

V. Florent · B. Gaudrat

### Food Portion Size and Energy Density Evoke Different Patterns of Brain Activation in Children

English LK, Fearnbach SN, Wilson SJ, et al (2017)  
Am J Clin Nutr [1]

**Background:** Large portions of food promote intake, but the mechanisms that drive this effect are unclear. Previous neuroimaging studies have identified the brain-reward and decision-making systems that are involved in the response to the energy density (ED) [kilocalories per gram] of foods, but few studies have examined the brain response to the food portion size (PS).

**Objective:** We used functional MRI (fMRI) to determine the brain response to food images that differed in PSs (large and small) and ED (high and low). **Design:** Block-design fMRI was used to assess the blood oxygen level dependent (BOLD) response to images in 36 children (7–10 years old; girls: 50%), which was tested after a 2-h fast. Pre-fMRI fullness and liking were rated on visual analog scales. A whole-brain cluster-corrected analysis was used to compare BOLD activation for main effects of the PS, ED, and their interaction. Secondary analyses were used to associate BOLD contrast values with appetitive traits and laboratory intake from meals for which the portions of all foods were increased.

**Results:** Compared with small-PS cues, large-PS cues were associated with decreased activation in the inferior frontal gyrus ( $P < 0.01$ ). Compared with low-ED cues,

high-ED cues were associated with increased activation in multiple regions (e.g., in the caudate, cingulate, and precentral gyrus) and decreased activation in the insula and superior temporal gyrus ( $P < 0.01$  for all). A PS  $\times$  ED interaction was shown in the superior temporal gyrus ( $P < 0.01$ ). BOLD contrast values for high-ED cues compared with low-ED cues in the insula, declive, and precentral gyrus were negatively related to appetitive traits ( $P < 0.05$ ). There were no associations between the brain response to the PS and either appetitive traits or intake.

**Conclusions:** Cues regarding food PS may be processed in the lateral prefrontal cortex, which is a region that is implicated in cognitive control, whereas ED activates multiple areas involved in sensory and reward processing. Possible implications include the development of interventions that target decision-making and reward systems differently to moderate overeating.

*Commentaires : C'est aujourd'hui bien démontré : l'augmentation des portions alimentaires majore les ingestas chez l'enfant. Les auteurs s'intéressent ici à l'activation en IRM fonctionnelle de certaines zones cérébrales chez l'enfant de poids normal, en réponse à la visualisation de photographies représentant diverses tailles de portions, ou diverses portions à densité énergétique différente, que les participants avaient au préalable mangées. Il en ressort que les zones cérébrales inhibitrices sont moins activées face à une large portion que face à une petite et que les aliments à haute densité énergétique activent davantage les zones cérébrales de la récompense, favorisant ainsi une majoration des apports. La visualisation en IRM de ces réponses neurobiologiques face à différents types de repas pourrait à terme permettre de développer des stratégies comportementales pour prévenir l'obésité infantile.*

V. Florent (✉)

Service de nutrition, centre spécialisé obésité (CSO),  
centre hospitalier d'Arras, 3, bld Besnier, CS 90006,  
62022 Arras cedex, France  
Unité Inserm U1172, centre de recherche Jean-Pierre-Aubert,  
59000 Lille, France  
e-mail : vincent.florent@ch-arras.fr

B. Gaudrat

Service de nutrition, centre spécialisé obésité (CSO),  
centre hospitalier d'Arras, 3, bld Besnier, CS 90006,  
62022 Arras cedex, France  
Laboratoire PSITEC EA4072, université Lille-III,  
domaine du Pont-de-Bois, BP 60149,  
59653 Villeneuve-d'Ascq cedex, France  
e-mail : bulle.gaudrat@ch-arras.fr

### Mobile Applications for Obesity and Weight Management: Current Market Characteristics

Nikolaou CK, Lean ME (2017) Int J Obes [2]

