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Simply adding the word “fruit” makes sugar healthier: The misleading effect of symbolic information on the perceived healthiness of food

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Abstract

People may use simple heuristics to assess the healthiness of food products. For instance, the information that a product contains “fruit sugar” (in German, “fruit sugar” is the colloquial term for fructose) could be interpreted as a cue that the product is relatively healthy, since the term “fruit” symbolizes healthiness. This can have a misleading effect on the perceived healthiness of a product. In Experiment 1, participants \( N = 164 \) were asked to evaluate the healthiness of one of two breakfast cereals based on the information provided in a nutrition table. For one group, the label “fruit sugar” was used; for the other, the label “sugar” was used. Results suggest that the phrase “fruit sugar” listed as an ingredient of the breakfast cereal resulted in a more positive perception of the healthiness of the cereal compared with the ingredient labeled “sugar.” In Experiment 2 \( N = 202 \), the results of Experiment 1 were replicated with a within-subjects design in which participants evaluated the two products simultaneously. Experiment 3 \( N = 251 \) ruled out the alternative explanation that the effect could be due to differing inferences about the product’s ingredients based on the label used, that is, that the product labeled with “fruit sugar” contains fruit. Finally, in Experiment 4 \( N = 162 \), the results show that the perceived healthiness associated with the labeling of the ingredient “sugar” (“fruit sugar” vs. “sugar”) mediates the observed effect. Results of the four experiments indicate that symbolic information is an important factor that can influence people’s health perceptions of food. These findings have implications for marketing and public health.

Keywords: Health perception, fructose, fruit sugar, heuristics, health halo effect, symbolic information
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1. Introduction

Most consumers seem to have limited nutrition knowledge (Parmenter & Wardle, 1999). For instance, a Swiss study showed that two thirds of the study participants erroneously believed that brown sugar is much healthier than white sugar (Dickson-Spillmann, Siegrist, & Keller, 2011). If people lack the necessary knowledge to make informed decisions, they have to rely on substitutes for knowledge. In such situations, people may rely on simple heuristics to make decisions (Tversky & Kahneman, 1974). A possible side effect related to the use of heuristics is that wrong conclusions are drawn. In the present research, we examined whether a product labeled as containing “fruit sugar” (in German, “fruchtzucker” is the colloquial term for fructose) is perceived to be healthier than a product labeled as containing sugar, since the term “fruit” symbolizes healthiness. Such a result would suggest that consumers rely on symbolic information (e.g., the word “fruit” in “fruit sugar”) to judge non-observable food properties, such as the healthiness of a specific food product. Furthermore, we examined the underlying mechanisms and whether the effect also extends to other product expectations, such as taste.

A general feature of heuristic judgment is attribute substitution (Kahneman & Frederick, 2005). A judgment is mediated by a heuristic when the attribute of the object a person wants to judge (target attribute) is not readily accessible and a person assesses this target attribute by substituting it with a seemingly semantically or associatively related property that comes more easily to mind (heuristic attribute). Informational attributes with high symbolic significance can serve as such heuristic attributes. Since the substituted heuristic attribute differs from the target attribute, the use of heuristics may result in biased decisions.
The influence of the symbolic significance of information on people’s information processing and evaluation of behaviors, attitudinal objects, and incidents has already been demonstrated in previous studies. Recent research, for example, showed that due to the tendency to focus on information with a strong symbolic meaning, people underestimate the energy consumption of consumers engaging in behaviors with a strong symbolic meaning of energy-friendliness, while they overestimate the energy consumption of consumers who show behaviors with a strong symbolic meaning of energy-unfriendliness (Sütterlin & Siegrist, 2014). In line with the assumption that people rely mainly on symbolically meaningful information, another study found that people are more concerned about negative outcomes of hazards, and evaluate them more negatively when they are caused by humans, compared with the identical negative outcomes caused by nature (Siegrist & Sütterlin, 2014). Due to the symbolic nature, the judgments were mainly based on the information about the cause, resulting in different evaluations of the very same outcome. In judgments of the healthiness of food, the word “fruit” has high symbolic significance, since “fruit” is commonly perceived as symbolizing healthiness (Briz et al., 2008). Therefore, if the phrase “fruit sugar” evokes healthy associations because it includes the word “fruit,” this may positively influence the perceived healthiness of a product that contains “fruit sugar,” compared with a product that is described as containing “sugar.”

What type of symbolic information is relevant when it comes to the perceived healthiness of food? Characteristics such as synthetic and natural seem to be important for evaluating food products (Evans, de Challemaison, & Cox, 2010; Rozin, 2005). Consumers in the Western world have a clear preference for natural products and seem to perceive synthetic products in a negative way. Consequently, symbolic information that indicates the naturalness of a food or reminds people that the food contains artificial ingredients may also influence the perceived healthiness of a product and its sensory evaluation. A symbolic meaning attributed to an aspect of a product or to a term used in the description of the ingredients (e.g., “fruit
sugar”) is based on people’s interpretation of this aspect (e.g., natural ingredient that is relatively healthy). The meaning is symbolic because it transcends the available facts, and stereotypical information associated with the food shapes perception. In line with this reasoning, findings of a recent qualitative study, for example, indicated that children tend to perceive honey to be healthier than white sugar, because they associate it with naturalness (Brierley & Elliott, 2015).

A closely related phenomenon is the health halo effect, which may lead consumers to make incorrect inferences (Andrews, Burton, & Netemeyer, 2000; Roe, Levy, & Derby, 1999). A health halo effect occurs when the perception of an attribute of a product influences the health evaluation of an unrelated product attribute. Research suggests that health claims can cause the perception of inappropriate health benefits (Roe et al., 1999). Perceiving food as healthy may result in underestimating their calories. For instance, the calories in food at fast-food restaurants that are perceived to be healthy were underestimated (Chandon & Wansink, 2007). This health halo effect has resulted in higher calorie consumption when food was provided by “healthy” restaurants rather than “unhealthy” restaurants. Health claims also have an impact on product evaluation and the perceived naturalness (Lähteenmäki et al., 2010).

