

## **The effect of food advertisements on food intake and neural activity: a systematic review and meta-analysis of experimental studies**

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Food advertisements are contributors to the obesity epidemic and are ubiquitous in our daily environment. Previous studies have assessed the effects of food advertising on food consumption with conflicting findings. The objective of this research was to conduct a systematic review and meta-analysis of recent evidence about the impact of food advertising on behavioral and neural outcomes. We developed a search strategy following PRISMA guidelines. PubMed, Web of Science, and Scopus databases were searched for relevant articles published from 2014 to 2021. Studies included were those that examined the impact of food commercials, food advertising, food brands, or food advergames on behavioral (food intake) or neural (brain activity) responses in an experimental context conducted among children or adults. A random-effects inverse variance meta-analysis was performed on standardized mean differences (SMD) in food intake calculated between food and non-food advertisement conditions of each study. Cochran's Q and I<sup>2</sup> statistics were calculated to assess heterogeneity. For brain activity, a seed-based d Mapping meta-analysis was performed. Of 151 unique retrievals, 19 articles were eligible for inclusion: 13 for food intake ( $n = 1303$ ) and 6 for neural activity ( $n = 303$ ). The pooled analysis of food intake revealed small, but statistically significant, effects of increased intake after viewing food advertising compared with the control condition among adults and children (adult SMD: 0.16; 95% CI: 0.03, 0.28;  $P = 0.01$ ;  $I^2 = 0$ ; 95% CI: 0, 95.0%; children SMD: 0.25; 95% CI: 0.14, 0.37;  $P < 0.0001$ ;  $I^2 = 60.4\%$ ; 95% CI: 25.6%, 79.0%). The neuroimaging studies involved children alone, and the pooled analysis corrected for multiple comparisons identified one significant cluster: the middle occipital gyrus, with increased activity after food advertising exposure compared with the control condition (peak coordinates: 30, -86, 12;  $z$ -value: 6.301, size: 226 voxels;  $P < 0.001$ ). The present results suggest that food advertising has a small, but significant, effect on food intake, as well as brain activity in relevant areas of food cue reactivity. This work supports continued investigation into food advertising as a target for addressing the obesity epidemic. (Funding: NSERC, INAF.)