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The Impact of Sugar-Related Claims on Perceived Healthfulness, Caloric Value and Expected Taste of Food Products

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Abstract

Food packaging usually includes multiple cues, including claims about nutrients that may modulate how the consumer perceives (and behaves towards) the product. In the current work, we systematically examined how different types of claims about sugar influenced the perception of food product categories (i.e., yogurts, ice creams, cookies, and breakfast cereals). In two experiments (combined n = 406), participants were asked to evaluate the perceived healthfulness, expected taste, and caloric value of products with (vs. without) sugar-related claims. Specifically, the claims were on the sugar content ("0% sugar", "sugar-free", "no added sugars", "low sugar" - Experiment 1) or on the type of sugars or sweeteners of natural origin ("sucrose", "cane sugar", "honey" and "stevia" - Experiment 2).

Results from Experiment 1 revealed that all products with sugar-related claims were perceived as healthier, less caloric, and less tasty than the regular alternatives. Still, products with the "low sugar" claim were perceived as the least healthy, most caloric, and tastiest. In Experiment 2, we observed that products with "stevia" claim were rated as healthier, less caloric, and less tasty than regular products. In both experiments, the frequency of consumption of products with sugar-related claims was positively associated with the general perception of these products, the influence of nutritional information on consumption decisions, attention to sugar intake, and interest in nutrition.

Overall, our results show that sugar-related claims may influence consumer's perceptions about food products, but the direction of that influence depends on the type of claim and evaluative dimension.

Keywords: S*ugar; Claims; Healthfulness; Expected Taste; Calories; Food perception*

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1. Introduction

Food labels are an important aspect of food packaging that can influence the decision to purchase and/or consume a particular food product. These labels include summaries or detailed nutritional information (e.g., nutritional traffic light system; nutrition facts panel) or statements associating certain nutrients with health benefits. Food claims have become a recognized means of communication with the consumer (van Trijp & van der Lans, 2007), and their use is legislated (e.g., European Union EC No 1924/2006; EU No 1047/2012). For instance, nutrition claims are statements about a particular nutritional characteristic of the product and include "content claims" (e.g., "sugar-free") and "comparative claims" (e.g., "reduced sugar", EC, 2006; Buul & Brouns, 2015; Mayhew et al., 2016).

Previous studies have concluded that nutritional claims may help consumers make healthier and informed food decisions (for reviews, see Kaur et al., 2017; Talati et al., 2017). However, the effectiveness of claims depends on whether consumers can correctly interpret them, which is often not the case (Anastasiou et al., 2019). Indeed, food claims may even mislead consumers (Roe et al., 1999) when they attribute excessive health benefits to a food product or infer the healthiness of a product simply because it contains a health or nutrition claim (e.g., Kaur et al., 2017; Williams, 2005). The impact of claims on perceived healthiness was even found with fictitious claims (i.e., "MUI-free", Priven et al., 2015). Critically, consumers may overlook potentially negative attributes (e.g., high sugar) due the presence of claims about positives ones (e.g., with calcium, Hastak & Mazis, 2011; Wellard et al., 2015). These effects may reflect a positivity bias (i.e., judging a product with a claim more favorably than a product without such claim, Roe et al., 1999) or a health halo effect (i.e., consumers generalize a positive perception to other characteristics that are not explicitly mentioned in

the claim, Chandon & Wansink, 2007; Roe et al., 1999). These misperceptions are particularly concerning for nutritionally poor products (Miklavec et al., 2015). For example, a systematic comparison of thousands of products has shown that products labeled as "reduced calories", "light", "low fat" present higher sugar-content than their "regular" versions (Nguyen et al., 2016).

Excessive sugar intake has been associated with numerous adverse health outcomes (e.g., overweight and obesity, Kleef & Dagevos, 2015). Considering this, the WHO (2015) recommends reducing free sugars intake throughout the life-course to less than 10% (ideally 5%) of total daily energy intake. Yet, overconsumption of sugar seems highly prevalent in numerous countries. For instance, in Portugal, 24.3% of the adult population, 48.7% of adolescents, and 40.7% of children exceed the intake recommended by the WHO (Lopes et al., 2017). Governments have developed several measures to address this problem (e.g., taxation of products with high sugar content, for a review, see Prada, Rodrigues, et al., 2020). For example, the "Integrated Strategy for the Promotion of Healthy Eating" developed by the Portuguese government (Dispatch No 11418, 2017) recommends the intake of "low sugar" products (i.e., less than 5% of sugar). Within the EU (2012), products may present claims such as "Low sugar" (i.e., no more than 5g of sugar per 100 g for solids, or 2.5 g of sugar per 100 ml for liquids); "Sugar-free" (i.e., no more than 0.5 g of sugar per 100 g or 100 ml); and "No added sugar" (i.e., sugars have not been added to food). Besides these quantitative claims, food packaging often presents other statements regarding the "type" of sugar or sweetener included in product's composition (e.g., "with cane sugar", "with coconut sugar", "with stevia").

Several studies have suggested that both types of claims related to sugar are able to influence consumers' perception and behavior toward food products. For example, consumers perceive products with claims such as "fruit sugar" (Sütterlin & Siegrist, 2015) or "reduced

sugar" (Nobrega et al., 2020) as healthier than their regular counterparts. However, not all the inferences seem to be positive as products with this type of claims are also sometimes deemed as less tasty (Lähteenmäki et al., 2010; Nørgaard & Brunsø, 2009; Raaij et al., 2009) and sweet (McCrickerd et al., 2020), with consumers preferring regular products over their sugar-reduced alternatives (Markey et al., 2015). For example, Patterson et al. (2012) conducted a study to explore consumer understanding of product claims, focusing mainly on nutrition claims related to sugars in the UK. The authors found that participants expected a calorie reduction when a product included a reduced content claim (e.g., "reduced sugar") and expressed negative reactions towards those products (e.g., "I really don't like the taste"). These negative expectations regarding the taste of products may be an important obstacle to reducing the quantity of sugar added to products.

Nonetheless, the impact of claims on food perception may depend on product category or even the consumers' characteristics. For example, Kaur et al. (2017) concluded that the effect of health and nutrition claims is greater for certain products (e.g., fish, meat, fruits, and vegetables) than for food products categorized as high in fat or sugar. Research has also pointed out that the impact of food claims may vary according to how frequently consumers use nutritional information. Using nutritional information is especially relevant in certain situations, namely when comparing the nutritional content of two products or buying a product for the first time (Gomes et al., 2017). Notably, women (e.g., Anastasiou et al., 2019; Gomes et al., 2017), young people (e.g., Campos et al., 2011; Gomes et al., 2017), and individuals with higher income (e.g., Anastasiou et al., 2019), and higher educational levels (e.g., Roe et al., 1999; Gomes et al., 2017) are more likely to use nutrition labels. A recent study showed that Portuguese consumers use information about sugar content more frequently than information related to other nutrients and consider this nutrient the most important to watch out for to stay healthy (Prada, Saraiva, et al., 2020). This was particularly

true for women, participants with children in the household, and with higher education. These groups of consumers were also more accurate in categorizing ingredients (e.g., sucrose, maltose, honey) as being intrinsic or added sugars.

