The Low Intensity of Light: Behavioral and fMRI Insights Into the Effects of “Light” and “Organic” Claims on Flavor Processing

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As the popularity of healthfulness food claims increases, so do consumers’ waistlines. But why? We find that light claims reduce expected and self-reported flavor pleasantness and intensity whereas “organic” claims have the opposite effect. However, fMRI data suggest that people confuse flavor intensity and pleasantness.

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What You Expect is Not Always What You Get –
The Effect of Consumer Biases on Food Intake

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Paper #1: Mix it Baby - the Effect of Self-creation on Perceived Healthiness
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Paper #2: The Best of Both Worlds: Effects of Product Color Brightness on Hedonic Food Consumption
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Paper #3: Red Bull versus Red Thunder - The Influence of Brand Labels on Consumption Amount
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Paper #4: The Low Intensity of Light: Behavioral and fMRI Insights into the Effects of “Light” and “Organic” Claims on Flavor Processing
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SESSION OVERVIEW

All too often, consumers find themselves making decisions deviating from their initial expectations. Indeed, product perceptions are often biased by the incorrect but also unintended and unconscious use of perceptual aspects in consumers’ decision making (Kahn, Luce, & Nowlis 2006). These biased perceptions might lead to suboptimal decisions (Hoegg & Alba 2007). In fact, extrinsic factors such as price and irrelevant product attributes have been identified to bias consumers in this manner. For example, it has been shown that visual cues can be more instrumental in driving taste perceptions than actual taste (Hoegg & Alba 2007) and that consumers incorrectly rely on assortment aspects rather than inherent hunger or diet restrictions to derive the appropriate consumption amount (Kahn & Wansink 2004). These findings demonstrate that consumers’ consumption decisions are often influenced by factors that bias their expectations and in turn might influence their behavior. Especially in the context of food consumption, investigating how and why consumption biases influence expectations and consumed amount is timely, since obesity rates are rising.

Therefore, it is important to understand these types of consumer biases such that one can mitigate their negative impact (Kahn et al. 2006). The papers in this session fit this need as they all provide insight into potentially biasing factors in the consumption environment. Indeed, these papers provide new findings with respect to the nature of consumer biases, and simultaneously offer consumers strategies that may help them to avoid suboptimal decisions or even unwanted behavior (i.e. increased consumption). In doing so, this session adds to existing research (e.g., Chandon & Wansink 2007a; Raghunathan, Naylor, & Hoyer 2006; Shiv, Carmon, & Ariely 2005) that has sought to identify negative biases on consumption.

In the first paper, Gros, Klesse, Meise and Dahl show that customization can be a source of bias in consumers’ product perceptions (i.e. healthiness perception). They establish the counterintuitive finding that selecting your own ingredients as compared to receiving a prepared product decreases its perceived healthiness. In the second paper, Madzharov, Ramanathan and Block focus on the unexamined biasing factor that color brightness might have on food consumption. Not only do they show that people consume more from food products in light colors than from food products in dark colors but they also investigate the relevant role of the cognitive and affective reactions to food color that lead to this biased consumption. The third paper by Gros, Goukens, Goukens and de Ruyter investigates the effects of brand labels on the consumed amount of snacks. Three studies show that the consumed amount of branded versus private label products depends on the consumption goal/context. The last paper by Plassmann, Chandon, Wadhwa, Linder, and Weber investigates how different nutrition claims associated with health perceptions of foods influence expectations about taste. Behavioral studies suggest that people perceive light vs. organic food claims to be lower in flavor pleasantness and intensity. However, fMRI data shows it is only experienced intensity, but not pleasantness that differs.

Taken together, these papers (all in advanced stage) disclose four unobtrusive factors that foster consumer biases in a food consumption context. This session does not only demonstrate that subtle cues might lead to counterintuitive consumers’ product evaluations but, more importantly, they might even, unexpectedly, alter consumption behavior. As this session integrates diverse paradoxical phenomena in a food consumption context and integrates a diversity of research techniques (behavioral data and neuroscience data), we believe it contributes to the topic “Appreciating Diversity”. We believe that this session will draw attention from a diverse audience. More specifically, it is expected to appeal to those interested in consumer biases, food consumption, self-control, and self-regulatory processes.