Furthermore, health labels have been shown to influence people’s expectations of a product’s taste (Liem, Toraman Aydin, & Zandstra, 2012). However, in studies demonstrating health halo effects, participants did not receive numerical information about the products. Participants had to evaluate food properties (e.g., calories) in a state of high ambiguity. Studies need to demonstrate that symbolic information also influences the interpretation of concrete numerical information, without providing health claims that are explicitly targeted to push consumers’ thoughts in a certain direction.

The goal of the present study was to test whether information interpretation and, consequently, perception of a food product differ depending on whether symbolic information is included, even if identical information about the nutrients and calories of the product is

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provided. We hypothesized that due to the positive symbolic meaning of the term “fruit,” the ingredient “fruit sugar” would be perceived as healthier than (the unspecific term) “sugar.” Thus, products labeled as containing “fruit sugar” may be perceived as healthier than products labeled as containing sugar. We expected such a result even if the nutrition profiles of the products are otherwise identical.

2. Experiment 1

In the first experiment, we used a between-subjects design to examine whether participants in fact evaluate the identical nutrition information of breakfast cereals differently with regard to healthiness when the labels “sugar” versus “fruit sugar” are used in the nutrition table for the ingredient sugar. We postulated that, due to the symbolic meaning of healthiness associated with the term “fruit,” the ingredient sugar is perceived to be healthier when labeled as “fruit sugar” than when labeled with the umbrella term “sugar,” and that, as a result, cereals presented as containing “fruit sugar” are assessed as healthier than cereals presented as containing “sugar.”

2.1. Methods

2.1.1. Participants

Experiment 1 involved 164 participants. Participants represented a convenience sample of people living in the German-speaking part of Switzerland who agreed to participate in online studies conducted by our group. The sample consisted of 61 (37%) women and 103 (63%) men. The mean age was 55 years ($SD = 14$).

2.1.2. Materials and Procedure

Participants received an e-mail asking them to fill out a short online questionnaire. In addition to the experiment presented here, participants answered questions not related to the research question of this study.

Participants received the following information: “Miss Meier wants to buy breakfast cereals for her children. The following information is displayed on the package.” After this
introductory text, a nutrition table containing the nutrition information presented in Table 1 was shown. Participants were presented with either the nutrition table with the label “fruit sugar” for the ingredient sugar (see Table 1, left side) or the one with the unspecific term “sugar” (see Table 1, right side). They were then asked to answer the following question using a slider: “How healthy are these breakfast cereals in your opinion?” The possible responses ranged from “not healthy at all” (0) to “very healthy” (100).

Study participants were randomly assigned to the “fruit sugar” condition or the “sugar” condition.

2.2. Results and Discussion

Experiment 1 showed that participants who received the nutrition table with the label “sugar” assessed the cereal as less healthy compared with participants who received the nutrition table with the label “fruit sugar.” The difference between the two groups was significant, $t(162) = 2.16, p = .032$. Means and standard deviations are shown in Table 2.

In studies examining the health halo effect, the information thought to influence participants’ perception was in the foreground and stood out from the other information (e.g., a health claim or a brand); no further information about the food product was provided (Gravel et al., 2012; Schuldt & Hannahan, 2013; Schuldt, Muller, & Schwarz, 2012). Table 1 shows that we used a very subtle manipulation, and provided the same concrete nutrition information about the food product. Nevertheless, the symbolic information resulted in a different perception of the product. Furthermore, in contrast to the studies on the health halo effect, no specific product attribute (e.g., ingredient) was especially emphasized, only a different labeling of the same attribute in the nutrition table was used.

3. Experiment 2

In Experiment 1, we used a between-subjects design; participants evaluated either the product with the nutrition table with the label “sugar” or the one with the label “fruit sugar.” This result could also be explained by the evaluability hypothesis described by Hsee (1998).
For example, he showed that in a separate evaluation condition, in which the participants were presented with the information about only one object of evaluation (in this case, a cup of ice cream), the participants’ willingness to pay for the ice cream was influenced by the irrelevant but easier to evaluate dimension of cup size. That is, they based their decisions on whether the cup was overfilled (5 oz cup with 7 oz of ice cream) or underfilled (10 oz cup with 8 oz of ice cream). In a joint evaluation condition, however, participants’ willingness to pay for the ice cream was influenced by the relevant dimension, that is, the actual amount of ice cream. The study results suggest that people generally use the dimension that is easiest to evaluate as a criterion for making a decision. It is therefore possible that people do not have any idea whether a given amount of sugar or calories is “a lot” when presented with a product. The information “fruit sugar” may be easier to evaluate due to its symbolic meaning, and may be interpreted as a signal that the product does not contain a lot of sugar or calories. Therefore, the numerical information was probably not taken into account, or to a lesser extent. To rule out this alternative explanation, we conducted an experiment with a within-subjects design in which participants could compare and evaluate two breakfast cereals: one with the label “sugar” and one with the label “fruit sugar.” This is a realistic scenario because consumers often compare products. Therefore, examining whether the same results can be observed in a joint evaluation (i.e., within-subjects design) and in separate evaluations (i.e., between-subjects design) is important.

3.1. Methods

3.1.1. Participants

Experiment 2 involved 202 participants. Participants represented a convenience sample of people living in the German-speaking part of Switzerland who agreed to participate in online studies conducted by our group. The sample for Experiment 2 consisted of 95 (47%) women and 107 (53%) men. The mean age was 54 years ($SD = 15$).

3.1.2. Materials and Procedure
Participants received an e-mail asking them to fill out a short online questionnaire. In addition to the experiment presented here, participants answered questions not related to the research question of this study.

