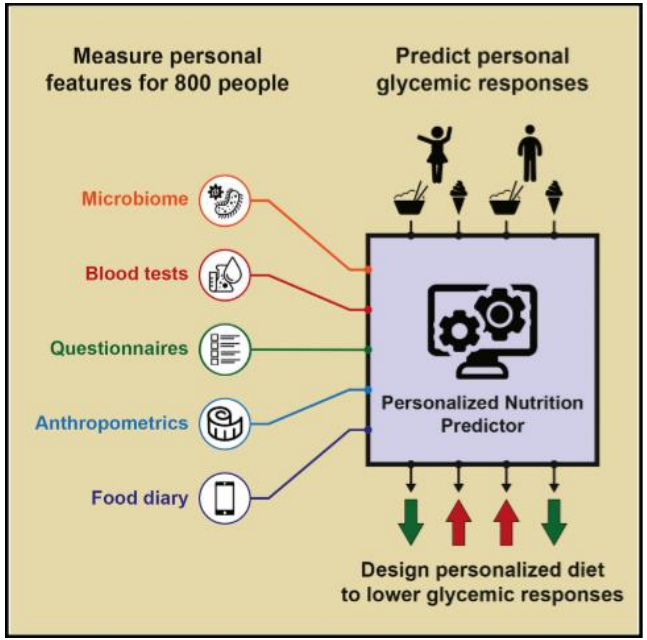
PERSONALISEREN VAN VOEDINGSADVIEZEN

Iris de Hoogh

TNO innovation for life

WHY PERSONALIZED NUTRITION?

- All individuals are different
- "… Personalized Nutrition advice … produced larger and more appropriate changes in dietary behaviour than a conventional approach." (Celis-Morales et al., 2016)
- Personalized recommendations are more relevant & feel more relevant to the individual

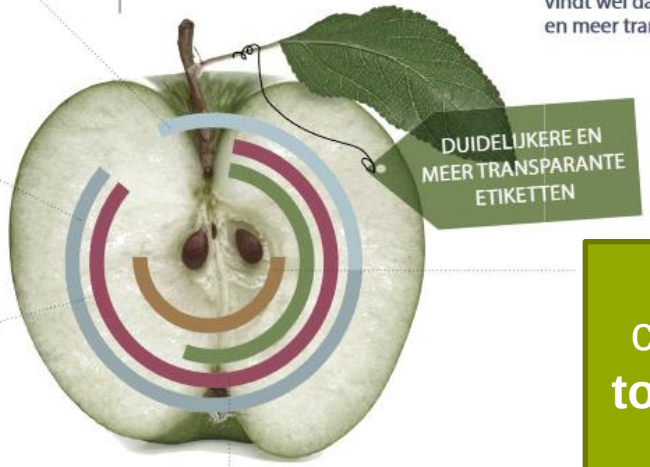


CONSUMERS SEEK ADVICE ON HEALTHY FOOD

94% van de Nederlanders kijkt naar de **bijdrage van voedsel aan diens gezondheid.**

72% **Het etiket** is voor 72% van deze consumenten de belangrijkste bron van informatie. Maar men vindt wel dat het etiket duidelijker en meer transparent moet.

2/3 of Dutch consumers say they have **insufficient knowledge** to decide on healthy food



van de mensen die gezonder zijn gaan eten heeft 86% **bewust minder 'ongezonde' voeding** gekocht.

86%

1/2 of Dutch consumers is **willing to pay** for healthy food to prevent illness

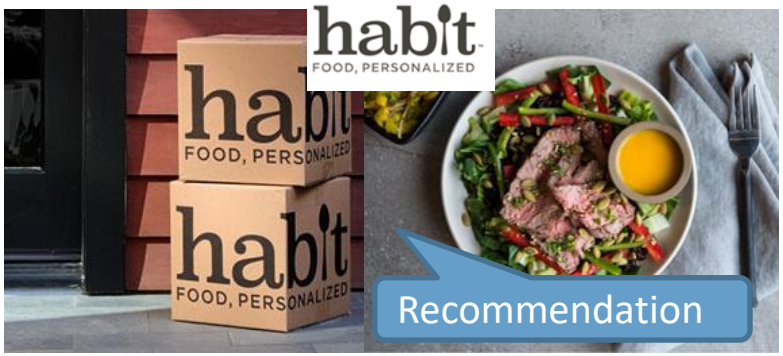
55% ...is het afgelopen jaar **gezonder gaan eten**

