

# Orthorexia Nervosa and Attentional Bias to healthy food

## Theoretical background

*Orthorexia Nervosa* is an eating behaviour disorder defined as a "fixation on eating proper food" <sup>1</sup>. Individuals with orthorexia tend to focus on food composition and feel guilty after eating what they consider unhealthy food. They spend excessive time thinking about meals and adopt stringent rules for food preparation and consumption. Extreme orthorexic behaviours are associated with impairment of physical health due to malnutrition and impaired social functioning due to obsessive thoughts about healthy eating<sup>2</sup>.

Several studies in the past years have shown that people with eating disorders show an attentional bias toward disease-salient information such as food and body shape information. This attentional bias is considered a mechanism that may potentially contribute to developing and maintaining the disorder<sup>3</sup>. Two studies have investigated the presence of attentional bias for healthy foods-related words in orthorexic individuals. They found that increased orthorexic tendencies are associated with increased attentional preference for healthy food-related words<sup>4-5</sup>. However, no study has investigated the attentional bias toward real foods or food images in orthorexia, even though images embed more salience than words (see <sup>6</sup>).

## Aims and Hypotheses

This study will investigate the existence and the nature of an attentional bias for healthy food in relation to orthorexic tendencies by recording eye movements during an attentional task with (healthy and unhealthy) food images and non-food stimuli. According to the eating rules of orthorexic individual and their attitudes toward unhealthy foods, we may expect higher orthorexic tendencies to be associated with attentional avoidance of unhealthy food. However, an alternative hypothesis proposes that individuals with high orthorexic tendencies may show an initial attentional bias towards unhealthy food (reflecting an increased preoccupation with food and an initial automatic orientation) during the first stage of cognitive processing of the food images, followed by a subsequent attentional avoidance in the last stage of the cognitive processing.

## Methods

### *Participants*

Eighty-four healthy participants (aged 20-35) will be recruited among the students of the University of Bologna (to detect a Pearson's correlation coefficient of  $r = .30$  with 80% power ( $\alpha = .05$ , two-tailed), according to G\*Power).

Exclusion criteria: neurological or psychiatric disease and/or having specific food restrictions (e.g., vegetarianism, allergy, religion).

### *Tools*

Self-report questionnaire: participants will report age, gender, height and weight (to calculate body mass index), hunger level (on a 7-point scale), and hours from the last meal.

Standardized questionnaires: The Düsseldorf Orthorexia Scale (DOS<sup>7</sup>) will be used to evaluate orthorexic tendencies. Moreover, participants will fill out the Eating Attitude Test (EAT-26<sup>8</sup>), a self-rated measure of eating attitudes to control for the presence of symptoms and concerns of eating disorders.

Stimulus set: Food pictures will be selected from existing food databases (e.g. FRIDA<sup>9</sup>, FoodPics<sup>10</sup>). Two food categories (healthy/non-healthy) will be created based on an online pilot study involving healthy young individuals (N=30). Pictures will be matched for visual properties, arousal, valence, familiarity and caloric content.

Dot Probe Task and eye movement recording: this task assesses automatic attention toward different food categories. Two images will be presented simultaneously, one on the left and the other on the right side of the screen. Then, a dot will appear either on the left or right, and participants will have to identify the dot location. The logic behind this task is that the faster the participant presses the

key where the dot is, the more likely they are to attend to the image in that position. The trials will consist of 30 pairs of images, with twenty critical pairs (healthy food vs non-food and unhealthy food vs non-food) and ten filler pairs. A Tobii eye tracker will be used to record eye movements.

**Food stimuli rating:** Liking (How pleasant do you think it is to taste a bite of the food in the picture?), Healthiness (How healthy is the food represented in the picture?), Wanting (How much do you desire at this moment the food depicted in the picture?) and Frequency of Consumption (How frequently do you consume the food in the picture) will be rated on a 100-point scale.

#### *Procedure*

First, participants will perform the dot-probe task. Then, they will rate each food picture for Liking, Healthiness, Wanting and Frequency of Consumption. Finally, they will complete Self-report, DOS and EAT-26 questionnaires. The entire procedure will take about 40 min.