In Experiment 2, a within-subjects design was used; participants evaluated breakfast cereals with a nutrition table with the label “fruit sugar” (“fruit sugar” condition) as well as cereals with a nutrition table with the label “sugar” (“sugar” condition). Participants received the following information: “Miss Meier wants to buy breakfast cereals for her children. The following information is displayed on the package.” After this introductory text, the description of the first product with the respective nutrition information was shown, followed by the second product with the respective nutrition information. The nutrition information depicted in Table 1 was used for the two products (i.e., conditions). The two product descriptions with the respective nutrition tables that differed only in the labeling of the ingredient sugar (“fruit sugar” vs. “sugar”) were presented simultaneously on the same screen, one above the other. This allowed for a direct comparison of the described attributes, and ensured the evaluability of the information about the amount of sugar and calories, which was identical in both nutrition tables.

To correct for possible order effects, for half of the participants, the nutrition table for the product labeled with “fruit sugar” was presented above the nutrition table for the product labeled with “sugar.” For the other half of the participants, the order was reversed. The presentation order to which the participants were assigned was randomly determined. After each product description, the participants were asked to answer the following question using a slider: “How healthy are these breakfast cereals in your opinion?” The possible responses ranged from “not healthy at all” (0) to “very healthy” (100).

### 3.2. Results and Discussion

All participants evaluated both products. The order of the product descriptions (i.e., nutrition tables) did not affect participants’ evaluations. Therefore, pooled data were
analyzed. As shown in Table 2, participants perceived the cereals with the label “fruit sugar” as healthier than the cereals with the label “sugar.” Results of a paired t-test show that participants evaluated the two products significantly differently, $t(201) = 5.28, p < .001$.

Although we used a joint evaluation design in Experiment 2, allowing the participants to directly compare the description attributes and the (identical) information on the amount of sugar and calories, the results of Experiment 1 were successfully replicated. Therefore, we can rule out evaluability as an alternative explanation for our results. The same effect can be observed in the case of separate (Experiment 1) and joint (Experiment 2) evaluations.

4. Experiment 3

Based on the information given to the participants in Experiments 1 and 2, we cannot rule out that the participants in the “fruit sugar” condition assumed that the cereal contained some fruit and, therefore, perceived them to be healthier. Consequently, the ingredient “fruits,” not the ingredient “fruit sugar,” may have influenced participants’ responses. To rule out this alternative explanation of the findings, in Experiment 3, a package of the cereals was shown to inform participants that the cereals did not contain any fruits (see Figure 1).

One goal of Experiment 3 was to replicate the findings of Experiments 1 and 2, this time making it clear to the participants that the cereal did not contain any fruits. To test for the robustness of the misleading effect of the symbolic meaning of the term “fruit sugar” on the perceived healthiness of the products, we used somewhat different numerical information about the nutrients of the cereals. A higher sugar content was indicated. Increasing the amount of sugar could make this information more prevalent, and possibly shift participants’ focus toward the indicated amount of sugar. This could result in greater consideration of the amount of sugar when evaluating a product’s healthiness and, consequently, in better judgments.

4.1. Method

4.1.1. Participants
Experiment 3 involved 251 participants. Participants represented a convenience sample of people living in the German-speaking part of Switzerland who agreed to participate in online studies conducted by our group. The sample consisted of 104 (41%) women and 150 (59%) men. The mean age was 58 years ($SD = 13$).

4.1.2. Materials and Procedure

Participants received an e-mail asking them to fill out a short online questionnaire. In addition to the experiment presented here, participants answered questions not related to this research question.

In this experiment, after the introductory text, a corn flakes package was shown and, subsequently, the nutrition table was presented. Figure 1 shows the text and information provided to the participants. The design and color of the corn flakes package did not have any similarities to existing packages on the Swiss market. The picture on the package indicated that the cereal did not contain any fruits. Furthermore, to make the information about the amount of sugar more prevalent, in the nutrition tables a higher amount of sugar (double digit number) was indicated. As in the two previous experiments, the nutrition information presented in the “fruit sugar” and the “sugar” conditions was identical, except for the labeling of the ingredient sugar.

After the product description, participants were asked to answer the following question using a slider: “How healthy are these breakfast cereals in your opinion?” The possible responses ranged from “not healthy at all” (0) to “very healthy” (100).

Participants were randomly assigned to the “fruit sugar” (n = 127) or the “sugar” condition (n = 124).

4.2. Results and Discussion

In line with the previous experiments, in the “fruit sugar” condition, the cereals were perceived to be significantly healthier ($M = 39.61, SD = 21.52$), compared with the “sugar” condition ($M = 32.51, SD = 19.32$), $t(249) = 2.75, p = .006$. 
Again, the same nutrition information was evaluated as less healthy when the label “sugar” was used in the nutrition table, compared with the label “fruit sugar.” In this experiment, a picture of the package made it clear to the participants that the cereals did not contain fruits. Therefore, we can rule out the alternative explanation that in the “fruit sugar” condition, the cereals were perceived to be healthier because participants believed that the cereals contained some fruit. Furthermore, pointing to the robustness of the effect, increasing the amount of sugar to make this information more prevalent did not result in a greater consideration of the amount of sugar. Consequently, the misleading effect of the symbolic meaning of “fruit sugar” on the perceived healthiness of a product persisted, and was equally pronounced.

5. Experiment 4

To this point, we have provided strong evidence for the existence and robustness of the misleading effect of the label “fruit sugar” on the perceived healthiness of products. However, that this misleading effect is in fact attributable to the symbolic meaning of healthiness associated with the term “fruit,” respectively, the label “fruit sugar,” has yet to be demonstrated. Consequently, a primary goal of Experiment 4 was to provide evidence for the assumption that the healthiness evaluation of the cereals was influenced, that is, mediated by the symbolic meaning of the information provided to the participants (i.e., the labeling of the ingredient sugar).

