

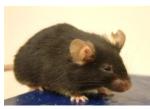


Extensive phenotyping by 'omics' analysis







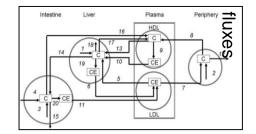


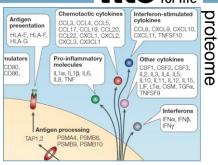


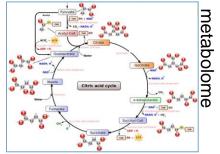


Technology: high throughput, multi organ, multi level

High-end data mining and warehousing





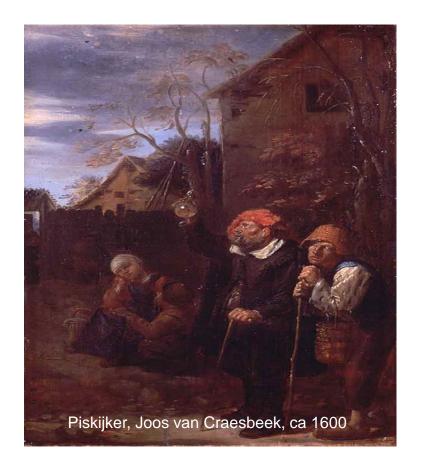




My expertise: Systems Health





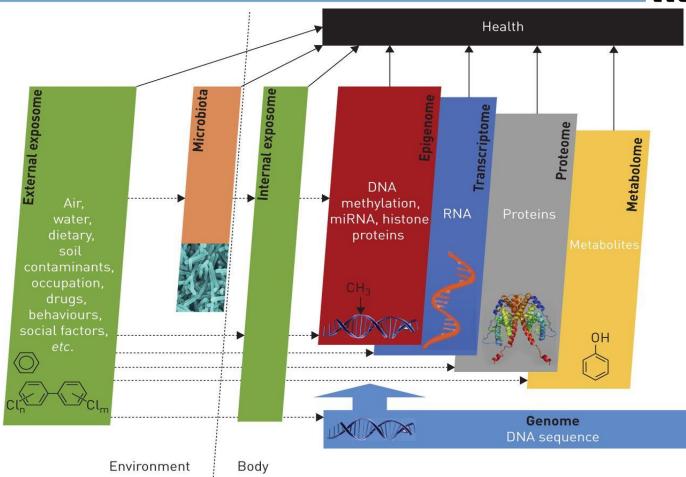






Biological elements for systems health...







....ability to adapt and self-manage in the face of social, physical and emotional challenges

BMJ

BMJ 2011;343:d4163 doi: 10.1136/bmj.d4163



How should we define health?

The WHO definition of health as complete wellbeing is no longer fit for purpose given the rise of chronic disease. **Machteld Huber** and colleagues propose changing the emphasis towards the ability to adapt and self manage in the face of social, physical, and emotional challenges

Machteld Huber senior researcher¹, J André Knottnerus president, Scientific Council for Government Policy², Lawrence Green editor in chief, Oxford Bibliographies Online—public health³, Henriëtte van der Horst head⁴, Alejandro R Jadad professor⁵, Daan Kromhout vice president, Health Council of the Netherlands⁶, Brian Leonard professor⁷, Kate Lorig professor⁸, Maria Isabel Loureiro coordinator for health promotion and protection⁹, Jos W M van der Meer professor¹⁰, Paul Schnabel director¹¹, Richard Smith director¹², Chris van Weel head¹³, Henk Smid director¹⁴

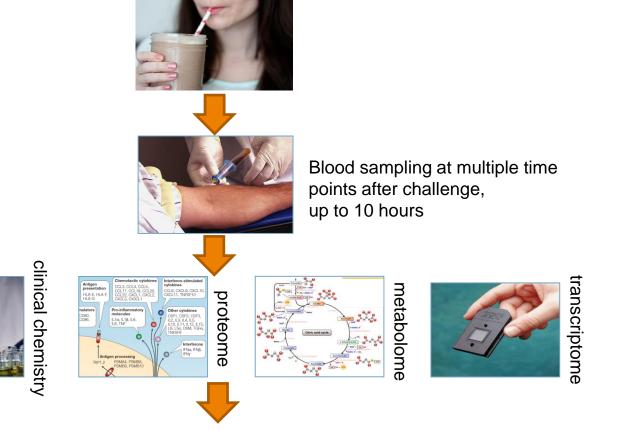
The challenge concept:

