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**Impact of Perceived Healthiness of Food on Food Choices and Intake**

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## **Abstract**

Healthy eating is an important determinant of health, but adherence to dietary guidelines remains a public health concern. Identifying factors that impact dietary habits are therefore important to facilitate healthy eating. One widely used strategy to help consumers make healthier food choices is nutrition information, such as labeling and claims. Despite the intention of these strategies to improve decision making, they can also be misunderstood or misinterpreted by consumers. The aim of this review is to explore food perceptions by examining how cognitive factors influence perceived healthiness of food, and the impact of perceived healthiness of food on food choices and intake. Overall findings of this review suggest that cognitive factors, such as type of food and branding, significantly contribute to judgmental bias and have an impact on perceived healthiness while not consistently or systematically influencing choice and intake.

## **Introduction**

Strong epidemiological evidence indicates that dietary choice and intake are important determinants of health, as dietary patterns play an essential role in reducing the risk of many chronic diseases (e.g., [1, 2]). Evidence on the links between diet and health underlies the development of current dietary guidelines and nutritional policies to promote healthy eating among the population (e.g., [3-5]). It has recently been shown in US adults that adherence to dietary guidelines is associated with a significantly lower risk of developing major chronic diseases [6]. Improvement in diet quality has also been recently associated with lower weight gain over many years [7]. Still, how many people really meet these recommended dietary guidelines? In Canada, assessment of food habits indicates that only about half of the adult population meets the minimum daily servings recommended for vegetables and fruit, and only a

third for milk products [8]. Identifying factors that impact eating patterns both positively and negatively thus remains an important public health challenge in order to help the population eat more healthy foods.

In an attempt to increase individuals' awareness toward healthy food choices and facilitate the adoption of better dietary patterns, various nutrition-education campaigns and nutrition tools have been developed by public health organizations. These initiatives represent a variety of strategies such as regulating the labelling of food products, including a variety of nutrient-content and diet-related health claims [9-11]. Together, these new regulations aim to help consumers make informed dietary choices that could assist in preventing health problems. Easily accessible sources of information, such as food-product labels, are in fact the primary source of nutrition information for most Canadians [12]. However, the presence of accurate and credible nutrition information on food labels does not always translate into clear understanding by the target population. A systematic review of the literature reported that consumers found nutrition information on food labels confusing, particularly with respect to more technical and numerical information such as the link between calories and energy or the difference between the terms "cholesterol" and "fatty acids." Besides the perceived complexity of nutrition information, they were better able to judge the overall healthiness of a food when using simple and familiar information as a point of reference [13]. Even if consumers looked at the food labels, they might not be able to understand fully and process it adequately, so the actual use and usefulness of nutrition information provided during food purchasing may be lower than expected [13]. Some evidence also suggests that people may become sceptical about nutrition messaging because of inconsistent and confusing information and/or scientific controversies covered (often inadequately) by the media. This consumer backlash against nutrition messages has been

associated with less healthful food choices [14]. It has been suggested that the presence of a health or safety message (i.e., “For your health, eat at least five fruits and vegetables a day”) may have a “boomerang effect” by negatively influencing food choices [15]. Werle and Cuny indeed observed that the choice of the healthy option decreased when this type of messaging was posted on menus. Consumers may make their own idiosyncratic interpretations of nutrition information. With several decisions to make each day, and with many of these decisions related to food choices, oversimplification of the nutrition information provided is a potential pitfall, so misinterpretations based on individuals’ perceptions about foods and unintended effects may occur.

