**The impulsive brain: new insights into the neural correlates of binge eating**

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Binge-eating is characterized by episodes of uncontrolled eating, within discrete periods of time. Although it is usually described in obese individuals or as a symptom of Binge Eating Disorder (BED), this behaviour can also occur in the normal-weight (NW) population. An interesting premise suggests that impulsivity might contribute to the development of binge-eating and weight gain. Many studies have indeed linked binge-eating in obesity with high trait impulsivity, and brain activity alterations in regions implicated in impulsivity-related processes. However, as most of these investigations focused on already-obese individuals, it is difficult to infer whether these results are causes or consequences of weight gain. In the present research, we aimed to investigate the role of impulsivity at the roots of binge-eating, in a non-clinical population of NW individuals. To this purpose, we recruited 42 NW individuals with and without binge eating episodes (21 BE and 21 non-BE) and explored:
• Trait impulsivity, with self-reported questionnaires;
• Response inhibition toward food, with a Go/No-Go, GNG and Stop Signal Task, SST;
• Task-related brain activity during the execution of both the GNG and the SST;
• Functional brain connectivity at rest.
We hypothesized that NW binge eaters would be characterized by higher trait impulsivity, poorer response inhibition abilities and functional changes in regions implicated in impulsivity (i.e., prefrontal and subcortical regions).
Our findings showed that despite similar behavioural performances, the two groups differed in trait impulsivity and brain activity. The fMRI results revealed differential engagement of fronto-striatal regions between the groups during the tasks. Indeed, the BE group, compared to non-BE, showed lower activation of the right middle frontal gyrus (MFG) and Putamen during the GNG task, and higher activation of the left MFG during the SST. The resting-state investigation revealed that the BE were characterized a lower degree centrality within the right MFG, left insula/putamen and temporo-parietal regions. Overall, these findings support the hypothesis that impulsivity may be a possible hallmark of binge-eating behaviour (in the absence of weight or eating disorders) and yield new insights on the role of regions typically involved in response inhibition and impulsivity as possible substrates of loss of control overeating.

**Keywords**: Binge eating; impulsivity; functional magnetic resonance imaging