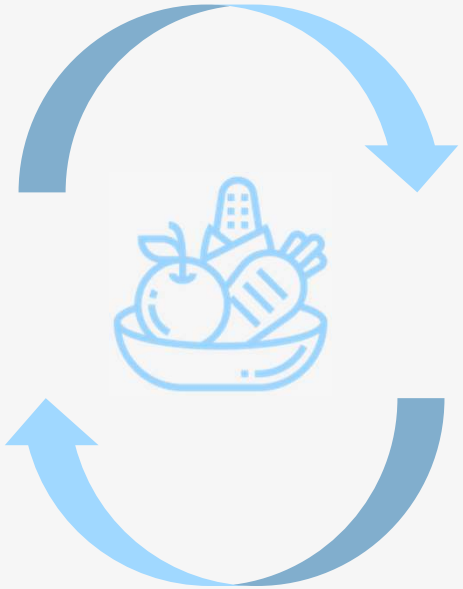
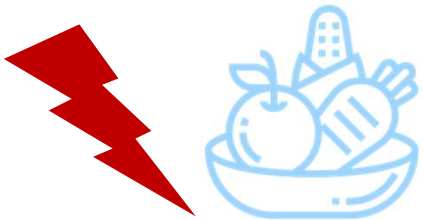
Abschlussvortrag ZKE

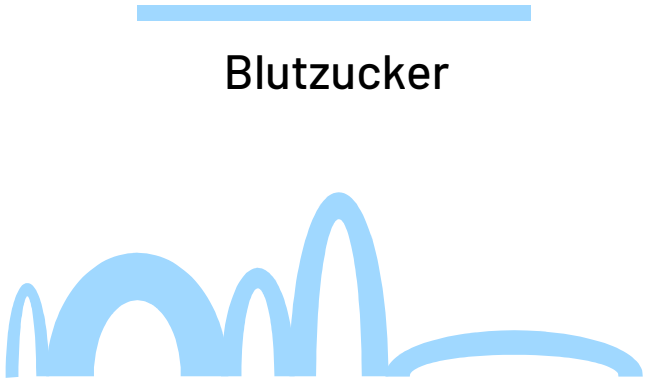


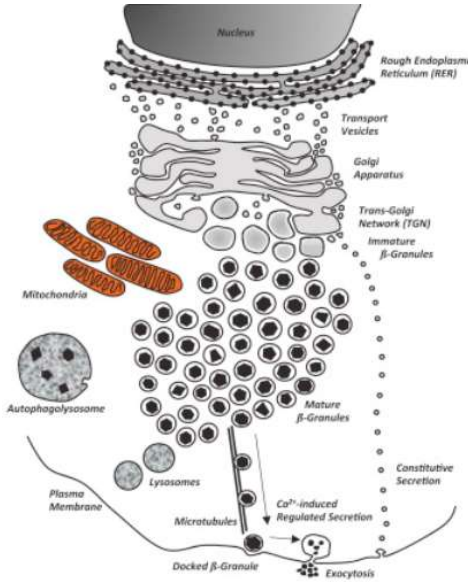
Die Rolle der Ernährung in der Glukoseregulation

Lia Bally, MD PhD
Universitätsklinik für Diabetologie, Endokrinologie, Ernährungsmedizin und Metabolismus, Inselspital Bern