With regard to the underlying mechanisms, the question about possible enforcing factors that could increase people’s susceptibility to the fallacy arises. Previous research showed that health-conscious consumers and consumers with high self-control tend to engage in more elaborate decision-making behavior, and are less subject to judgment biases that could arise from a reliance on heuristic cues, when it comes to explicit beliefs and cognitively shaped evaluations regarding health-related issues (Mai & Hoffmann, 2015). As a result, they profit less from information presentation measures aimed at facilitating the evaluation of
concrete nutrition information, such as the amount of calories (Koenigstorfer, Groeppel-Klein, & Kamm, 2014). Given these findings, it would be of interest to see whether this moderating influence of health-consciousness holds true for people’s susceptibility to the misleading effect of the “fruit sugar” labeling. Attempting to shed more light on the mechanisms underlying the postulated misleading effect of the symbolic meaning of the labels used for ingredients, Experiment 4 was additionally aimed to investigate whether more health-conscious consumers are less prone to this fallacy than less health-conscious consumers, or whether it is equally prevalent.

Summing up, the first goal of Experiment 4 was to provide more insights into the mechanisms underlying the misleading effect of the label “fruit sugar.” For this purpose, it was aimed at more profoundly analyzing the differential perceptions associated with the terms “fruit sugar” versus “sugar,” substantiating our claim that the effect is due to the symbolic meaning assigned to the label “fruit sugar,” and identifying factors that exert a moderating impact on the pronunciation of the fallacy.

Front-of-package food claims are generally associated with favorable impressions about food products bearing such a claim, and they exert a substantial impact on consumers’ perceptions of a product’s healthiness (Roe et al., 1999). The presence of front-of-package food claims can have a misleading effect on consumers’ product evaluations, and result in suboptimal decision-making, because consumers tend to attribute inappropriate nutritional characteristics and health benefits to products (Labiner-Wolfe, Jordan Lin, & Verrill, 2010). Consumers with high product involvement were found to be less susceptible to the misleading effect of product claims (Lee, Shimizu, Kniffin, & Wansink, 2013). Their higher motivation to deal with this topic in depth leads to a more comprehensive and critical evaluation of the information provided ( Petty & Cacioppo, 1986). In light of these findings, a second goal of Experiment 4 was to investigate whether the additional presence of a front-of-package claim
that the cereal contained “fruit sugar” would have a reinforcing effect on the fallacy of the symbolic meaning, especially when it comes to consumers with low health consciousness. When judging food products, criteria other than healthiness are also evaluated. The evaluation of these criteria may be derived based on different product characteristics, such as package design, front-of-package claims and labels, as well as based on information on nutritional components (cf. Orquin & Scholderer, 2015). For example, consumers automatically draw inferences from claims about a food’s healthiness on the tastiness. They tend to associate “unhealthy” foods with being tasty (Raghunathan, Naylor, & Hoyer, 2006). Consequently, a final aim of Experiment 4 was to find out whether the fallacy related to the symbolic meaning of the label “fruit sugar” also extends to the other evaluation criteria of food, or whether it is specifically related to perceived healthiness.

5.1. Method

5.1.1. Participants

As in the previous experiments, the data were collected using a convenience sample of residents of the German-speaking part of Switzerland who agreed to take part in online studies of our group on a regular basis. A total of 162 people participated in the study. The sample consisted of 53 women (33%) and 109 (67%) men, with an average age of 59 years (SD = 13).

5.1.2. Materials and Procedure

An invitation email was sent to the participants, asking them to take part in a short online study. In addition to the experiment presented here, participants also answered questions not related to these research questions.

The experiment consisted of three conditions. For the “fruit sugar” and the “sugar” conditions, scenario descriptions and information (including the picture of the package of cereal) identical to Experiment 3 were used. The text and information provided in the third condition, the “fruit sugar & claim” condition, were the same as in the “fruit sugar” condition,
except for the fact that in the “fruit sugar & claim” condition, on the corn flakes package, the food claim “contains 100% fruit sugar” was depicted on the front. Figure 2 shows the picture of the corn flakes package presented to the participants in the “fruit sugar & claim” condition. Participants were randomly assigned to one out of the three experimental conditions.

Following the product description, participants were asked to indicate their perceived healthiness of the corn flakes using a slider ranging from “not healthy at all” (0) to “very healthy” (100). The question read as follows: “How healthy are these breakfast cereals in your opinion?” Moreover, they were asked to indicate how they judged the cereals with regard to naturalness, from “not natural at all” (0) to “very natural” (100); how they judged the nutritional value of these cereals, from “very low” (0) to “very high” (100); and how they would judged the taste of these cereals, from “very bad” (0) to “very good” (100).

To provide evidence for the differential perceptions associated with the terms “fruit sugar” and “sugar” related to their symbolic meaning of healthiness, previous to the experimental part with the breakfast cereals, participants were asked the following questions: “How healthy is fruit sugar [sugar] in your opinion?” (“not healthy at all” [0] to “very healthy” [100]); “How high do you judge the nutritional value of fruit sugar [sugar]? (“very low” [0] to “very high” [100]); and “How strongly does the consumption of food products containing fruit sugar [sugar] symbolize health consciousness in your opinion? (“very weak symbol” [0] to “very strong symbol” [100]). The participants assigned to the conditions “fruit sugar” or “fruit sugar & claim” answered these questions with regard to “fruit sugar”. In the questions provided to the participants assigned to the condition “sugar,” the term “fruit sugar” was replaced by “sugar.”

Health consciousness, which was assumed to represent a moderator, was measured by three items formulated in the form of statements: “I am interested in nutritional issues.”; “A healthy diet is important to me.”; and “I am not interested in the topic of nutrition.” Participants had to rate, on a 6-point scale ranging from “applies not at all” (1) to “completely
applies” (6), how much the statement applied to them. The reliability of the health
consciousness measurement was satisfying, with a Cronbach’s alpha of .74.

To control for a possible social desirability bias that might occur, especially for topics
that are strongly subject to social norms, such as health and environmental friendliness,
socially desirable response patterns were assessed. For this purpose, we utilized the short
form of the Marlowe-Crowne Social Desirability Scale M-C 1, proposed by Strahan and
Gerbasi (1972). This short form was shown to be most appropriate for online studies, for
which, due to time constraints, it is essential to draw on short forms of the scale that are of
sufficient psychometric quality (Vésteinsdóttir, Reips, Joinson, & Thorsdottir, 2015). The
internal consistency of the short social desirability scale was $\alpha = .56$, which corresponds to the
reliability scores found in other studies (Strahan & Gerbasi, 1972; Vésteinsdóttir et al., 2015).