Food perception is a very large concept that can be defined as how individuals think about food or the way they understand it. For example, it can relate to the meanings and values given by someone toward particular foods or ingredients (e.g., milk or gluten) or dietary patterns (e.g., vegetarianism). Perceptions can be considered as person-related determinants of food choice and behaviors [16]. Previous studies have shown that foods can be, and often are, perceived as healthy or unhealthy by consumers [17-19] and that consumer’s estimations of the energy content of foods can be biased by these perceptions [18, 19]. For example, it has been suggested that restaurants claiming to serve “healthy” foods may lead consumers to underestimate the energy density of the foods that they offer [20]. Categorical thinking about food and stereotypes has possible implications for food intake. This cognitive influence, called a “health halo” effect [20], may drive some consumers to allow themselves to eat more when they categorize some foods as healthy. We have indeed demonstrated that perceptions about the healthiness of food can have a significant impact on food intake (i.e., “if it’s healthy, I can eat more”) [21]. Such perceptions have also been identified in a qualitative study in which participants talk about “guiltless eating”

[22]. They mentioned that beliefs about healthy eating could influence portion control, with “healthy” foods being excluded from food intake monitoring [22]. Overall, these findings suggest potential negative and unintended consequences of perceived healthiness of food on food choice and intake.

In line with these concerns, the present review builds on the work conducted by our research team as well as by the work of other researchers over the last decade. The aim of this paper is to further explore the concept of food perceptions by examining some of the evidence related to how cognitive factors shape perceived healthiness of food, and the impact of perceived healthiness of food on food choices and intake.

### **Influence of cognitive factors: Theoretical background**

When faced with decisions, each person needs to use various information-processing strategies to make a choice. During this cognitive task, judgemental bias can influence these decisions.

Individuals tend to use automatic rules to make rapid everyday choices, in order to avoid the long and effortful process of analyzing each and every possibility, even though these mental shortcuts may be misleading [23]. Numerous food decisions are made each day, so these decisional shortcuts and the use of simplistic inferential strategies are often inevitable. Understanding the nature of these heuristics and the way they can contribute to deviations from logic and rational thinking may help facilitate everyday food choices. Two social psychologists, Nisbett and Ross, previously described human inference and its shortcomings [24]. Their work is complementary to the work of Kahneman and Tversky related to prospect theory and decision making under risk [25]. Nisbett and Ross argue that the basis for human inferences and intuitions are of two types [24]. The first are “knowledge structures” (i.e., beliefs, theories, propositions and schemas) that rapidly allow labeling and categorizing objects and events as appropriate or not. For example, a belief about food could be “salad is healthy”, which could lead one to categorize each and every salad as healthy, independent of its actual composition. The second are judgemental heuristics, which are cognitive strategies that reduce the complexity of inferential tasks to more simple judgemental operations (e.g., representativeness heuristic by simple similarity judgement, and availability heuristic by judging frequency, probability and causality). For example, a food could be considered as a healthy choice because it appears similar to another healthy food or because it is eaten frequently. Another intuitive strategy proposed by Nisbett and Ross involves the relevance and salience of the information, as meaningful information is more likely to be used in the inferential processes. For example, the more information is displayed on a package (in terms of color, size, etc.), the more it will contribute to decision making [24]. Unfortunately, these

cognitive strategies can lead to misleading conclusions, and may influence behaviors negatively. Within the eating research domain, two other psychologists, Herman and Polivy, suggested that to facilitate regulation of food intake, eaters have established (consciously or unconsciously) various norms in an attempt to avoid excessive eating [26]. A norm is defined as a belief, a cognitive construct that determines, in this case, the type and amount of food that is appropriate to eat [26]. Information from the food environment can serve as arbitrary guidelines as to what is allowed and acceptable, but these cues can also be misleading [27]. Someone could therefore overeat even while still believing that he or she is avoiding eating excessively [27]. Nutrition information provided on food labels and within advertising (e.g., health and nutrition claims, logos), or published by the media, influence social norms of healthy eating and contributes to simplistic inferential strategies. Restrained eaters (i.e., individuals who are concerned by their weight and attempt to restrict their food intake [28]) and overweight/obese individuals who are trying to better manage their weight could also be sensitive to nutrition information related to healthy eating and weight loss, since these are salient cues to support dieting rules. These cognitive influences, identified within the “health halo” effect [20], may contribute to overeating. As described by Chandon and Wansink, food marketing that includes branding and food claims (in addition to food pricing strategies) can bias food consumption [29].