1.1 Overview of the Current Studies

To the best of our knowledge, no previous studies systematically compared the influence of different sugar-related claims on food perception. Here, we present two experiments examining how the use of claims about sugar content (Experiment 1) and claims referring to the type of sugar or sweetener (Experiment 2) influence the perception of food products. Including different product categories is important to test for the generalizability of the effect of such claims. For the current studies, we selected food product categories that contribute significantly to the daily intake of free sugars in Portugal, namely ice-cream, yogurts, cookies, and breakfast cereals (Lopes et al., 2017).

Specifically, in Experiment 1, we examined how nutrition claims regarding sugar content (i.e., “sugar-free”, “no added sugar”, “0% sugar” and “low sugar”) influence the perceived healthfulness, calories, and expected taste of different products in comparison with their regular version (i.e., without such claims). Experiment 2 examined the impact of nutritional claims that highlight the presence of different types of sugars or sweeteners of natural origin (i.e., “sucrose”, “cane sugar”, “stevia”, and “honey”, hereafter referred as “natural sugars”) in the same evaluative dimensions.

In line with the health halo effect (e.g., Chandon & Wansink, 2007), we expected that products with both types of claims about sugar would be perceived as healthier and less caloric in comparison to “regular” products. Predictions about the impact on expected taste may depend on the type of claim. Specifically, claims regarding sugar content (Experiment 1) are likely to negatively impact expected taste ratings (e.g., Patterson et al., 2012, Lähteenmäki et al., 2010). However, it is possible that claims regarding the presence of

different types of natural sugars (Experiment 2) positively impact expected taste ratings due to the known associations between naturalness and tastiness (for a review, see Román et al., 2017). Finally, we also assessed the role of individual characteristics (e.g., frequency of use of nutritional information, gender, age, education level) in participants' assessments.

2. Experiment 1

2.1 Method

2.1.1 Participants and Design

This study included 200 Portuguese-speaking participants who volunteered to collaborate in this online study (83% woman, M_{age} = 30.26, SD = 11.22). Participants were recruited through social networks websites (snowball sampling). Most participants reported having or attending higher education (67.5%). Nearly all participants (91%) reported having a regular/omnivorous diet, a Body Mass Index (BMI) within the normal range (64% of 189 valid responses), and not having been diagnosed with a health condition that impacts their eating habits (only 12.5% reporting conditions such as diabetes, allergies, intolerances, see Table 1).

The design included two within-participants factors: 4 (Product categories: breakfast-cereals, yogurts, ice cream, cookies) X 4 (Type of claim: 0% sugar, sugar-free, no added sugar, low sugar). The main dependent variables were perceived healthiness, caloric value, and expected taste.

INSERT TABLE 1 HERE

2.1.2 Procedure and Measures

This study was approved by the Research Ethics Committees of the [Blind for Review]. Participants were invited through social network websites to collaborate in a web survey (hosted in Qualtrics) about the perception of food products.

The instructions page explained the general goals of the study and stated ethical considerations (benefits and voluntary nature of participation, anonymity, confidentiality, and that participants could end their participation at any time). After obtaining written informed consent, participants were asked to provide sociodemographic information (e.g., gender, nationality, occupation, education). Instructions for the main task stated that participants were to evaluate four food categories (yogurts, ice cream, cereal breakfast, and cookies in random order). Each product category (written in all capitals at the center of the screen) was paired with the four claims about sugar content (0% sugar, sugar-free, no added sugar, and low sugar, random order). Specifically, participants were asked to evaluate each category/claim pair, as compared to their regular version, in three dimensions using 7-point rating scales (e.g., "In your opinion, 0% sugar cookies are": *1 = Less healthful/tasty/caloric* to 7 = *More healthy/tasty/caloric* than its regular counterpart, Prada et al., 2017, 2019). The evaluative dimensions were also presented in random order.

After evaluating the 16 food-category/claim pairs, we assessed participants' perceived influence of nutritional information on their consumption decisions ("How often the information on nutritional table/list of ingredients/nutrition claims influences your consumption decisions?", *1 = Never* to *7 = Always*, $\alpha = .74$, Tierney et al., 2017). Participants were also asked about their general perception of products with claims about sugar content ("In general, low or sugar-free foods are …", Prada et al., 2019), including ratings of healthfulness, expected taste, and caloric content as well as four additional dimensions: naturalness (*1 = Unnatural* to *7 = Very natural);* cost (*1 = Cheap* to *7 = Expensive*); valence (*1 = Bad* to *7 = Good*); and trust, *(1= Distrustful* to *7 = Trustworthy*). Participants were also asked about the frequency of consumption of products with sugar-related claims ("How often do you consume products without sugar or low sugar? *1 = Never* to *7 = Always*), and whether they pay attention to the amount of sugar they consume (*1 =*

Never to *7 = Always*, Hagmann et al., 2018). Finally, participants were asked about their interest in health and nutrition (*1 = Elementary* to *7 = Advanced*); diet (regular/omnivorous, vegetarian, vegan, other), height, weight, and health condition (e.g., diabetes, allergies, food intolerances). At the end of the survey, participants were thanked and debriefed.

3. Results

Only complete questionnaires were considered for analysis (n = 200). Next, we present the following analyzes:

(a) Impact of type of claim on perceived healthfulness, taste, and caloric (section 3.1): a 4 (product category) x 4 (claim) repeated-measures ANOVA was conducted for each evaluative dimension. Whenever assumptions of sphericity were violated, Huynh-Feldt correction was applied;

(b) Additional analyzes: general perceptions of products with sugar related-claims, differences according to participants' gender and education level (independent samples t-tests) and pattern of correlations (section 3.2).

As stated, product categories were included in our analyses to provide a context for the claims and test if the effects are replicable in different product categories. Hence the potential main effects of product category are not informative for the main goal of this study.

3.1 Impact of claim on perceived healthfulness, taste, and caloric value

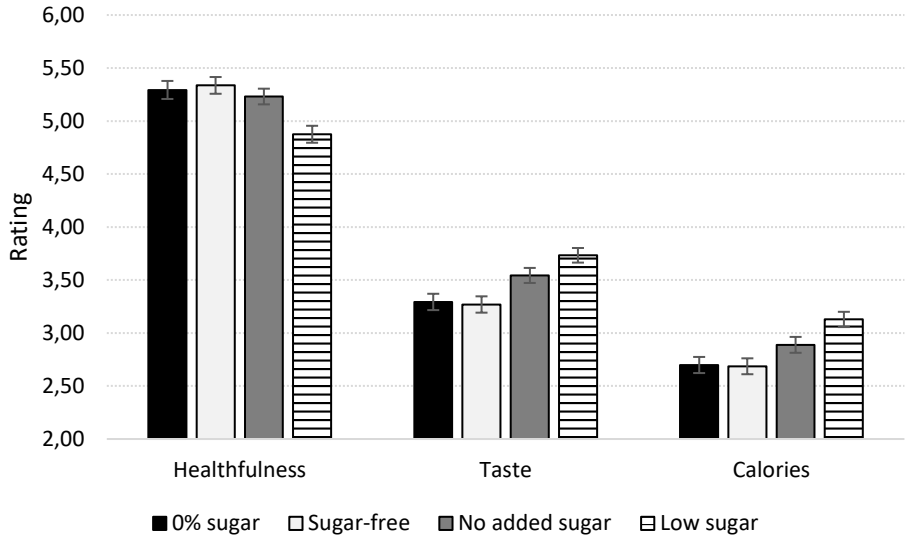
Results about the impact of claims across evaluative dimensions are summarized in Figure 1[1]. We observed a main effect of the type of claim on perceived healthfulness, $F(2.89, 575.37) = 27.43$, $p < .001$, $\eta_p^2 = .121$, 95% CI [.07, .17], expected taste, $F(2.77, 550.53) = 32.15$, $p < .001$, $\eta_p^2 = .139$, 95% CI [.09, .19], and caloric value, $F(2.78, 553.72) = 32.93$, $p <$

