

# Neural substrates of anticipatory food reward in healthy young and older adults, investigated with fMRI.

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Investigating the neural mechanisms underlying the anticipation of food reward induced by visual cues related to different food characteristics in healthy adults would provide 1) brain activity patterns that can be associated with the anticipation...

<b>Ethical review</b>	Approved WMO
<b>Status</b>	Will not start
<b>Health condition type</b>	Other condition
<b>Study type</b>	Observational invasive

## Summary

### ID

NL-OMON42037

### Source

ToetsingOnline

### Brief title

Food reward

### Condition

- Other condition

### Synonym

n.v.t.

### Health condition

Er wordt geen aandoening bestudeerd

### Research involving

Human

## Sponsors and support

**Primary sponsor:** Universitair Medisch Centrum Groningen

**Source(s) of monetary or material Support:** Friesland Nutrition, Nutricia, Top Institute Food and Nutrition

## Intervention

**Keyword:** fMRI, Food, Older adults

## Outcome measures

### Primary outcome

The main study parameters are: the combination of visual food stimuli administered to the participants (four categories), the reaction time to choose from the presented combination of visual food stimuli, and the brain activity corresponding to each choice. The outcome of the study (endpoints) will consist of 1) the neural activity patterns associated with anticipatory food reward, and 2) a description of the age-related differences in brain activity patterns.

### Secondary outcome

nvt

## Study description

### Background summary

This study is part of a TI Food and Nutrition project, which aims to understand food choice in healthy younger and older adults. Perceived pleasantness while consuming a food product must be translated into motivation in order to influence subsequent food choice. Such motivation is also known as anticipatory food reward. Visual features that motivate people to choose a specific food product induce anticipatory reward, and are a strong predictor of food choice.

In recent studies, we have shown that older adults perceive sweet and salty tastes as more pleasant while consuming these basic tastes. Other studies also reported that older adults showed less activation in brain areas involved in

the anticipation of reward as compared to younger adults. Whereas both changes in food choice and the neural motivation system have been observed with age, the age-related changes in motivation towards food products has not received much attention so far. Therefore, in the current study we aim to investigate the neural mechanisms behind the anticipation of reward from food products in younger and older adults.

## **Study objective**

Investigating the neural mechanisms underlying the anticipation of food reward induced by visual cues related to different food characteristics in healthy adults would provide 1) brain activity patterns that can be associated with the anticipation of food reward and 2) a baseline to further investigate if and how these brain activity patterns differ between younger and older adults. This information, in combination with other studies within the larger project, ultimately allows us to create tools that understand (individualized) food choice.

## **Study design**

This study will combine fMRI and behavioral measurements. Participants will undergo one fMRI scanning session in which they will perform a computer-based paradigm consisting of visual (anticipatory) food stimuli. All stimuli will vary along two dimensions \* taste (sweet or salty) and calorie (high or low). The anticipatory reward to each visual food stimulus will be assessed by a two-alternative forced choice methodology (i.e. an established controlled measure of choice which is widely used to test choice behavior), designed and executed using Matlab. In this task, the participants will be instructed to select the food they \*would most like to eat now\* in a series of trials in which a visual food stimulus from one of the four food categories will be paired with a stimulus from either the same or another category. Each choice, made via key-press on the keyboard, triggers the next pair of stimuli and so on until all possible combinations (i.e. 10 combinations) are presented 16 times in order to acquire a reliable brain response. The total amount of 160 trials will be divided over four task blocks of 40 trials. The order of all combinations of visual food stimuli will be randomized across all four block as well as balanced and counter-balanced between participants.

A behavioral and neural measure of \*anticipated reward\* is derived in two ways. First, the brain response derived during each choice can convey information about the degree (on a continuous, interval unit of measurement) to which a chosen visual food stimulus is anticipated to be rewarding relative to an alternative. Second, the analysis of the fMRI data will take into account the reaction times when choices are made to each food category respectively as a covariate. This might show what brain activation can be associated to anticipated food reward for each food category for each participant

individually.

The design of this study is single-blind; at the moment of presenting the visual food stimulus, the participants do not know which food category they are experiencing. However, the participants will be informed about the nature of the stimuli, before inclusion into this study.

