SO WHAT?
POLICY BRIEF N° 20 • JUNE 2022
www.chaireunesco-adm.com/en

UNESCO Chair in World Food Systems

The UNESCO Chair in World Food Systems breaks down the barriers of knowledge on food. The So What? collection translates the results of research into straightforward conclusions for action.

Does weight status increase vulnerability to the food environment?

Marine Mas, UMR CSGA, INRAE, Dijon, France
Stéphanie Chambaron, UMR CSGA, INRAE, Dijon, France
Marie-Claude Brindisi, CHU Dijon-Bourgogne, France

KEY POINTS

- All individuals tend to "go towards" food automatically, especially food that is energy-dense. This potentially explains the obesogenic effect of the Western food environment.
- Some individuals have a cognitive vulnerability to the food environment. This vulnerability is driven by more than conscious factors, and challenges the "lack of willpower" stereotype that is often (wrongly) associated with individuals with obesity.
- Encouraging people to eat food of high nutritional quality appears to be more effective than discouraging them from eating less healthy food.

Obesity is an important public health issue with socio-economic consequences. Its origin is multifactorial, with environmental, biological, psychological and social dimensions. Furthermore, its consequences involve physical, psychological and social complications on an individual level.

The main tool employed to categorize individuals according to their weight status is the body mass index (BMI). This indicator, based on the ratio of weight to height, is used to define what constitutes a "normal" weight status (between 18.5 and 24.9 kg/m^2), overweight (between 25 and 29.9 kg/m^2), and obesity (30 kg/m^2 and above).

Current approaches to tackling obesity target a number of actors in the food system, ranging from food manufacturers to consumers and the healthcare system. Over the years, the various health policies implemented in several Western countries have led to the conclusion that these approaches have limited effectiveness.

Current approaches to tackling obesity have limited effectiveness.

Recently, reflection to identify new levers for fostering healthy food choices has focused on the way food information is processed by individuals: a form of "cognitive vulnerability" to the food environment seems to influence eating behaviour, and could be a potential factor in the development and maintenance of obesity.

Organisation des Nations Unies pour l'éducation, la science et la culture
Chaire Unesco en alimentations du monde France
L'INSTITUT agro Montpellier
cirad
With the support of Carasso Daniel & Nina

Drawing on cognitive psychology to understand eating behaviours

Cognitive psychology is a field that focuses on studying human beings' psychological functions, including decision-making abilities. By studying how individuals make food decisions, cognitive psychology allows us to understand how to encourage healthy eating behaviours. Its object of study is at the crossroads between the individual and their environment: the individual perceives information from the environment through cognitive processes (i.e. automatic and controlled mental operations), and then sorts this information to act on their environment through their behaviour (Figure 1).

Due to the quantity of information coming from our environment, however, not all information is processed in the same way, leading to some information being prioritized and therefore having a greater impact on cognition. The signals processed as a priority include those associated with reward (pleasure) and those necessary for survival: two characteristic dimensions of food!

The diversity and abundance of food signals to which we are exposed in our daily lives (advertisements, restaurants, smells, etc.) far exceed our information processing capacity. Thus, some food signals, although non-attentively perceived, still influence our food choices. The study of cognitive processes allows us to understand what happens when an individual is not fully aware of all the information influencing their behaviour. The aim of the work carried out was to shed light on the interaction between the individual and their food environment.

METHODOLOGY

This work combines methods from cognitive psychology, neuropsychology, psychometrics, food science, and sensory analysis. Men and women with various weight statuses (normal weight, overweight, obesity) and between the ages of 18 and 60 took part in five studies. Several measures were taken to obtain a sample of healthy individuals with different weight statuses. First, participants with a chronic disease (heart diseases, diabetes, hypertension), taking a treatment affecting their alertness (anxiolytics, antidepressants or antipsychotics), or suffering from a disease that can affect olfaction (anosmia, hyposmia, chronic sinusitis, cold) were excluded from the sample. Pregnant women and individuals who had undergone bariatric surgery (surgery to reduce the size of the stomach or bypass it for weight loss purposes) were also excluded. Finally, at the end of the experimental sessions, all participants completed a questionnaire that assessed the presence of an eating disorder. The answers and performances of participants with an eating disorder were then excluded from the analyses.