### **Type of food and perceived healthiness of food**

Various factors may influence whether foods are categorized as healthy or unhealthy, such as their perceived fat content [19] as well as some stereotypical beliefs related to their names and description [30, 31]. In fact, categorical messages and popular beliefs about energy and fat content can influence the perceived capacity of food to promote weight gain [30]. For example, foods associated with negative attributions, were considered as weight gain promoters by men

and women participants even when energy content was similar or lower than foods associated with the health halo (e.g., 3 slices of bacon vs. 1 banana or 1 regular hamburger vs. 8 oz. container of low-fat fruit yogurt and 1 carrot) [30]. Furthermore, it has been demonstrated that perceptions about healthiness or how fattening a food is may bias estimations of energy content of foods [18, 19]. When compared to the actual energy content of the foods, “healthy” food choices are perceived as having lower energy content (underestimation), whereas “unhealthy” food choices were perceived as having higher energy content (overestimation) [18, 19]. A so-called “negative calorie illusion” has also been reported [32, 33]. In several experimental studies, participants tended to underestimate the energy content of a meal where a healthy food (virtue) was combined with an unhealthy food (vice), compared to the unhealthy food alone (vice alone), as the energy derived from the healthy item was not added to the total energy content of the meal [32, 33]. When attempting to replicate these findings, Forwood and colleagues underline the importance to use a reference food, as the negative calorie illusion was present only when healthy foods are compared against less healthy referents [34•]. Finally, Sutterlin and Siegrist reported that perceived healthiness of food could be misleading because of symbolic information [35•]. Using four different experimental studies, they consistently showed that the use of the term « fruit sugar » in the list of ingredients, instead of sugar alone, led the participants to rate the foods as healthier. If the influence of the type of food on food perceptions is translated into unintended consequences on food intake, “health halo” could be particularly meaningful for high-energy-dense foods, since energy intake is entirely dependent on the amount of food consumed [36].



## **Branding, perceived healthiness of food and food intake**

Messaging on food packaging is also noteworthy as this too can influence the perceived healthiness of food. Chandon and Wansink illustrated how food marketing could negatively influence food choices and intake [29]. More specifically, interesting findings from Cavanagh and colleagues clearly demonstrate how powerful brands can be [37, 38•]. In a first experimental study, women participants were exposed to an *ad libitum* snack of cookies that differed according to the brand labeling, i.e., brand usually related to healthy foods (Kashi) vs. brand usually related to less healthy foods (Nabisco) [38•]. They observed that when participants were exposed to the healthful brand, cookies were rated as better than when exposed to the less healthy brand (i.e., taste, flavour, satisfaction, and overall rating), which shows that branding can influence food perceptions. Also, a main effect of branding on food intake was found and an interaction with restrained eating, which revealed that restrained eaters exposed to the healthful brand ate more cookies than those exposed to the less healthy brand. No difference in food intake was noted among unrestrained eaters, suggesting that the influence of brand names could be more salient for restrained eaters. The authors proposed that restrained eaters could be more sensitive to the heuristic that healthy branded food contains less energy than brands associated with less healthy attributes, which could legitimate increased consumption [38•]. They replicate these findings in a second experimental study, in which participants were also exposed to a nutrition label indicating the amount of energy in calories per serving (low calorie, high calorie, no label) [37]. They observed that providing nutrition information influenced both liking and food intake. In fact, liking of cookies (i.e., flavor, satisfaction and overall rating) identified by the less healthy brand was significantly lower for participants exposed to the high-calorie label or to no label when compared to the low-calorie label. These findings suggest that unhealthy branded foods could be viewed as more attractive when labeled as lower in energy content. In addition, they reported that

participants generally ate more cookies when exposed to the low-calorie label compared to the high-calorie label and the no label [37]. While unrestrained eaters ate more cookies in the healthful brand condition, no matter if exposed or not to calorie labels, restrained eaters ate more cookies in the less healthy brand condition when they were exposed to a low-calorie label compared to a high-calorie label [37]. Again restrained eaters seem more sensitive to nutrition information (i.e., calorie labeling), particularly when the food is from a less healthy brand. On the other hand, when perceiving that a healthy company markets the food, energy content appears less important for restrained eaters. These results suggest that providing nutrition information may be insufficient in itself to counteract the effect of judgemental bias.

