

Food @ Cognition programme

Food & Cognition play a major role in key societal challenges. Bad eating habits are risk factors for major chronic diseases like cancer, diabetes and cardiovascular diseases, presenting a threat to human health worldwide. However, the underlying nutritional and cognitive mechanisms necessary to understand and prevent overconsumption are still unknown. Moreover, in our ageing society, maintaining a high quality of life by preventing cognitive decline is becoming more challenging and costs associated with neurodegenerative diseases like vascular dementia, Parkinson's or Alzheimer's disease are increasing dramatically.

Healthy development in early life may be most important in the prevention of brain diseases later in life, while taking into consideration, social inequality and its influence on necessary behaviour changes.

The interaction between food, brain and cognition is bilateral, with both (a) bottom-up and (b) top-down mechanisms:

(a) We are beginning to understand that our diet, including its effect on our intestinal microbes, has a major influence on cognitive performance. Nutrients are important to provide (functional) ingredients for a healthy development and maintenance of brain function and cognition. How to use food ingredients to prevent or delay neuropsychiatric diseases early in life (like autism and ADHD), throughout life (like depression) and later in life (like dementia) on an individual basis is still largely unknown. Personalised health profiling, early diagnosis and prevention are of major importance in meeting the current societal challenges.

(b) On the other hand, our dietary choices and eating behaviour are not only driven by homeostatic needs, but determined by top-down brain processes, which include hedonic, motivational, social, emotional and habitual (inattentive) processes that promote overeating. The neurocognitive mechanisms involved with conscious and unconscious choices and behaviour are still being unravelled.

Radboud campus and Wageningen UR join forces

Radboud University (RU), Radboud University Medical Centre (RUMC) and the Max Planck Institute for Psycholinguistics have chosen and prioritized “Healthy Brain” and the subtheme Food & Cognition as one of their leading themes. Its world class research institutes like the Donders Institute for Brain, Cognition and Behaviour and the Behavioural Science Institute are devoted to understanding the mechanistic underpinnings of the human mind and behaviour. The mission of Wageningen University and Research (WUR) is “to explore the potential of nature to improve quality of life”. It is renowned worldwide for its outstanding Food and Nutrition research, which focuses on the role of nutrition and behaviour in health and well-being. The Radboud Campus and Wageningen University and Research have joined their complementary forces to create a worldwide leading Food & Cognition Programme.

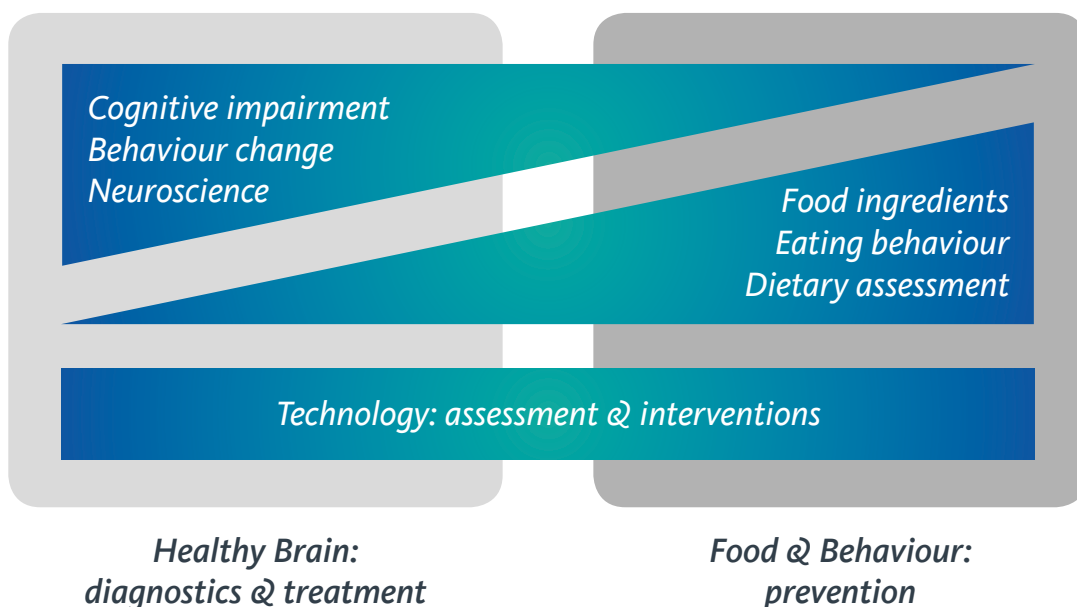
Goals of Food & Cognition

Food & Cognition addresses societal challenges concerned with food and cognition from early cognitive development in young children towards healthy adolescence and adult life, up to

