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The effect of front-of-package nutrition labels on the choice of low sugar products

Abstract

Policy makers around the world are facing serious challenges in controlling citizens' obesity and healthiness, hence, they devote increased attention to the development of tools that communicate easily processable nutrition information. Front-of-package (FOP) nutrition labels are one of such tools and have been used to signal the extent to which food items contain potentially unhealthy ingredients such as sugar or fat. In this research, we focus on sugar cues on three different food categories to investigate their impact on consumer choice. We compare two labels, one already used (traffic-light) and one never used (sugar teaspoon): sugar teaspoons prove to be more effective than the previously used traffic-lights in healthy product choices, but only for specific food categories. In two experiments, we find that sugar teaspoon labels indicating sugar content, as opposed to traffic-light labels, are more effective in signaling sugar levels and thus, in helping consumers making healthier choices. We find that this is particularly relevant for food categories that have a simpler ingredient composition (i.e., whose healthiness relies more heavily on sugar). We finally propose processing fluency as the mechanism for the relation between sugar signals and product choices.

Keywords: front-of-package nutrition labels, processing fluency, healthiness, traffic-light labels, food choices.

1 INTRODUCTION

In a world where obesity is considered among the main causes of illness (World Health Organization, 2017), front-of-package (FOP) nutrition information has become a priority. Previous research has established the conceptual connection between the idea of being healthy and various ideologies of marketing (Silchenko & Askegaard, 2020a). This reinforces the fact that healthiness is an important aspect discussed in the marketing field, but also that marketing can play an important role in affecting healthy behavior of people (Silchenko & Askegaard, 2020a, 2020b; Silchenko, Askegaard, & Cedrola, 2020). FOP nutrition labels play an important role in decision-making. Presence of the FOP label (vs. not) can facilitate attention, processing, and consumer decision-making (Hersey, Wohlgenant, Arsenault, Kosa, & Muth, 2013). This is due to the fact that consumers spend at best a few seconds evaluating each choice, and this choice is drastically dependent on the FOP information. What happens is that the information transmitted through FOP can sometimes be misleading, if the label is not understood correctly (Temple & Fraser, 2014). Types of FOP labels vary from very complicated (e.g., Guidelines Daily Amount system that indicates the amount of nutrients per serving and the percentage of suggested daily intake that it contributes) to very easy (e.g., stars or tick symbols to communicate healthiness (Temple & Fraser, 2014). A comprehensive and effective choice of FOP label plays an important role in consumer decision-making. Enhancements in nutrition labelling could help consumers select healthier options at the point-of-purchase (Cowburn & Stockley, 2005; Dubois et al., 2020) and they hold a substantive share in the research in marketing (Silchenko et al., 2020). Furthermore, food labelling can serve as a powerful basis for more effective communication and product positioning, which ultimately can turn into competitive advantage for companies (Lim, Rishika, Janakiraman, & Kannan, 2020). Therefore, more effort should be

made by both policymakers, researchers and marketers to get insights into how consumers use and understand food labels, in order to reach their food goals and make more informed choices (Souiden, Abdelaziz, & Fauconnier, 2013).

There is extant research investigating the importance of food labelling on consumer wellbeing (e.g., Baltas, 2001; Corvalán, Reyes, Garmendia, & Uauy, 2019; Cowburn & Stockley, 2005; Drichoutis, Lazaridis, & Nayga, 2006), which is in line with the importance of the topic (Silchenko et al., 2020). However, the current state of research about the effect of FOP nutrition labelling on consumer product evaluation and purchase is far from being conclusive (Dubois et al., 2020; Hieke & Taylor, 2012). Indeed, there is still disagreement upon whether the mandated label formats and the current provision of information are optimal for communicating to the consumers and influencing their dietary choices (Ikonen, Sotgiu, Aydinli, & Verlegh, 2020; Seiders & Petty, 2004). Changes in behavior are extremely difficult to prove, considering the complexity of the decision-making process, which is affected by a huge deal of internal and external factors. In addition, often labels are simply completely ignored (Rotfeld, 2008a, 2008b; Rotfeld, 2010). A study on European consumers showed that only 16.8% of consumers use food labels when making purchases (Grunert, Wills, & Fernández-Celemín, 2010).

