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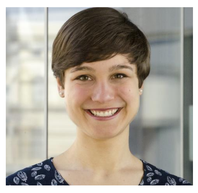
How do memory and attention influence food decisions and what are the underlying neuronal mechanisms?



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Background

Unhealthy food decisions are a main contributor to the increasing prevalence of obesity.

Important roles in food decision making & food preferences play:
- interaction with the environment (attention to food cues)
- learning and memory
- the internal state (hunger vs. satiety)

(Fedoroff et al., 1997; Higgs, 2005; Lozano et al., 1999)

Cognitive functions such as memory and attention might correlate with brain structure assessed by diffusion weighted imaging:
- memory performance with the microstructure of the medial temporal lobe (MTL) *(Fuentemilla et al., 2009)*
- attention with the microstructure of the anterior corona radiate (ACR) *(Yin et al., 2013)*

… and memory performance is thoroughly associated with brain activation of the MTL, especially the hippocampus and the amygdala during encoding and recollection *(Canli et al., 2000; Greicius et al., 2003; Murty et al. 2010)*.

Additionally, being hungry is associated with increased arousal and susceptibility for food cues which could be a explanation for better food memory performance compared to non-food items *(Montagrin et al., 2019; Morris & Dolan, 2001)*.

It is known that diets such as plant-based diets have large effects on metabolism but the ”bottom up“ impact of dietary interventions on brain structure and function has not been well studied yet *(Medawar et al., 2019)*.

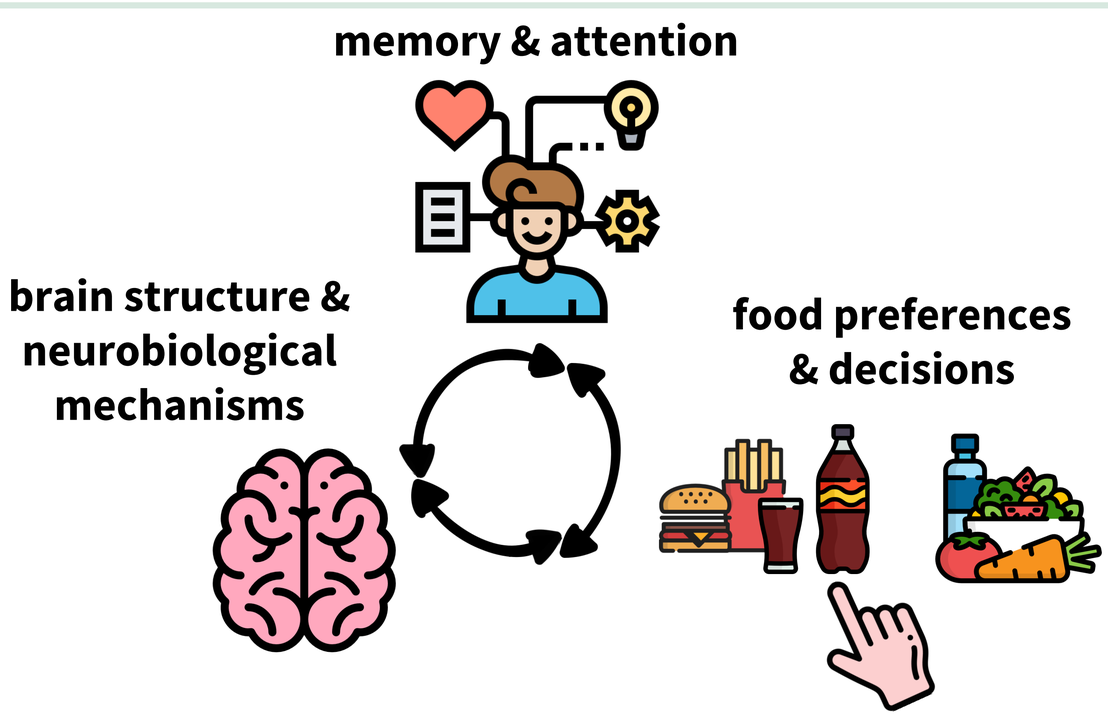
Research Questions

Do memory performance and attention efficiency reflect in white matter coherence and brain activity?

Is (food) memory influenced by the individual‘s hunger feelings and (food) preferences or biased by attention deficits?

What are the underlying neurobiological mechanisms of the interplay ofmemory, attention and (food) desires?

Can diet modulate any of the above mentioned cognitive functions orneurological correlates?