maintaining cognitive health in ageing. It covers prevention of obesity/metabolic disease and brain disease by studying eating behaviour (changes) and effects of healthy diets and functional ingredients. Moreover, it assesses the effect of nutrients in treating or delaying cognitive impairment in elderly and in neurological and psychiatric diseases, targeted towards the individual. Understanding the cognitive mechanisms of both eating behaviour and personalised nutrition helps people to make the healthy choice, the easy choice.

Market trends

The focus of the Food & Cognition themes is in line with the current transition to precision medicine, big data, citizen science and the quantified-self movement. With personalized nutrition and dietary advice on handheld devices, Food & Cognition contributes to the shift from treatment to prevention and from hospitalization to self-care. Applications include functional ingredients, personalised monitoring devices and infrastructure, as well as smart devices and games for assessment and training at home.



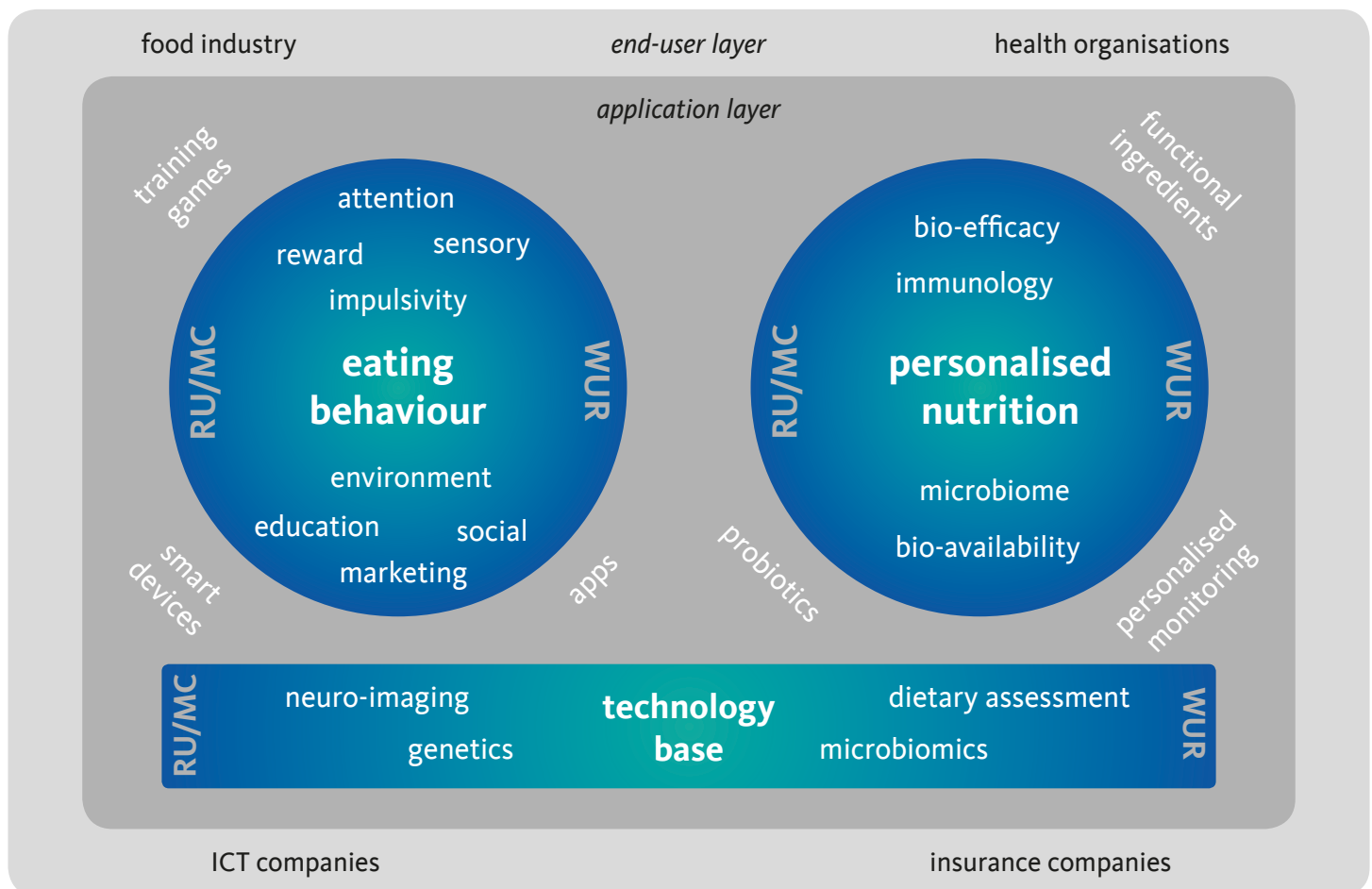
Themes of Food & Cognition

In a collaborative effort, Radboud campus and Wageningen UR addresses the following Food & Cognition themes:

Eating behaviour is studied from all its different angles across the life span: from food science to sensory and gut-brain homeostatic aspects, as well as (neurochemically modulated) individual differences in hedonics, reward motivation, emotion, impulsivity and self-regulation in both humans and rodents. In addition, the consumer's environment is investigated, including marketing, advertising, language, packaging and social influences. Improving healthy choice behaviour is directed at changing consumers' habits and attention and stimulating resilience to the

obesogenic environment by education in both lab and field studies.

