

Physical Activity—The Major Unaccounted Impediment to Closed Loop Control

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Abstract

This article presents a mathematical model of glucose homeostasis that is valid during physical activity. Known changes in glucose dynamics during exercise were accounted for in the model, and exercise itself was detected and quantified through heart rate (beats per minute). The model was successfully fit to 21 type 1 diabetic subjects during a hyperinsulemic clamp protocol, and performance of the new model was compared with the standard minimal model of glucose kinetics that it was derived from.

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Abbreviations: (BG) blood glucose, (MMGK) minimal model of glucose kinetics, (SH) severe hypoglycemia, (T1DM) type 1 diabetes mellitus, (WMSE) weighted mean square errors

Keywords: exercise, glucose dynamics, insulin sensitivity, minimal model, physiological modeling

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