Our research taps into this theoretical gap and studies how different FOP label systems (i.e., sugar teaspoons vs. traffic-light) can affect the likelihood of choosing healthier food options. We expect that different types of FOP labels would affect healthy product choices to different extents, with sugar teaspoon labels having the greatest impact on healthy choices. Drawing from previous literature on processing fluency (Alter & Oppenheimer, 2009), we also propose that the different FOP labels (i.e., sugar teaspoons vs. traffic-light) are easier to understand, thus showing the role that processing fluency plays as mediator. Finally, we also

suggest the role that simplicity in terms of food ingredients composition plays in this relationship.

Methodologically, the paper presents two experimental studies. Study 1 investigates the relation between FOP labels (i.e., sugar teaspoon vs. traffic-light) and the likelihood of making healthy choices, by using a real consumption context. Study 2 – while replicating the findings of Study 1 – also measures the mediating effect of processing fluency in the relation between FOP labels and food choice and the moderating effect of simplicity of the food item. Overall, the findings suggest that compared to traffic-light, sugar teaspoon labels have the greatest impact on healthy choices. This is because of processing fluency: when a sugar teaspoon is used as a cue, the information is easier to process and use, leading to more accurate choices in terms of product healthiness, hence, choosing products with less sugar. Finally, we find that these effects are moderated by the simplicity of ingredient composition.

With this study, we contribute to previous research on the effect of FOP nutrition labels on consumers' healthy food choices in at least three ways (e.g., Dubois et al., 2020; Lim et al., 2020). First, to our best knowledge, this is the first study that tests and finds evidence for the effectiveness of a new FOP label – sugar teaspoons – that, compared to the traffic-light, is proved to be a simpler and more intuitive labelling system to process and understand, thus leading to healthier choices. Second, this paper offers a theoretical explanation on the effectiveness of FOP on consumers' healthy choices (Ikonen et al., 2020), showing the central role of processing fluency. Third, we provide evidence for the role of simplicity as a boundary condition that affects processing fluency and consumers' food choices.

From a practical standpoint, this research provides useful insights to practitioners on the use of labels to signal healthiness to consumers and to policy makers on the use of these labels to lead to healthier consumption habits and lower sugar consumption.

2 LITERATURE REVIEW

2.1. Factors promoting healthy food consumption

Individuals execute over 200 food decisions per day (Wansink & Sobal, 2007), which are often accompanied by an increasing amount of information aimed at making them more knowledgeable about these decisions, and ideally promoting healthy food choices (Martins, Block, & Dahl, 2015). Healthy food consumption can be defined as the eating behaviors that enable a person to achieve "a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity" (World Health Organization [WHO], 2006). According to WHO, a healthy diet protects against malnutrition in all its forms, as well as diseases such as diabetes, heart disease, stroke and cancer. Thus, promoting a healthy food consumption becomes a priority for policy makers and governments all over the world (Food and Agriculture Organization of the United Nations, 2020), leading to an increasing use of health communications designed to inform and capture the attention of consumers, as well as to motivate them to change unhealthy food behaviors.

Given the increasing importance of this issue, researchers have attempted to better understand how individuals make healthy food decisions. In this regard, previous literature shows that healthy food consumption is influenced by both individual and contextual factors (Guthrie, Mancino, & Lin, 2015). Table 1 presents the prior work exploring the main factors affecting individuals' healthy food choices.

Among the individual factors, research suggests consumers' nutrition knowledge and nutrition literacy as precursors to dietary behavior (Spiteri Cornish & Moraes, 2015; Sundar & Kardes, 2015). Similarly, the paper by Hansen and Thomsen (2013) points out consumers' health competency, health involvement and personal food identity and beliefs as drivers that affect health behaviors. Finally, prior works suggests self-affirmation and identity threats (e.g., ego threat) as determining in healthy/unhealthy food choices (Ivanic, 2016).