Personalised nutrition. What we choose to eat affects our brain and cognitive functioning with marked individual differences. To attain personalised nutrition - including prevention, diagnostics and treatment - both bio-availability and bio-efficacy are examined, i.e. from food to nutrients and from nutrients to brain and cognition respectively, with a major role for the gut microbiome and immunology. The effect of dietary patterns, nutrients and food supplements is studied (observational and interventional) in animal models and humans during healthy development, adulthood and ageing, but also in neurodevelopmental, degenerative, mood and metabolic disorders.



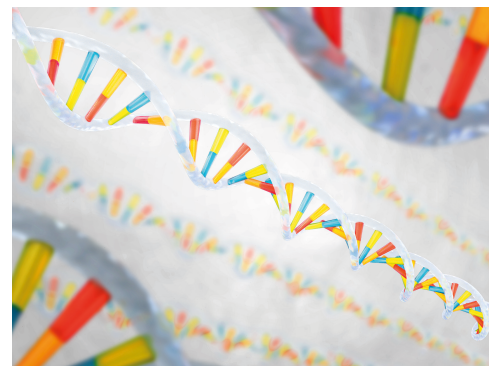
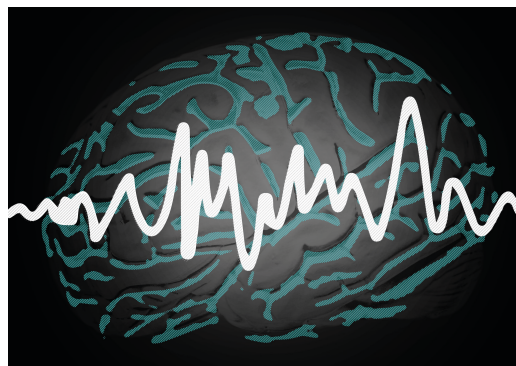
Technology Base and Facilities

The high-tech neuroimaging facilities of the Donders Institute for Brain, Cognition and Behaviour enable non-invasive measurements in humans and rodents, in addition to state-of-the-art biomedical, microbiological and behavioural measures at the Radboud campus. The Behavioural Science Institute at the Radboud campus is renowned for its behavioural laboratory and field studies, longitudinal designs and randomized controlled trials. Wageningen University and Research centre is internationally well-known for its advanced controlled nutrition intervention trials, using food technology, dietary assessment, sensory science, and gut imaging, as well as for

its nutrigenomics and microbiomics. Data science and modelling are an integral part of the research done at both universities.

Province of Gelderland

With the realisation of the Food & Cognition Programme by the two universities in the province of Gelderland, Food Valley Wageningen and Health Valley Nijmegen connect; creating a worldwide uniquely strong expertise position. Food and tech industry (both SMEs and large companies) can benefit greatly from the creation of this public-private open innovation hub for Food & Cognition. Gelderland will increase its visibility and will be recognized for its innovation, research application (see market trends) and brain-aware society.



Stakeholders

Food @ Cognition is still gathering new stakeholders. Are you interested in participation, please contact:

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Radboud University



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**HEALTHY
BRAIN**



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