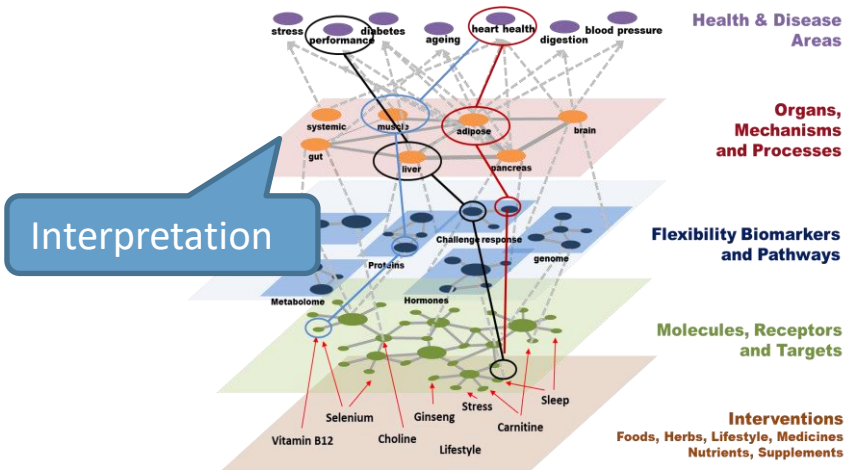
Bron: GfK, Rabobank, 2016

WHAT IS PERSONALIZED NUTRITION?

NutraIngredients, 2017

Assessment
225
CHOL
mg/dl
BLOOD SUGARS
MINUTES AFTER THE HABIT CHALLENGE™ SHAKE


habit
FOOD, PERSONALIZED
habit
FOOD, PERSONALIZED
habit
FOOD, PERSONALIZED
Recommendation


Interpretation
stress
performance
diabetes
ageing
heart health
digestion
blood pressure
Health & Disease Areas
systemic
muscle
adipose
brain
gut
liver
pancreas
Organs, Mechanisms and Processes
Challenge response
Proteins
genome
Flexibility Biomarkers and Pathways
Metabolome
Hormones
Molecules, Receptors and Targets
Sleep
Stress
Selenium
Ginseng
Carnitine
Vitamin B12
Choline
Lifestyle
Interventions
Foods, Herbs, Lifestyle, Medicines
Nutrients, Supplements