Mix it Baby - the Effect of Self-creation on Perceived Healthiness

EXTENDED ABSTRACT

Nowadays consumers are often given the opportunity to customize a certain product (Bendapudi & Leone 2003). Even companies in the food industry (e.g., M&Ms, Chocomize or Mymuesli) engage customers in the production process. That is, consumers have the possibility to select between different chocolate toppings or cereal ingredients and can create their individual product.

The primary purpose of this research is to explore whether the mere act of selecting one’s own ingredients for a given food/drink influences its perceived healthiness. Considering the increasing trend for customization as well as the rising rates of obesity, it is relevant to investigate whether customizing food products could bias consumers’ healthiness perceptions. In doing so, this research intends to add to existing research that identifies factors, such as price (Shiv et al. 2005), health positioning (Chandon & Wansink 2007a), and healthi-
ness (Raghunathan et al. 2006) which bias consumers’ product perceptions. We present three studies to demonstrate that the mere act of selecting one’s own ingredients as compared to buying the complete product decreases its perceived healthiness. Further, we show that this effect occurs independently of whether individuals perform the mixing action themselves or merely select the ingredients of their choice.

Study 1 fulfills the purpose to investigate whether students that mix their own juice and those that obtain a ready-made juice differ in their healthiness perceptions of the drink. For this purpose we asked students (N=85) entering the university whether they would like to have a free glass of juice in exchange for answering a questionnaire. Depending on the condition the student either saw one carafe containing a mixture of juices (non-creators) or three different carafes (self-creators), each containing a different juice. Since we want to test whether the mere act of selecting ingredients influences individuals’ healthiness perceptions, we need three juices that do not differ in perceived healthiness. Based on a pre-test (N=38) we selected cranberry, lemon and orange juice since these juices were rated as equally healthy and tasty. After participants mixed their juice or obtained the prepared mix they were given a short questionnaire. The dependent variable was the perceived healthiness of the juice measured on a 7 points semantic differential scale (1=healthy and 7=unhealthy). An ANOVA with the healthiness ratings of the juice as dependent variable revealed that self-creators (Mself-creators=2.88, SD=0.21) rated the juice as significantly less healthy than non-creators (Mnon-creators=2.12, SD=0.21; F(1,83)=6.58, p<0.05).

Study 2 replicates these findings in a laboratory setting. For generalizability of our findings, we make use of food (i.e., cereal). In line with study 1 we intend to explore whether selecting your own cereal ingredients as compared to obtaining a prepared mix decreases the perceived healthiness of the cereal. Participants (N=62) were assigned to a self-creator condition or non-creator condition. While the self-creators selected the cereal ingredients of their choice (dried strawberries, dried apples, hazelnuts and almonds; pre-tested to be equal in perceived healthiness and taste), the non-creators obtained a prepared mix of ingredients. Before participants were allowed to eat the cereal, they indicated its perceived healthiness on an 11 point Likert scale (0=unhealthy, 10=very healthy). An ANOVA with the healthiness ratings of the cereal as dependent variable revealed that self-creators (Mself-creators=6.39, SD=0.32) rated the cereal as significantly less healthy than non-creators (Mnon-creators=7.29, SD=0.32; F(1,60)=4.07, p<0.05).

Study 3 fulfills the purpose to explore whether this effect is dependent on the physical act of mixing the ingredients together oneself. To test this we manipulate whether participants (N=114) can create their own cereal (self-creators vs. non-creators) and whether they perform the action of mixing themselves (yes vs. no). We make use of cereal but use different ingredients (i.e., walnuts, pumpkin seeds and dried strawberries; pre-tested to be equally healthy and tasty). The set-up for study 3 is similar to study 2. However, we manipulate whether participants perform the act of mixing their ingredients themselves or whether a researcher assistant takes care of this. That is, self-creators can either fill the ingredients of their choice together themselves or tell a researcher which ones to mix. Similarly, non-creators can either fill the pre-determined ingredients together themselves or a researcher takes care of this. Before participants were allowed to eat the cereal, they indicated its perceived healthiness. A two-way ANOVA with healthiness ratings of the cereal as the dependent variable revealed a statistically significant main effect for creating your own cereal with self-creators rating the cereal as less healthy (Mself-creators=7.93, SD=0.22; F(1,110)=4.02, p<0.05) irrespective of who performs the action of mixing the ingredients.

