

Impact of e-biking on postprandial glucose excursions in individuals with type 2 diabetes

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Background:

By 2040, approximately 3.9 million people are expected to be diagnosed with type 2 diabetes mellitus (T2DM). Among individuals with T2DM postprandial hyperglycaemia (the increase in plasma glucose concentrations after consuming a meal) is strongly and independently associated with cardiovascular disease and mortality in individuals with T2DM. Encouragingly, studies have shown that a single bout of exercise, of various intensities and modalities, can improve postprandial glucose control in individuals with T2DM. However, individuals with T2DM are less physically active than healthy individuals and with the incidence of T2DM on the rise there is a need for tolerable physical activity interventions. Electrically-assisted bicycles (e-bikes) have been highlighted as a method through which to increase physical activity while overcoming some of the common barriers to exercise. However, the impact e-biking on health related outcomes, including postprandial hyperglycaemia and glycaemic variability has yet to be thoroughly explored.

Aims & Objectives:

To explore whether an acute bout of e-biking has an impact on postprandial hyperglycaemia and 24-hour glucose variability in individuals with type 2 diabetes mellitus compared to a no exercise control

Method:

Individuals will be recruited from PEDAL and STAMP study populations. The study will use a two-treatment randomized cross over design (30-minutes of e-biking and 30-mins of sedentary activity). The study will be conducted at the CREATE center. Participants will visit the center on 4 occasions over 6 days. Visit 1 will consist of an e-bike familiarization and continuous glucose monitor insertion (CGM). The CGM will measure interstitial glucose concentration every 5 minutes for 6 consecutive days. Visit 2 and 3 will consist of either e-biking or a sedentary activity. Heart rate and ratings of perceived exertion will be used to establish the intensity at which participants are working while riding the e-bike. On visits 2 and 3 participants will be provided with a standardized meal plan for the day. Meal plans will be based on daily energy requirements calculated using Mifflin equations with macronutrient being in line with average macronutrient intake of UK adults. On Visit 4 the CGM will be removed

Outcome measures:

Primary outcomes:

2-hour post-breakfast interstitial glucose incremental area under the curve (iAUC)

Secondary outcomes:

Post-breakfast peak and mean interstitial glucose

Post lunch and dinner iAUC

24-hour glucose variability