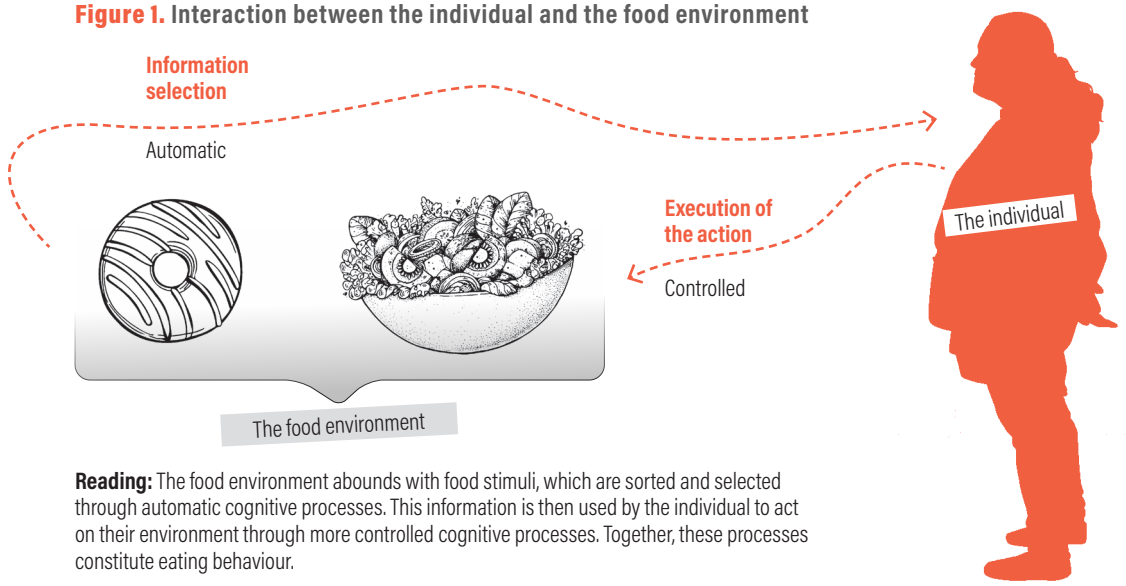
1. To simulate the effects of a consciously perceived obesogenic environment, the participants underwent cognitive tests on a computer. The tests included images of objects (controls) and images of high-energy-dense and low-energy-dense foods. Participants were instructed to detect the appearance of certain images on screen as quickly and accurately as possible. This process measured their cognitive performance when faced with different foods by recording their response time and error rate.
2. To simulate the effects of a non-consciously perceived obesogenic environment, participants were non-attentively exposed to very low concentrations of food odours (pear, pound cake).
3. In order to better understand the relationship between weight status and cognitive abilities, the participants underwent neuropsychological tests.
4. To ensure that weight status did not influence olfactory abilities, participants were given an olfactory test to determine their detection and identification capabilities for food and non-food odours.

An approach bias towards food

The results showed that food behaviour (and associated upstream cognitive processes—Figure 1) is biased by the presence of food stimuli in the environment, irrespective of the individual's weight status (Mas *et al.*, 2019). All individuals commonly have an approach bias towards food (i.e. a tendency to "go towards" food: attentional orientation, fast detection, difficulty to control behaviour towards food cues), and this tendency is especially pronounced for high-energy-dense foods (Mas *et al.*, 2020).

This tendency could be harnessed to prevent poor nutritional food choices: excessive consumption of fatty, sweet or salty foods could be avoided by counteracting the tendency to go towards these foods. It may be more instinctive to go towards food, including food of higher nutritional quality, than to refrain from consuming less healthy foods. Messages designed to steer consumers away from certain foods sometimes have a counterproductive effect, the so-called "boomerang effect", and ultimately lead to greater consumption of these products (Werle and Cuny, 2012). This suggests that prevention messages which encourage individuals to "go towards" foods with the most health benefits may therefore be more suitable than those that invite consumers to "avoid" consuming foods that are too fatty, too sweet or too salty. Likewise, increasing the availability of foods of higher nutritional quality appears to offer a promising way to avoid "default" choices, driven by the automatic tendency to gravitate towards energy-dense foods.

Figure 1. Interaction between the individual and the food environment



Reading: The food environment abounds with food stimuli, which are sorted and selected through automatic cognitive processes. This information is then used by the individual to act on their environment through more controlled cognitive processes. Together, these processes constitute eating behaviour.

A pervasive effect of the food environment

The studies conducted also revealed an effect of the non-attentively perceived food environment on the cognitive processes underlying eating behaviour.

No effect of food odours on participants' performance was observed when they had been notified of the presence of odours, nor when measuring controlled processes (such as behavioural inhibition). By contrast, non-attentively perceived exposure to food odours did have an effect on cognitive performance, which differed depending on the weight status of the individuals. When unknowingly exposed to the smell of pound cake (a smell that signals high-energy-dense food, participants with obesity directed their attention towards food items more than when the odour was absent. The response time in the cognitive tests of participants with overweight was slower when exposed to the odour of pear—a smell that signals a rather low-energy-dense food—than when exposed to a pound cake smell. No effect of the odours was observed on the performance of individuals with a "normal" weight status.

These results show that our food environment therefore has an effect on cognition, and that this effect is significant even when the individual is unaware of the presence of food cues around them. This helps to understand how the obesogenic environment affects eating behaviours in ways that are not simply a matter of willpower or being aware of dietary recommendations: these results illustrate the influence of automatic factors on cognition and food choices, factors which escape individuals' control and attention.