[1] The main effect of product category was significant on perceived healthfulness, $F(2.94, 585.08) = 8.45$, $p < .001$, $\eta_p^2 = .041$, 95% CI [.01, .07] and caloric value $F(3,597) = 5.90$, $p = .001$, $\eta_p^2 = .029$, 95% CI [.01, .06], but not on expected taste, $F(2.83, 562.94) = .735$, $p = .524$. Pairwise comparisons with Bonferroni correction revealed that participants considered yogurt to be healthier than all other products, ps <.033, and cookies to be more caloric than yogurt, $p = .002$, and ice cream, $p = .016$. No further differences reached statistical significance. The full factorial data is available as supplementary material (Appendix A).

.001, η_p^2 = .142, 95% CI [.09, .19]. Pairwise comparisons with Bonferroni correction revealed that, compared with their regular version, participants considered products with the claim "low sugar" to be less healthy, *p*s < .001, tastier, *p*s ≤ .005, and more caloric, *p* < .001, than products with other sugar-related claims. Additionally, products with the claim “no added sugar” were considered tastier and more caloric than products with the claims “0% sugar” and “sugar free”, *p*s ≤ .001. No other differences reached statistical significance.

Figure 1

Impact of Claim Across Evaluative Dimensions



Note. Error bars represent standard errors.

Moreover, all ratings (independently of claim and evaluative dimension) differed from the scale midpoint (one-sample *t* tests, test value = 4), *p*s < .001. Specifically, perceived healthfulness ratings were above scale midpoint, whereas calories and expected taste ratings were below the scale midpoint. These results suggest that, as expected, products with claims related to sugar content as healthier, less caloric, and less tasty than their regular versions.

Noteworthy, the main effects of claims were not moderated by product category as none of the interaction effects were significant, namely healthfulness, $F(8.31, 1653.66)$ =

0.48, $p = .875$, expected taste, $F(8.75, 1741.30) = 1.05$, $p = .399$, nor caloric value, $F(8.48, 1688.06) = 0.83$, $p = .585$.

3.3. Additional analysis

Results about general perceptions toward products with sugar-related claims are presented in Table 2. Participants rated these products as healthy, natural, positive, and low in calories, $ps \leq .021$. However, they perceived them as having inferior taste and higher cost, $ps \leq .013$, and as moderately trustworthy, $p = .709$. Participants also mentioned to often consume products without sugar or lower in sugar, $t(199) = 2.76$, $p = .006$, $d' = 1.59$, 95% CI [.09, .53].

INSERT TABLE 2 HERE

Moreover, we tested for differences according to gender and education level regarding healthfulness, taste and caloric content ratings, influence of nutritional sources, general perceptions of products with sugar-related claims, and attention to sugar intake. Overall, we did not find differences according to these variables, all $ps > .05$. The only exception was that women ($M = 4.62$, $SD = 1.57$) reported using nutritional information more often than men ($M = 3.76$, $SD = 1.53$), $t(192) = 2.92$, $p = .004$, $d' = 1.56$, 95%CI [-.92, -.17].

Finally, correlation analysis (Table 3) showed that participants who reported higher frequency of consumption of products with sugar-related claims also indicated a more positive general perception of these products, higher influence of nutritional information on consumption decisions, paying more attention to their sugar intake and being more interested in nutrition, all $ps < .001$. The latter three variables were also positively inter-related, all $ps < .001$. Age was only negatively associated with perceived socioeconomic status, $p < .001$, which was positively associated with nutrition interest, $p = .029$.

4. Experiment 2

Experiment 1 showed that claims related to sugar content influenced the perceived healthfulness, taste, and caloric value of different food products categories. Using a similar procedure, Experiment 2 examined the impact of claims regarding the presence of different natural sugars – sucrose, cane sugar, stevia, honey.

4.1 Method

4.1.1 Participants and Design

This study included 206 Portuguese-speaking participants who volunteered to collaborate (76.2% woman, M_{age} = 29.87, *SD* = 12.40). Participants were recruited through social networks (snowball sampling). Most participants reported having or attending higher education (62.7%), reported having a regular/omnivorous diet (90.8%), a BMI within the normal range (62.6% of 196 valid responses,), and not having a diagnosed health condition that impacts their eating habits (only 13.1% reported conditions such as diabetes, allergies, intolerances, see Table 1).

The design included two within-participants factors: 4 (Product categories: breakfast-cereals, yogurts, ice cream, cookies) X 4 (Type of claim: sucrose; cane sugar; stevia, honey).

4.1.2 Procedure and measures

Informed consent, instructions, and measures were identical to Experiment 1. The only exception is the item about frequency of consumption that was adapted to products with claims about natural sugars (*1 = Never* to *7 = Always*).

5. Results

The data analysis plan was similar to Experiment 1.

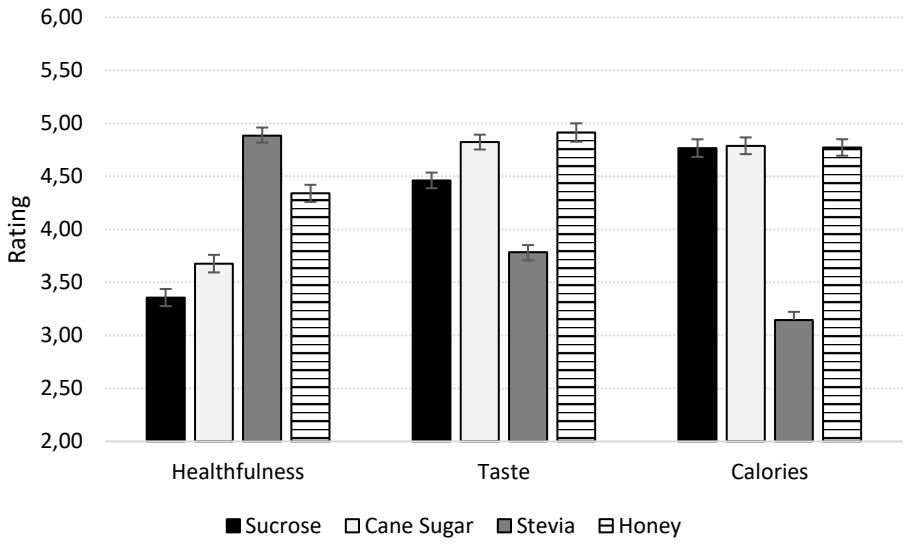
5.1 Impact of claim on perceived healthfulness, taste, and caloric value