5.2. Results and Discussion

5.2.1. The misleading effect of the label “fruit sugar”

The data were analyzed for each evaluation criterion (healthiness, naturalness,
nutritional value, taste) of the cereals separately using one-way analysis of variance
(ANOVA) with the factor experimental condition (“fruit sugar” vs. “sugar” vs. “fruit sugar &
claim”). Analyses revealed a significant effect of the factor experimental condition on the
perceived healthiness of the cereals, $F(2, 159) = 3.91$, $p = .022$. The cereals were judged
significantly healthier when the label “fruit sugar” compared to “sugar” was used. The same
was true for the condition with the additional “fruit sugar” claim. The conditions “fruit sugar”
and “fruit sugar & claim” did not significantly differ in the perceived healthiness of the
cereals. Detailed results are displayed in Table 3. The three experimental conditions did not
differ with regard to the other evaluation criteria: naturalness ($F[2, 159] = 0.71$, $p = .493$),
nutritional value ($F[2, 159] = 2.31$, $p = .103$), and taste ($F[2, 159] = 0.18$, $p = .837$). No
biasing influence of socially desirable response patterns was detected. 2
To test for a possible moderating effect of health consciousness, participants were grouped into low and high health consciousness using a median split. Subsequently, an ANOVA with the factor experimental condition and the factor health consciousness group (low vs. high health consciousness) was performed. The analysis yielded significant main effects for the factors experimental condition, $F(2, 154) = 3.61, p = .029,$ and health consciousness group, $F(1, 154) = 31.59, p < .001.$ However, there was no interaction effect, $F(2, 154) = 1.09, p = .337,$ indicating that the participants low and high in health consciousness were equally susceptible to the misleading effect of the label “fruit sugar.” The two health consciousness groups only differed in their healthiness judgments in general. The health conscious participants over all of the experimental conditions judged the cereal’s healthiness to be lower.  

According to the findings, the misleading effect of the symbolic meaning of the label “fruit sugar” seems to appear specifically when it comes to judgments related to the product’s healthiness. Additionally, adding an explicit front-of-package claim that the product contains “fruit sugar” did not significantly reinforce the biasing effect. No matter whether the symbolic information is supposedly unobtrusively displayed in the nutrition table, or prominently positioned on the front of the package, once the symbolic information has been read, it exerts an equally misleading effect on the perceived healthiness. Furthermore, health consciousness was not found to have a moderating influence on the misleading effect of the labeling. Health-conscious consumers are as equally susceptible to the misleading effect as consumers who are less interested in health-related issues. Consequently, when confronted with a labeling of ingredients that has a strong symbolic meaning, a more profound evaluation of the depicted nutritional information (as occurs with health conscious consumers) does not guarantee an accurate judgment of the product’s healthiness. Also, in this case, the misleading effect of the symbolic meaning of the used labeling still prevails, and reduces judgment accuracy.

5.2.2. The mediating role of the perceived healthiness associated with symbolic information
In line with the assumption that the term “fruit sugar” symbolizes healthiness due to the use of the word “fruit,” which finally results in an increase in the ingredient’s perceived healthiness and a more favorable judgment of other health-related aspects, significant differences in the perceptions associated with the terms “fruit sugar” and “sugar” emerged (see Table 4). Compared to the general term “sugar,” “fruit sugar” was perceived to be healthier, to have a higher nutritional value, and the consumption of products containing “fruit sugar” was considered to be a stronger symbol for healthiness.

We postulated that the perceived healthiness of cereal was driven by the symbolic meaning of the provided information, that is, the symbolic meaning of healthiness associated with the labeling of the ingredient sugar (“fruit sugar” vs. “sugar”). Based on this assumption, we expected that the impact of the different labeling (i.e., the provision of information with different symbolic meanings) on the perceived healthiness of the cereal would be mediated by the perceived healthiness associated with the labeling, as a result of its symbolic meaning. This simple mediation effect was tested using the method proposed by Preacher and Hayes (2008). The cereals in the experimental conditions “fruit sugar” and “fruit sugar & claim” were described using the label “fruit sugar.” Since these two conditions did not significantly differ in the perceived healthiness of the cereals, the data from these conditions were pooled for the mediation analysis. The variable “labeling of the ingredient sugar” was dummy coded (0 = sugar and 1 = fruit sugar). The results of the mediation analysis are presented in Figure 2. Results show that the labeling of the ingredient sugar (i.e., the symbolic information) had a significant impact on the healthiness associated with the ingredient, which, in turn, significantly influenced the perceived healthiness of the cereal. Controlling for the healthiness associated with the ingredient sugar due to its labeling resulted in a non-significant impact of the labeling on the perceived healthiness of the cereal. Therefore, a full mediation could be observed. A bias-corrected 95% bootstrap confidence interval for the indirect effect based on 1,000 bootstrap samples was clearly above zero (3.90 to 12.47).
Results suggest that the misleading effect of the labeling on the product’s perceived healthiness can be explained by the difference in the perceived healthiness of the ingredient sugar, when labeled “fruit sugar” compared to “sugar” (i.e., umbrella term), which is due to the associated symbolic meaning of healthiness. The mediation analysis revealed that the labeling of the ingredient sugar led to a different perception of the healthiness of the ingredient sugar, and that the participants evaluated the healthiness of the breakfast cereals based on the perceived healthiness associated with the labeling of the ingredient sugar.