Study and quantification of the stress response curve



Time course studies to monitor challenge test response





Measuring a total of ~150 different markers representing ~25 health related processes





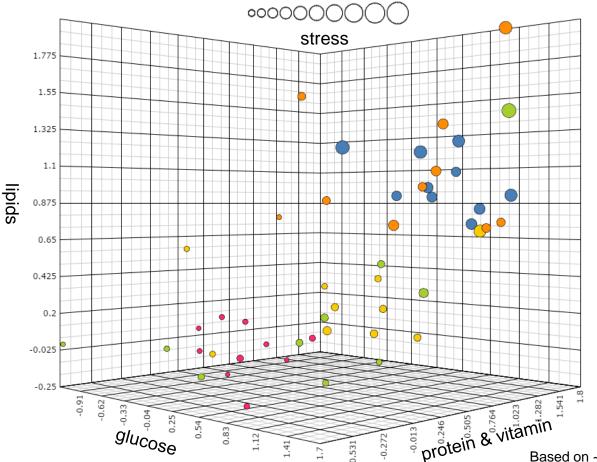




Genes Nutr. 2017;12:21 Genes Nutr. 2017;12:32 TYPE
2
DIABETICS

Variation in phenotypic flexibility in healthy subjects



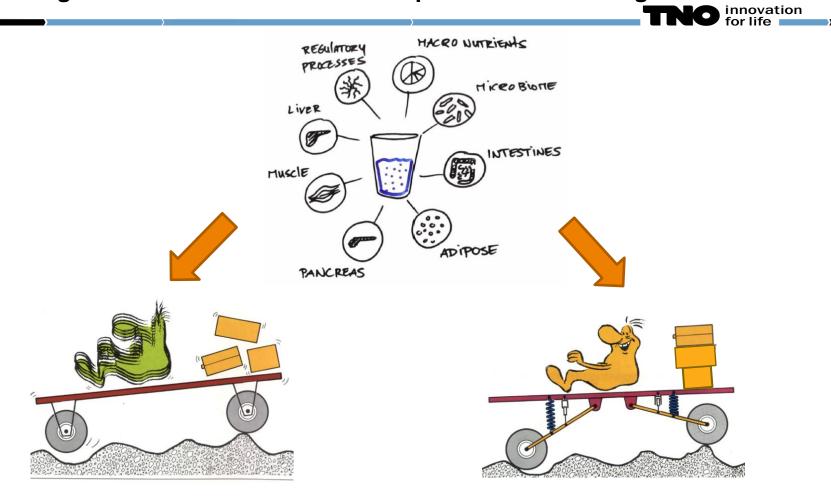


Age 20-29, L-N Age 60-69, N-H

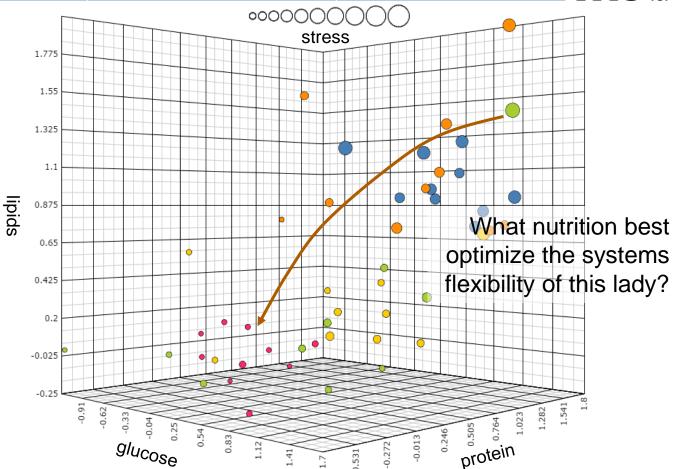
Age 30-59 LOW FAT% NORMAL FAT% HIGH FAT%

Based on ~160 markers

Challenge test as sensitive toolbox for personal health diagnosis



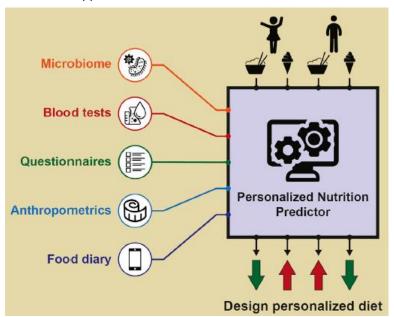




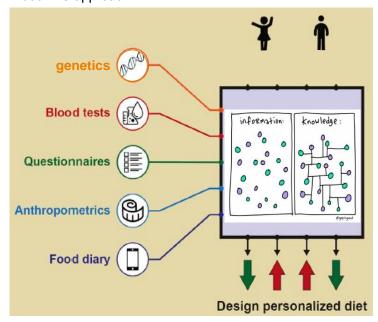
Personalising helps for health improvement!