Results about the impact of claims across evaluative dimensions are summarized in Figure 2[2]. We observed a significant main effect of claim on all dimensions: perceived healthfulness, $F(2.92, 598.82) = 83.40$, $p < .001$, $\eta_p^2 = .289$, 95% CI [.23, .34], expected taste, $F(2.75, 563.14) = 68.65$, $p < .001$, $\eta_p^2 = .251$, 95% CI [.19, .31], and caloric value, $F(2.87, 588.21) = 138.07$, $p < .001$, $\eta_p^2 = .402$, 95% CI [.34,45]. Pairwise comparisons revealed significant differences between all claims for the healthfulness dimension, such that products with sucrose were perceived as the least healthy, *p*s ≤ .022, and stevia products as the healthiest, *ps* ≤ .001. Products with honey were perceived as tastier, *ps* ≤ .001 (but not different from those with cane sugar, *p* =.271), and products with stevia were perceived as the least tasty, *ps* < .001. All other differences between claims for the expected taste dimension were significant, *p* < .001. Finally, products with stevia were also perceived as less caloric, *ps* ≤ .001 and products with the remaining claims did not differ from each other, *ps* = 1.00.

Figure 2

Impact of Claim Across Evaluative Dimensions

[2] We observed a main effect of product category on expected taste, $F(2.95, 604.41) = 3.55$, $p = .015$, $\eta_p^2 = .017$, 95% CI [.00, .045], Pairwise comparisons using Bonferroni correction revealed that breakfast cereals were perceived as tastier than ice cream ($p = .015$). No other differences reached statistical significance, *ps* > .112. The main effect of product category was not significant for healthfulness, $F(3, 615) = .380$, $p = .767$, and caloric content, $F(3, 615) = .310$, $p = .818$, evaluative dimensions.



Also, all the ratings (independently of claim and evaluative dimension) differed from the scale midpoint (one-sample *t* tests, test value = 4), *p*s ≤ .002. These results suggest that, compared with regular products, participants evaluated products with stevia and honey as healthier. In contrast, products with sucrose and cane sugar claims were rated as less healthy than regular products. Regarding the expected taste dimension, products with stevia were considered less tasty, whereas those with honey, cane sugar, and sucrose were rated as tastier than the regular products. Finally, products with stevia were evaluated as less caloric, while products with the remaining claims were considered more caloric than their regular counterparts.

Lastly, results showed that the impact of claim was not moderated by product category for healthfulness, F (8.55, 1753.55) = .773, p = .636, or caloric content, F (8.76, 1795.14) = 1.40, p = .185. However, the interaction effect was significant for taste, F (8.23, 1687.47) = 5.64, p < .001, η_p^2 = .027, 95% CI [.01, .04]. Pairwise comparisons revealed that, compared to products in their regular version, the sucrose claim led to more positive evaluations for the category of breakfast cereals, *p*s < .046 (but not different from yogurts, p = .166). Products “with cane sugar” received the highest evaluation for the yogurt category,

ps ≤ .006 (but not different from cookies, $p = .290$). The claim "stevia" led to higher evaluations for the ice cream category, $p < .046$ (but not different from cookies and breakfast cereals, *ps* > .194). The "with honey" claim led to more positive assessments for the breakfast cereal category, *p*s ≤ .003 (but not different from cookies, $p = .287$). The full factorial data is available as supplementary material (Appendix B).

5.3 Additional analysis

Table 2 presents general perceptions toward products with natural sugars claims. These products were perceived as healthy, tasty, natural, expensive, positive, and trustworthy, all *ps* < .001, and as moderately caloric, $p = .124$. Participants reported consuming products with claims regarding the presence of natural sugars occasionally ($M = 3.34$, $DP = 1.76$), $t(202) = -5.30$, $p < .001$, $d' = 1.76$, 95% CI [-.90, -.41].

As in Experiment 1, the only gender difference observed was that women ($M = 4.75$, $SD = 1.51$) reported higher influence of nutritional sources on consumption decisions than men ($M = 3.67$, $SD = 1.62$), $t(204) = 4.30$, $p < .001$, $d' = 1.56$, 95% CI [-1.58, -.58]. We did not find differences according to education level, all *p*s > .050.

Finally, correlation analysis (Table 4) showed that participants who reported higher frequency of consumption of products with sugar-related claims also indicated a more positive general perception of these products, higher influence of nutritional information on consumption decisions, paying more attention to their sugar intake, all *p*s < .001, and being more interested in nutrition, $p = .012$. The latter three variables were also positively inter-related, all *p*s < .001. Age was only negatively associated with perceived socioeconomic status, $p < .001$.

6. General discussion

Food claims have the potential to inform healthier choices and improve the consumers' diet (Cowburn & Stockley, 2005). However, these claims may also mislead

consumers (Fernan et al., 2018; Thorndike et al., 2012), increasing the perception that a food is healthier than it really is (Nguyen et al., 2016; Wills et al., 2012). Research examining the impact of claims specifically related to sugar on food perception is still scarce (cf. Sütterlin & Siegrist, 2015). Here, we present two experiments that systematically compared how claims related to the amount of sugar (Experiment 1), or to the type of sugar or sweetener included in products' composition (Experiment 2) influence food perception.

Overall, we observed that products containing claims related to sugar content (Experiment 1) were rated as more healthful and less caloric than their regular alternatives but also as less tasty. The impact of claims related to the type of sugar (Experiment 2) was not as straightforward as it varied according to the specific claim and evaluative dimension. Specifically, in comparison to their regular version, products with honey and stevia were rated as more healthful, whereas products with sucrose and cane sugar were rated as less healthful. Also, products with stevia were rated as less tasty and as having fewer calories (vs. regular products), whereas products with sucrose, cane sugar, and honey were rated as tastier and as more caloric. Because the ratings did not depend on the product category (except for the taste dimension in Experiment 2), these results may be generalized to other product categories.

We were also interested in testing the impact of each claim in comparison to similar ones. For instance, in some cases, the claims communicated different sugar contents (e.g., "sugar-free" vs. "low sugar"), whereas in other cases, the amount of sugar conveyed by the claim was similar (e.g., "0% sugar" and "sugar-free"). Experiment 1 showed that participants mainly differentiated the "low sugar" claim from all the others (i.e., products with low sugar were rated as the least healthful, more caloric, and tastier). Notably, the impact of the "no added sugar" for the healthfulness dimension is similar to the claims that actually refer to the absence of sugar (i.e., "0% sugar", "sugar-free"). This finding suggests that consumers may

be inferring that "no added sugars" products are sugar-free (which is often not the case – e.g., products with fruit purees or pastes as sweeteners). Still, we found evidence that participants are able to differentiate the "no added sugar" from both "0% sugar" and "sugar-free" claims in other evaluative dimensions (e.g., "no added sugar" rated as more caloric and tastier). In Experiment 2, results revealed that participants mainly differentiated the "stevia" claim from all the others (i.e., products with stevia were rated as the healthiest, the least caloric, and the least tasty). Although sucrose is usually extracted from sugar cane, participants rated products with sucrose as less healthful than all the others, including cane sugar.