These findings highlight the importance of continuing to reshape our food environment to make it less "tempting" to individuals, so as to moderate its effect on choice behaviour. For example, this could be achieved by systematically offering nutritionally superior alternatives to high-energy-dense products and by limiting the advertising of fatty, salty or sweet foods.

Furthermore, informing consumers about the environment's rather automatic effects would enable them to be more vigilant and conscious in their decisions regarding food, which tend to be guided by the food environment. In this respect, intuitive eating, a method designed to enhance individuals' awareness of feelings of hunger and satiety when eating, seems to be a promising approach to develop in the context of food education and health prevention.

Finally, these results challenge the "lack of willpower" stereotype about obesity that is widespread in society, particularly among health professionals (Glauser, 2015). It would be beneficial to integrate these findings into healthcare practitioners' training and to better inform the general population, so as to reduce the stigma associated with weight status.

A conception of weight status in need of refining

The results also showed that olfactory and cognitive abilities (inhibition, mental flexibility) were rather similar from one individual to the next and did not depend on weight status. A link was however

observed between a high BMI and lower inhibition abilities (i.e. cognitive abilities to inhibit behaviour) (Mas *et al.*, 2022).

The conclusions of the study show that the definition of weight status categories based on BMI does not provide sufficient information to fully understand and therefore prevent obesity. It would seem pertinent to refine this unit of measurement by taking into account psychological, cognitive, and social factors of food choices. The French National Authority for Health is currently working on the implementation of new best practice recommendations for health professionals working with patients with obesity. Similarly, the 4th National Nutrition and Health Program[1] is striving for the psychological factors of obesity to be better taken into account.

1. https://solidarites-sante.gouv.fr/archives/archives-presse/archives-communiques-de-presse/article/lancement-du-4eme-programme-national-nutrition-sante-2019-2023

CONCLUSIONS

This work demonstrates how the food environment can influence decision-making mechanisms surrounding food, in an automatic and non-conscious way. Given the omnipresence of food in our daily lives (marketing, health and nutrition messages, public health policies), coupled with its growing accessibility (abundance of shops, diversification of supply sources, fast food restaurants), these are important questions with implications for human health.

The results highlight that the abundance of food in our environment can influence the cognitive mechanisms underlying dietary decision making, automatically favouring energy-dense foods of poor nutritional quality. These effects are independent of an individual's weight status and appear to be based on primary survival mechanisms. All individuals tend to automatically "go towards" food, especially if it is high-energy-dense. This potentially explains the obesogenic effect of the Western food environment. The findings shed light on relevant levers that can be used by public health policies to improve the health of individuals through a healthier diet. Notably, encouraging individuals to eat foods of high nutritional quality seems to be more effective than dissuading them from consuming foods of poor nutritional quality.

Some individuals appear to have a cognitive vulnerability to the food environment. This vulnerability is not just dependent on conscious factors, and challenges the "lack of willpower" stereotype that is often (wrongly) associated with obese individuals.

Reference

Doctoral thesis reference: Mas, M. (2020). Compréhension des processus cognitifs de traitement de l'information alimentaire chez des individus normo-pondéraux, en surpoids et en obésité : influence d'un amorçage olfactif implicite et rôle des caractéristiques individuelles (Number 2020UBFCH020) [Doctoral theses, Université Bourgogne Franche-Comté]. https://tel.archives-ouvertes.fr/tel-03141919

PhD funded by the Ministry of Higher Education, Research and Innovation (MESRI, Ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation) and carried out within the framework of the ImplicEAT project funded by the French National Research Agency (ANR-17-CE21-0001).

Bibliography

Mas M., Brindisi M.-C., Chabanet C., Nicklau S., Chambaron S. 2019. Weight Status and Attentional Biases Toward Foods: Impact of Implicit Olfactory Priming. Frontiers in Psychology, 10.

Mas M., Brindisi M.-C., Chabanet C., Chambaron S. 2020. Implicit food odour priming effects on reactivity and inhibitory control towards foods. PLOS ONE, 15(6), e0228830.

Mas M., Chambaron S., Chabanet C., Brindisi M.-C. 2022. Inhibition and shifting across the weight status spectrum. Applied Neuropsychology. Adult, 1-8.

Glauser T. A., Roepke N., Stevenin B., Dubois A. M., Ahn S. M. 2015. Physician knowledge about and perceptions of obesity management. Obesity Research & Clinical Practice, 9(6), 573-583.

Werle C. O. C., Cuny C. 2012. The boomerang effect of mandatory sanitary messages to prevent obesity. Marketing Letters, 23(3), 883891.

Authors

Marine Mas, clinical psychologist and Ph.D in Psychology, Dijon, France. PhD from the University of Burgundy, UMR Centre des sciences du goût et de l'alimentation (CSGA), INRAE, Dijon, France.

Stéphanie Chambaron, Research Director, UMR Centre des sciences du goût et de l'alimentation (CSGA), INRAE, Dijon, France.

Marie-Claude Brindisi, University Professor, hospital nutrition practitioner, Dijon-Bourgogne university hospital, France.

ISSN 2680-1329