SYSTEMS VIEW: USING MULTI-DOMAIN MEASUREMENTS

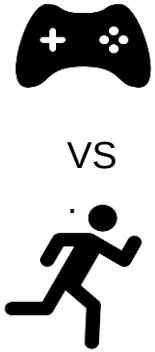
Health status

Blood markers, nutrient status, anthropometrics

Genetics

Individual SNPs, genetic risk scores

Behavior

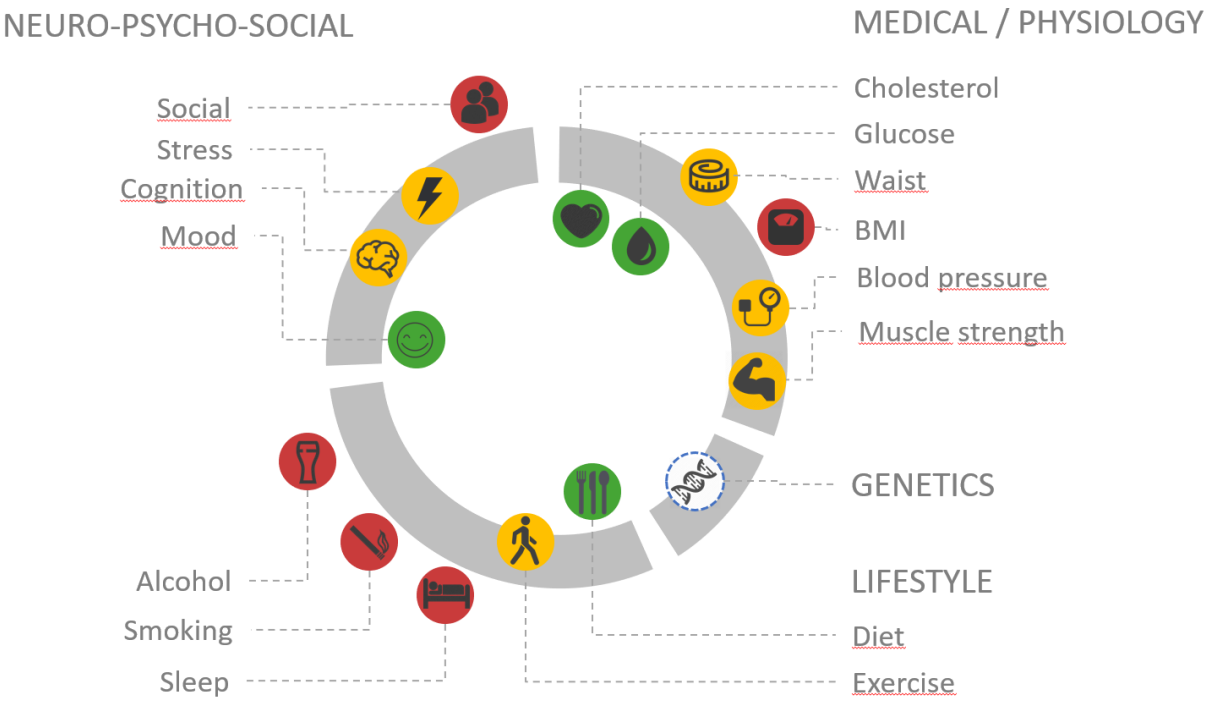


Dietary intake, physical activity, sleep, etc.

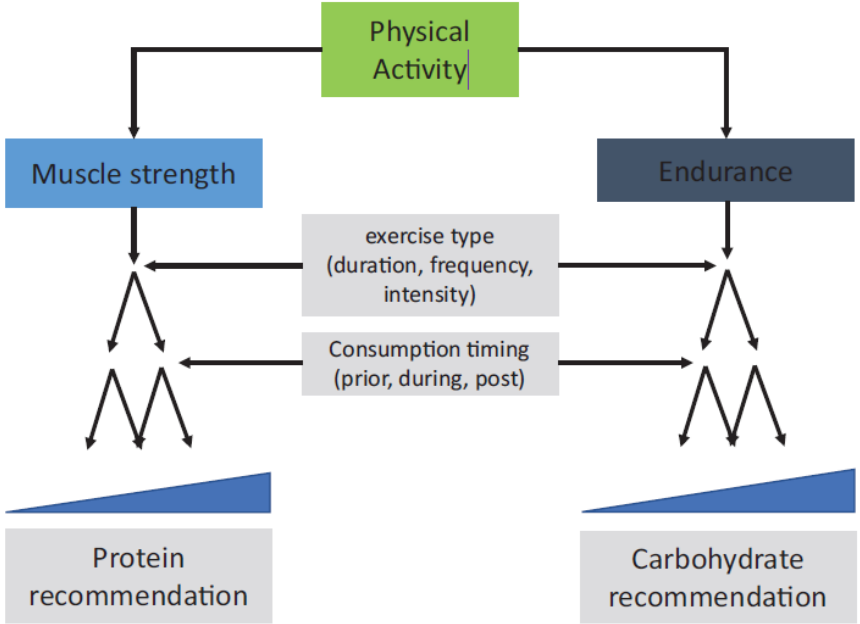
Personality

Motivation, self-efficacy, preferences, etc.

360° DIAGNOSIS FOR TYPE 2 DIABETES



PERSONALIZED NUTRITION BASED ON CONSUMER GOALS



Van Ommen, Nutrition Reviews, 201

HOW ‘ACTIONABLE’ ARE GENETIC VARIANTS?

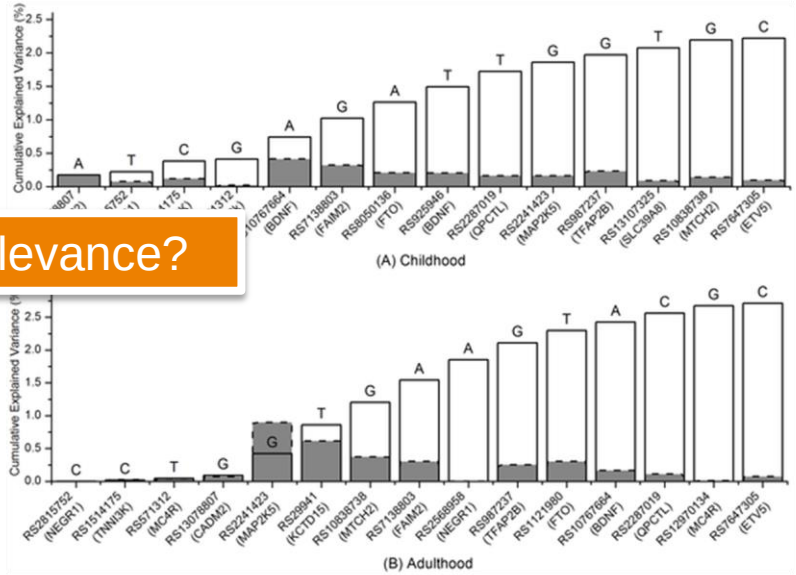
Table 1 | Effect size and explained variance of BMI-associated FTO SNPs

