Distinct brain representations of natural and manufactured foods: a spatio-temporal brain dynamics investigation

Carol Coricelli[1], Ulrike Toepel[2], Marie-Laure Bielser[2], Micah M. Murray[2,3,4,5], Raffaella I. Rumiati[1]

[1] Neuroscience and Society Laboratory, SISSA, Italy; [2] The Laboratory for Investigative Neurophysiology (The LINE), Department of Radiology and Department of Clinical Neurosciences, University Hospital Center and University of Lausanne, Switzerland; [3] Electroencephalography Brain Mapping Core, Center for Biomedical Imaging (CIBM) of Lausanne and Geneva, Switzerland; [4] Department of Ophthalmology, Jules Gonin Eye Hospital and University of Lausanne, Switzerland; [5] Department of Hearing and Speech Sciences, Vanderbilt University, USA

Keywords: food categorization, food perception, EEG, electrical neuroimaging, source estimation

The processing of foods by means of transforming raw ingredients for consumption is thought to have played a fundamental role in human evolution [1]. The ability to distinguish between raw and manufactured food is considered an adaptive behavior since processing reduces the risk of infections and poisoning. Moreover, ingestion of processed foods generally leads to a higher energy intake [2]. Here, we identified the spatio-temporal brain dynamics of this discrimination. To do this, we employed an electrical neuroimaging analysis [3] framework to visual evoked potentials (VEPs) recorded from volunteers (n=20) who viewed color images of natural (unprocessed) or manufactured (processed) foods with balanced caloric content, as well as non-food objects. Participants categorized foods vs. non-food images, and no overt discrimination of processes vs. unprocessed foods was required. VEPs to natural vs. manufactured foods differed as early as 130ms after image onset and due to changes in the VEP topography (Global Dissimilarity). From ~190ms, these differences were also reflected in the strength of the electric field (Global Field Power). Distributed source estimations over the 130-170ms and 190-230ms post-image onset time windows revealed that viewing manufactured foods elicited greater activity in visual association cortices and inferior temporal cortex, likely due to the more complex nutrient composition of the processed edibles. Unprocessed foods induced enhanced lateral premotor cortex responses, presumably reflecting action preparation, as well as elevated inferior frontal activity. We thus provide the first evidence of substantial differences in brain responses between natural and manufactured foods independent of caloric content shedding light on a so far relatively unexplored aspect of food perception.

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