Essen = Stress für den Blutzucker

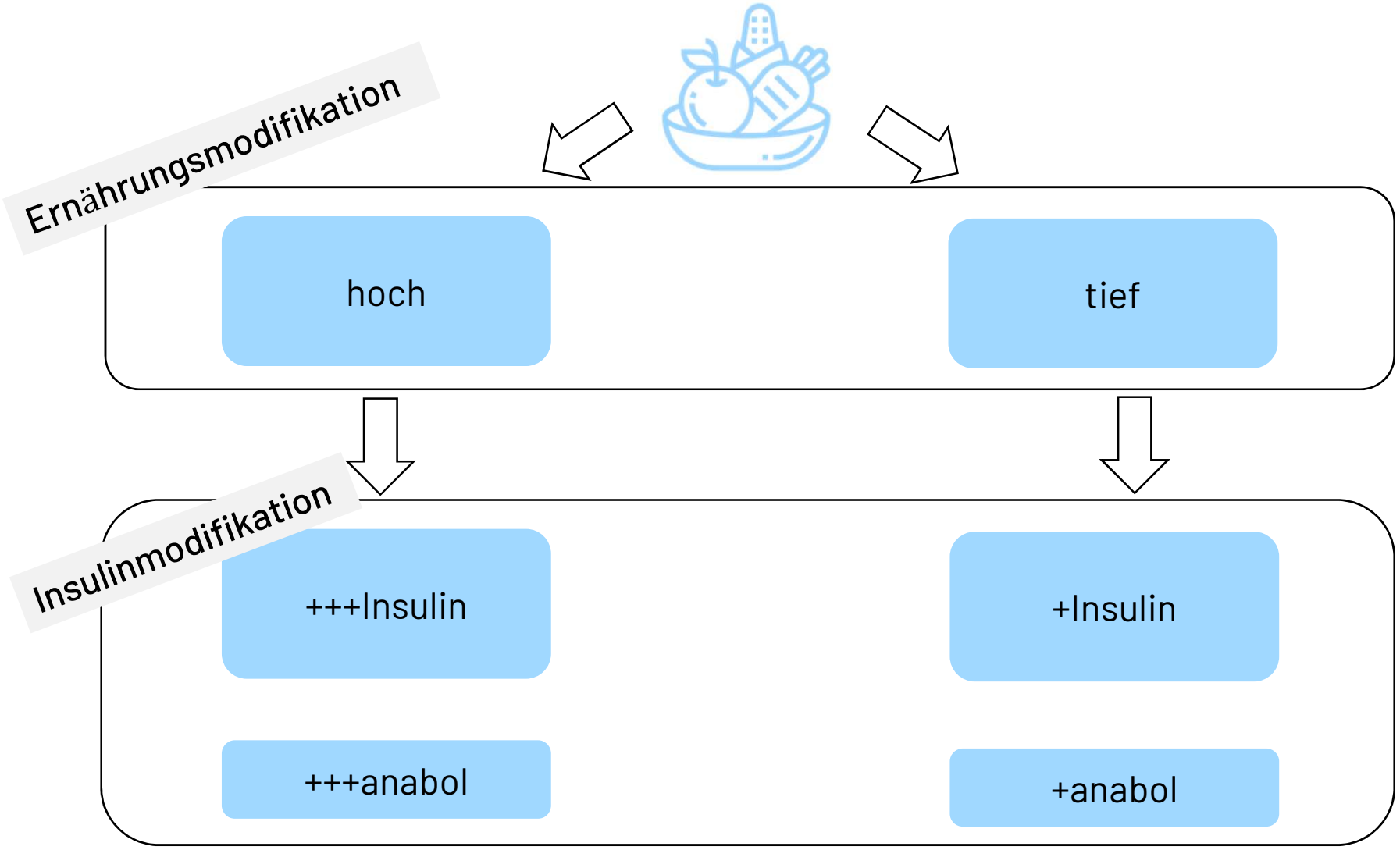






Boland BB, Molecular Metabolism 2017; Polonsky KS et al, J Clin Invest 1988

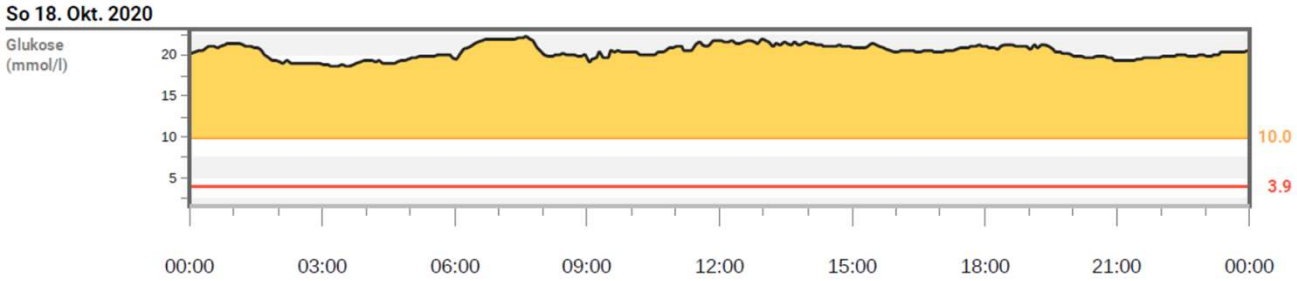
Glykämischer Impakt



Monro JA et Shaw M, Am J Nutrition, Am J Nutr 2008

Ernährungstherapie im Spital

PEN/EN-induzierte Hyperglykämie: bis zu 50%



POP-LOOP Studie NCT04361799

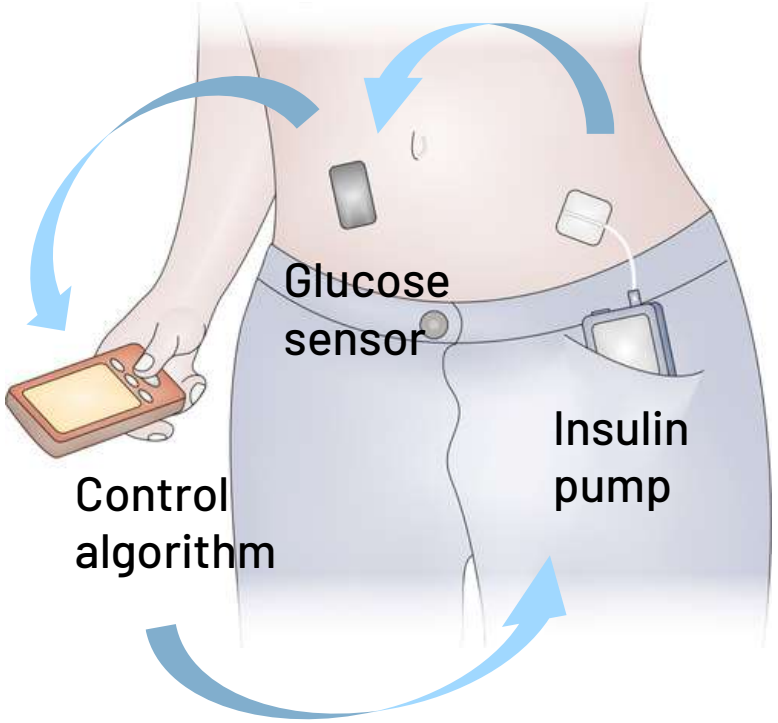
Table 2—*Risk of complication by blood glucose level quartile after adjusting for age, sex, and presence of preexisting diabetes*