Our studies reveal customization as a factor that biases consumers’ healthiness perception: The mere act of selecting ingredients oneself decreases consumers’ healthiness perception. We believe that this decrease in perceived healthiness could be due to altered variety perceptions. Extant research revealed that consumers’ perceptions of variety are not necessarily contingent on the actual number of options present but can be influenced by assortment structure (Kahn & Wansink 2004) or categorizations (Mogilner, Rudnick, & Iyengar 2008). In line with this, we argue that selecting ingredients oneself might alter individuals’ variety perceptions because it draws individuals’ attention to the separate ingredients (i.e., sub-categories) rather than the product as a whole. Consequently, we argue that self-creators are more likely to recognize high- or low variety, i.e. three/four different ingredients than non-creators as in our experiments. In line with this argumentation study 3 demonstrates that self-creators rate the perceived variety as lower than non-self-creators. Further, we argue that individuals associate product variety with healthiness. That is, we predict that self-creators perceive the product as less healthy because they perceive it to contain less variety than non-creators. In a follow-up experiment, we intent to test this argumentation explicitly by manipulating the variety of ingredients participants choose from. If our effect is indeed caused by the fact that self-creators perceive the choice set to offer less variety, the effect should be blocked or even reversed if they can choose from a high variety of ingredients.

The Best of Both Worlds: Effects of Product Color Brightness on Hedonic Food Consumption

EXTENDED ABSTRACT

Color of food is essential for the consumption experience as it forms expectations about the food’s flavor, freshness and taste (Chandon and Wansink 2010). In modern days, more and more foods are created in colors that do not necessarily match their natural color or have little relation to flavor (e.g., Gatorade drinks, Goldfish crackers, M&Ms). Advances in food coloring technology have made it possible for food companies to use color in innovative ways in order to differentiate their products, add variety to their assortments, and even to bring more fun and excitement to the food experience. Despite a dramatic increase in the variations and shades of colors and the corresponding increase in consumers’ acceptance of them, scant attention has been paid to the topic of color in a food context in the consumer research literature (Labrecque and Patrick 2012).

Much of the consumer behavior research on color has looked at the effects of specific hues or hue categories (e.g., red vs. blue), while it has neglected the effects of color brightness, defined as the degree of lightness or darkness of the color (Labrecque and Patrick 2012). However, extant research from psychophysics and psychology posits that color brightness can produce strong systematic effects on people’s emotions, perceptions and behavior (Meier, Robinson, and Clore 2004). For instance, previous research has found that lighter vs. darker colors evoke more positive affect and carry more positive meaning, and that people automatically perceive light objects positively and dark objects negatively (Meier et al. 2004). In the present research, we build on these findings, and propose that color brightness of the food will serve as an implicit perceptual and affective cue that ultimately biases food consumption.

Over a series of five studies, we present evidence that the color brightness of a hedonic food serves both as an automatic evaluative cue about its taste and healthiness and as an input to in-the-moment emotions that ultimately bias the volume of food consumed. We
demonstrate that light-colored foods are seen as both healthier and tastier, and are consumed more than dark-colored snacks. In addition, we show that the increased consumption of light-colored foods is due to a heterogeneous emotional response, with some people doing so due to increasing positive emotions and others due to decreasing negative emotions.

In study 1a we begin an investigation of the effect of food color brightness on consumption volume with two colors that vary on brightness but not on hue and chroma in order to control for these two properties of color. Study 1a was run as a single factor (product color brightness: light vs. dark color vs. control) between-subject design where respondents were given white M&Ms in the first condition, black M&Ms in the second, and gray M&Ms in the control condition. Respondents consumed more of the white M&Ms than the gray and black M&Ms. These effects were robust even after controlling for factors such as color preference, product liking, hunger and dietary restraint. In Study 1b we replicated these effects of increased consumption of the light-colored food with a different food product and shades of color, namely Golden Oreos which have a light, beige color, and Original Oreos which have a dark, black-brown color.

