

Toward individualized high intensity interval training in type 1 diabetes: a framework for safe implementation

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INTRODUCTION & AIM

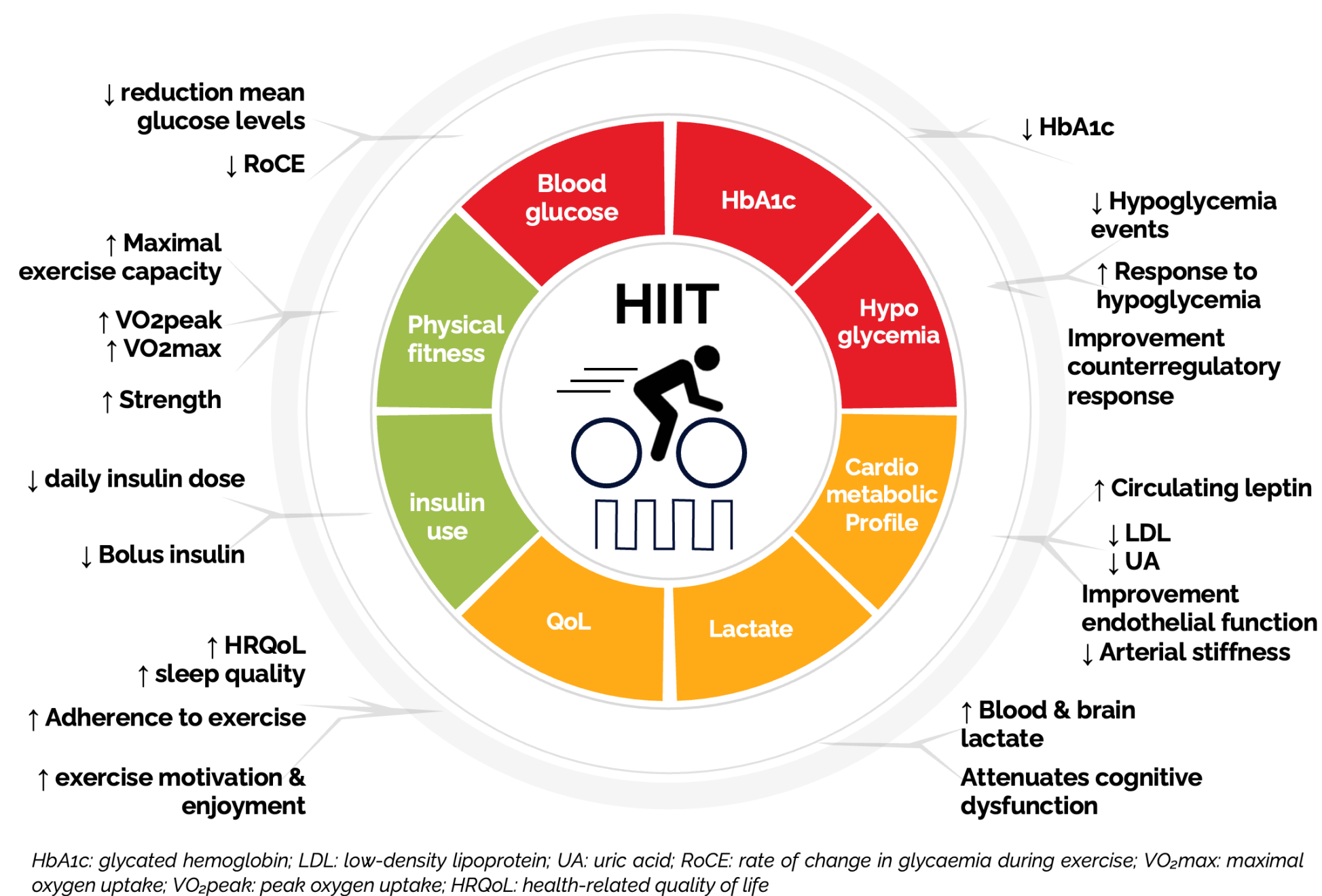
High Intensity Interval Training (HIIT) emerges as a safe, effective, and time efficient strategy for individuals with type 1 diabetes (T1D), with positive effects on glycemic control, cardiovascular function, and physical fitness. Studies suggest that HIIT reduces the risk of both acute and late onset hypoglycemia compared to other exercise modalities, thus promoting adherence. Factors such as prandial state, insulin dosage, and time of day influence glycemic responses. However, there is no clear consensus on the optimal type, structure, or dosage of HIIT for people with type 1 diabetes. The wide variability in protocols—regarding intensity, interval duration, repetitions, rest periods, and weekly frequency—hampers study comparisons and the development of standardized recommendations. This study aims to analyze and synthesize current scientific evidence, identifying key parameters for safe and effective implementation.

METHODS

A total of 18 studies from MEDLINE and PubMed Central were reviewed, selected based on strict inclusion criteria. Priority was given to HIIT interventions in individuals with T1D, preferably using cycle ergometers, and reporting metabolic, physiological, or neurological outcomes. Data were organized into four main categories: population characteristics, HIIT protocol parameters, reported outcomes, and safety criteria.