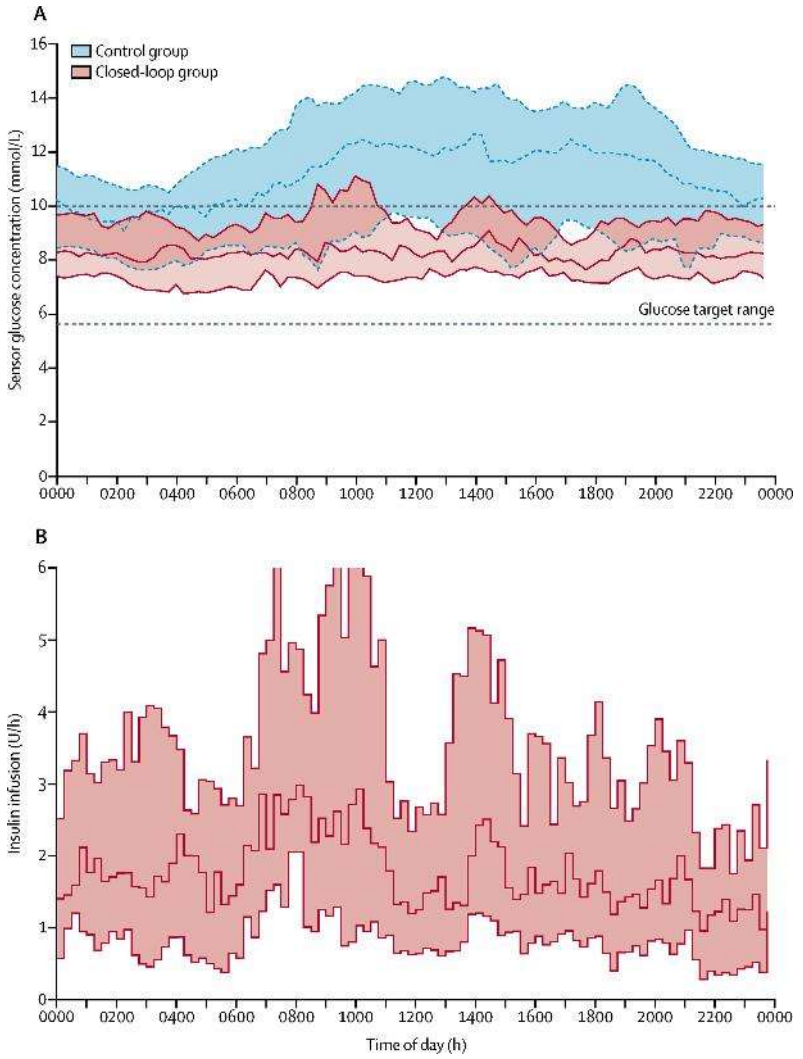
	<6.9 mmol/l (OR)	6.9–7.8 mmol/l		7.9–9.1 mmol/l		>9.1 mmol/l	
		OR (95% CI)	*P*	OR (95% CI)	*P*	OR (95% CI)	*P*
Any infection	1	1.3 (0.4–4.2)	0.71	2.8 (0.9–8.8)	0.08	3.9 (1.2–12.0)	0.02
Septicemia	1	0.8 (0.2–3.6)	0.73	1.0 (0.2–4.5)	1.0	2.5 (0.7–9.3)	0.17
Acute renal failure	—	1	—	14.8 (1.7–129.1)	0.02	10.9 (1.2–98.1)	0.03
Cardiac complications	1	1.1 (0.1–18.7)	1.0	4.9 (0.5–47.4)	0.17	6.2 (0.7–57.8)	0.11
Death	1	1.0 (0.1–8.0)	1.0	3.4 (0.6–19.9)	0.18	10.9 (2.0–60.5)	<0.01
Any complication	1	1.2 (0.4–3.8)	0.76	4.1 (1.4–12.4)	0.01	4.3 (1.4–13.1)	<0.01

Data determined by stepwise logistic regression analysis. ORs are expressed using blood glucose ≤6.9 mmol/l as a reference category. Because there were no cases of acute renal failure in the lowest quartile of blood glucose, the combined blood glucose groups <6.9 and 6.9–7.8 mmol/l were used as the reference category.

Cheung NW et al, Diabetes Care 2005; Laesser CE et al, Int J Clin Med. 2019

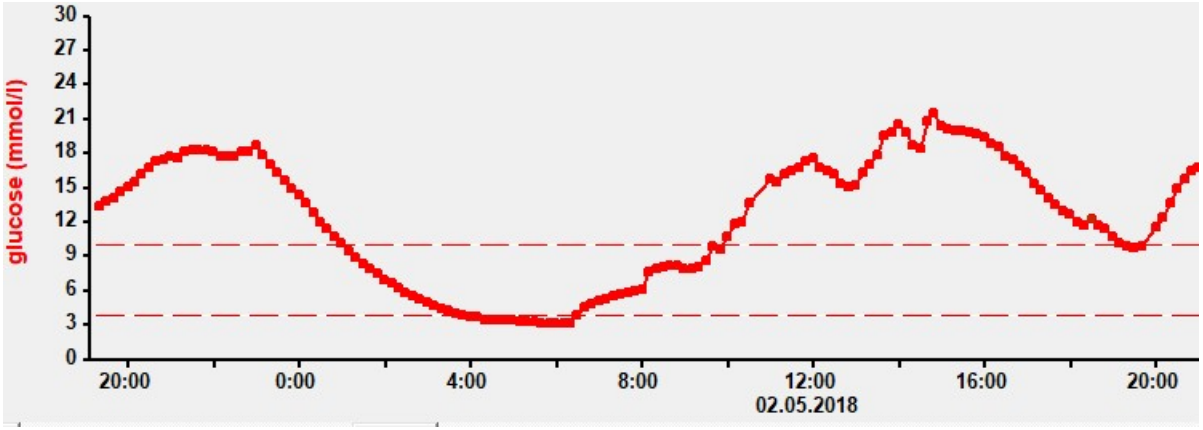
Insulinmodifikation: Closed-loop Insulintherapie

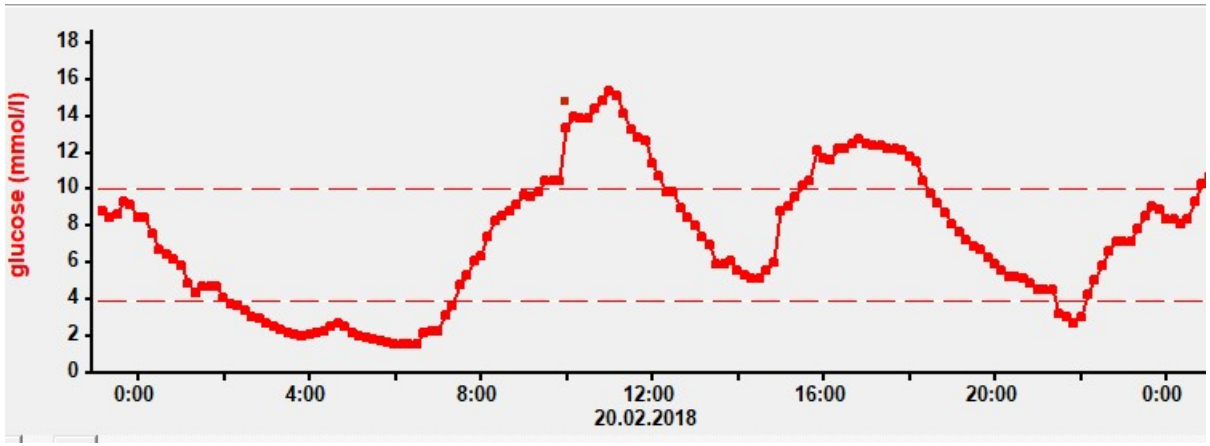




Bally L et al, New Engl J Med 2018, Boughton C/Bally L, Lancet Diabetes Endocrinol 2019