Ancestry	BMI-increasing allele frequency (%)	Effect on BMI (kg/m² per allele)	Explained BMI variance (%)	Effect on obesity risk‡ (OR per allele)	Reference
European	42	0.39	0.34	1.20	
East Asian	12–20	0.25	0.16	1.27	Li *et al.*[58]
Indian Asian	30–33	0.29	0.20	1.18	Li *et al.*[58]
African	12	0.41*	0.10	ND	Monda *et al.*[26]

*Derived from the stage 2 effect size (inverse variance units) reported by Monda *et al.*[26] (assuming an SD of 6 kg/m²). ‡Obese versus normal weight; in European ancestry populations the obesity cut-off level is 30 kg/m², in Asian ancestry populations the cut-off level is 28 kg/m². Abbreviations: ND, not determined; OR, odds ratio.

Loos, R. J. F. & Yeo, G. S. H. (2013) The bigger picture of *FTO*—the first GWAS-identified obesity gene *Nat. Rev. Endocrinol.* doi:10.1038/nrendo.2013.227

Figure 4. Percentage of cumulative BMI variance explained by sequentially added SNPs, shown from left to right, for (A) childhood BMI and (B) adulthood BMI.



Clinical relevance?

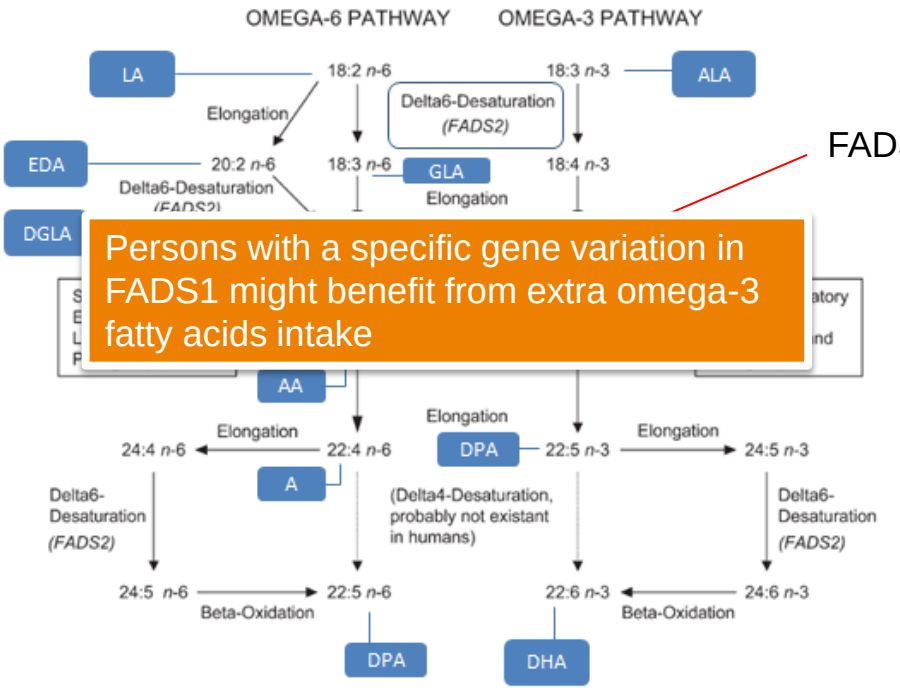
Mei H, Chen W, Jiang F, He J, Srinivasan S, et al. (2012) Longitudinal Replication Studies of GWAS Risk SNPs Influencing Body Mass Index over the Course of Childhood and Adulthood. PLOS ONE 7(2): e31470. https://doi.org/10.1371/journal.pone.0031470
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0031470

GENETIC VARIANTS WITH CLEAR LINK TO PROCESSES

corn oil, soybean oil
cotton seed oil

flaxseed, walnuts
canola oil

FADS1



Persons with a specific gene variation in FADS1 might benefit from extra omega-3 fatty acids intake

meat, egg yolk,
dairy

salmon, herring
mackerel, sardines

TNO - PERSONALIZED NUTRITION GUIDANCE

- 1. Science based only

All nutrition-health relations should be substantiated with published scientific evidence, in a transparent and documented manner.