#### **Nutrition information: A strategy to counteract the influence of cognitive factors or not?**

Our previous work shown that perceiving a snack food (i.e., oatmeal-raisin cookies) as healthy (following verbal claims targeting healthy nutrients; e.g., soluble fibres, low in saturated fat and free from trans fat), significantly increased intake of that food by 35% during an *ad libitum* single meal in comparison to a condition in which the same food was perceived as less healthy (following verbal claims targeting hedonic ingredients; e.g., fresh butter and brown sugar) [21]. We also showed that even restrained women eaters, who think that they are successfully restricting their food intake, ate more of the “healthy” snack. The “healthy” snack was viewed as healthier and more appropriate to eat, again supporting the “health halo” effect [20]. In a larger study performed in normal-weight and overweight/obese men and women to assess the impact of verbal nutrition claims on food perceptions and intake during *ad libitum* snacks [39], we demonstrated that perceived healthiness of foods was influenced by nutrition claims, but this had no significant impact on food intake. To explain differences between findings, we hypothesized that importance given to nutrition by participants in the second study (which was conducted in a

well-known nutrition research center) might have prevented the presence of the “health halo” effect leading to higher food intake, but this need to be further explored. We recently assessed the impact of nutrient claims and calorie labelling on measured food intake over a 10-day period in women [40]. Our data showed that being exposed to a low-fat label or to a label indicating the amount of energy in calories per serving at lunch during 10 consecutive days did not influence food intake nor perceived healthiness of foods. Such findings stress the need to further investigate the public health impact of nutritional labelling strategies on dietary intake in various settings .

Wansink and Chandon observed that participants ate about 28% more calories from chocolate candies when they were labeled as low in fat than when labeled as regular [41]. Overweight participants were more sensitive to the “low-fat” labeling than were normal-weight participants; their intake increased by 47% (vs. 16% for normal-weight participants). To explain why the low-fat-label condition increased intake, the researchers noted that “low-fat” labeling increased perception of the appropriate serving size by 25%, decreased energy content estimation by 260 kcal, and reduced anticipated consumption guilt. Similar results regarding anticipated consumption guilt and calorie-content estimation were observed for both hedonic (i.e., chocolate candies) and utilitarian (i.e., granola) snacks with similar calorie density as well as for both normal-weight and overweight participants (with the exception that for chocolate candies, “low-fat” labels reduced anticipated guilt only among overweight individuals) [41]. These results thus demonstrated that “low-fat” labels contributed to overeating, although consumers were not aware that this nutrition claim influenced their consumption. Schuldt and Hannahan have also found a significant impact of “organic” food claim on perceived healthiness and taste quality [42]. They observed that organic foods were generally perceived as healthier, but less tasty; the latter result being mainly observed among participants showing low environmental concerns. Girz and