In study 2a, we used an IAT test to investigate the nature of the evaluations that people have of food that differs on color brightness. The results show that light-colored snacks are automatically seen as healthier, but also as tastier than dark-colored snacks. Thus, light-colored foods develop a positive halo that is deeply internalized, thereby evoking an automatic positive response among consumers, in terms of both the short-term hedonic and the long-term functional consequences of consumption. In study 2b we use a process-dissociation test and show that the health-related evaluations are stronger than the taste-related evaluations.

In Study 3 we examine how color brightness affects the dynamics of both positive and negative emotions over time as people consume the food. The results revealed that the effect of product color on emotions is heterogeneous. Two distinct latent classes of individuals were identified from the emotion data: a) High positive, Low negative, and b) High positive, High negative. In the first class, light-colored foods caused a strong ramp-up in positive emotions compared to dark colored foods, but had no effect on negative emotions. In the second class, light colored foods caused a significantly reduced level of negative emotions over time compared to dark colored foods, but had no effect on positive emotions. In addition, the analysis revealed that these emotion trajectories mediated the effect of color on consumption.

In the present paper we identify a new food halo, namely the effect of color brightness as a perceptual cue that automatically influences evaluations, in-the-moment emotions and actual consumption. We contribute to the literature on stimulus-based effects on food consumption by being the first to show that the color of the food itself influences consumption volume. This work also represents the first research in consumer behavior to provide an in-depth exploration of the effects of color brightness. In doing so, we also contribute to the consumer behavior and color psychology literatures by providing a moment-to-moment analysis of the effect of color during actual consumption.

Red Bull versus Red Thunder - The Influence of Brand Labels on Consumption Amount

EXTENDED ABSTRACT

Existing literature illustrates and supports that marketing actions can affect consumers’ judgments, expectations and behavior. Studies investigating the influence of branding information on behavior showed, for example, that the energy brand displayed on cars in video games can affect the driving style (e.g. speed (Brasel & Gips 2011)), and that the pricing of an energy drink can impact objective performance metrics, also referred to as the placebo effect (Shiv et al. 2005). However, none of them investigated the effects of brand information on the consumed amount of that specific product. This is however an urgent matter given that the number of consumers switching from national brands to private label brands is drastically increasing (Steenkamp, Van Heerde, & Geyskens, 2010).

Based on the placebo effect literature in marketing, we assume that branded products are perceived to be more effective and of higher quality compared to private label brands. These differences in perception might affect the consumed amount of these products in two opposing ways. On the one hand, the higher effectiveness and quality signaled by a branded product might lead consumers to consume more of the branded product to generate more added value. On the other hand, previous research has shown that consumers trade off taste reductions for increased consumption. That is, labeling food as “healthy” reduces consumers’ taste expectations (Raghunathan et al. 2006) and labels such as “low-fat” increase food intake (Wansink & Chandon, 2006). Following this reasoning, it might be that consumers compensate for the perceived lower quality of private label products by consuming more of them.

This research intends to shed some insight in these opposing predictions. Interestingly, we see that the answer is not as univocal as previously thought. Across three studies, we see that the relationship between branding and consumption depends on the consumption context. More specifically, if a product (e.g., candy) is consumed for a purpose in line with the general positioning of the brand (e.g., pleasure), consumption is expected to be higher for the branded product since this product is of higher quality and therefore expected to be more effective in contributing to reach the purpose. In other words, attributes communicated through the branding of a product become more relevant and thus consumers will consume more of the product to derive those benefits. However, interestingly, if a product (e.g., candy) is consumed for no particular purpose (e.g. recognition task), consumption is expected to be higher for the private label product since consumers want to compensate the lower quality by consuming more.

Study 1 (N=182) investigates the effect of brand information on the consumed amount of cola candies in two different consumption contexts. Cola candies are advertised as a product to enjoy. Participants were given a bowl of cola candies, preceded by a text with either no specific brand information, a “well-known and internationally recognized brand”, or a “private label” information, and were asked to rate the candy either on taste enjoyment (Product Related context) or taste recognition (Product Unrelated context). A two-way ANOVA with consumption amount as the dependent variable revealed a statistically significant interaction effect (F(2,176)=5.700, p < .05), indicating that in the Related Context condition more of the “branded” cola candies is consumed compared to the “private label” cola candies or the cola candies without any brand information. However, in the Unrelated Context condition, participants ate more of the “private label” cola candies compared to the “branded” cola candies or the cola candies without any brand information.

