

SCIENTIFIC REPORTS



OPEN

Compared to self-immersion, mindful attention reduces salivation and automatic food bias

Constanza Baquedano^{1,2,3}, Rodrigo Vergara⁴, Vladimir Lopez^{2,3}, Catalina Fabar², Diego Cosmelli^{2,3} & Antoine Lutz¹

Immersing ourselves in food images can sometimes make it feel subjectively real, as if the actual food were right in front of us. Excessive self-immersion into mental content, however, is a hallmark of psychological distress, and of several psychiatric conditions. Being aware that imagined events are not necessarily an accurate depiction of reality is a key feature of psychotherapeutic approaches akin to mindfulness-based interventions. Yet, it is still largely unknown to what extent one's engagement with mental content, considering it as real, biases one's automatic tendencies toward the world. In this study, we measured the change in subjective realism induced by a self-immersion and a mindful attention instruction, using self-reports and saliva volumes. Then, we measured behaviorally the impact of subjective realism changes on automatic approach bias toward attractive food (FAB) using an approach–avoidance task. We found a reduction in saliva volume, followed by a reduction in FAB in the mindful condition compared to the immersed condition. During the immersed condition only, saliva volumes, state and trait measures of subjective realism, and food craving traits were positively correlated with FAB values, whereas meditation experience was negatively correlated to it. We conclude that mindful attention instructions can de-automatize food bias.

Thoughts can sometimes seem “subjectively real”, as if the imagined event was happening in the moment. This process of being self-immersed in the contents of one's mind has been called cognitive fusion¹, reification², absorption³, experiential fusion⁴, or subjective realism⁵. In contrast, being aware that thoughts or perceptions are mere representations, and not necessarily an accurate depiction of reality, is a process that has been labeled as phenomenological reduction⁶, decentering⁷, cognitive diffusion¹, mindful attention^{8,9}, or dereification². Subjective realism is common in daily life. For instance, merely reading about or viewing attractive food items is sufficient to trigger activation in the gustatory and reward areas in the brain¹⁰ or to increase salivation¹¹. Blood levels of ghrelin, a hormone responsible for physiological hunger, are also modulated by one's mere belief in the caloric values of food items¹². By contrast, becoming aware that one has self-immersed into attractive food stimuli, and that this experience is a mere transient mental event, reduces reward simulations and appetitive behavior⁹. In this study, we aim to extend this research by investigating how much one's engagement with thoughts and perceptions, considering them as being real or not, biases one's automatic approaching/avoidance tendencies toward them.

To address this question, we used a food engagement paradigm developed by Papies, Barsalou and Custers (2012)⁸, and adapted it to make it suitable for physiological measures (such as EEG, EKG, and salivation). In the aforementioned study, the authors applied an approach–avoidance task (AAT), in a between-subject design, to show that a mindful attention instruction decreases automatic impulses towards attractive food when compared to a control or immersion instruction. These two instructions manipulated the degree of engagement with mental events as being real or not. Neutral and attractive food images were displayed on a computer screen accompanied by a cue that indicated either to approach or avoid the presented food picture. The AAT paradigm implicitly assesses automatic approach–avoidance behavior¹³. The reaction times (RT) difference between incompatible conditions (i.e. avoiding attractive food) and compatible conditions (i.e. approaching attractive food) is referred to

¹Lyon Neuroscience Research Center INSERM U1028, CNRS UMR5292, Lyon 1 University, Lyon, France. ²School of Psychology, Pontificia Universidad Católica de Chile, Santiago, Chile. ³Interdisciplinary Center for Neuroscience, Pontificia Universidad Católica de Chile, Santiago, Chile. ⁴Biomedical Neuroscience Institute, Faculty of Medicine, Universidad de Chile, Santiago, Chile. Correspondence and requests for materials should be addressed to A.L. (email: antoine.lutz@inserm.fr)