Mobile-Health (mHealth) is the fastest-developing eHealth sector, with over 100,000 health applications (apps) currently available. Overweight/obesity is a problem of

wide public concern that is potentially treatable/preventable through mHealth. This study describes the current weight-management app-market. Five app stores (Apple, Google, Amazon, Windows and Blackberry) in UK, US, Russia, Japan and Germany, Italy, France, China, Australia and Canada were searched for keywords: “weight”, “calorie”, “weightloss”, “slimming”, “diet”, “dietitian” and “overweight” in January/February 2016 using App-Annie software. The 10 most downloaded apps in the lifetime of an app were recorded. Developers’ lists and the app descriptions were searched to identify any professional input with keywords “professional”, “dietitian” and “nutritionist”. A total of 28,905 relevant apps were identified as follows: Apple iTunes = 8,559 (4,634, 54% paid), Google Play = 1,762 (597, 33.9% paid), Amazon App = 13,569 (4,821, 35.5% paid), Windows = 2,419 (819, 17% paid) and Blackberry = 2,596 (940, 36% paid). The 28,905 identified apps focused mainly on physical activity (34%), diet (31%), and recording/monitoring of exercise, calorie intake and body weight (23%). Only 17 apps (0.05%) were developed with identifiable professional input. Apps on weight management are widely available and very popular but currently lack professional content expertise. Encouraging app development based on evidence-based online approaches would assure content quality, allowing healthcare professionals to recommend their use.

*Commentaires : Actuellement, plus de 100 000 applications mobiles dédiées à la santé existent sur les principaux marchés d’applications, et ce secteur de l’« e-santé » connaît un réel essor. Parmi ces applications, 28 905 sont dédiées à la nutrition, à l’activité physique ou encore à la gestion du poids. Les auteurs ont déterminé que seulement 0,05 % de celles-ci étaient développées par des professionnels de santé, et que seulement trois d’entre elles étaient validées par des données de recherche clinique quant à leur efficacité. Il apparaît donc prudent de patienter avant de proposer ce type de support à nos patients...*

### **Brown Adipose Tissue Does not Seem to Mediate Metabolic Adaptation to Overfeeding in Men**

Peterson CM, Orooji M, Johnson DN, et al (2017) Obesity [3]

*Objective:* Brown adipose tissue (BAT) generates heat in response to cold, and low BAT activity has been linked to obesity. However, recent studies were inconclusive as to whether BAT is involved in diet-induced thermogenesis and mitigates weight gain from prolonged overeating. Therefore, this study investigated whether BAT activity is related to metabolic adaptation arising from 8 weeks of overfeeding in humans.

*Methods:* Fourteen men (aged  $24 \pm 3$  years, BMI  $24.5 \pm 1.6$  kg/m<sup>2</sup>) were overfed by 40% for 8 weeks. Before and after, energy expenditure and metabolic adaptation were measured by whole-room respiratory calorimetry. A marker of BAT activity was measured using infrared imaging of the supraclavicular BAT depot.

*Results:* At the end of 8 weeks of overfeeding, metabolic adaptation — defined as the percent increase in sleeping energy expenditure beyond that expected from weight gain — rose from  $-0.9 \pm 3.9\%$  to  $4.7 \pm 5.6\%$  ( $P = 0.001$ ). However, BAT thermal activity was unchanged ( $P = 0.81$ ). Moreover, BAT thermal activity did not correlate with the degree of metabolic adaptation ( $P = 0.32$ ) or with the change in body weight ( $P = 0.51$ ).

*Conclusions:* BAT thermal activity does not change in response to overfeeding, nor does it correlate with adaptive thermogenesis. Our data suggest that BAT does not mediate metabolic adaptation to overeating in humans.