#### *Statistical analyses*

First, three attentional bias indices will be computed based on eye-tracking data: 1) a direction bias score (percentage of the total initial fixations on either food or non-food cues); 2) a gaze dwell time bias score (total amount of time that participants fixated their gaze on food); 3) a reaction time bias score based on response latencies. Relationships between orthorexia questionnaire scores and attentional bias data will be examined using correlational analyses. Multiple regression analyses will be used when appropriate, also considering the picture ratings (e.g. healthiness, liking, wanting) and the variables in the self-report questionnaire (e.g. body mass index). Individuals with pathological scores on the EAT-26 or specific food restrictions will be excluded from the analyses.

#### *Commitment to request ethical approval*

The protocol will be submitted to the Ethics Committee of Bologna University for approval.

### **Expected Results and Implications**

An association between attentional bias toward healthy/unhealthy food in the dot probe task and orthorexia questionnaire scores is expected. Moreover, higher orthorexia scores are expected to be associated with higher healthiness, liking and wanting scores for healthy foods and lower healthiness, liking and wanting scores for unhealthy foods.

This work will provide valuable insights for understanding psychological processes linked to developing and maintaining orthorexia-related behaviours. These data may provide data for developing further studies aimed at testing the neurobiological underpinnings of orthorexic tendencies and, in turn, generate ideas for novel approaches to both timely diagnosing and treating orthorexia. Indeed a recent survey among psychologists, psychiatrists, nurses, and social workers, reported that two-thirds of them have observed patients presenting with orthorexia in their practice<sup>11</sup>. Importantly, they also indicated that the syndrome deserves more scientific attention.

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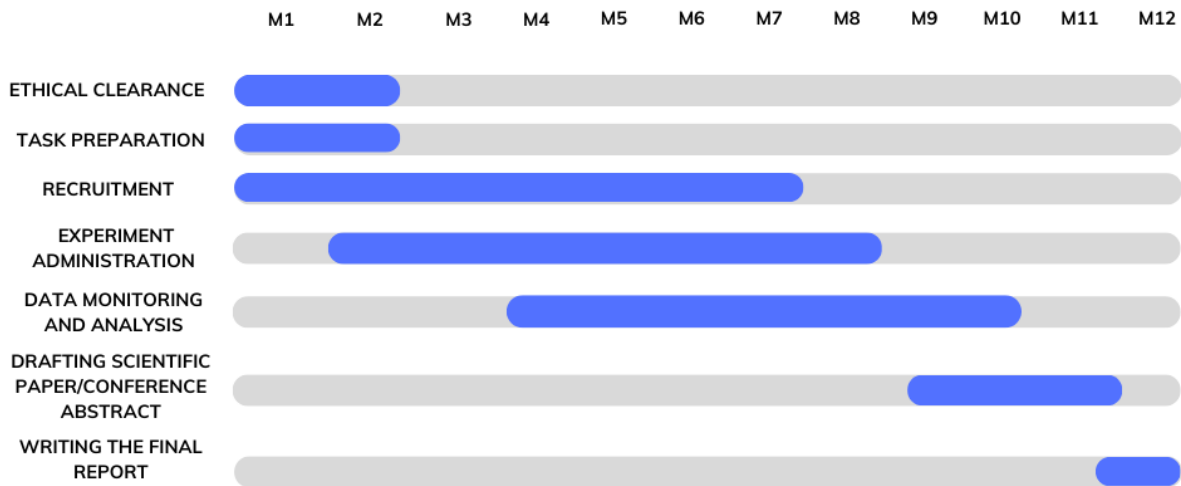
## Project activities

- Ethical clearance
- Task preparation
- Recruitment
- Experimental protocol administration
- Continuous data monitoring and analysis
- Drafting scientific paper/conference abstract
- Writing the final report

## Training activities

- Deepening the explicit and implicit paradigms for studying food
- Deepening the statistical analysis
- Supervision for scientific writing (papers and conference abstracts)

## Timing of activities



## Feasibility

The project contains a food evaluation protocol already used in literature and stimuli selected from an available database. The main risk is insufficient participant recruitment. However, connection with the UNIBO's course on Nutrition will allow us to involve many participants (i.e. nutritionists) interested in the research topic and representing a population prone to orthorexic tendencies according to the literature.

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