- 2. Health is a system

Nutritional advices should be based on a systems view of health, by integrating outcomes of multi-domain measurements.

- 3. Health is about flexibility

Many nutrition and health related processes aim at maintaining homeostasis in a continuously changing environment. Therefore health status quantification should also focus at measuring resilience.

- 4. Genetics in perspective

Genetic variation plays a minor part in dietary advice and can vary per context. Genetics are always evaluated as part of the complete phenotype.

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PROJECT EXAMPLE: TO2 FLEX

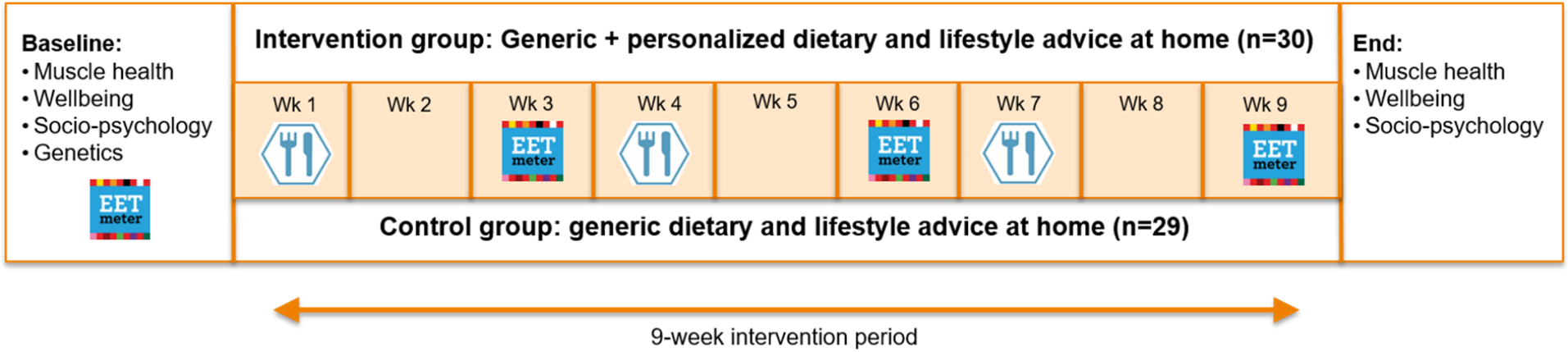
TO2 FLEX PROJECT: 2015 - 2016

Personalized diet and health

Study aim:

- explore whether **personalized lifestyle advice** compared to generic lifestyle advice improves **muscle health** & **wellbeing** in a population of active **seniors**

STUDY DESIGN



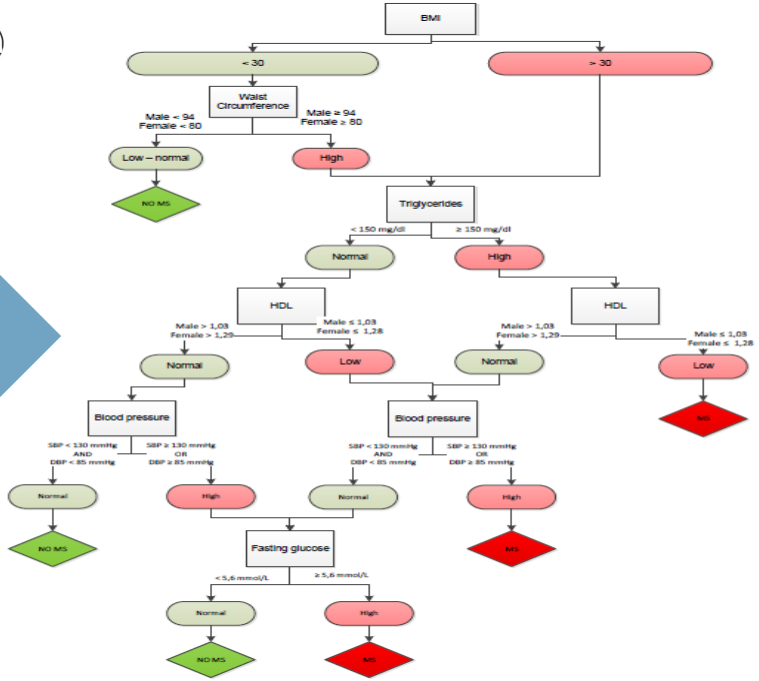
PERSONALIZED NUTRITION BASED ON SCIENTIFIC KNOWLEDGE