6. General Discussion

The aim of the present research was to provide evidence that people rely on symbolic information when evaluating food properties. More precisely, it aimed to examine whether presenting consumers with the information that a product contains “fruit sugar” affects product evaluation due to the symbolic nature of the term “fruit.” Results of the present study indicate that the phrase “fruit sugar” listed as an ingredient of breakfast cereals results in a more positive perception of the cereals’ healthiness. The mediation analysis conducted in Experiment 4 revealed that the labeling of the ingredient sugar as “fruit sugar” leads to a higher perceived healthiness of the ingredient, compared with the labeling as “sugar,” and that the healthiness associated with the ingredient as a result of the labeling mediates the perceived healthiness of the food product. The findings impressively show that the healthiness of the very same product, with the very same nutrition information, is perceived differently, simply by changing the labeling of the ingredient sugar. The labeling of the ingredients by making use of symbolic information may, consequently, exert a misleading effect on a consumer’s assessment of the product’s healthiness. The findings suggest that the effect is quite robust. A more profound and comprehensive evaluation of the provided information (as occurs with people with pronounced health consciousness) does not protect against the misleading effect of symbolic information, and does not add to judgment accuracy. This indicates that relying and drawing on the symbolic meaning of information is, to a certain extent, an automatic and
implicit process that cannot easily be correct by increasing people’s health consciousness. Furthermore, evidence was provided that the perception of a subtle cue is sufficient to trigger reliance on symbolic information, when evaluating the healthiness of food products.

Why can we claim that the decisions in our experiments were biased? In general, it can be stated that the term “sugar” represents an umbrella term that subsumes the different types of sugar, such as fructose (“fruit sugar”). Bearing this in mind, no difference between the ingredient sugar labeled as “fruit sugar” and labeled with the umbrella term “sugar” should be observed. However, consumers could automatically associate the term “sugar” with sucrose, commonly named “table sugar,” which is a combination of fructose and glucose. Therefore, the question arises whether associating “fruit sugar” with higher healthiness than sucrose is in fact inaccurate, and results in biased judgments. It has been shown that high fructose consumption can induce, among other things, insulin resistance (Rizkalla, 2010), and that it is a driver for pathological cardiac growth and dysfunction (Mirtschink et al., 2015). However, in most of these studies, unrealistically high doses of fructose were used. In a comprehensive review of the literature, no direct evidence was found for more negative effects of high fructose compared with sucrose (Tappy & Le, 2010). Based on the scientific evidence, it can be concluded that it does not matter whether the breakfast cereals contain added fructose or sucrose (Rizkalla, 2010; Tappy & Le, 2010). There is no scientific justification for assessing the cereals containing “fruit sugar” as healthier than the cereals containing sugar. On the contrary, a recent study provided evidence that the brain and behavioral response to fructose, relative to glucose, may promote feeding behavior. It was shown that the ingestion of fructose relative to glucose resulted in a greater brain reactivity to food cues and, in line with this, led to greater hunger and desire for food, as well as greater willingness to give up long-term monetary rewards to obtain immediate high-caloric food rewards (Luo, Monterosso, Sarpelleh, & Page, 2015). It is safe to conclude, therefore, that we have observed biased
responses in our experiments, because participants were influenced by the symbolic
significance of information that is not relevant to the evaluation task.

In the present experimental design, we made sure that the participants had identical
information about the two products, except for the manipulated variable (i.e., the labeling of
the ingredient sugar). The goal of our experiment was to test whether people perceive “fruit
sugar” as healthier than sugar and not whether people assume that the nutrition profile (e.g.,
the number of calories or amount of fat) of a product containing “fruit sugar” is different from
that of a product containing sugar. Therefore, we used the identical realistic nutrition
information for the products and presented it in the form of a nutrition table. In nutrition
tables commonly used in Switzerland and other European countries, the unspecific term
“sugar,” not “fruit sugar,” is used. However, claims on food packages or in advertisements
may emphasize that the product is sweetened with “fruit sugar”. Had we only used the full
product packaging and the “fruit sugar” claim, the participants could have concluded that the
breakfast cereals labeled as containing “fruit sugar” had a different nutritional profile than the
breakfast cereals labeled as containing “sugar.”

In the present study, participants evaluated breakfast cereals. This product category
was chosen because in Switzerland, breakfast cereal manufacturers often emphasize that their
product does not contain additional sugar but is sweetened by honey and maple syrup or that
the product contains only “fruit sugar”. In various countries, soft drinks are sweetened with
high-fructose corn syrup. Sweetened soft drinks are most likely not perceived as healthy
products, which is why we used the more neutral food category of breakfast cereals. Future
studies could examine whether similar effects can also be observed for more hedonic products
such as soft drinks.

The present study is not the first to suggest that symbolic information influences the
perception of food (Chandon & Wansink, 2007; Gravel et al., 2012; Lähteenmäki et al., 2010;
Schuldt & Hannahan, 2013; Schuldt et al., 2012; Schuldt & Schwarz, 2010; Wansink &
However, our research differs from the existing studies in a number of aspects. First, our manipulation was more subtle than the interventions in most past studies. We did not make an explicit claim regarding the food products directly targeted at pushing consumers’ product evaluation in a certain direction (Chandon & Wansink, 2007; Gravel et al., 2012; Lähteenmäki et al., 2010; Schuldt & Hannahan, 2013; Schuldt et al., 2012; Schuldt & Schwarz, 2010). In our experiments, we provided identical detailed information in the nutrition tables with the same ingredients. Only a different labeling of the ingredient sugar was used, which was effectuated by merely changing one word in the nutrition table. Nevertheless, our manipulation had an impact. This further shows the powerful impact of symbolic information on the perception of food. Second, in some past studies, the information provided was ambiguous to participants (Gravel et al., 2012). It is very difficult to estimate the calories of food without receiving concrete information about its ingredients. In the present study, participants were fully informed about the nutrition profile of the food. Third, past studies did not examine possible mechanisms of the observed effect. In Experiment 4, we tested the perceived healthiness associated with ingredients’ labeling as a possible mechanism underlying the effect of presenting symbolic information on the perception of food. Our results point to the misleading effect of symbolic information, showing that simply by using the symbolically positive label “fruit sugar,” consumers are misled to perceive the ingredient sugar as healthier and, in the end, this results in the perception of the cereals as healthier. Fourth, to the best of our knowledge, despite all the studies that have shown the possible negative effects of high fructose intake (Luo et al., 2015; Tappy & Le, 2010), this is the first study to suggest that the term “fruit sugar” is still perceived in a more positive way compared with the unspecific term “sugar.”