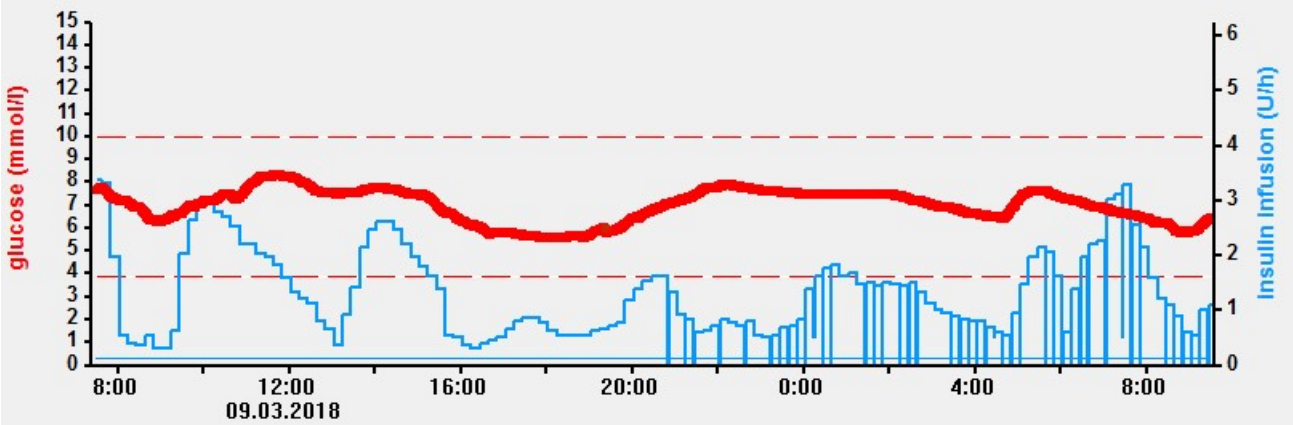
Insulinmodifikation: Konventionelle Therapie

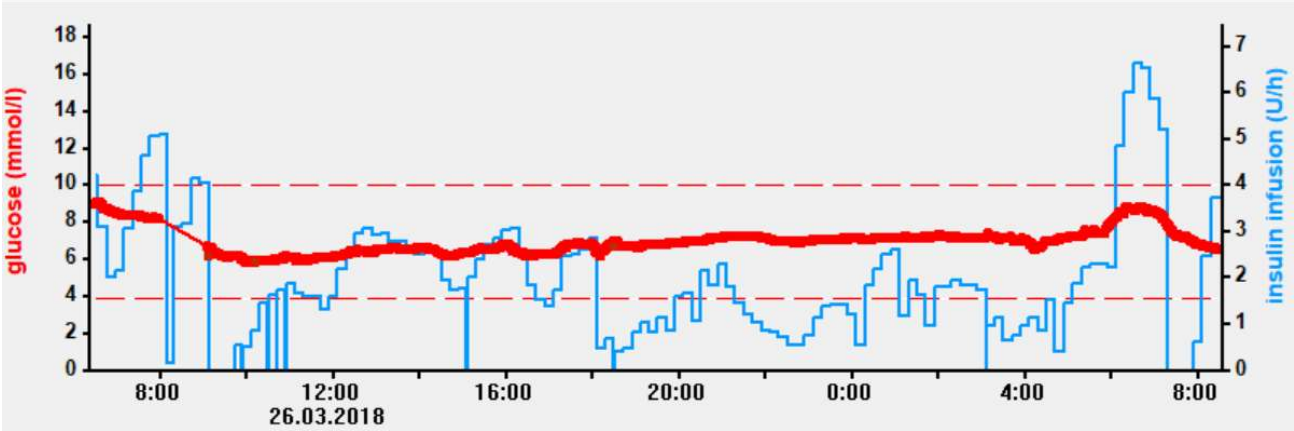




Bally L et al, New Engl J Med 2018, Boughton C/Bally L, Lancet Diabetes Endocrinol 2019

Insulinmodifikation: Closed-Loop Insulintherapie





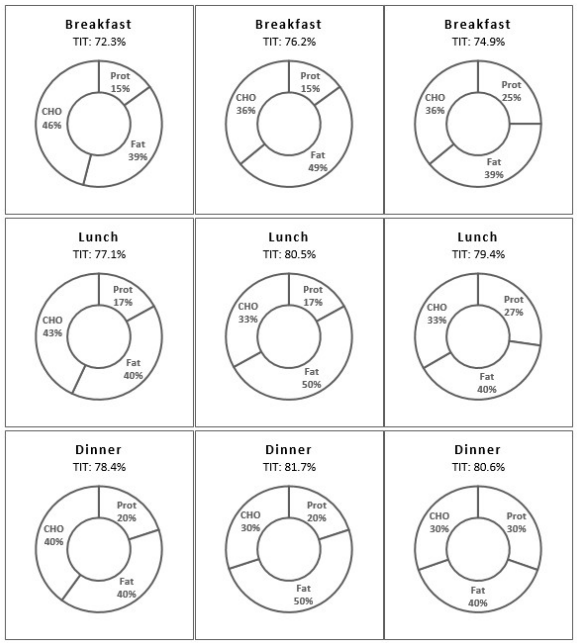
Bally L et al, New Engl J Med 2018, Boughton C/Bally L, Lancet Diabetes Endocrinol 2019

Ernährungsmodifikation: Kohlenhydratreduktion

› Diabetes Obes Metab. 2020 Sep 4. doi: 10.1111/dom.14187. Online ahead of print.