Behaviour & wellbeing

Genetic variations

ACE, TCF7L2, FTO, FADS1, GDF5, VDR

Phenotypic markers



PERSONALISED ADVICE BASED ON SOCIO-PSYCHOLOGICAL ASPECTS

- Behavior change techniques:
  - Implementation intentions

When I'm going for a 3 pm snack ,
I'll choose an apple

- Personal characteristics
  - "Freedom of choice" for number of options

Maximizer	Satisficer
• Only the best can do. • Constantly worry about something else can be better than the current choice. • Happy only when he or she gets the best.	• Good enough will do. • Not worried about the possibility that something else might be better. • Happy when something meets his/her criteria – no need to be the best

THE PERSONALIZED ADVICE PORTAL

Home **Advies** Doelstellingen pam017@tnostudie.nl Uitloggen

Vitamine D inname

U krijgt niet voldoende vitamine D binnen. Vitamine D is belangrijk in het vergroten van uw spieren en zorgt ervoor dat u zich energiek voelt. U heeft een genetische variatie waardoor het voor u extra belangrijk is om te zorgen dat u voldoende vitamine D binnen krijgt. Dit kunt u op de volgende manieren doen: • Eet meer voeding met veel vitamine D, zoals vette vis. Vitamine D wordt ook toegevoegd aan halvarine, margarine en bak- en braadproducten (geldt niet voor olie). • Slik elke dag een vitamine D supplement. Let bij het kopen van supplementen goed op de hoeveelheid vitamine D per tablet, zodat u niet te veel binnenkrijgt; de maximale hoeveelheid is 100 microgram per dag. Laat u zo nodig adviseren.