Zeevi et al. approach



Food4Me approach



Adapted from: Zeevi et al., 2015, Cell. Celis-Morales C et al., Int J Epidemiol. 2016

Personalised advice for healthy muscles





N=59 (63% female) Age 60 – 79y Sedentary behaviour ≥ 10h/day

BMI 20-30

Good general health





Personalised advice:

7 x nutrition, 2 x exercise Personalisation based on:

- Content: Muscle health, wellbeing, lifestyle
- · Form: freedom of choice



Generic advice:

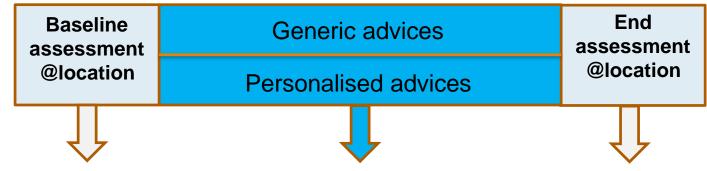
Leaflet Dutch food based dietary guidelines (Voedingscentrum)



Study design: measurements, feedback & advice



9 week intervention period DiY@home





Measurements: Muscle health Wellbeing Socio-psychology

Monitoring:

Weekly: physical activity
Every 3 weeks: Food intake
Every 3 weeks: Compliance & self-efficacy



Muscle health
Wellbeing
Socio-psychology





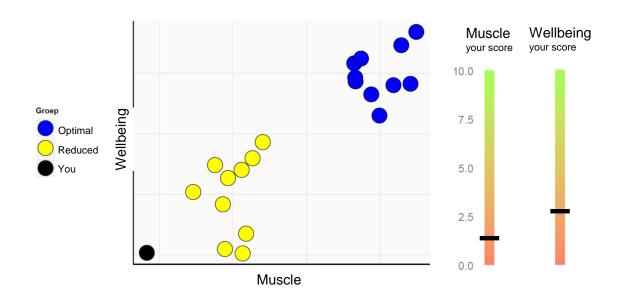




Feedback & Advice

Baseline & end: Feedback on health
Every 3 weeks: Feedback & advice on lifestyle
behaviour





Do it yourself (DIY) tools: muscle health & wellbeing



Instruments

Ratio tot Chol/HDL

Triglycerides

Measures included in muscle score:







Short Physical Performance Battery







Measures included in wellbeing score:









Questionnaires



Personalized advices based on health status, intake & knowledge on mechanisms

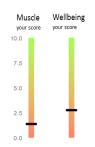




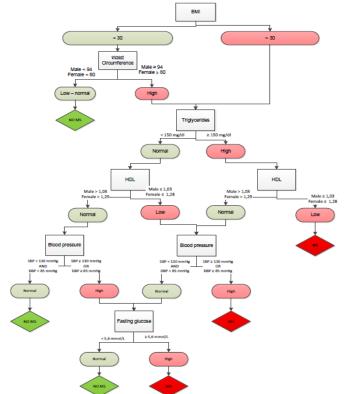
Food diary



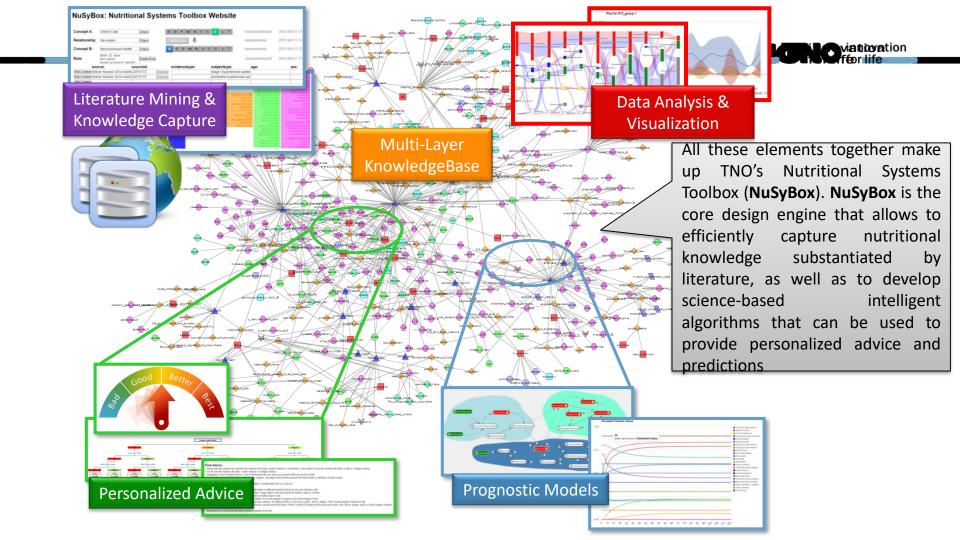
Genetic variation ACE, TCF7L2, FTO, FADS1, GDF5, VDR