*Commentaires : Différentes études ont montré que les sujets obèses pouvaient présenter une défaillance de la thermogénèse induite par le froid au niveau du tissu adipeux brun, suggérant ainsi que ce tissu avait un rôle dans l’homéostasie énergétique. Les auteurs ont donc proposé à 14 volontaires de réaliser une mesure de dépense énergétique en chambre calorimétrique associée à une mesure d’activité thermique du tissu adipeux brun par imagerie infrarouge, avant et après huit semaines de régime hypercalorique. Malgré une prise de poids significative d’environ 10 % du poids initial des participants, responsable d’une majoration significative de leur dépense énergétique de repos, aucune variation de l’activité thermique du tissu adipeux brun n’a été observée. À conforter par d’autres études !*

### **Sugar Addiction: the State of the Science**

Westwater ML, Fletcher PC, Ziauddeen H, et al (2016) Eur J Clin Nutr [4]

*Purpose:* As obesity rates continue to climb, the notion that overconsumption reflects an underlying “food addiction” (FA) has become increasingly influential. An increasingly popular theory is that sugar acts as an addictive agent, eliciting neurobiological changes similar to those seen in drug addiction. In this paper, we review the evidence in support of sugar addiction.

*Methods:* We reviewed the literature on food and sugar addiction and considered the evidence suggesting the addictiveness of highly processed foods, particularly those with high sugar content. We then examined the addictive potential of sugar by contrasting evidence from the animal and human neuroscience literature on drug and sugar addiction.

**Results:** We find little evidence to support sugar addiction in humans, and findings from the animal literature suggest that addiction-like behaviours, such as bingeing, occur only in the context of intermittent access to sugar. These behaviours likely arise from intermittent access to sweet tasting or highly palatable foods, not the neurochemical effects of sugar.

**Conclusion:** Given the lack of evidence supporting it, we argue against a premature incorporation of sugar addiction into the scientific literature and public policy recommendations.

**Commentaires :** Cette revue de la littérature discute l'état des connaissances actuelles concernant le concept d'addiction au sucre et souligne l'absence de preuves scientifiques établies à l'heure actuelle. Les auteurs mettent en évidence que les données neurobiologiques actuelles ne permettent pas de définir la substance comme ayant des propriétés addictives. Par ailleurs, les études conduites chez l'animal montrent de franches différences de réaction entre la consommation de drogue chez les rongeurs et la consommation de sucre. De plus, celles-ci ont mis en évidence le développement de comportements addictifs dirigés vers le sucre uniquement lorsque les rongeurs sont placés dans une situation préalable de non-disponibilité complète, ce qui ne peut être le cas de l'être humain en milieu écologique. Enfin, les auteurs insistent sur le fait que les mesures actuelles d'addiction alimentaire restent trop imprécises, et les résultats ne permettent pas pour l'instant de distinguer l'addiction au sucre des autres troubles du comportement alimentaire (comme le binge eating disorder).

### **The Dual-Pathway Model of Binge Eating: Is There a Need for Modification?**

Sehm M, Warschburger P (2017) *Appetite* [5]

The dual-pathway model proposes that body dissatisfaction might lead to Binge Eating (BE) through restraint eating and negative affect. Both pathways have been confirmed longitudinally, but there is evidence that the affect-pathway might rather be found in the short-term, whereas other variables might be involved over longer periods. Research suggests that self-esteem represents a key-factor in the etiology of BE in adolescent girls and might serve as a mediator between body dissatisfaction and eating pathology. Based on these findings, the aim of this study was to investigate the original dual-pathway model across 20 months and to evaluate a modified version of the model with self-esteem instead of negative affect as a mediator in the affect-pathway. We assessed eating pathology, negative affect and self-esteem by self-report in a sample of 523 adolescent girls at two time points separated by 20 months. Data were analyzed

using a cross-lagged panel design. Both, the original and the modified model provided good fit to the data, but results yielded limited support for the assumptions of the original model. Neither restraint eating nor negative affect mediated the link between body dissatisfaction and BE. The modified model fit the data slightly better and results indicated that low self-esteem mediated the relationship between body dissatisfaction and BE. Notably, our results indicated that restraint eating might even reduce the risk for BE through the enhancement of self-esteem. Results suggest that the dual-pathway model could benefit from the inclusion of a more trait-like variable such as self-esteem when evaluated across the long-term. Furthermore, our findings indicate that healthy restraint eating might have positive effects on self-esteem, thereby reducing risk for BE in adolescent girls, who are dissatisfied with their bodies.