Als ik lunch, dan neem ik meer Gekookt ei

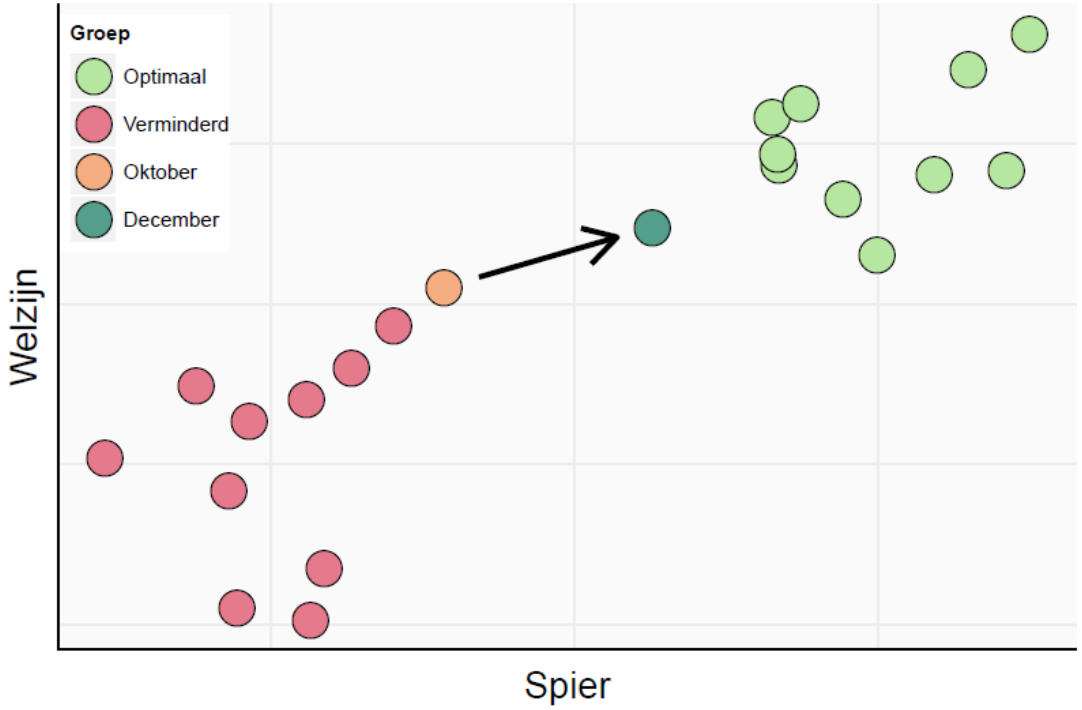
Verzadigd vet inname

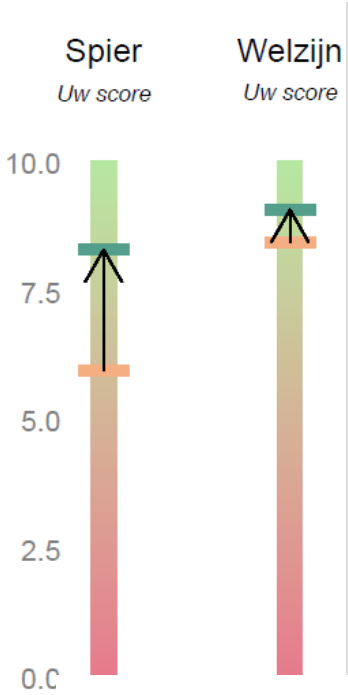
Calorie inname

Zout inname

Water inname

EXAMPLE OF INDIVIDUAL FEEDBACK ON HEALTH





Personalized Nutrition and Health Research Program

A consortium to ***research*** the ***technology and knowledge*** to make ***personalised food & health advice*** possible on a large scale

PNH personalised nutrition & health

WAGENINGEN UNIVERSITY & RESEARCH

TNO

Personalised Nutrition & Health
Living Lab Research

Highly Motivated People:
Prevention of Metabolic Syndrom

People with Low Socio Economic Status

Wellbeing @ Work

PNH personalised nutrition & health

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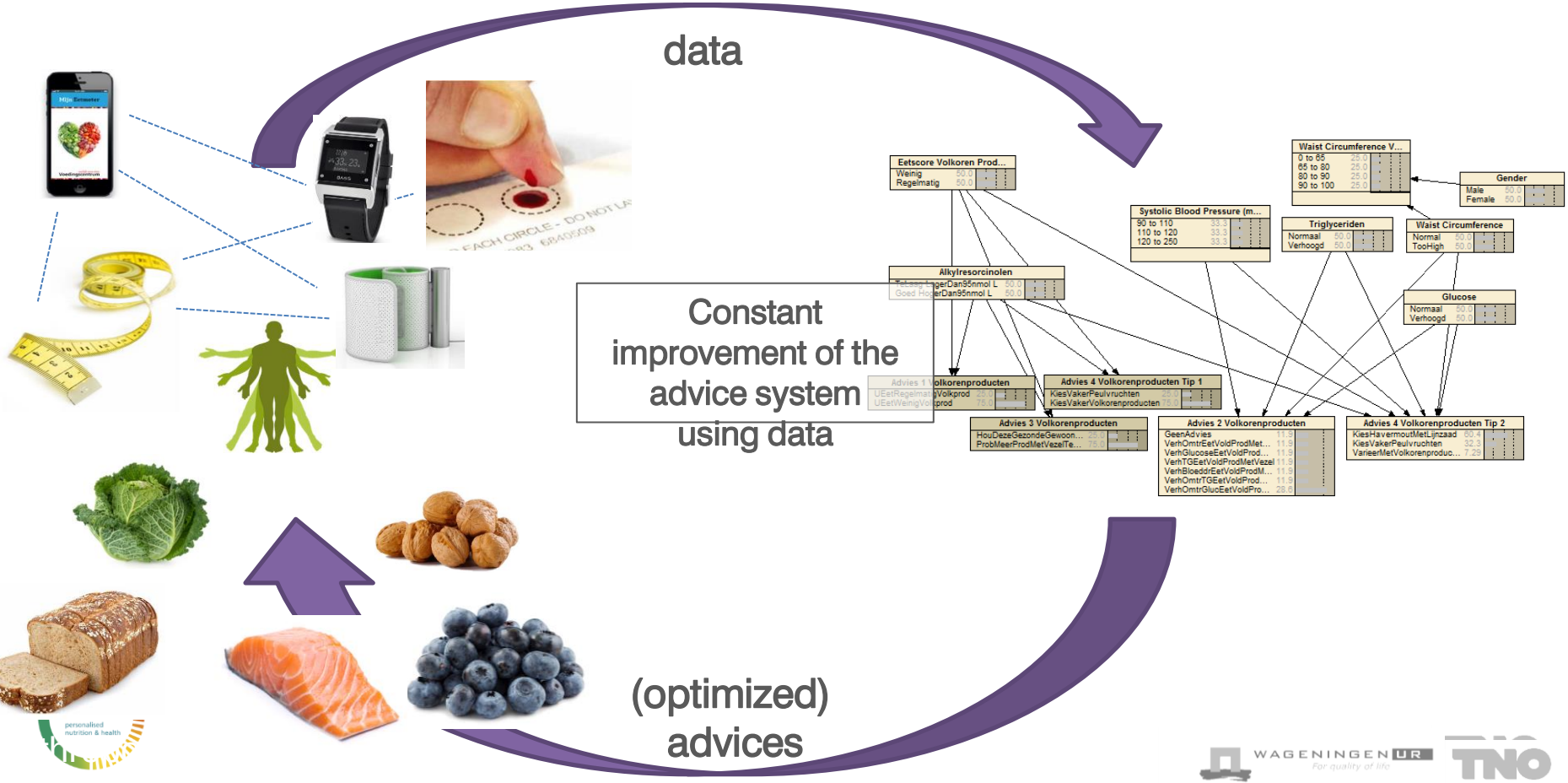
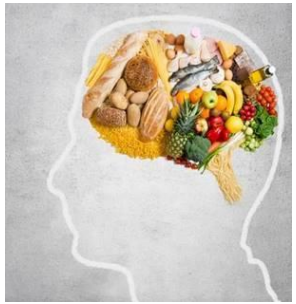
Bayesian network approach