## **Study burden and risks**

Functional MRI is an eminently safe technique; there are no risks that have been associated with the acquisition of fMRI data per se. Above certain limits, warming and/or an itching/tingling feeling (stimulation of peripheral nerve terminations) are possible. However, the magnetic intensities used in this research are amply below these limits. Subjects will be exposed to a magnetic field of 3 Tesla and rapidly alternating gradients and radio frequency fields. This field and gradients' changes are routinely used in fMRI and MRI research. It is worth to mention that scanners supporting a magnetic field that is more than twice as powerful (7 Tesla) are used in The Netherlands for research purposes. Also, no harmful side effects have been reported there. The data collected during the functional and anatomical MRI scans will be used for research purposes only. However, if evident abnormalities in the brain are noticed, then the General Practitioner, who is indicated by the subject, will be notified. The strong magnetic fields used by fMRI can dislocate ferromagnetic particles inside the brain and the eyes, interfere with the functioning of electronic devices implanted inside a person's body (pacemakers, insulin pumps, etc.), as well as induce heating in artificially metal-rich regions (red tattoos, metallic supports to previously fractured bones, prosthetic implants). In order to stave off the risks involved with such possible conditions, subjects will be required to complete a questionnaire and only if none of the exclusion criteria is met the subject will be allowed to participate in our experiment. The environmental conditions of being inside an MR scanner and of being partially restrained can induce claustrophobic feelings. Three steps will be taken to reduce this risk: 1) the subject will be explicitly asked about being claustrophobic, 2) the subject will experience a training moment in a dummy scanner and 3) prior to the beginning of the actual experiment, and during pauses between scans, subject will be asked about their well being. Additionally, they will receive an alarm trigger that they will be able to use at any moment to interrupt the scanning. Finally, an experimenter will be in close proximity of the participant during the session, for the primary reason to present the aforementioned small amounts of liquids. Such proximity will allow a close monitoring of the subject's well being. The subject's burden is as follows, regarding time: a screening moment by

telephone, to ensure that all the requirements are met and to determine the individual intensity/pleasantness curve needed for the scanning session. Before each scanning session the subject will be required to fill and sign a safety-specific questionnaire. The scanning sessions will be between 16:00 and 19:00 hours; we will ask the subjects to stop eating at least three hours before the scan to ensure a sufficient state of hunger to induce a stronger BOLD response to the stimuli. To undergo a fMRI scan involves: exposure to loud noise (addressed with ear protection, by means of both ear plugs and headphones), a moderate amount of physical restraint (the head is inside a fMRI coil; the feeling is similar to wearing a motorbike helmet), as well as to a strong constant magnetic field (3Tesla), and small variable electromagnetic fields (see question E9).

## Contacts

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## Trial sites

### Listed location countries

Netherlands

## Eligibility criteria

### Age

Adults (18-64 years)

Elderly (65 years and older)

## Inclusion criteria

Caucasian, right handed, normal (or corrected to normal) vision, healthy, BMI 18-25 kg/m<sup>2</sup>, non-smoking, fMRI compatible, no history of neurological or psychiatric disorders  
Age range: 18-30 (vrouwen met hormonale anticonceptie) or 60-75, fluent in Dutch.

## Exclusion criteria

MR incompatible (possibility of any incompatible metal objects inside the body)  
History of psychiatric disorders  
Smokers  
Alcohol/drug abuse

## Study design

### Design

**Study type:** Observational invasive

Masking: Single blinded (masking used)

Control: Uncontrolled

Primary purpose: Other

### Recruitment

NL

Recruitment status: Will not start

Enrollment: 40

Type: Anticipated

## Ethics review

Approved WMO

Date: 20-04-2015

Application type: First submission

Review commission: METC Universitair Medisch Centrum Groningen (Groningen)

Not approved

Date: 09-07-2015

Application type: Amendment

Review commission: METC Universitair Medisch Centrum Groningen (Groningen)

## Study registrations

### Followed up by the following (possibly more current) registration

No registrations found.

### Other (possibly less up-to-date) registrations in this register

No registrations found.

### In other registers

Register	ID
CCMO	NL51566.042.14