RESULTS

MAIN BENEFICIAL EFFECTS OF HIIT IN INDIVIDUALS WITH TYPE 1 DIABETES



HbA1c: glycated hemoglobin; LDL: low-density lipoprotein; UA: uric acid; RoCE: rate of change in glycaemia during exercise; VO₂max: maximal oxygen uptake; VO₂peak: peak oxygen uptake; HRQoL: health-related quality of life

Figure 1. Beneficial effects of HIIT in people with type 1 diabetes reported in the analyzed studies. These effects tend to strengthen when exercise is maintained over time.

HIIT in individuals with T1D reduces glycemic variability and hypoglycemia risk through counterregulatory hormonal responses. Evidence shows improvements in 24-hour glycemic control, reductions in HbA1c and insulin requirements and enhancements cardiorespiratory fitness, endothelial and autonomic function, body composition, and overall cardiometabolic profile.

CONCLUSIONS & RECOMMENDATIONS

Given the heterogeneity of studies and populations, no single protocol can define the optimal way to prescribe HIIT in individuals with type 1 diabetes. Therefore, exercise programming should be individualized, including clear parameters for intensity, duration, and frequency. Insulin adjustments and continuous glucose monitoring must be integrated into each session, and professional supervision by exercise physiologists or clinical specialists is essential to ensure safety and effectiveness.

RECOMMENDATIONS FOR SAFE HIIT IN PEOPLE WITH TYPE 1 DIABETES

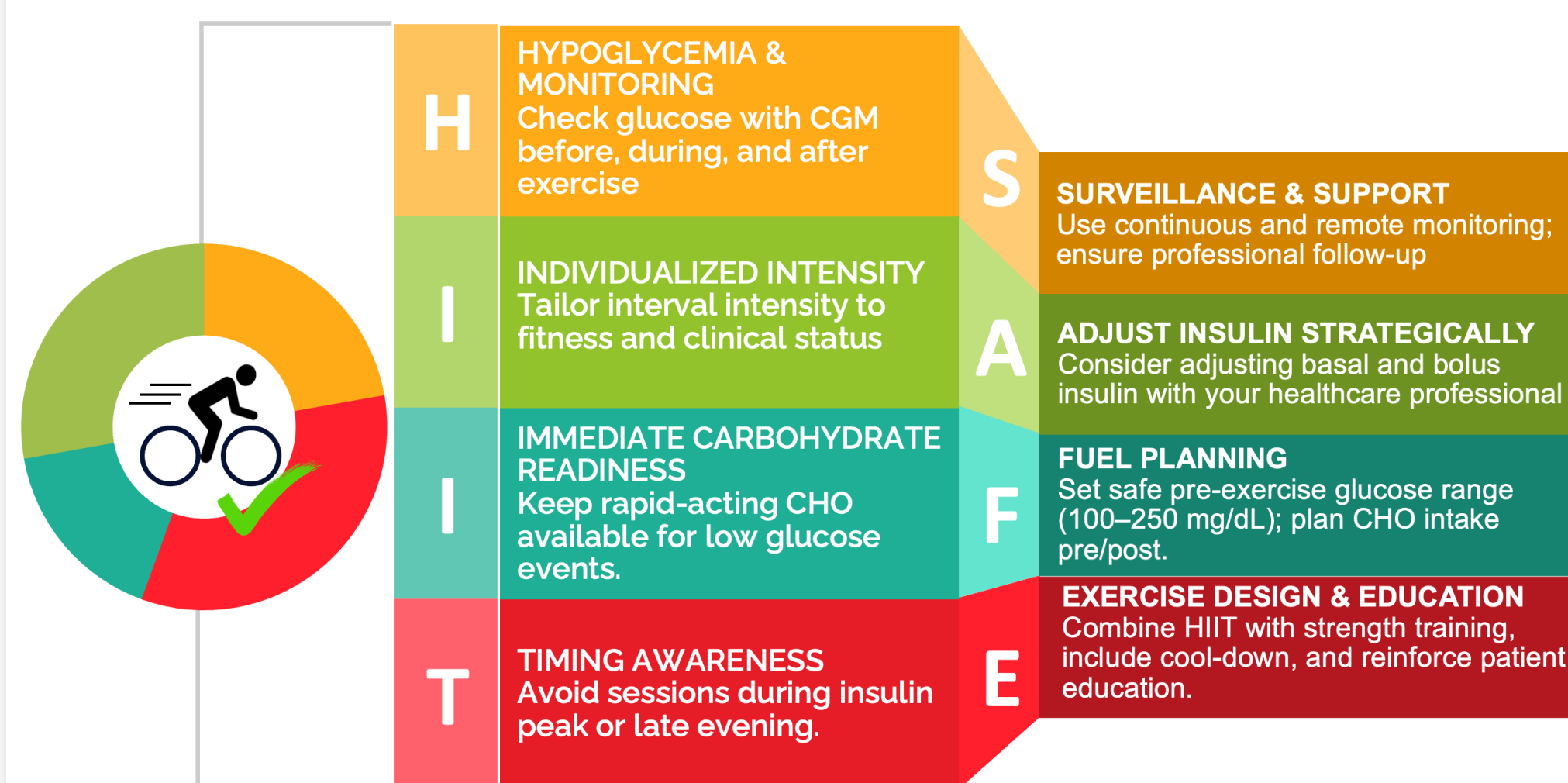


Figure 2. Evidence-Based recommendations for safe HIIT in Individuals with Type 1 Diabetes

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