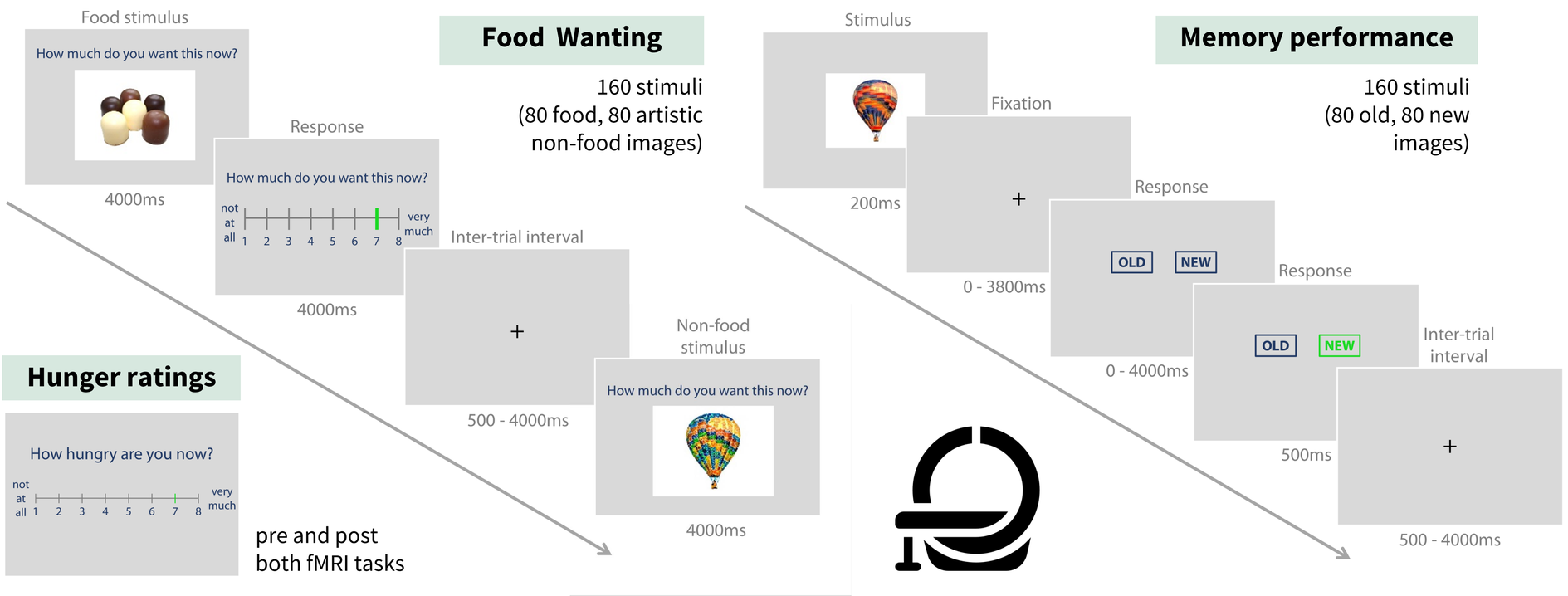


Methods

Neuroimaging

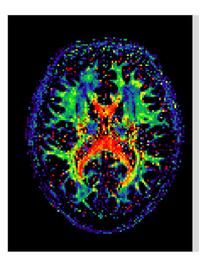
fMRI tasks

EPI BOLD sequence. TR 2000ms; $(2.0mm)^3$; multi-band 3



Structural scans

T1 (MPRAGE).
ADNI protocol:
TR 2300ms; TE 2.98ms;
resolution $(1.0mm)^3$



Diffusion-weighted imaging (DWI).
ap/pa-encoded b0-images for distortion correction; TR 5200ms; TE 75ms; resolution $(1.7mm)^3$; 6 b0-images; $b=1000s/mm^2$; 60 directions; partial Fourier 7/8; multi-band 2; GRAPPA 2

Attention Network Test

- 3 blocks x 5min computer-based task
- subjects‘ reaction time and error rate

Fan et al., 2002

Relevance

Identifying the inter-play of memory, attention and (unhealthy) food decisions and their underlying brain structure and activity.

Developing novel dietary intervention strategies to reduce overweight and obesity.

Double-blind within subject cross-over design

BL: baseline
FU: follow-up

- 18-45 years of age
- body-mass-index: 25-30 kg/m^2
- omnivorous diet
- females: on hormonal contraception

- restrictive eating (vegan, vegetarian, gluten-free, lactose-free, allergies, eating disorder, …)
- antibiotics in the last 3 months

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