Several limitations of the present study must be addressed. In all three experiments, convenience samples were used. It is, therefore, unclear to what extent the present findings can be generalized. Furthermore, we focused on the effect of symbolic information on
information processing and the resulting perceived healthiness of products, and the perception of other evaluation criteria (e.g., taste). Several response types can be used to evaluate the impact of symbolic information. In the present study, we examined the effect of the label “fruit sugar” on the perceived healthiness. Another type of response that could be assessed is people’s willingness to buy the product utilizing real food packages. We did not choose this second approach, because some participants may not buy cereal, and the perceived healthiness may be only one factor that influences people’s willingness to buy food products. Given these additional confounding variables, much larger samples would be needed to show the expected effects. Therefore, the focus of the present study was on the perceived healthiness, and not on the purchase decision. In our experiments, we provided evidence for the misleading effect of the labeling of nutrition information. Of course, paying attention to the information presented in the nutrition table does not guarantee for a healthier product choice. However, it is obvious that consumers, first of all, need to correctly interpret and process the nutrition information, before they can use it to make more healthy decisions. Therefore, insights into the processing of nutrition facts and potentially biasing factors are crucial for producers and policy makers, when it comes to the provision of health-related information.

Future research should examine how people judge the healthiness of food in more detail, and whether there exists other symbolic information that may exert an (misleading) influence on a consumer’s perception of a product’s healthiness. Furthermore, exploring whether the label “fruit sugar” also changes other product expectations (e.g., product quality, environmental friendliness), or the perception of other nutritional values provided on the package (e.g., fat) would be worthwhile. In the present research, we focused on “fruit sugar”; however, examining how other sugars (e.g., honey) are perceived compared to “fruit sugar” using an experimental approach would also be interesting. As mentioned above, the presented experiments investigated the biasing effect of symbolic information on the perceived healthiness of food products, that is, on the processing of nutrition information. Future
research might wish to expand the focus to the analysis of the impact of symbolic information on the final food choice.

In sum, results of the present study suggest that consumers perceive a product labeled as containing “fruit sugar” as healthier than one labeled with the unspecific term “sugar.” We can rule out that the label “fruit sugar” made participants believe that the product has fewer calories, less fat, or less sugar compared to the other product, because we provided identical nutrition information for the products. Moreover, in the joint evaluation condition (i.e., within-subjects design in Experiment 2), it was obvious to participants that the nutrition profiles of the two products were identical. Therefore, our results are in line with our hypothesis that symbolic information is an important factor in people’s evaluation of how healthy a food product is, and may lead to biased judgments. People perceive fruits as healthy food (Bucher, van der Horst, & Siegrist, 2013); therefore, since the word “fruit” symbolizes healthiness, the term “fruit sugar” is associated with higher healthiness. As a result, the ingredient “fruit sugar” and, consequently, the food product are perceived to be relatively healthy.

The implications of these findings for marketing and public health are clear. From a marketing point of view, the emphasis on natural ingredients and ingredients with a positive symbolic meaning may result in a better health perception of food. Not only direct health claims (Lähteenmäki, 2013), but also ingredients may automatically evoke positive associations that have an important impact on a consumer’s information processing and decision-making. From a public health perspective, the challenge is how to educate the public so that consumers are not influenced by misleading symbolic product information, when they evaluate the healthiness of food products. Our findings suggest that consumers are highly susceptible to the symbolic information that food marketers may specifically use in an attempt of greenwashing or nutriwashing to promote their products. Such information may bias consumers’ information processing and product evaluation, and finally, result in suboptimal
purchase decisions. This is especially concerning, given that subtle symbolic cues are already sufficient to induce biased product evaluation, and given that even high involvement consumers, who generally engage in more profound information processing, are susceptible to this fallacy.
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Footnotes

1 We are aware that in the English language, the word “fructose,” not the phrase “fruit sugar,” is used. In German, however, the word “Fruchtzucker,” which translated into English means “fruit sugar,” is commonly used. This word has much closer associations with fruits and naturalness compared with the word “fructose.” Therefore, we use the term “fruit sugar,” the literal translation of the German word “Fruchtzucker,” in this paper.

2 An analysis of variance, with participants’ social desirability score as a covariate to test for possible social desirability effects, revealed no significant results for the covariate social desirability, $F(1, 154) = 0.38, p = .538$. Consequently, the findings on the perceived healthiness were not subject to a social desirability bias. The same was true for the perceived naturalness ($p = .957$), estimated nutritional value ($p = .856$), and estimated taste ($p = .221$).

3 Regression analyses resulted in the same conclusion.

4 The German word “Frühstücksflocken” was used. This term refers to breakfast cereals and muesli.
Table 1
Nutrition information provided in the “fruit sugar” (nutrition table on the left) and “sugar” (nutrition table on the right) conditions in Experiments 1 and 2.

<table>
<thead>
<tr>
<th>Nutrition value for a portion (30 g)</th>
<th>Nutrition value for a portion (30 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td><strong>Energy</strong></td>
</tr>
<tr>
<td>121.8 kcal</td>
<td>121.8 kcal</td>
</tr>
<tr>
<td>514.5 kJ</td>
<td>514.5 kJ</td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td><strong>Protein</strong></td>
</tr>
<tr>
<td>3.6 g</td>
<td>3.6 g</td>
</tr>
<tr>
<td><strong>Carbohydrates</strong></td>
<td><strong>Carbohydrates</strong></td>
</tr>
<tr>
<td>21.6 g</td>
<td>21.6 g</td>
</tr>
<tr>
<td>- Fruit sugar</td>
<td>- Sugar</td>
</tr>
<tr>
<td>7.8 g</td>
<td>7.8 g</td>
</tr>
<tr>
<td>- Starch</td>
<td>- Starch</td>
</tr>
<tr>
<td>13.8 g</td>
<td>13.8 g</td>
</tr>
<tr>
<td><strong>Fat</strong></td>
<td><strong>Fat</strong></td>
</tr>
<tr>
<td>2.1 g</td>
<td>2.1 g</td>
</tr>
</tbody>
</table>
Table 2

Perceived healthiness of breakfast cereals using the label “fruit sugar” vs. “sugar” in the nutrition table.

