unaltered CRF, but reduced HRV in 3 out of 9 indices (P<0.05) indicating both diminished vagal and sympathetic HRV modulation. HRV measures correlated with VO₂max in patients with type 1 diabetes (r>0.34; P<0.05), but not those with type 2 diabetes.

Conclusion Cardiorespiratory fitness is reduced in recently diagnosed type 2 diabetes, but preserved in type 1 diabetes, while cardiac autonomic function is reduced in both diabetes types albeit strongly associated with cardiorespiratory fitness only in type 1 diabetes. These results support the therapeutic concept of promoting physical fitness in the early course of diabetes.