Regarding contextual factors, it has been shown that the portion size as well as the size of the food container (e.g., plate, cup and alike) affects food intake, such that larger portions increase individuals' eating amount (e.g., Wansink & Van Ittersum, 2013; Zlatevska, Dubelaar, & Holden, 2014). There is also much research which demonstrates that healthy food consumption is affected by social influences (Huneke, Benoit, Shams, & Gustafsson, 2015), social norms (Saunders & Rahilly, 1990), priming norms about healthy eating (e.g., fruit and vegetable consumption; Epstein et al., 2001) as well as general (vs. specific) goals (Bareket-Bojmel, Grinstein, & Steinhart, 2020). To conclude, a relevant research stream has been devoted to study the effect of nutritional information and FOP nutrition labels on consumers' healthy choices (Guthrie et al., 2015; Hagmann, Siegrist, & Hartmann, 2018). In this regard, prior works have shown that individuals who use labels are more likely to seek nutrition information and to eat healthy foods (e.g., Miller & Cassady, 2012). Specifically, consumers facing nutrition claims on a product seem to perceive the same product as healthier (independently of its objective healthiness), and to consume more of it, compared to consumers faced with the same product without nutrition claims (Holtrop, Cleeren, Geyskens, & Verhoef, 2019).

As shown in Table 1, many factors can affect consumers' healthy food choices. However, to the best of our knowledge, the current state of research about the effect of nutrition labels on

consumers' healthy decisions is far from being conclusive, which leaves rooms for further investigations (Ikonen et al., 2020).

Table 1

	Authors, year	Methodology (n.a. – not available)	Proposed IV (n.a. – not available)	Proposed DV (n.a. – not available)	Key Findings
	Epstein et al. (2001)	Experimental Study (over 12 months)	1) Increase of fruit and vegetable intake 2) Decrease intake of high fat / high sugar foods	1) Changes in servings per day of fruits and vegetables and high-fat/high-sugar foods 2) Changes in percentage of overweight Both variables measured over 12 months for parents and children in both groups	• The treatment had an impact on parent and child fruit and vegetable intake and high-fat/high-sugar intake • Parents in the increased fruit and vegetable group showed significantly greater decreases in percentage of overweight than parents in the decreased high-fat/high-sugar group
Individual Factors	Ivanic (2016)	Study 1: experimental Study 2: experimental	Study 1: race; group focus as moderator Study 2: self-affirmation, race was measured	Study 1: food choice Study 2: food choice	• When set into group-focus, individuals make food choices that reflect the racial stereotypes • When in self-focus, African Americans exhibit healthier preferences • There is no effect for Caucasians
	Spiteri Cornish and Moraes (2015)	Qualitative - Phenomenological interviews	n.a.	n.a.	• Nutrition information, and knowledge, are not sufficient to drive healthy eating • Consumers need appropriate nutrition literacy • Flawed nutrition information: foods containing particular nutrients are healthy • Flawed nutrition information disregards calorific, fat, or sugar content • Such beliefs tend to be enhanced via a health-halo effect

	Sundar and Kardes (2015)	Study 1: experimental Study 2: experimental Study 3: experimental Study 4: experimental	Study 1: perceived attribute variability (calories vs. high-fructose corn syrup); health halo as moderator Study 2: perceived attribute variability (calories: high vs low); health halo as moderator Study 3: replication of Study 2 with different product category Study 4: replication of Study 3 with different product category	Study 1: nutritional inferences Study 2: nutritional inferences (i.e., calories inferences) Study 3: nutritional inferences (i.e., sugar inferences) Study 4: nutritional inferences, calories inferences, taste rating, consumption rates	• Consumers form less favorable nutritional inferences about the possible values of missing product attributes when perceived attribute variability is high versus low • This effect is attenuated by the health halo effect • Results were consistent across a variety of products, across several attributes, and across several different health halo labels • Health halo labels influence consumers' expectations, hence, consumption behavior
	Hansen and Thomsen (2013)	Qualitative pilot study Survey main study	Personal food identity Unhealthy food taste belief Health involvement Health competency Perceived health barrier Health behavior	BMI	• Increasing consumers' competencies concerning healthy food consumption may improve the healthiness of their food behavior and reduce their BMI • These effects may occur even for consumers who perceive healthy food consumption to be a challenge
Contextual Factors	Bareket-Bojmel et al. (2020)	Study 1: experimental Study 2: experimental Study 3: experimental	Study 1: Information (conflicting vs. non-conflicting); consumption goals (specific vs. general) as moderator Study 2: Information (conflicting vs. non-conflicting); consumption goals (specific vs. general) as moderator; perceived value of information as mediator Study 3: Consumption goals (specific vs. general)	Study 1: Reduced meat consumption Study 2: Reduced number of sugar teaspoons a day Study 3: Reduce coffee consumption	• Communication that emphasizes specific goals is more effective in reducing overconsumption than communication that emphasizes general goals in consumption contexts with conflicting information • Consumers perceive conflicting information as less informative • This drives the effectiveness of specific (vs. general) consumption goals for reduced overconsumption
	Guthrie et al. (2015)	Conceptual	n.a.	n.a.	• Food choices depend on: – new information that consumers assimilate – their habits – their attitude variations as a result of the information they are exposed to • Future research needs to apply a variety of empirical methods to investigate the efficacy of new messages, technologies, intervention