Results from both experiments, relating taste and healthfulness perceptions, seem to support a "Health-Pleasure" trade-off (e.g., Loebnitz & Grunert, 2018). According to this effect, the presence of nutritional claims may lead to the anticipation of more negative hedonic attributes (e.g., less tasty, see also Fenko et al., 2016). These expectations may be detrimental to consumers' purchase intention and consumption patterns of these types of products. Still, this association does not seem to hold for all types of sugars or sweeteners. For instance, in Experiment 2, results for the overall perception of products containing honey showed that these products were simultaneously rated as healthier and tastier. It is possible that these results emerge from an association of certain types of sugar to greater naturalness (Lähteenmäki et al., 2010; Patterson et al., 2012; Sütterlin & Siegrist, 2015). For example, in a previous study, most participants categorized honey as a natural sugar, whereas many were unsure about the origin of sucrose or categorized it as artificial (Prada, Saraiva, et al., 2020).

Considering the general perceptions about products with sugar-related claims, participants rated these products as high healthy, natural, positive, and expensive. Still, some differences emerged: products with sugar content claims (Experiment 1) were rated as low in calories, taste, and as moderately trustworthy, whereas products with natural sugar claims (Experiment 2) were rated as moderately caloric, and highly tasty and, trustworthy. Results

about the latter dimension are interesting as it seems that consumers have higher trust in products with claims about natural sugars than in claims about sugar content. This is in line with the idea that consumers tend to trust food with claims suggesting its naturalness (e.g., Petty, 2015). This may be related to the marketing strategy of highlighting a given ingredient even if it is not being the main source of sugar (e.g., "honey biscuits" often include sucrose is much higher proportions than honey). The expectation that products with sugar-related claims are simultaneously healthful and expensive is also congruent with previous research (Haws et al., 2017) and may influence consumer decision-making. This belief that healthy food is more expensive than unhealthy food sometimes is actually accurate. For example, in a recent review, McCain et al. (2018) revealed that some natural sugar substitutes, specifically stevia, are more expensive than common sugar or even than some artificial sugars (e.g., saccharin). Still, in the current study, we did not assess how familiar participants were with each of the natural sugar sources. For instance, not all consumers may be aware that sucrose and cane sugar are actually common sugar. Indeed, previous research has shown that consumers' knowledge about sugar sources is low (Prada, Saraiva, et al., 2020; Tierney et al., 2017). Future studies should take this into consideration.

Regarding individual variables, in both studies, we found that the frequency of consumption of products with sugar-related claims was positively associated to the general perception of such product and to variables related to the use and interest in nutritional information (e.g., influence of nutritional information in purchase decisions; attention to one's sugar intake). This result is in line with previous studies reporting health interest as an important determinant for the use of nutrition claims (e.g., for reviews, see Kaur et al., 2017; Nocella & Kennedy, 2012; Carrillo et al., 2012; Cavaliere et al., 2016; Grunert et al., 2012). In general, we did not find differences in results according to participants' gender (except for a stronger influence of nutritional information in purchase decisions reported by women),

education level, age, or perceived socioeconomic status. However, these findings must framed according to the characteristics of our samples – that is, mainly women, younger individuals (mean age around 30 years old), and with a higher education level. Moreover, most of our participants also reported a weight status within the normal range and the absence of diagnosed health conditions restricting their eating patterns. Critically, these characteristics differ from the general Portuguese population in several ways. For instance, recent data suggested that 67.6% of the population (individuals over 15 years) presents a BMI above normal range (i.e., BMI > 25, OCDE, 2019). We also have a much higher proportion of participants with higher education which is estimated around 25% (Portuguese individuals from 24 to 64 years old; OCDE, 2019). Because those with higher education also are more likely to present a BMI level within normal range, this may explain why our participants seem to be quite healthy. Moreover, this may reflect a self-selection bias (i.e., greater participation of individuals who already have an interest in the research topic, Young et al., 2020). Previous studies have also revealed that women and highly educated individuals are more likely to participate in research in nutrition and health topics (Andreeva et al., 2015). Hence, generalization of results should be made with caution and future studies should seek to recruit more heterogeneous samples.

These studies constitute a first attempt to examine systematically how different claims about sugar influence consumer perceptions. Although we included food categories to contextualize the claims, they were not paired with specific exemplars. This constitutes a limitation of our experiments and generalization to real-life food products should be made with caution. Considering that food packaging often includes numerous clues, it is likely that the claims less salient. Future studies can manipulate the same type of claims in real food products, while controlling for familiarity and food packaging aspects (see, for example, a study with gluten-free label, Prada et al., 2019). This method would also allow to overcome a

limitation of our work related to the use of comparative ratings (i.e., products of a category paired with a given type of sugar claims in comparison to its regular version). Although both the instructions in each trial and the scale anchors emphasized this comparative nature (see also, Schuldt & Hannahan, 2013; Prada, Garrido, & Rodrigues, 2017), we cannot guarantee that participants perceived the scale midpoint as indicative of similarity between products (regular version and with claim). Hence, future studies could compare ratings between product exemplars with a given claim with the same exemplars without the claim (i.e., control condition).

Overall, our study replicated the health halo and positivity bias effects (Prada et al., 2017; Roe et al., 1999). Products with claims about the absence of (added) sugar, in particular, were perceived as more healthful and less caloric than regular products. A potential caveat is that research has shown that the inclusion of nutrition claims may result in overconsumption (for a review see, BROWN). Hence, future studies should seek to test the impact of different sugar-related claims on consumer choice and eating behavior.

Consumers seem to be open to change in product composition, particularly regarding sugar content (e.g., “less sugar” is more valued than “less calories” when consumers are looking for a healthier product, Lever et al., 2018). However, our results also suggest that consumers may expect products with such claims to taste worst. Moreover, the perceptions of healthfulness, calories, and taste of the product may differ depending on the specific claim presented in the packaging of the product, mainly when the claims focus on the type of sugar or sweetener that is present (e.g., stevia; honey).

7. References

Anastasiou, K., Miller, M., & Dickinson, K. (2019). The relationship between food label use and dietary intake in adults: A systematic review. *Appetite*, *138*, 280–291. https://doi.org/10.1016/j.appet.2019.03.025

Ares, G., Giménez, A., & Gámbaro, A. (2009). Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. *Food Quality and Preference*, *20*(1), 50–56. https://doi.org/10.1016/j.foodqual.2008.07.002

Bailey, R., & Muldrow, A. (2019). Healthy food identification: Food cues and claims affect speeded and thoughtful evaluations of food. *Health Communication*, *34*(7), 735–746. https://doi.org/10.1080/10410236.2018.1434734

Brierley, M., & Elliott, C. (2015). Nutritional components and children's interpretations of packaged food. *International Journal of Health Promotion and Education*, *53*(5), 230–243. https://doi.org/10.1080/14635240.2015.1010654

Buul, V. J. van, & Brouns, F. J. P. H. (2015). Nutrition and health claims as marketing tools. *Critical Reviews in Food Science and Nutrition*, *55*(11), 1552–1560. https://doi.org/10.1080/10408398.2012.754738

Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: A systematic review. *Public Health Nutrition*, *14*(8), 1496–1506. https://doi.org/10.1017/S1368980010003290