Study 2 (N=78) replicates these findings with another hedonic product (i.e. chocolate spread) and with an adjusted manipulation in which the consumption time was kept constant (exactly 12 minutes). Chocolate spread is also positioned as a product to enjoy. The results of the 2 (Label: Nutella vs Private label) x 2 (Product Related context) design where respondents were given white M&Ms in the first condition, black M&Ms in the second, and gray M&Ms in the control condition. Respondents consumed more of the white M&Ms than the gray and black M&Ms. These effects were robust even after controlling for factors such as color preference, product liking, hunger and dietary restraint. In Study 1b we replicated these effects of increased consumption of the light-colored food with a different food product and shades of color, namely Golden Oreos which have a light, beige color, and Original Oreos which have a dark, black-brown color.

In all three studies the branded product was used. All products were pre-tested on their hedonic/functional perception.
text: enjoyment of a movie vs Product Unrelated context: remembering details of a movie) design indicate a significant interaction effect on consumption (F(1,71)=5.470, p < 0.05). In the Related Context condition, more is consumed “Nutella” chocolate spread compared to “private label” chocolate spread. However, in the Unrelated Context condition, more is consumed of the “private label” chocolate spread compared to the “Nutella” chocolate spread.

Study 3 (N=92) intends to rule out an alternative hypothesis for the above-found effect. That is, in the two previous studies, the product-related context was always an hedonic context, while the product unrelated context was a utilitarian one. This might drive the results. In this study we therefore used a product that is positioned as a product that is consumed for utilitarian reasons (i.e., Red Bull). A 2 (Label: Red Bull, Private Label) x 2 (Product Related context: non-verbal reasoning test vs Product Unrelated context: watching a movie) design reveals a significant interaction effect on consumption amount (F(1,88) = 10.192, p < 0.01), replicating the findings of the previous studies. When doing a non-verbal reasoning test (Product Related context), participants consume significantly more of the Red Bull energy drink compared to the energy drink labeled as a private label. When the consumption does not have a particular purpose (Product Unrelated context), participants consume significantly more of the energy drink labeled as a private label compared to the energy drink labeled as Red Bull if the consumption.

Throughout three studies, we show that the consumed amount of branded versus private label products depends on the consumption goal/context. Interestingly, when the product does serve the consumption purpose, people consume more of the product if it is labeled as a well-known brand. However, if the product does not serve the consumption purpose, people consume more of the product if it is labeled as a private label. These findings imply that positioning branded products as serving a particular purpose seems to be a profitable strategy since it increases consumption of the branded product.

The Low Intensity of Light: Behavioral and fMRI Insights into the Effects of “Light” and “Organic” Claims on Flavor Processing

EXTENDED ABSTRACT

Why has people’s weight kept increasing even though “healthy” foods have become more popular? One explanation is that people eat more when foods are positioned as healthy (Chandon & Wansink 2007a; Provencher, Polivy, & Herman 2009; Wansink & Chandon 2006). However, other studies (Raghunathan et al. 2006) have shown that people expect healthy food to taste less good. How can we reconcile these two findings and understand why people eat more when they expect the food to taste less good?

One reason is that people eat more when the food is presented as “healthy” (either as “diet,” or “organic”) because they expect that it contains fewer calories and hence that they can eat more of it without gaining weight (Chandon & Wansink 2007b; Provencher et al. 2009; Wansink & Chandon 2006; Schuldt & Schwarz 2010). On the other hand, these healthfulness claims differ with respect to consumers’ expectations about the tastiness of the food. Unlike light foods, organic foods are perceived to be both healthy AND tasty (Niewold 2010).

Exploring answers to these conflicting findings about health associations, we examine how claims that the food is “light,” “organic,” or “regular” influence flavor perceptions using behavioral, self-reported, and neuro-imaging data. By doing this, we test another explanation of the “low fat food and high fat people” phenomenon, which is that people expect food positioned “light” to have a less intense flavor, and hence consume more of it to achieve the desired levels of hedonic satisfaction.

