What do you want to eat?

Regulatory strategy effects on choice and neural activation

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// BACKGROUND

• Billions of **diet decisions** are made every day. With more than 2/3 of the US population estimated to be overweight or obese[1], many of these decisions are leading to poor health outcomes.

• Research suggests that self-control may be **more effective** when it results in **genuine desire** for a goal (i.e. **want-to** vs. **have-to** motivation)[2].

• **Problem**: fMRI research paints a conflicting picture as to whether regulation actually changes valuation signals in value circuitry[3,4].Is this due to differences in strategy (e.g. attribute-focused vs. response-focused)?

• **Goal**: Compare two different regulatory strategies (Focus on Healthiness vs. Decrease Desire), using both computational and neural measures.

// HYPOTHESES

1) If regulation alters valuation, we should observe changes in 'evidence' parameters of a DDM, but if it is response-focused, we could observe changes in starting point bias.

2) If regulation alters valuation, we should observe goal-consistent changes in regions associated with decision value (e.g., vmPFC[3]). If response-focused, we may see decoupling of value regions' association to behavior[4].

3) Different regulatory strategies (e.g. Focus on Healthiness vs. Decrease Desire) may result in different routes to regulatory success.

// METHODS

1. Fasted subjects (n = 50, F = 34, mean age = 23.1; range = 18–38) rated a wide range of foods for **Liking** pre-scan, and then for **Liking**, **Taste** and **Health** post-scan.

2. In scanner, subjects made choices about these foods under two regulatory conditions (**Focus on Health** and **Decrease Desire**) and one control condition (**Respond Naturally**).

Run Structure

Analyses

GLM

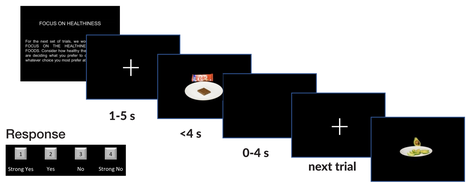
GLM1: *Condition (Nat, Decrease, Health) x Decision Value*

GLM2: *Condition (Nat, Decrease, Health) x Taste Attribute + Condition (Nat, Decrease, Health) x Health Attribute*

Small Volume Correction

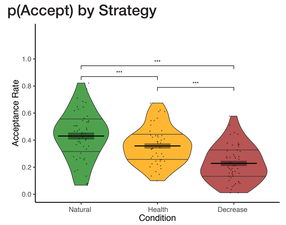
The vmPFC was evaluated using small volume correction as defined by the conjunction of value regions from two meta-analyses of neural correlates of subjective value[5,6].

Trial Format

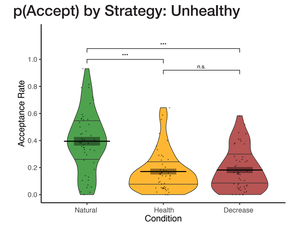


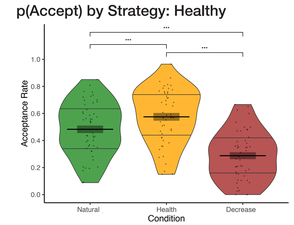
// RESULTS

// Behavioral

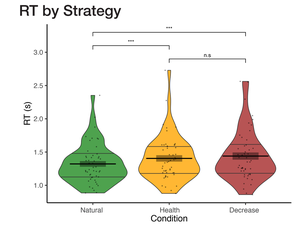


• **Both regulatory strategies** reduce acceptance rates of food.





• The health condition can be seen as a more "nuanced" mode of regulation, as it increases participants' acceptance rates of healthy foods.



• Regulation slows RT.

// Drift Diffusion Model

6 Parameter DDM

» threshold

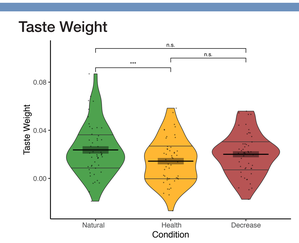
» non-decision time

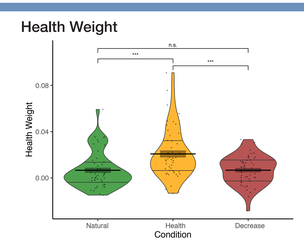
» starting point

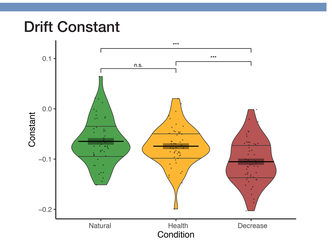
» drift bias/constant

» $drift_{Taste}$

» $drift_{Health}$





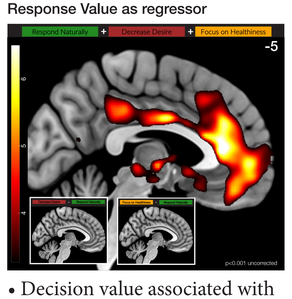


• Taste Weight is lower in **both** regulatory conditions, suggesting that this may be driving the higher acceptance rates for the Natural condition.