Effect of nutrition on postprandial glucose control in hospitalized patients with type 2 diabetes receiving fully automated closed-loop insulin therapy

Nicolas Banholzer [# 1], David Herzig [# 2], Camillo Piazza [2], Mario Álvarez-Martínez [2 3], Christos T Nakas [4 5], Christophe Kosinski [2], Stefan Feuerriegel [1], Roman Hovorka [6 7], Lia Bally [2]



Lower Daily Carbohydrate Intake Is Associated With Improved Glycemic Control in Adults With Type 1 Diabetes Using a Hybrid Closed-Loop System

Vera Lehmann, Thomas Zueger, Anna Zeder, Sam Scott, Lia Bally, Markus Laimer, Christoph Stettler

Diabetes Care 2020 Sep; dc201560.

OBJECTIVE

To assess the association between daily carbohydrate (CHO) intake and glycemic control in adult hybrid closed-loop (HCL) users with type 1 diabetes (T1D).

RESEARCH DESIGN AND METHODS

Mean individual daily CHO intake (MIDC) and relative deviation from MIDC (≤80% low; 81–120% medium, >120% high CHO consumption) were compared with parameters of glycemic control assessed by continuous glucose monitoring.

RESULTS

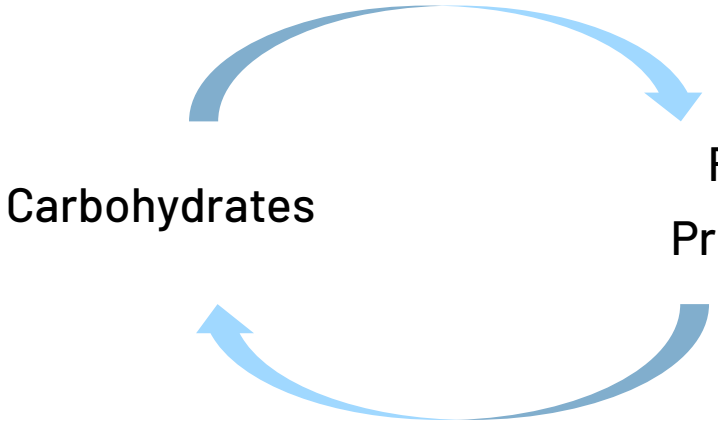
Records from 36 patients (26 male, 10 female; age 36.9 ± 13.5 years; HbA_{1c} 7.1 ± 0.9% [54 ± 10 mmol/mol]) provided 810 days of data (22.5 ± 6.7 days per patient). Time in range (70–180 mg/dL) for low, medium, and high CHO consumption was 77.4 ± 15.4%, 75.2 ± 16.7%, and 70.4 ± 17.8%, respectively ($P < 0.001$). Time above range (>180 mg/dL) was 20.1 ± 14.7%, 22.0 ± 16.9%, and 27.2 ± 18.4%, respectively ($P < 0.001$). There was no between-group difference for time in hypoglycemia (<70 mg/dL; $P = 0.50$).

CONCLUSIONS

Daily CHO intake was inversely associated with glycemic control in adults with T1D using an HCL system. Lower CHO intake may be a strategy to optimize glucose control in HCL users.