Carrillo, E., Varela, P., & Fiszman, S. (2012). Effects of food package information and sensory characteristics on the perception of healthiness and the acceptability of enriched biscuits. *Food Research International*, *48*(1), 209–216. https://doi.org/10.1016/j.foodres.2012.03.016

Cavaliere, A., De Marchi, E., & Banterle, A. (2016). Does consumer health-orientation affect the use of nutrition facts panel and claims? An empirical analysis in Italy. *Food Quality and Preference*, *54*, 110–116. https://doi.org/10.1016/j.foodqual.2016.07.008

Chandon, P., & Wansink, B. (2007). The biasing health halos of fast-food restaurant health claims: Lower calorie estimates and higher side-dish consumption intentions. *Journal of Consumer Research*, *34*(3), 301–314. https://doi.org/10.1086/519499

Cowburn, G., & Stockley, L. (2005). Consumer understanding and use of nutrition labelling: A systematic review. *Public Health Nutrition*, *8*(1), 21–28. https://doi.org/10.1079/PHN2004666

Dean, M., Lähteenmäki, L., & Shepherd, R. (2011). Nutrition communication: Consumer perceptions and predicting intentions. *Proceedings of the Nutrition Society*, *70*(1), 19–25. https://doi.org/10.1017/S0029665110003964

Dispatch No 11418. (2017, December 29). Diário Da República, 2.a Série — N.o 249. Retrieved from https://dre.pt/pesquisa/-/search/114424591/details/normal?l=1

European Commission (2006). Regulation No. 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods. *Official Journal of the European Union*, L 404 49, 9-25.

Fenko, A., Kersten, L., & Bialkova, S. (2016). Overcoming consumer scepticism toward food labels: The role of multisensory experience. *Food Quality and Preference*, *48*, 81–92. https://doi.org/10.1016/j.foodqual.2015.08.013

Fernan, C., Schuldt, J. P., & Niederdeppe, J. (2018). Health halo effects from product titles and nutrient content claims in the context of "protein" bars. *Health Communication*, *33*(12), 1425–1433. https://doi.org/10.1080/10410236.2017.1358240

Gomes, S., Nogueira, M., Ferreira, M., & Gregório, M. J. (2017). *Portuguese consumers'attitudes towards food labelling*. World Health Organization.

Grunert, K. G., Wills, J., Celemín, L. F., Lähteenmäki, L., Scholderer, J., & Storcksdieck genannt Bonsmann, S. (2012). Socio-demographic and attitudinal determinants of nutrition knowledge of food shoppers in six European countries. *Food Quality and Preference*, *26*(2), 166–177. https://doi.org/10.1016/j.foodqual.2012.04.007

Hagmann, D., Siegrist, M., & Hartmann, C. (2018). Taxes, labels, or nudges? Public acceptance of various interventions designed to reduce sugar intake. *Food Policy*, *79*, 156–165. https://doi.org/10.1016/j.foodpol.2018.06.008

Hastak, M., & Mazis, M. B. (2011). Deception by implication: A typology of truthful but misleading advertising and labeling claims. *Journal of Public Policy & Marketing*, *30*(2), 157–167. https://doi.org/10.1509/jppm.30.2.157

Haws, K. L., Reczek, R. W., & Sample, K. L. (2017). Healthy diets make empty wallets: The healthy = expensive intuition. *Journal of Consumer Research*, *43*(6), 992–1007. https://doi.org/10.1093/jcr/ucw078

Kaur, A., Scarborough, P., & Rayner, M. (2017). A systematic review, and meta-analyses, of the impact of health-related claims on dietary choices. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 93. https://doi.org/10.1186/s12966-017-0548-1

Kleef, E. V., & Dagevos, H. (2015). The growing role of front-of-pack nutrition profile labeling: A consumer perspective on key issues and controversies. *Critical Reviews in Food Science and Nutrition*, *55*(3), 291–303. https://doi.org/10.1080/10408398.2011.653018

Lähteenmäki, L. (2013). Claiming health in food products. *Food Quality and Preference*, *27*(2), 196–201. https://doi.org/10.1016/j.foodqual.2012.03.006

Lähteenmäki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, Ø., Åström, A., & Martinsdóttir, E. (2010). Impact of health-related claims on the perception of other

product attributes. *Food Policy*, *35*(3), 230–239. https://doi.org/10.1016/j.foodpol.2009.12.007

Leathwood, P. D., Richardson, D. P., Sträter, P., Todd, P. M., & Trijp, H. C. M. van. (2007). Consumer understanding of nutrition and health claims: Sources of evidence. *British Journal of Nutrition*, *98*(3), 474–484. https://doi.org/10.1017/S000711450778697X

Lee, W. J., Shimizu, M., Kniffin, K. M., & Wansink, B. (2013). You taste what you see: Do organic labels bias taste perceptions? *Food Quality and Preference*, *29*(1), 33–39. https://doi.org/10.1016/j.foodqual.2013.01.010

Lever, G., Ensaff, H., & Moore, J. B. (2018). Sugars, biscuits and consumer perception: A survey of the UK biscuit market and consumers' perceptions in the context of government mandated sugar reduction and reformulation. *Proceedings of the Nutrition Society*, *77*, E201. https://doi.org/10.1017/S0029665118002070

Loebnitz, N., & Grunert, K. G. (2018). Impact of self-health awareness and perceived product benefits on purchase intentions for hedonic and utilitarian foods with nutrition claims. *Food Quality and Preference*, *64*, 221–231. https://doi.org/10.1016/j.foodqual.2017.09.005

Lopes, C., Torres, C., Oliveira, A., Sereno, M., Alarcão, V., Guiomar, S., Mota, J., Teixeira, P., Rodrigues, S., Lobato, L., Magalhães, V., Correia, D., Pizarro, A., Marques, A., Vilela, S., Oliveira, L., Nicola, P., Soares, S., & Ramos, E. (2017). *Inquérito Alimentar Nacional e de Atividade Física de 2015-2016*. Universidade do Porto.

Markey, O., Lovegrove, J. A., & Methven, L. (2015). Sensory profiles and consumer acceptability of a range of sugar-reduced products on the UK market. *Food Research International*, *72*, 133–139. https://doi.org/10.1016/j.foodres.2015.03.012

Mayhew, A. J., Lock, K., Kelishadi, R., Swaminathan, S., Marcilio, C. S., Iqbal, R., Dehghan, M., Yusuf, S., & Chow, C. K. (2016). Nutrition labelling, marketing

techniques, nutrition claims and health claims on chip and biscuit packages from sixteen countries. *Public Health Nutrition*, *19*(6), 998–1007. https://doi.org/10.1017/S1368980015000658

McCain, H. R., Kaliappan, S., & Drake, M. A. (2018). Invited review: Sugar reduction in dairy products. *Journal of Dairy Science*, *101*(10), 8619–8640. https://doi.org/10.3168/jds.2017-14347

McCrickerd, K., Tang, C. S., & Forde, C. G. (2020). The independent and combined impact of front-of-pack labelling and sensory quality on calorie estimations and portion selection of commercial food products. *Food Quality and Preference*, *79*, 103766. https://doi.org/10.1016/j.foodqual.2019.103766