<table>
<thead>
<tr>
<th></th>
<th>Fruit sugar</th>
<th>Sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ ($SD$) [N]</td>
<td>$M$ ($SD$) [N]</td>
</tr>
<tr>
<td>Experiment 1</td>
<td>48.71 (23.82) [73]</td>
<td>40.16 (26.22) [91]</td>
</tr>
<tr>
<td>(between-subjects design)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment 2</td>
<td>52.01 (20.37) [202]</td>
<td>45.40 (21.21) [202]</td>
</tr>
<tr>
<td>(within-subjects design)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. The ratings of perceived healthiness could range from 0 (not healthy at all) to 100 (very healthy).
Table 3

Perceived healthiness, perceived naturalness, estimated nutritional value, and estimated taste of breakfast cereals in the conditions “fruit sugar” vs. “sugar” vs. “fruit sugar & claim” of Experiment 4.

<table>
<thead>
<tr>
<th></th>
<th>Fruit sugar</th>
<th>Sugar</th>
<th>Fruit sugar &amp; claim</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$ ($SD$) [N]</td>
<td>$M$ ($SD$) [N]</td>
<td>$M$ ($SD$) [N]</td>
</tr>
<tr>
<td>Perceived healthiness</td>
<td>39.29$^a$ (21.50) [52]</td>
<td>29.25$^b$ (20.07) [55]</td>
<td>38.58$^a$ (21.07) [55]</td>
</tr>
<tr>
<td>Perceived naturalness</td>
<td>32.60$^a$ (18.03) [52]</td>
<td>30.82$^b$ (23.47) [55]</td>
<td>35.60$^a$ (21.75) [55]</td>
</tr>
<tr>
<td>Estimated nutritional value</td>
<td>48.15$^{ab}$ (21.57) [52]</td>
<td>41.78$^b$ (27.29) [55]</td>
<td>51.93$^a$ (25.68) [55]</td>
</tr>
<tr>
<td>Estimated taste</td>
<td>50.52$^a$ (21.76) [52]</td>
<td>50.64$^a$ (27.96) [55]</td>
<td>52.93$^a$ (20.64) [55]</td>
</tr>
</tbody>
</table>

Note. Different letters indicate significant differences between particular experimental conditions, $p < 0.05$, using planned comparisons. The ratings of perceived healthiness could range from 0 (not healthy at all) to 100 (very healthy), ratings of perceived naturalness from 0 (not natural at all) to 100 (very natural), ratings of estimated nutritional value from 0 (very low) to 100 (very high), and ratings of estimated taste from 0 (very bad) to 100 (very good).
### Table 4

Health-related perceptions associated with the labels “fruit sugar” vs. “sugar” in Experiment 4.

<table>
<thead>
<tr>
<th></th>
<th>Fruit sugar</th>
<th>Sugar</th>
<th>t-test result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD) [N]</td>
<td>M (SD) [N]</td>
<td></td>
</tr>
<tr>
<td>Perceived healthiness</td>
<td>53.63 (19.24) [107]</td>
<td>32.55 (16.68) [55]</td>
<td>t(160) = 6.90, p &lt; .001</td>
</tr>
<tr>
<td>Estimated nutritional value</td>
<td>56.35 (21.88) [107]</td>
<td>49.47 (28.78) [55]</td>
<td>t(160) = 1.70, p = .046 a</td>
</tr>
<tr>
<td>Symbolic meaning of healthiness associated with consumption</td>
<td>47.33 (23.40) [107]</td>
<td>40.04 (29.44) [55]</td>
<td>t(160) = 1.72, p = .044 a</td>
</tr>
</tbody>
</table>

Note. a One-tailed p-value is indicated. Participants in the “fruit sugar” and the “fruit sugar & claim” conditions answered the questions related to “fruit sugar,” while participants assigned to the “sugar” condition answered the questions related to “sugar.” The ratings of perceived healthiness could range from 0 (not healthy at all) to 100 (very healthy), ratings of estimated nutritional value from 0 (very low) to 100 (very high), and ratings of the symbolic meaning of healthiness associated with consumption from 0 (very weak symbol) to 100 (very strong symbol).
Figure 1

Information provided in the “fruit sugar” condition in Experiment 3. In the “sugar” condition, the same information was provided, but the label “fruit sugar” was replaced by the label “sugar.”

Mrs. Meier wants to buy breakfast cereals for her children.

Mrs. Meier finds the following information on the package:

Nutrition value for a portion (30 g)

- Energy: 111.3 kcal, 466.0 kJ
- Protein: 1.4 g
- Carbohydrates: 26.1 g
  - Fruit sugar: 11.1 g
  - Starch: 15.0 g
- Fat: 0.2 g
Figure 2
Picture of the corn flakes package with the claim “contains 100% fruit sugar” (in German: “enthält 100% Fruchtzucker”) on the front, as presented to the participants in the experimental condition “fruit sugar & claim” of Experiment 4.
Figure 3

Results of the mediation analysis for the impact of the labeling of the ingredient sugar (‘fruit sugar’ vs. ‘sugar’) on the perceived healthiness of cereals are shown. Direct effects are presented in (a), and the model with the mediator variable “healthiness associated with labeling” is shown in (b). Nonstandardized coefficients (and standard errors in parentheses) are presented. Non-significant paths are depicted as dotted lines. * $p < .05$, ** $p < .01$, *** $p < .001$.

![Diagram of mediation analysis](image-url)
Research Highlights

- Symbolic information influences people’s health perceptions of foods
- Using the label “fruit sugar” instead of “sugar” increases perceived healthiness of foods
- Perceived healthiness associated with ingredients’ labeling affects health perception of foods
- Health consciousness does not reduce the biasing effect of symbolic information