colleagues showed that calorie labels had significant impact on food choices, but only among restrained eaters [43•]. They were indeed more likely to choose a salad when the salad was described as containing less energy, while they were more likely to choose pasta (both low- and high-calorie pasta) when the salad was described as having higher energy content. Whereas restrained eaters' food choices were influenced by energy content information, they selected a less healthy food when the healthier one was labeled as high in energy. This information also influenced food intake, but mainly among unrestrained eaters. In fact, while no difference was observed among restrained eaters, unrestrained eaters exposed to energy content labeling and information about daily energy intake recommendation ate marginally less than those not exposed to calorie labels [43•]. Hodgkins and colleagues also compared the impact of different front-of-pack labeling strategies (i.e., guideline daily amounts, traffic lights, combination of guidelines and traffic lights, and health logos) on judgments about healthiness of the foods [44]. All the front-of-pack labeling strategies tested improved the ability to differentiate the healthier option within a food category, but no significant difference was noted between strategies providing only basic numerical nutritional information compared to strategies offering a more interpretive approach (e.g., colors with the traffic light or picture with health logos). They also observed that participants tended to underestimate the healthiness of pizza and yogurt, while they overestimated the healthiness of biscuits. One important factor underlined by the authors is the role that motivation or time may play when consumers are using nutrition information at point-of-purchase [44].

### **Other examples factors to consider when exploring the concept of food perceptions**

Motivational and emotional drives are also examples of factors that can also influence food choice decisions. In their qualitative research, Spence and colleagues reported that emotional

eating determines the portion sizes of « comfort » foods [22]. Kroeses and colleagues also demonstrated that strength of temptations could be associated to perceived healthiness of food, so that individuals may eat more from weak food temptations (considered to be less unhealthy) than from strong food temptations (considered to be more unhealthy) [45]. Besides cognitive factors and its influence on perceived healthiness of food, emotional states are thus important factors to consider to better understand eating behaviors, as they may influence healthy eating in a bi-directional way [46]. As described by Chandon and Wansink, pricing is also strong marketing factor to consider in predicting food choices and intake that needs further considerations [29]. In addition, contextual factors have been identified in the literature as important in decision processes. Cohen and Babey reviewed the evidence showing how eating behaviors can be largely influenced by automatic responses to contextual food cues (e.g., restaurants and grocery stores settings encouraging impulse purchases), which can have a significant impact on food choices and intake [47]. Positive eating approaches that help to better connect the individuals with their senses and their relationship with foods could be of interest to improve eating-related attitudes and behaviors, and make it more conscious [48]. In that context, an intuitive approach to eating by, for example, focusing on consciousness, paying attention to the context and to the foods when eating, satisfying hunger and reframing thoughts about foods (i.e., motivations) may be further explored as a relevant alternative to lessen automatic responses to food cues and reduce the role played by cognitive factors.

## **Conclusion**

Overall findings demonstrate how cognitive factors, such as beliefs and stereotypes about foods, branding strategies and nutrition information, influence perceived healthiness of food, which can then have an impact on food choice and intake. Results suggest that, cognitive factors significantly contribute to judgmental bias and have an impact on attitudes toward foods, such as perceived healthiness, while not consistently or systematically influencing choice and intake. To counteract this bias, the assumption that by giving nutritional information to individuals, they can, and will make well-informed and rational everyday food choices implies that eating is a conscious act. However, eating can be an automatic behavior that occurs without awareness [49]. Refusing tempting food requires continuous self-regulation effort [49], which can be temporarily effective but is not particularly sustainable in the long term. This may be even more the case for individuals who have lost weight, as peripheral cues are salient and ubiquitous [50]. In that context, previous work suggest that exposing dieters to diet-congruent food cues (e.g., fruits) may help them to better control their food intake when tempted by palatable food (e.g., chocolate) by unconsciously reminding them to stick to their diet [51]. Instead of focusing mainly on education and nutrition information (i.e., knowledge), individual counselling would benefit from targeted psychosocial determinants of healthy eating together with a more positive and intuitive approach to eating. Changing the eating environment to promote healthy eating will also facilitate food choice, nudging consumers towards healthier dietary patterns.

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**Compliance with Ethics Guidelines****Conflict of Interest**

Véronique Provencher and Raphaëlle Jacob declare that they have no conflict of interest.

**Human and Animal Rights and Informed Consent**

This review article contains studies with human subjects performed by Véronique Provencher. As indicated in the papers cited, these studies were all approved by authorized Ethics Committees (i.e., Office of Research Ethics at the University of Toronto and Laval University Ethics Committee)

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