Miklavec, K., Pravst, I., Grunert, K. G., Klopčič, M., & Pohar, J. (2015). The influence of health claims and nutritional composition on consumers' yoghurt preferences. *Food Quality and Preference*, *43*, 26–33. https://doi.org/10.1016/j.foodqual.2015.02.006

Nguyen, P. K., Lin, S., & Heidenreich, P. (2016). A systematic comparison of sugar content in low-fat vs regular versions of food. *Nutrition & Diabetes*, *6*(1), e193–e193. https://doi.org/10.1038/nutd.2015.43

Nobrega, L., Ares, G., & Deliza, R. (2020). Are nutritional warnings more efficient than claims in shaping consumers' healthfulness perception? *Food Quality and Preference*, *79*, 103749. https://doi.org/10.1016/j.foodqual.2019.103749

Nocella, G., & Kennedy, O. (2012). Food health claims – What consumers understand. *Food Policy*, *37*(5), 571–580. https://doi.org/10.1016/j.foodpol.2012.06.001

Nørgaard, M. K., & Brunsø, K. (2009). Families' use of nutritional information on food labels. *Food Quality and Preference*, *20*(8), 597–606. https://doi.org/10.1016/j.foodqual.2009.07.005

Patterson, N. J., Sadler, M. J., & Cooper, J. M. (2012). Consumer understanding of sugars claims on food and drink products. *Nutrition Bulletin*, *37*(2), 121–130. https://doi.org/10.1111/j.1467-3010.2012.01958.x

Petty, R. D. (2015). "Natural" claims in food advertising: Policy implications of filling the regulatory void with consumer class action lawsuits. *Journal of Public Policy & Marketing*, *34*(1), 131–141. https://doi.org/10.1509/jppm.14.147

Prada, M., Garrido, M. V., & Rodrigues, D. (2017). Lost in processing? Perceived healthfulness, taste and caloric content of whole and processed organic food. *Appetite*, *114*, 175–186. https://doi.org/10.1016/j.appet.2017.03.031

Prada, M., Godinho, C., Rodrigues, D. L., Lopes, C., & Garrido, M. V. (2019). The impact of a gluten-free claim on the perceived healthfulness, calories, level of processing and expected taste of food products. *Food Quality and Preference*, *73*, 284–287. https://doi.org/10.1016/j.foodqual.2018.10.013

Prada, M., Rodrigues, D. L., Godinho, C., Lopes, D., & Garrido, M. V. (2020). Knowledge and acceptance of interventions aimed at reducing sugar intake in Portugal. *Public Health Nutrition*, *23*(18), 3423–3434. https://doi.org/10.1017/S1368980020002165

Prada, M., Saraiva, M., Garrido, M. V., Rodrigues, D. L., & Lopes, D. (2020). Knowledge about sugar sources and sugar intake guidelines in portuguese consumers. *Nutrients*, *12*(12), 3888. https://doi.org/10.3390/nu12123888

Priven, M., Baum, J., Vieira, E., Fung, T., & Herbold, N. (2015). The influence of a factitious free-from food product label on consumer perceptions of healthfulness. *Journal of the Academy of Nutrition and Dietetics*, *115*(11), 1808–1814. https://doi.org/10.1016/j.jand.2015.03.013

Raaij, J. van, Hendriksen, M., & Verhagen, H. (2009). Potential for improvement of population diet through reformulation of commonly eaten foods. *Public Health Nutrition*, *12*(3), 325–330. https://doi.org/10.1017/S1368980008003376

Roe, B., Levy, A. S., & Derby, B. M. (1999). The impact of health claims on consumer search and product evaluation outcomes: Results from FDA experimental data. *Journal of Public Policy & Marketing*, *18*(1), 89–105. https://doi.org/10.1177/074391569901800110

Román, S., Sánchez-Siles, L. M., & Siegrist, M. (2017). The importance of food naturalness for consumers: Results of a systematic review. *Trends in Food Science & Technology*, *67*, 44–57. https://doi.org/10.1016/j.tifs.2017.06.010

Schuldt, J. P., & Hannahan, M. (2013). When good deeds leave a bad taste. Negative inferences from ethical food claims. *Appetite*, *62*, 76–83. https://doi.org/10.1016/j.appet.2012.11.004

Steinhauser, J., & Hamm, U. (2018). Consumer and product-specific characteristics influencing the effect of nutrition, health and risk reduction claims on preferences and purchase behavior – A systematic review. *Appetite*, *127*, 303–323. https://doi.org/10.1016/j.appet.2018.05.012

Storcksdieck genannt Bonsmann, S., & Wills, J. M. (2012). Nutrition labeling to prevent obesity: Reviewing the evidence from Europe. *Current Obesity Reports*, *1*(3), 134–140. https://doi.org/10.1007/s13679-012-0020-0

Sütterlin, B., & Siegrist, M. (2015). Simply adding the word "fruit" makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food. *Appetite*, *95*, 252–261. https://doi.org/10.1016/j.appet.2015.07.011

Talati, Z., Pettigrew, S., Neal, B., Dixon, H., Hughes, C., Kelly, B., & Miller, C. (2017). Consumers' responses to health claims in the context of other on-pack nutrition

information: A systematic review. *Nutrition Reviews*, *75*(4), 260–273. https://doi.org/10.1093/nutrit/nuw070

Thorndike, A. N., Sonnenberg, L., Riis, J., Barraclough, S., & Levy, D. E. (2012). A 2-phase labeling and choice architecture intervention to improve healthy food and beverage choices. *American Journal of Public Health*, *102*(3), 527–533. https://doi.org/10.2105/AJPH.2011.300391

Tierney, M., Gallagher, A. M., Giotis, E. S., & Pentieva, K. (2017). An online survey on consumer knowledge and understanding of added sugars. *Nutrients*, *9*(1), 37. https://doi.org/10.3390/nu9010037

Tórtora, G., & Ares, G. (2018). Influence of time orientation on food choice: Case study with cookie labels. *Food Research International*, *106*, 706–711. https://doi.org/10.1016/j.foodres.2018.01.045

van Trijp, H. C. M., & van der Lans, I. A. (2007). Consumer perceptions of nutrition and health claims. *Appetite*, *48*(3), 305–324. https://doi.org/10.1016/j.appet.2006.09.011

Volkova, E., & Ni Mhurchu, C. (2015). The influence of nutrition labeling and point-of-purchase information on food behaviours. *Current Obesity Reports*, *4*(1), 19–29. https://doi.org/10.1007/s13679-014-0135-6

Wansink, B., & Chandon, P. (2006). Can "low-fat" nutrition labels lead to obesity? *Journal of Marketing Research*, *43*(4), 605–617. https://doi.org/10.1509/jmkr.43.4.605

Wellard, L., Hughes, C., Tsang, Y. W., Watson, W., & Chapman, K. (2015). Investigating fruit and vegetable claims on Australian food packages. *Public Health Nutrition*, *18*(15), 2729–2735. https://doi.org/10.1017/S1368980014002511

WHO. (2015). *Guideline: Sugars intake for adults and children*. World Health Organization. https://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=2033879

Williams, P. (2005). Consumer understanding and use of health claims for foods. *Nutrition Reviews*, *63*(7), 256–264. https://doi.org/10.1111/j.1753-4887.2005.tb00382.x

