Stage M2, 5° année ingénieur

RESEARCH SUBJECT TITLE: UNDERSTANDING THE NEURAL MECHANISMS UNDERLYING FOOD VALUATION

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Minimum language level required:

- English: required
- French:
- Other:

Abstract:

A fundamental component of our decisions in our daily life is the valuation of food. This decision process is performed multiple times a day, and is common to many species including humans. According to an array of studies using diverse methods, the orbitofrontal cortex (OFC) and adjacent medial prefrontal cortex (mPFC) play a key role in representing the expected value or utility of options at the time of decision making [1–5]. Value signals have been found in this region in response to cues or actions associated with many different types of potential outcomes, such as food rewards, but also monetary rewards, consumer goods and even more abstract goals such as pursuing imaginary leisure activities [1,6–17]. Yet, we do not know much about how the value signals for food and other rewards are constructed by the brain.

We therefore intend in this project to study the brain mechanisms which lead to a representation of value for food. To do so, we will use a food-based decision task in human participants from which we will measure brain activity. The representation of the value of food may depend on many different aspects of the food item itself, such as nutritive constituents, texture, color, etc., but also on the subject's hunger, past experience with the food, culture, habits, etc. We will modify a previous task to investigate whether subjective values can be predicted, not only from beliefs about constituent nutritive attributes of food (protein, fat, carbohydrates and vitamin content), but also from the subject's past experiences, habits and *a priori* with a food item [18]. Using fMRI with this new task, we will establish whether there is a correlation between Willingness-To-Pay (WTP) and the aforementioned parameters. The measurements acquired from our task will then be used to train and test a computational model using deep learning to assess how food is processed when observing familiar and unfamiliar food items [19]. We will test and compare this model with other computational models. We will then use the output of the best model to investigate the brain regions correlating with computational signals of this learning model. This should provide us a better understanding of food valuation and decision process. The potential outcomes of this project is a better understanding of the processes underlying food valuation. These findings could then potentially be generalized to the valuation of food items in different pathologies, such as eating disorders.

Key words: Food reward, motivation, eating disorders.

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