Herzig D et al, Diabetes Obes Metab 2020; Lehmann V et al, Diabetes Care 2020

Ernährungsmodifikation: Kohlenhydratreduktion

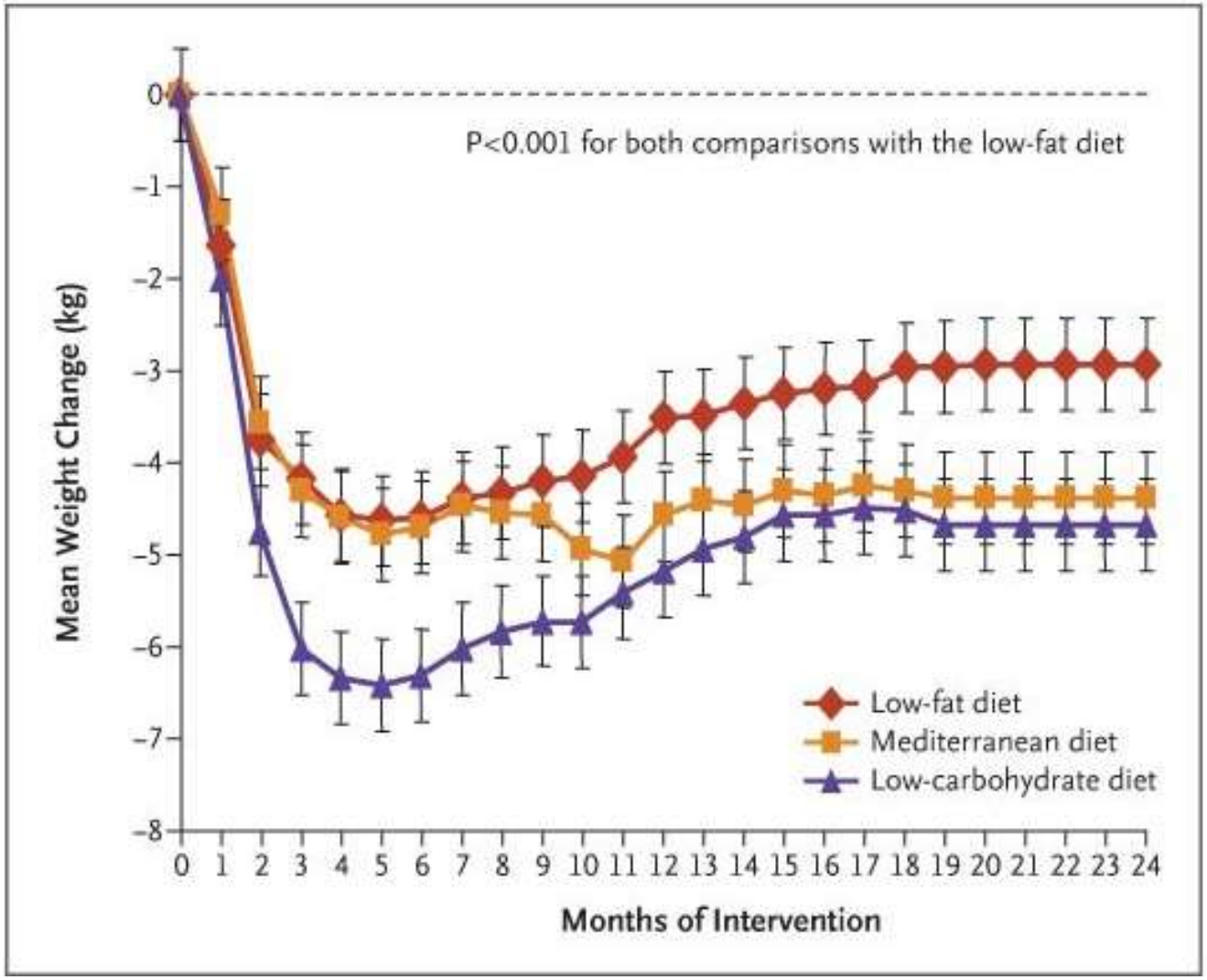


Isocaloric substitution modelling

Across meals, when carbohydrates were replaced by fat, or to a lesser extent by protein, postprandial glucose control improved. For breakfast, a 3.9% improvement in TIT was observed when 10% of the energy from carbohydrates was replaced by fat. Improvements were slightly lower during lunch and dinner (3.2% and 3.4%) or when carbohydrates were replaced by protein (2.2 and 2.7%, respectively).

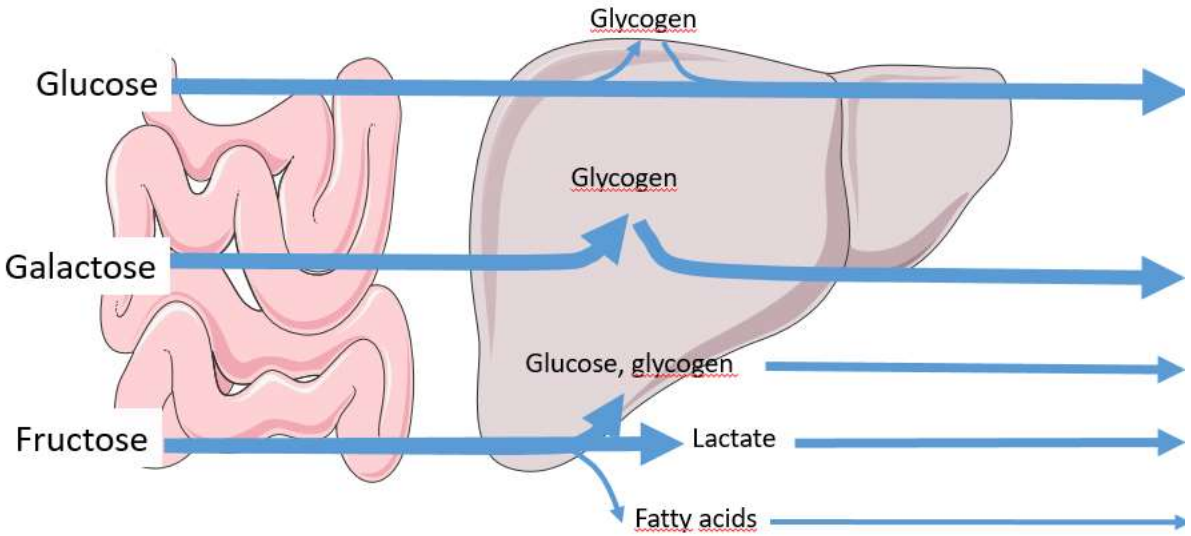
Herzig D et al, Diabetes Obes Metab 2020

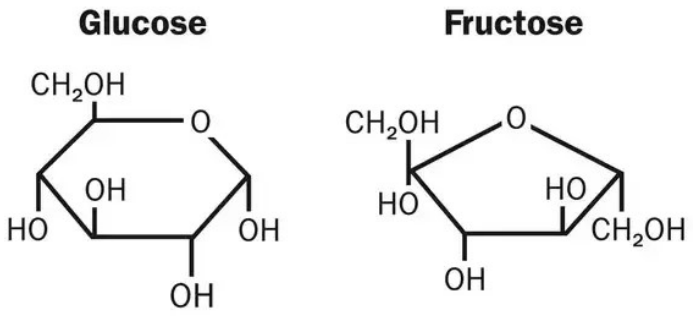
Ernährungsmodifikation: Kohlenhydratreduktion

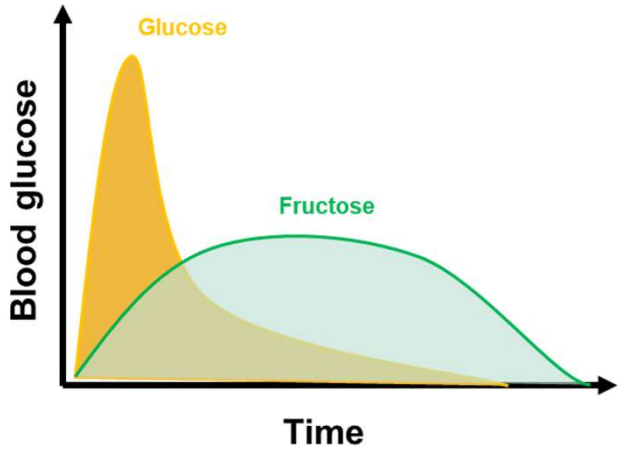


Shai I et al. N Engl J Med 2008.