In the first study, 57 participants were asked to sample a regular version of a drink and then to match the flavor pleasantness or flavor intensity of this drink with another (not sampled) drink that was either labeled as “healthy” or “organic”. To do this, they were provided with concentrated pure flavor extracts, which they were asked to add to either the “regular” drink they had just sampled or the other drink. Participants added more flavor to the “light” drink than to the “regular” drink (F(1, 56) = 77.61, p<.001), regardless of whether they were asked to match them on pleasantness (Mlight=4.85, SEM=.49 vs. Mregular=0.58, SEM=.26) or on intensity (Mlight=5.63, SEM=.73; Mregular=0.68, SEM=.26). As predicted, the organic claim had opposite (though weaker) effects (F(1, 56) = 7.46, p<.05). People added more flavor to the regular drink in both the pleasantness matching task (Morganic=1.01, SEM=.31 vs. Mregular=2.05, SEM=.47) and the intensity matching task (Morganic=1.43, SEM=.39 vs. Mregular=3.06, SEM=.71). Overall, the study showed, from behavioral data, that people expect “light” to be worse than “regular”, which is in turn worse than “organic”, in terms of both flavor pleasantness and intensity.

In the second study (N=58), we investigated how flavor expectations induced by health claims affect how the flavor is actually experienced using both self-reported and functional magnetic resonance (fMRI) data. Consistent with the expectations obtained in Study 1, experienced pleasantness was higher in the “regular” (Morganic=5.62; SEM=0.21) than in the “light” condition (Mlight=5.27; SEM=0.21; T(1,28)=2.93; p<.05). Another comparison also showed that pleasantness was higher in the organic condition (Morganic=6.09; SEM=0.16) than in the regular condition regular (Mregular=5.58; SEM=0.17; T(1,28)=3.74; p<.001). Ratings of experienced intensity were also consistent with the expectation results found in study 1 for light claims (Mlight=5.83; SEM=0.17 vs. Morganic=5.19; SEM=0.19; T(1,28)=3.66; p<.001) but not for organic claims, which did not significantly affect experienced flavor intensity (Morganic=5.68; SEM=0.14 vs. Mregular=5.68; SEM=0.14; T(1,28)=0.04; p=.52).

Analyses of the brain activity while people were consuming these identical foods were consistent with the reported ratings for intensity, but not for pleasantness. The “light” label reduced activity in the brain area encoding flavor intensity (i.e. the ventral striatum, amygdala), and activity in this area was similar in the “organic” and “regular” conditions. The “organic” label increased brain activity in the area encoding flavor pleasantness (i.e. the orbitofrontal cortex), which was consistent with the ratings. However, activity in the area encoding pleasantness was similar in the “light” and “regular” conditions, contrary to what the self-reports indicated. These results support earlier findings about the unreliability of self-reported measures of flavor intensity, which did not adequately represent brain activity, and demonstrate the value of measuring brain activity to understand the effects of food claims. More importantly, they show that people actually experienced similar taste pleasantness for light food.

Given the interesting pattern of results for the “light” claims, in a third study, we focused on the effects of “light” claims. We asked 34 participants to add milk to a drink powder that either claimed to be “light” or “regular”. People added less milk when the powder was labeled as “light” (M = 294.26 ml; SEM = 36.85 ml) than “regular” (M = 327.08 ml; SEM = 49.09 ml; F(1,32)= 8.52, p<.01). Yet, they expected to need to drink more of a pre-mixed version of the drink to feel full for three hours when the powder was labeled “light” (M = 675.23 ml; SEM = 55.01 ml) vs. “regular” (M = 403 ml; SEM = 36.03 ml; F(1,32)= 3.19, p<.08).
Overall, our results show that “light” and “organic” claims, while both seen as improving the healthfulness of the food, have mostly opposite effects in terms of the flavor of the food. Organic claims improve expected flavor intensity and both expected and experienced pleasantness, and these results are consistent across all measures.

Our results about the effects of “light” claims reveal an intriguing pattern. People think that “light” foods have a less pleasant and less intense flavor, before and after consuming them, which is why they expect that they have to drink more of it to be satiated. However, fMRI data shows that “light” claims only influence experienced intensity, but not pleasantness. Thus, people may overeat light products because of reduced perception of flavor intensity—yet may misattribute it to lower taste pleasantness. This may explain the paradoxical phenomenon that people overeat light products even though they expect to like them less. It also offers a potential solution: Let people compensate for the lower expected intensity of light products by increasing the dosage of the flavor component, rather than by eating more of it.

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