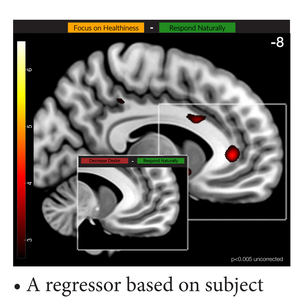
• A higher Health Weight (value modulation) drives the higher acceptance rates of healthy foods in the **Health** condition.

• The drift constant appears to drive the lower overall acceptance rate for the **Decrease** condition.

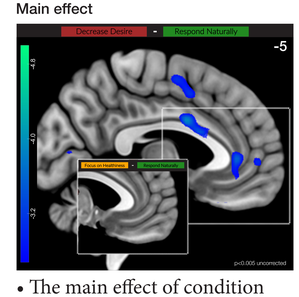
// Neural



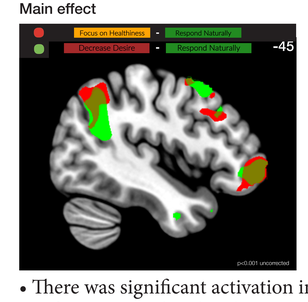
• Decision value associated with similar activation in vmPFC in **all conditions** (i.e. no evidence of response-focused modulation).



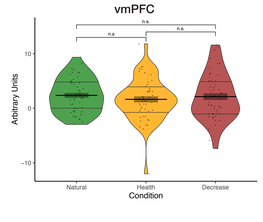
• A regressor based on subject ratings of food healthiness showed significantly higher activation in the **Health** condition, matching the DDM result.

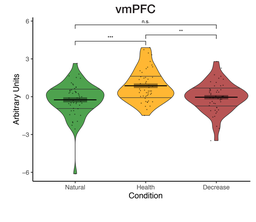


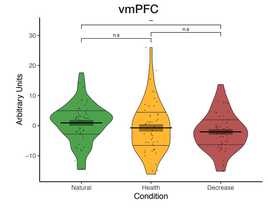
• The main effect of condition showed **reduced** activation in the vmPFC when contrasting the **Decrease** and **Natural** conditions (Health-Natural contrast n.s.).

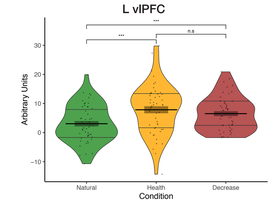


• There was significant activation in L inferior parietal and L vlPFC in **both** regulatory conditions when contrasted with the **Natural** condition (whole brain corrected).

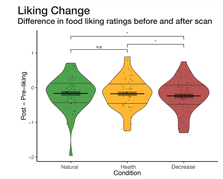


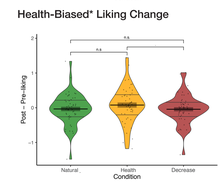


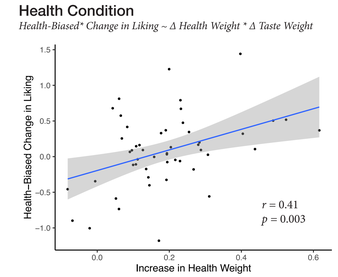




// Lasting Effect?







*Health-biased is defined as a subject increasing their Likingrating of a **healthy** food, and decreasing their Liking rating of an **unhealthy** food. The change is calculated by:

post-task Liking rating - pre-task Liking rating

• Post-scan Liking ratings, when compared to the Pre-scan Liking rating, allowed us to see whether foods viewed in different regulatory conditions changed in value after the experiment. We found evidence that those subjects most successful at changing their health weighting were also best at successfully re-evaluating foods.

// DISCUSSION

1. Regulation strategies focused both on attributes (**Health** condition) and on craving (**Decrease Desire** condition) decrease acceptance rates of food offers, but **only** in the **Health** condition is acceptance **biased** toward healthy options.

2. Neurally, we find that regulation does **not** alter the representation of decision value in the vmPFC, contrary to hypothesis 2.

3. Both regulatory conditions see **increased activation** in both L inferior parietal and L vlPFC, suggesting general involvement of these regions in regulation strategies.

4. Changes in evidence parameters of DDM and changes in vmPFC activation patterns were both consistent with goal-consistent value modulation in both conditions.

5. Next steps include looking at subject trial-by-trial variation, MVPA, and examing individual difference effects.

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// FURTHER INFORMATION

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