Ernährungsmodifikation: Qualität der Kohlenhydrate



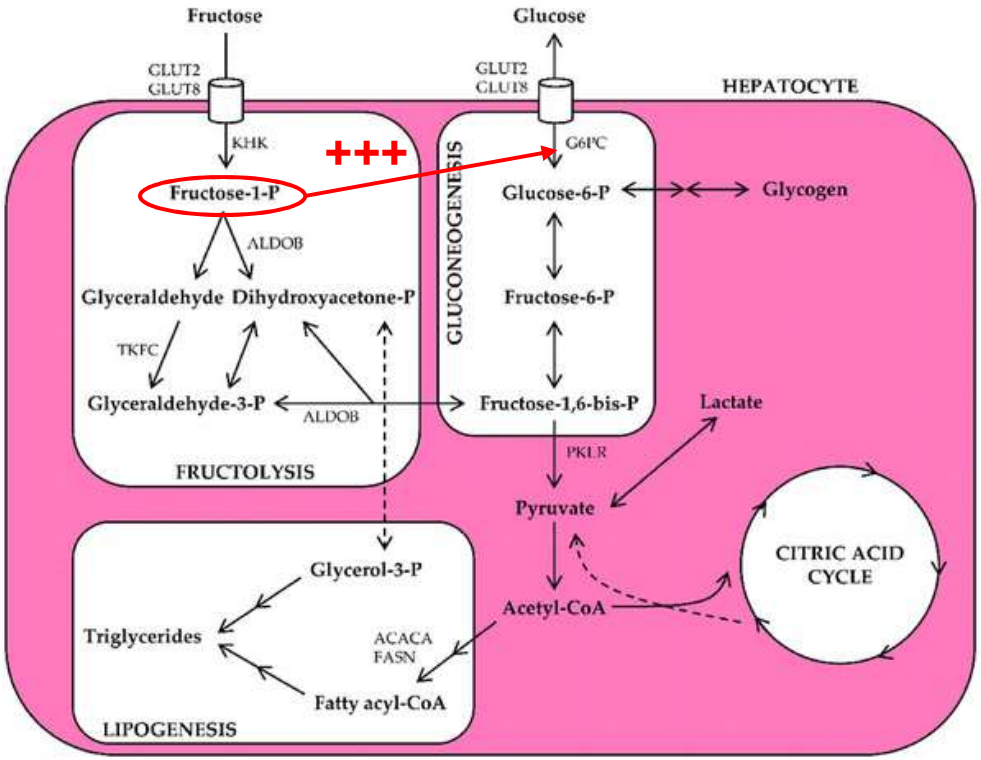




Bally L et al, Nutrients 2017; Kosinski K et al, Diabetes Care 2020

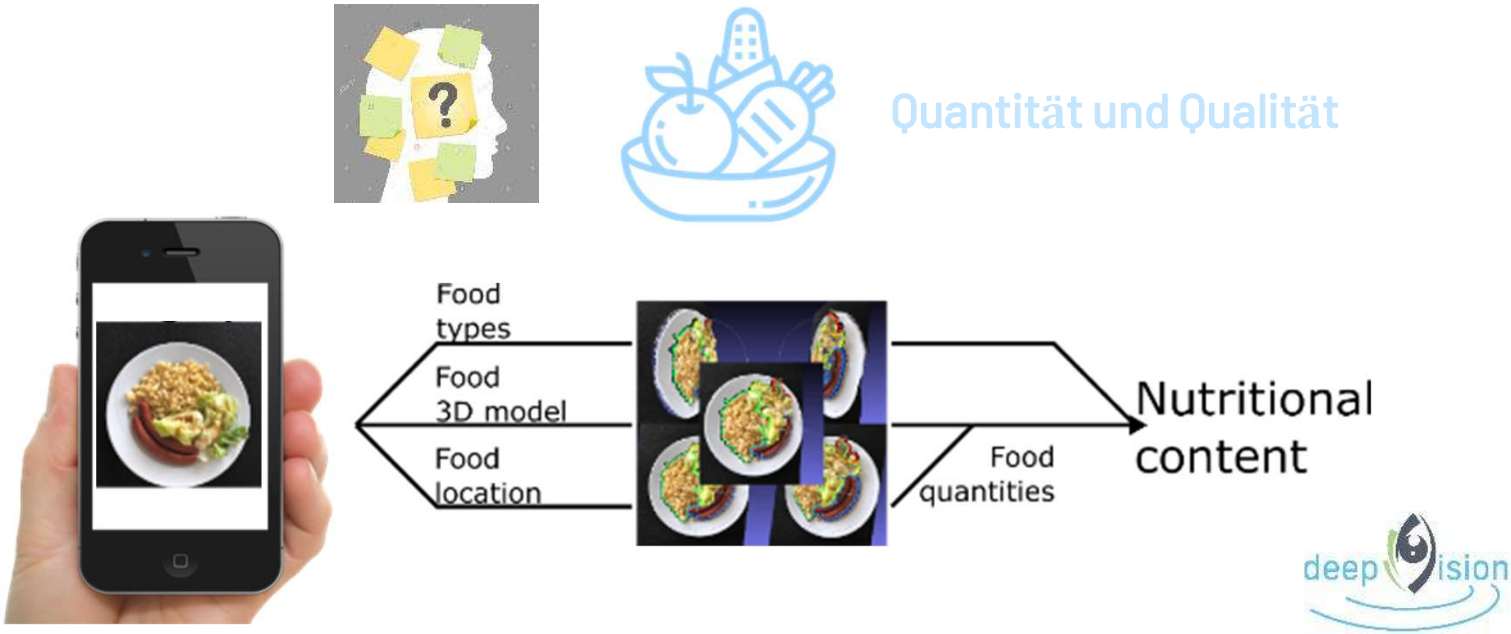
Ernährungsmodifikation: Fruktose

- Isokalorische Substitution durch Fruktose für andere Kohlenhydrate→↓HbA1c by 0.5%, keine unerwünschten metabolischen Nebenwirkungen
- Mechanismen
  - Hepatischer First-Pass
  - 2-stufen Metabolisierung
  - "katalytischer" Effekt



Choo VL et al, BMJ . 2018; Cozma AI et al, Diabetes Care; JL Sievenpiper et al, Br J Nutr 2012

Ernährungsmodifikation: Neue Technologien



JMIR MHEALTH AND UHEALTH Herzig et al

Original Paper

Volumetric Food Quantification Using Computer Vision on a Depth-Sensing Smartphone: Preclinical Study

David Herzig[1*], PhD; Christos T Nakas[2,3*], PhD; Janine Stalder[1], MSc; Christophe Kosinski[1], MD; Céline Laesser[1], MD; Joachim Dehais[1], PhD; Raphael Jaeggi[1]; Alexander Benedikt Leichtle[3], MD; Fried-Michael Dahlweid[4], PhD; Christoph Stettler[1*], MD; Lia Bally[1*], MD, PhD

Diabetes Care. 2017 Feb;40(2):e6-e7. doi: 10.2337/dc16-2173. Epub 2016 Nov 29.

