

Abstract

The Effects of Various Dietary and Exercise Interventions on Continuously Measured Glucose Levels in People with Type 2 Diabetes, and Potential for Personalized Treatment [†]

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[†] Presented at the 14th European Nutrition Conference FENS 2023, Belgrade, Serbia, 14–17 November 2023.

Abstract: Introduction: Dietary and physical activity interventions have beneficial health effects for people with type 2 diabetes (T2D). Although the effects of such interventions on long-term changes in glucose levels are well studied in a controlled setting, little is known about the acute effects of lifestyle interventions in a real-life setting and on an individual level. Quantifying the effects of lifestyle on metrics of continuously measured glucose and how these differ between individuals may allow for personalized lifestyle advice for people with T2D. Methods: Forty people with T2D were included in this study. Participants wore a continuous glucose monitor (CGM) for 11 periods of 4 days, of which 3 were control periods (habitual everyday life) and 8 were intervention periods (2× low carbohydrate diet, 2× Mediterranean diet, 2× walking after each meal, and 2× hourly exercise bouts of 5 minutes ('active day')). The CGM metrics used in the ambulatory glucose profile, an internationally recognized standard for interpreting glucose control, were calculated. We used a random effects model to quantify the effect of the four lifestyle interventions on CGM metrics with the participants as a random effect. Results: On average, a low carbohydrate diet, walking after a meal, and an active day resulted in improved CGM metrics, including a lower mean glucose (−0.70, −0.34, and −0.25 mmol/L, respectively) and SD (−0.22, −0.05, and −0.02) and higher time in range (6.9, 3.5, and 3.2%, respectively), the latter being the average percentage of time per day spend in the target glucose range (3.9–10.0 mmol/L). Only the low carbohydrate diet had a positive effect on the coefficient of variation (−1.48), a measure of glucose variability. Also, the magnitude of the effects varied between the interventions. Surprisingly, the Mediterranean diet had adverse effects on all the calculated CGM metrics. Our next step is to investigate inter-individual variation in these intervention effects. Discussion: The low carbohydrate diet, walking after a meal, and active day intervention showed positive, but differential, effects on CGM metrics within 4 days, while the Mediterranean diet showed negative effects. Further analysis on inter-individual variation can be used for personalized lifestyle recommendations, for instance targeted at avoiding high glucose peaks, or reducing variability in glucose levels.

Keywords: continuous glucose monitoring; lifestyle treatment; multilevel model; type 2 diabetes mellitus; personalized advice

Author Contributions: I.M.d.H., T.S. and R.J.M.K. conducted the clinical study, researched data. I.M.d.H. and H.P. wrote the first draft of the manuscript. T.K. conducted the statistical analyses. I.M.d.H., A.A.d.G., R.J.M.K., T.K., H.M.E. and H.P. contributed to discussion, reviewed and edited the abstract. All authors have read and agreed to the published version of the manuscript.



Citation: de Hoogh, I.M.; Snel, T.; Kamstra, R.J.M.; Krone, T.; Eggink, H.M.; Pijl, H.; de Graaf, A.A. The Effects of Various Dietary and Exercise Interventions on Continuously Measured Glucose Levels in People with Type 2 Diabetes, and Potential for Personalized Treatment. *Proceedings* **2023**, *91*, 159. <https://doi.org/10.3390/proceedings2023091159>

Academic Editors: Sladjana Sobajic and Philip Calder

Published: 1 February 2024



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Funding: The Gluco Insight collaboration project is co-funded by a PPP Allowance made available by Health-Holland, Top Sector Life Sciences & Health, to stimulate public-private partnerships.

Institutional Review Board Statement: The study protocol was approved by the Medical Ethics Committee Brabant, the Netherlands (NL70771.028.19).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: Authors I.M.d.H., R.J.M.K., T.K., A.A.d.G. and H.P. declare no conflicts of interest. T.S. has a paid position at Roche Diabetes Care Nederland B.V. that markets tools related to diabetes self-management.

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