**Commentaires :** Les auteurs questionnent le modèle de Stice [6] postulant que l'insatisfaction corporelle conduirait au binge eating via deux voies distinctes : la voie restrictive et la voie des affects négatifs. Les auteurs testent ce modèle qui a finalement fait l'objet de résultats expérimentaux mitigés et proposent d'y introduire l'estime de soi (conceptualisée comme ayant un effet à plus long terme que les affects négatifs). Leur nouveau modèle incluant l'estime de soi illustre que, contrairement aux affects négatifs, celle-ci jouerait un rôle central à long terme dans la prédiction du binge eating. En effet, une insatisfaction corporelle élevée prédirait une fréquence plus élevée de binge eating, et cette relation serait médiée par l'estime de soi. Les deux modèles testés (celui de Stice et celui des auteurs) ne semblent pas confirmer la voie restrictive ; au contraire, la restriction semblerait protéger à long terme du binge eating, ce qui semble accréditer l'existence d'une forme de restriction adaptative.

### **What Makes Dietary Restraint Problematic? Development and Validation of the Inflexible Eating Questionnaire**

Duarte C, Ferreira C, Pinto-Gouveia J, et al (2017) *Appetite* [7]

This study presents the Inflexible Eating Questionnaire (IEQ), which measures the inflexible adherence to subjective eating rules. The scale's structure and psychometric properties were examined in distinct samples from the general population comprising both men and women. IEQ presented an 11-item one-dimensional structure, revealed high internal consistency, construct and temporal stability, and discriminated eating psychopathology cases from non-cases. The IEQ presented significant associations with dietary

restraint, eating psychopathology, body image inflexibility, general psychopathology symptoms, and decreased intuitive eating. IEQ was a significant moderator on the association between dietary restraint and eating psychopathology symptoms. Findings suggested that the IEQ is a valid and useful instrument with potential implications for research on psychological inflexibility in disordered eating.

*Commentaires : Le développement et la validation d'un questionnaire de comportement alimentaire inflexible par les auteurs mettent en exergue l'intérêt croissant pour la distinction entre une forme de restriction inadaptée d'un côté, qui sous-tendrait les troubles du comportement alimentaire et le développement d'un surpoids, et d'un autre côté une restriction adaptative qui permettrait de maintenir un poids normal ou de perdre du poids durablement en évitant les écueils observés couramment dans le cas de l'instauration d'une restriction cognitive rigide. Ce questionnaire, utile tant en matière de recherche que de pratique clinique, relance le débat autour de l'existence d'une restriction alimentaire non dommageable sur le long terme [8].*

## Références

1. English LK, Fearnbach SN, Wilson SJ, et al (2017) Food portion size and energy density evoke different patterns of brain activation in children. *Am J Clin Nutr* 105:295–305
2. Nikolaou CK, Lean ME (2017) Mobile applications for obesity and weight management: current market characteristics. *Int J Obes (Lond)* 41:200–2
3. Peterson CM, Orooji M, Johnson DN, et al (2017) Brown adipose tissue does not seem to mediate metabolic adaptation to overfeeding in men. *Obesity (Silver Spring)* 25:502–5
4. Westwater ML, Fletcher PC, Ziauddeen H (2016) Sugar addiction: the state of the science. *Eur J Clin Nutr* 55:55–69
5. Sehm M, Warschburger P (2017) The dual-pathway model of binge eating: is there a need for modification? *Appetite* 114:137–45
6. Stice E (2001) A prospective test of the dual-pathway model of bulimic pathology: mediating effects of dieting and negative affect. *J Abnorm Soc Psychol* 110:124–35
7. Duarte C, Ferreira C, Pinto-Gouveia J, et al (2017) What makes dietary restraint problematic? Development and validation of the inflexible eating questionnaire. *Appetite* 114:146–54
8. Schaumberg K, Anderson DA, Anderson LM, et al (2016) Dietary restraint: what's the harm? A review of the relationship between dietary restraint, weight trajectory and the development of eating pathology. *Clin Obes* 6:89–100