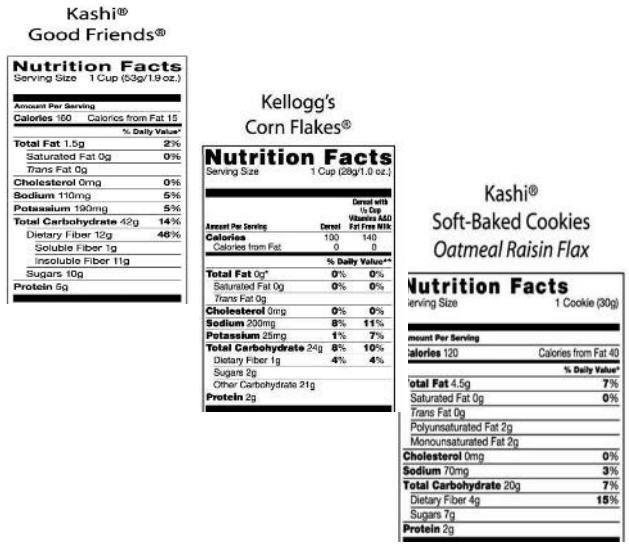
Carbohydrate Estimation Supported by the GoCARB System in Individuals With Type 1 Diabetes: A Randomized Prospective Pilot Study

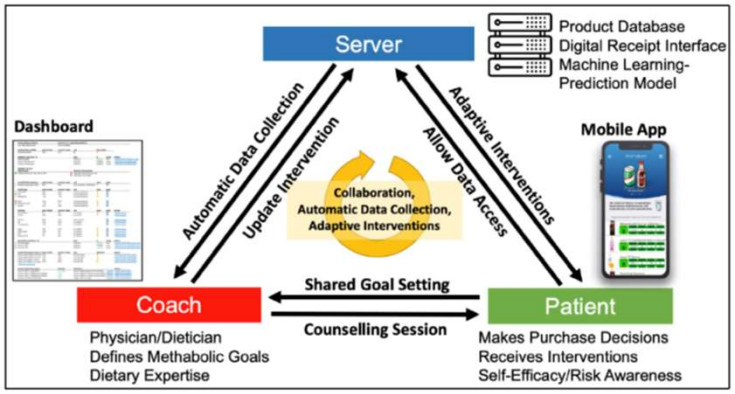
Lia Bally [1], Joachim Dehais [2], Christos T Nakas [3 4], Marios Anthimopoulos [2 5], Markus Laimer [1], Daniel Rhyner [2], George Rosenberg [1], Thomas Zueger [1], Peter Diem [1], Stavroula Mougiakakou [2], Christoph Stettler [6]

Herzig D et al, JMIR Mhealth 2020: Bally L et al, Diabetes Care 2016

Ernährungsmodifikation: Neue Technologien

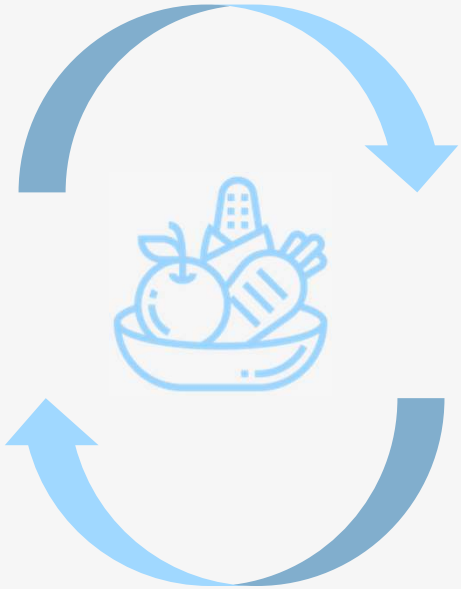
- Kohlenhydratqualität in Nährwertangabe nicht ersichtlich
- Guter Richtwert für Kohlenhydratqualität: Verhältnis totale Kohlenhydrate/Nahrungsfasern
  - >10:1 = vermeiden
  - <10:1 = gute Wahl
  - <5:1 = noch bessere Wahl





Mozaffarian RS et al, Public Health Nutr 2013; Liu J et al, PLOSone 2020

Schlussfolgerungen



Essen=Stress für den Blutzucker
Ideal: Blutzucker stabil, Insulin hochvariabel

Neue Technologien ermöglichen hochvariable Insulinzufuhr (Closed-Loop)

Ernährungsmodifikation=effizient und sicher, Quantität und Qualität der Kohlenhydrate, neue Technologien unterstützen Entscheidungen

Table S4. Meal energy and macronutrient content.

	Energy (kcal)	CHO (g)	Fat (g)	Prot (g)
Breakfast (n=272)	533 ± 215	62 ± 25	23 ± 12	19 ± 9
- variability	140 ± 107	15 ± 11	8 ± 6	6 ± 4
Lunch (n=284)	525 ± 211	52 ± 22	24 ± 12	25 ± 11
- variability	160 ± 71	18 ± 8	10 ± 5	8 ± 3
Dinner (n=266)	574 ± 247	61 ± 31	26 ± 14	24 ± 13
- variability	189 ± 102	23 ± 13	12 ± 6	11 ± 5

Data are mean ± SD. Variability is participant-specific standard deviation from meal energy and macronutrient content. CHO, carbohydrates.