Appendix A: Beslisboom voor Metabole Gezondheid (MS = Metabolic Syndrome)







Home Advies Doelstellingen

Advies

Wij raden U aan om voor minimaal 2 rode of oranje aspecten een doelstelling te formuleren.

Bij voorkeur 1 op voeding (dit is één van de bovenste 7 aspecten) en 1 op bewegen (dit is één van de onderste 2 aspecten, Kracht of Beweging). Voor groene aspecten hoeft u geen doelstelling te formuleren.

Klik op een aspect om een doelstelling te formuleren.

Een voorbeeld van een doelstelling is:

Als ik 's ochtends ontbijt, dan vervang ik een boterham met hagelslag door een gekookt ei

Als ik 's avonds eet, eet ik meer vis.

Als ik naar mijn werk ga, dan ga ik op de fiets.

- Vitamine D innameVerzadigd vet inname
- Calorie inname
- Zout inname
- Water inname
- U Eiwit Inname
- Omega-3 inname
- Kracht
- Beweging



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

Vaut inname

Water inname

Eiwit Inname

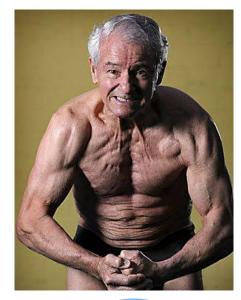
Cracht

Beweging

Summary of health results



- Both groups showed an improved muscle health and wellbeing after 9 weeks of being provided with lifestyle advice
- Personalisation is beneficial especial for subjects with a low self-efficacy
- Only the personalised advice group showed reduced weight, fat % and waist circumference and improved vitamin D & n-3 levels
- The personalised advice group showed more improved resilience!





This laid the foundation for three new initiatives...



1





2



(3





Personalised nutrition in healthy range of population











THE HABIT CHALLENGE™ SHAKE

To help determine the ratio of carbs, fats, and protein that may be best for you, you are given a metabolic challenge beverage that is nutritionally equivalent to a large American breakfast. A lab measures indicators in your blood using samples you collected at different points before and after you drank the shake. Your results show us how your body responded to carbs, fats, and protein during the testing process.







Feature Article

Nutrition reviews 2017;75(8):579-599.

Systems biology of personalized nutrition

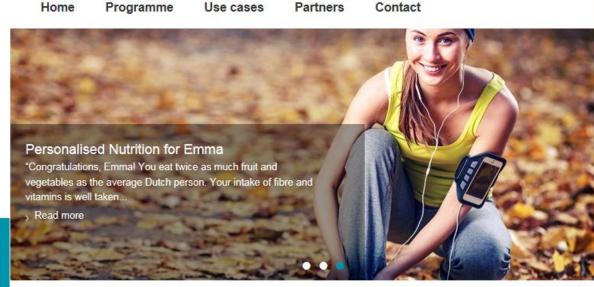
Ben van Ommen, Tim van den Broek, Iris de Hoogh, Marjan van Erk, Eugene van Someren, Tanja Rouhani-Rankouhi, Joshua C. Anthony, Koen Hogenelst, Wilrike Pasman, André Boorsma, and Suzan Wopereis

Personalized nutrition is fast becoming a reality due to a number of technological, scientific, and societal developments that complement and extend current public health nutrition recommendations. Personalized nutrition tailors dietary recommendations to specific biological requirements on the basis of a person's health status and goals. The biology underpinning these recommendations is complex, and thus any recommendations must account for multiple biological processes and subprocesses occurring in various tissues and must be formed with an appreciation for how these processes interact with dietary nutrients and environmental factors. Therefore, a systems biology–based approach that considers the most relevant interacting biological mechanisms is necessary to formulate the best recommenda-



Creating a society in which every individual is able to follow an eating pattern that precisely meets their needs.