Living Lab Wellbeing @ Work



Feasibility of self measurements @ work

Relation individual food intake, blood glucose level, cognition and wellbeing

Which should ultimately lead to new insights for personalized nutrition

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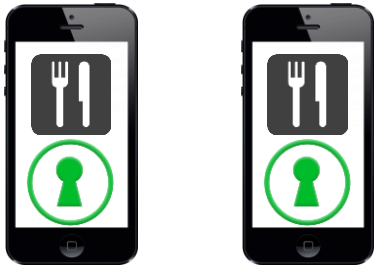
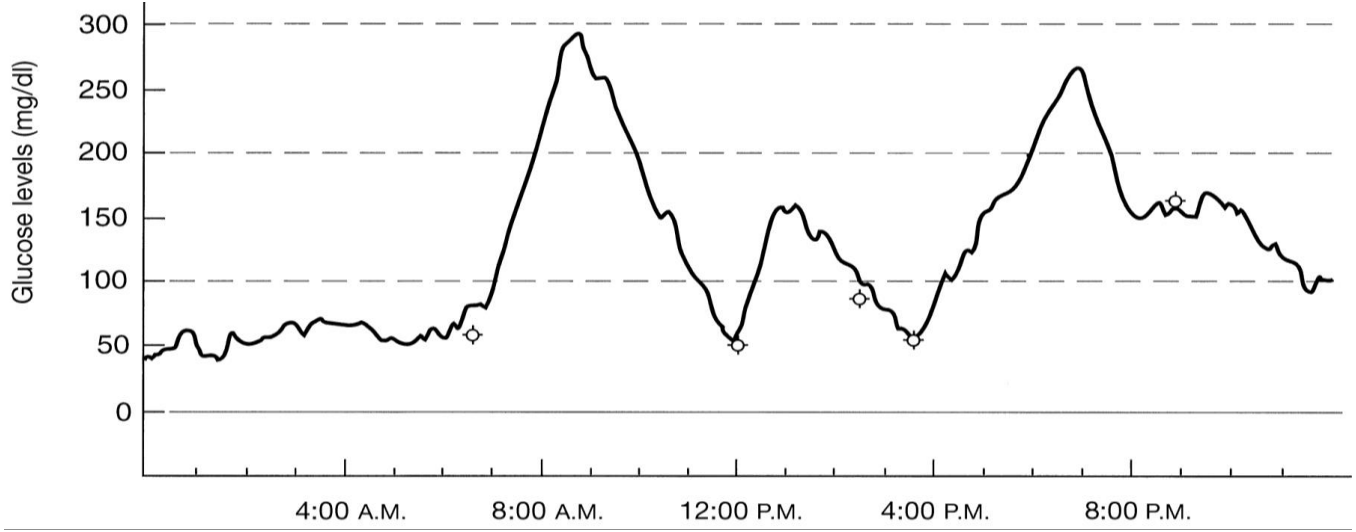
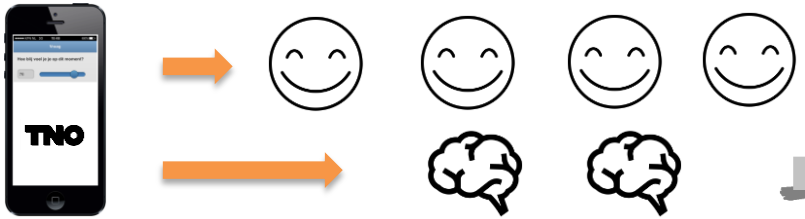
Study measures



FreeStyle Libre
FLASH GLUCOSE MONITORING SYSTEM





PNH personalised nutrition & health

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BEDANKT VOOR JULLIE AANDACHT!

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