Wills, J. M., Bonsmann, S. S. genannt, Kolka, M., & Grunert, K. G. (2012). European consumers and health claims: Attitudes, understanding and purchasing behaviour. *Proceedings of the Nutrition Society*, *71*(2), 229–236. https://doi.org/10.1017/S0029665112000043

Table 1

Participants' Diet and Health-Related Characteristics

	Experiment 1		*Experiment 2*	
	n	*%*	*n*	*%*
Diet				
Regular/Omnivorous	182	91	187	90.8
Vegetarian	12	6	10	4.9
Vegan	2	1	3	1.5
Other	4	2	6	2.9
Health conditions[a]				
Food allergies (e.g., lactose, gluten)	11	5.5	14	6.8
Diabetes	3	1.5	6	2.9
Cholesterol	2	1.0	1	0.5
Gastrointestinal diseases	4	2.0	5	2.4
Eating disorders	1	0.5	2	1.0
Hypertension	1	0.5	1	0.5
Anemic	1	0.5	0	0.0
None	176	88.0	179	86.9
Other (non-diet-related)	4	2	0	0.0
Body Mass Index (BMI)[b]				
Underweight (< 18.5)	12	6.0	11	5.3
Normal weight (18.5-24.9)	128	64.0	129	62.6
Pre-obesity (25-29.9)	39	19.5	35	17.0
Obesity (> 30)	10	5.0	21	10.2
Missing	11	5.5	10	4.9

[a] Some participants indicated more than one health condition (n = 203 responses - Experiment 1; n = 208 responses - Experiment 2).

[b] BMI was computed using the metric formula (Weight in kilograms)/(Height in meters)^2 (for more information on BMI, see http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi).

Table 2

General Perceptions of Products with Sugar-related Claims

	Experiment 1			Experiment 2		
	M	*SD*	*t*(199)[1]	*M*	*SD*	*t*(205)[1]
Healthfulness	4.82	1.27	9.06***	4.46	1.37	4.84***
Taste	3.79	1.21	-2.52*	4.68	1.27	7.68***
Calories (r)	4.80	1.22	9.25***	3.86	1.26	-1.55
Naturalness	4.22	1.37	2.33*	4.39	1.41	3.96***
Cost (r)	2.70	1.18	-15.61***	3.08	1.25	-10.62***
Valence	4.70	1.28	7.66***	4.79	1.24	9.18***
Trust	4.04	1.51	.374	4.47	1.29	5.24***
General perception of products with sugar-related claims[a]	4.31	1.59	2.76**	4.44	0.90	7.06***

Note. (r) = reversed rating (i.e., higher ratings indicate less calories and cheaper cost)

[a] This index includes all dimensions, except price (Cronbach $\alpha = .72$)

[1]Value for the one-sample *t*-test against the scale midpoint (4).

*** $p < .001$; * $p < .050$.

Table 3

Correlations

	M	*SD*	1	2	3	4	5	6
1. Frequency of consumption of products with sugar-related claims	4.31	1.59	-					
2. General perception of products with sugar-related claims[b]	4.39	0.85	.30***	-				
3. Influence of nutritional information on consumption decisions[a]	4.31	1.86	.48***	-.03	-			
4. Attention to sugar intake	4.56	1.67	.50***	-.05	.58***	-		
5. Self-reported nutrition interest	5.03	1.80	.30***	-.09	.61***	.56***	-	
6. Age	30.26	11.22	.10	.02	-.11	-.002	-.09	-
7. Perceived socioeconomic status	5.83	1.34	-.06	.02	.03.	.07	.15*	-.28***

[a] This index includes all three nutritional information sources (i.e., claims, list of ingredients, and nutrition table; Cronbach α = .74)

[b] This index includes all dimensions, except price (Cronbach α = .72)

*** $p < .001$, ** $p < .01$ * $p < .050$

Table 4

Correlations

	M	*SD*	1	2	3	4	5	6
1. Frequency of consumption of products with natural sugar claims	3.34	1.76	-					
2. General perception of products with sugar-related claims[b]	4.44	0.90	.33***	-				
3. Influence of nutritional information on consumption decisions[a]	4.50	1.60	.30***	.05	-			
4. Attention to sugar intake	4.55	1.62	.23**	.10	.53***	-		
5. Self-reported nutrition interest	4.90	1.92	.18*	.10	.57***	.49***	-	
6. Age	29.87	12.40	-.04	.05	.04	.13	.03	-
7. Perceived socioeconomic status	5.87	1.25	-.05	-.03	.06	-.03	-.05	-.27***

[a] This index includes all three nutritional information sources (i.e., claims, list of ingredients, and nutrition table; Cronbach α = .74)

[b] This index includes all dimensions, except price (Cronbach α = .78)

*** $p < .001$, ** $p < .010$ * $p < .050$

Appendix

Means and Standard Errors for Each Evaluative Dimension According to Claim and Product Category

	EXPERIMENT 1								**EXPERIMENT 2**							
	0% sugar		**Sugar-free**		**No added sugar**		**Low sugar**		**Sucrose**		**Sugar cane**		**Stevia**		**Honey**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Healthfulness																
Yogurt	5.44	1.48	5.54	1.51	5.45	1.42	5.01	1.44	3.29	1.39	3.68	1.44	4.93	1.34	4.37	1.37
Ice Cream	5.22	1.50	5.25	1.40	5.10	1.31	4.79	1.31	3.40	1.45	3.69	1.31	4.88	1.21	4.37	1.37
Breakfast cereals	5.30	1.36	5.37	1.43	5.23	1.34	4.86	1.47	3.37	1.40	3.76	1.48	4.86	1.33	4.31	1.41
Cookies	5.21	1.42	5.18	1.41	5.15	1.36	4.84	1.43	3.37	1.42	3.58	1.38	4.87	1.30	4.32	1.39
Taste																
Yogurt	3.39	1.54	3.26	1.55	3.62	1.45	3.78	1.28	4.45	1.35	4.97	1.34	3.71	1.24	4.85	1.54
Ice Cream	3.36	1.37	3.35	1.38	3.50	1.28	3.68	1.29	4.41	1.29	4.73	1.13	3.86	1.18	4.65	1.55
Breakfast cereals	3.24	1.45	3.23	1.48	3.54	1.34	3.79	1.28	4.57	1.22	4.71	1.29	3.81	1.18	5.12	1.35
Cookies	3.19	1.32	3.24	1.30	3.51	1.30	3.68	1.26	4.41	1.31	4.89	1.19	3.76	1.10	5.03	1.48
Caloric value																
Yogurt	2.52	1.38	2.66	1.44	2.81	1.36	3.05	1.28	4.80	1.41	4.83	1.34	3.08	1.41	4.75	1.46
Ice Cream	2.70	1.36	2.63	1.26	2.81	1.32	3.03	1.22	4.72	1.45	4.79	1.25	3.11	1.30	4.75	1.29
Breakfast cereals	2.74	1.29	2.63	1.31	2.91	1.33	3.20	1.21	4.82	1.39	4.67	1.39	3.21	1.37	4.83	1.31
Cookies	2.83	1.40	2.82	1.36	3.03	1.34	3.24	1.31	4.72	1.36	4.86	1.33	3.18	1.30	4.77	1.31