Current partners Wageningen U&R TNO **Philips** Menzis Marks & Spencer Jumbo FrieslandCampina PS in foodservice Noldus IT SmartWithFood Sense Health Vital 10 **BASF** Albron MLDS vitality DNA Habit



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

Become a partner!

Read more

Contact

Read more



Highly Motivated People: Prevention of Metabolic Syndrome



People with Low Socio Economic Status



Wellbeing @ Work







Personalized advice and feedback

- empowers motivated and low SES consumers to eat more healthy and therefore they feel more healthy
- has beneficial health effects on the short-term for highly motivated consumers

Personal attention is preferred

- Self-measurements @work need to be adapted to employee context and have clear benefits
- For men: cognition after lunch is lower as compared to before lunch, whereas in women this is equal







To demonstrate that a healthy or optimal diet in an intervention study can improve "metabolic age" and "metabolic stress", which are composite biomarkers by quantifying phenotypic flexibility, within a healthy population. These composite markers validate previous findings from other intervention studies using phenotypic flexibility and could be the next generation biomarkers.











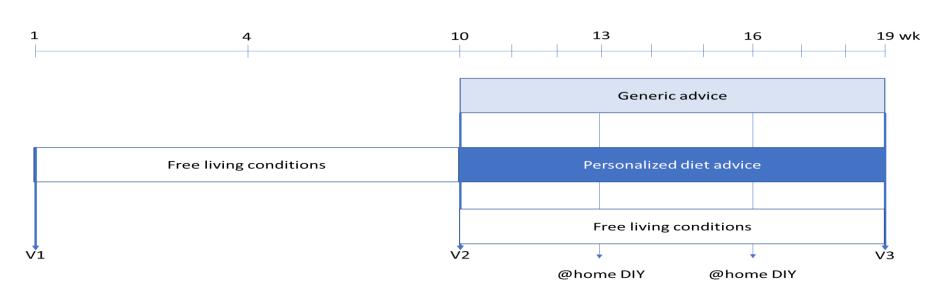
Consumer Healthcare





Study design phenflex-2 study

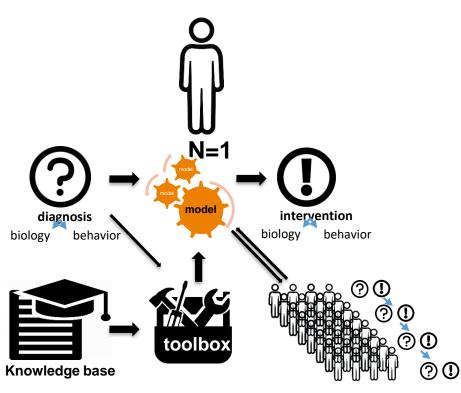




To show additional advantages of **personalization** / tailoring of dietary recommendations over general dietary recommendations. PhenFlex-2 delivers the scientific evidence that a healthy diet is beneficial for your health specially when this is tailored to the (nutritional) needs of a person.

So how will nutrition look like in 10 years?





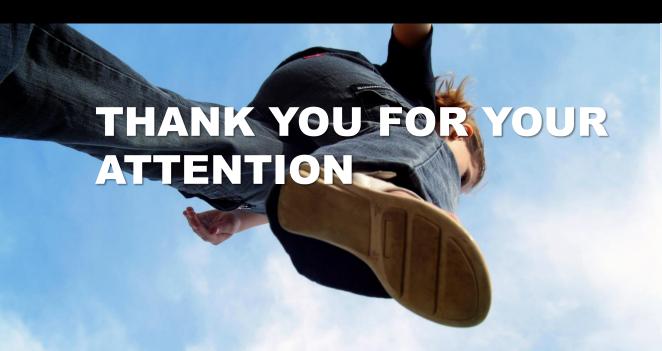
- 1. It is personal
- 2. The intervention or advice is based on a diagnosis, i.e. my personal health data.
- 3. A (science based) model is used to translate diagnosis into advice
- 4. The model is tailored to specific conditions and goals from a large toolbox
- 5. The toolbox is continuously and systematically updated with all relevant scientific knowledge
- 6. Exploit/use information from large numbers of personal health data

Summary & take home message



- Food and nutrition are hot!
- There is a booming business of new technology and apps allowing a consumer to quantify aspects of health
- Phenotypic flexibility is a sensitive way to quantify health and effects of lifestyle on health
- Personalised dietary advices may empower individuals to make a sustainable healthy lifestyle choice
- Personalized nutrition from the perspective of phenotypic flexibility will bring the water from the fountain of youth on the shelves!





The innovation for life