

Orthorexia and magical thinking

Theoretical background

Orthorexia Nervosa (ON) is a disorder characterised by an unhealthy fixation on consuming only "pure" foods¹. Individuals with ON obsess over the composition of their meals, feel guilty after consuming foods perceived as unhealthy, spend excessive time thinking about food, and adopt stringent rules for food preparation and consumption. Extreme cases of ON can lead to physical health impairments due to malnutrition and social functioning impairments as a result of obsessive thoughts about healthy eating². Individuals with ON may develop magical thinking about food and health⁴. They entertain unrealistic beliefs about certain foods: they may believe that healthy food may relieve stress, or that a diet free of "impure" foods can cure diseases such as allergies to cancer³. Additionally, they may adopt rituals related to cooking and eating, referred to as "kitchen spirituality"⁴. Cases of orthorexic individuals who analyse food based on local climate, the season of the year, and daily weather to eat in precisely balanced harmony with the environment are reported⁵. Crucially, magical ideation, regardless of its content, is a common symptom of the psychotic spectrum and is a good predictor of future psychosis⁶. However, no experimental study explored magical thinking in individuals with ON.

Aims and Hypotheses

This study aims to explore magical thinking in orthorexia nervosa through two studies. Both studies will explore magical belief based on the *law of contagion*, which holds that things that have been in real or imagined contact continue to influence each other over time or space. An example is the belief that even brief contact with any animal product (e.g. a piece of meat) renders a whole vegetarian dish inedible⁷.

The first study will assess the hypothesis that individuals with higher ON tendencies have stronger magical beliefs about food and reduced reward responsiveness (*liking and wanting*) toward foods that have come into contact with perceived disgusting products. The second study will investigate responses of the autonomic nervous system (heart rate and skin conductance) when ON individuals are exposed to foods touched by perceived disgusting products. Psychophysiological measures will provide insights into the individual's level of engagement and arousal.

Study 1

Method

Participants: Eighty-two participants (aged 18-45) will be recruited (to detect a Pearson's correlation coefficient of $r = .30$ with 90% power, $\alpha = .05$, two-tailed, according to G*Power) and asked to participate in an online survey on the Qualtrics platform. Exclusion criteria: neurological disease, medical condition that affects eating (e.g., diabetes, allergy).

Tools

Self-report questionnaires: 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. They will fill out the following questionnaires: 1. the Düsseldorf Orthorexia Scale (DOS⁸) evaluating orthorexic tendencies; 2. the Eating Attitude Test (EAT-26⁹) evaluating the presence of symptoms of eating disorders; 3. the Magical beliefs about food and health scale (MFH¹⁰) assessing the tendency to adopt eating and health instructions obeying the laws of similarity and contagion, which are considered as forms of magical thinking; 4. the Community Assessment of Psychic Experiences (CAPE¹¹) measuring the lifetime prevalence of psychosis-like experiences in the general population.

Contagion task: Participants will observe a picture of two products on a store shelf (a source product and a food target). Source products may be disgusting or neutral. The source product will rest slightly on the food target product in the touching condition. A six cm space will separate the source and food target in the non-touching condition. Each pair source product/food target will be presented in both the touching and the non-touching conditions. Participants will be asked to rate how much they like the food target on a 7-point Likert scale (*liking*) and how much they will be

willing to spend for it on a scale from 0 to 4 euros (*wanting*). Six disgusting source products, six neutral source products and six food targets will be used for a total of 72 trials in the touching condition and 72 in the non-touching condition. Finally, participants will rate how disgusting they find the source products used in the experiment on a 7-point Likert scale.

Stimulus set: Source targets have already been selected according to an online independent pilot study on 20 healthy participants.

Procedure

Participants will fill out the self-report questionnaires and then perform the Contagion task.

Statistical analyses

Relationships between ON questionnaire scores and other data (MFH, CAPE, and contagion tasks) will be examined using correlational analyses. Multiple regression analyses will be used when appropriate.

Study 2

Participants: Fifteen participants with ON and 15 participants without ON will be recruited (according to the DOS cut-off). The sample size was computed by GPower 3.1, by selecting "ANOVA: Repeated measure, within-between interaction" as a statistical test, effect size $f = 0.25$, α err prob = 0.05, power ($1 - \beta$ err prob) = 0.90, number of groups = 2, number of measurements = 4, and keeping the rest of the parameters default. Based on these parameters, 30 participants were considered necessary for the study. Exclusion criteria: as in Study 1.

Tools

Self-report questionnaire: As in Study 1.

Contagion task: the task will be the same as in Study 1. In addition, heart rate and skin conductance will be recorded during the task with the data acquisition unit MP36 (BIOPAC Systems, Inc.).

Procedure

As in Study 1.

Statistical analyses

A 2x2x2 Repeated measure ANOVA will be used with condition (touching/non-touching) and source type (disgusting/neutral) as within factor and group (ON/no-ON) as between factor.

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 magical thinking assessed through the MFH questionnaire and ON questionnaire scores is expected. In addition, higher ON scores are expected to be associated with lower reward responsiveness for food associated with disgusting products. In study 2, we expect that ON participants display increased skin conductance responses and decreased heart rate responses in the touching condition for foods touched by disgusting products.

Over the past few decades, there has been a significant increase in interest in healthy eating and lifestyle habits. However, the behavioural pattern referred to as ON has received little empirical attention and is not yet formally recognized as a psychiatric disorder despite being frequently observed by clinicians. This study aims to provide a thorough understanding of ON's clinical bases. Additionally, it might create tools to identify individuals at risk of severe ON.

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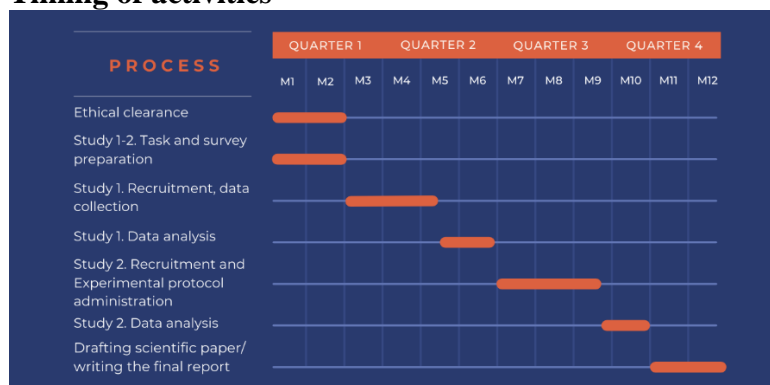
Project activities

- Ethical clearance
- Study 1-2. Task and survey preparation
- Study 1. Recruitment, data collection
- Study 1. Data analysis
- Study 2. Recruitment and Experimental protocol administration
- Study 2. Data analysis
- Drafting scientific paper/writing the final report

Training activities

- Deepening paradigms for studying magical beliefs about food
- Deepening the statistical analysis
- Supervision for scientific writing (papers and conference abstracts)

Timing of activities



Feasibility

We have already identified source products for the contagion task through an online pilot study on 20 healthy participants. Photographs of objects and foods have been collected. Concerning study 2, the main risk is insufficient participant recruitment in person in the lab. For this reason, if necessary, participants will also be recruited through online platforms, social media, community centers, universities, mailing lists and invited to the lab. Regularly monitoring recruitment progress will help address any challenges that will arise throughout the recruitment process.

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