				strategies, and surveillance data on healthy food choices
Hagmann et al. (2018)	Review of different interventions	Type of intervention Sugar and health consciousness Risk group or not (overweight participants and those consuming higher amounts of sugar-sweetened beverages) Area of living	Public acceptance of specific government interventions to lower sugar intake in the population	• Less intrusive FOPs receive the most support • More restrictive interventions create higher resistance • Sugar consciousness and diet-related health consciousness are the strongest predictors of acceptance
Holtrop et al. (2019)	Secondary data: UK household scanner purchase data from 29 food product categories	Presence of nutrition claims	SKU choice	• Nutrition claims can increase the choice probability • The increasing focus of consumers on healthier lifestyles and healthy food leads consumers to buy products with nutrition claims because of their tendency to improve the perceived healthiness of the SKU • The characteristics and the credibility of the claim seem to play a role in the above relationship
Huneke et al. (2015)	Study 1: experiment	Study 1: Waitress' appearance	Study 1: Time to first observation and total observation duration toward healthy vs. unhealthy meal alternatives	• Exposure to the overweight employee does not stimulate greater (i.e., earlier or longer) attention to unhealthy meal alternatives • Exposure to the employee who displayed an unhealthy lifestyle does
Miller and Cassady (2012)	Eye-tracking	Food label information	Decision making accuracy	• Those with goals related to changing their diet make relatively more comparisons between nutritional fact panels with increasing knowledge and motivation • Decision-making accuracy depends on age and motivation • Knowledge and motivation protect against declines in accuracy in later life • Knowledge mediates the relationship between motivation and decision accuracy

Saunders and Rahilly (1990)	Survey	Belief, value and social influences on intention to adopt target behavior University major (health and non-health majors) used as moderating variable	Intention to reduce fat and sugar intake Current self-reported fat and sugar restriction	• Both subjective norms and attitudes toward the behavior predict the subject's intention to reduce fat and sugar intake • For health majors, attitude toward the behavior had most influence • For the non-health majors, the subjective norm was most important • Reporting current restriction of fat and sugar intake (vs. not) has more positive behavioral beliefs about health benefits
Zlatevska et al. (2014)	Meta-analyses	n.a.	n.a.	• There is an effect between portion size and consumption • This effect is curvilinear: as portions become increasingly larger, the effect diminishes • This relation is moderated by several factors, proving weaker among children, women, and overweight individuals
Our paper	***Study 1: experimental*** ***Study 2: experimental***	***Study 1: FOP label (traffic-light vs. sugar teaspoons)*** ***Study 2: FOP label (traffic-light vs. sugar teaspoons) and food category***	***Study 1: healthy food choice*** ***Study 2: healthy food choice***	• ***The findings suggest that different types of FOP labels affect healthy product choices to different extents, with sugar teaspoon labels having the greatest impact on healthy choices*** • ***This is because of processing fluency: when a sugar teaspoon is used as a cue, the information is easier to process and use, leading to more accurate choices in terms of product healthiness, (choosing products with less sugar)*** • ***These effects are moderated by the simplicity of ingredient composition***

3 CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

3.1. Front-of-package (FOP) nutrition labels effect on consumers' healthy food choices

Food labelling represents *"all forms of information disclosure on a product, ranging from mere nutrition facts panel to daily reference values, recommendations, health claims and disclaimers"* (Hieke & Taylor, 2012, p. 7). Specifically, Nutrition Facts Panel (NFP) is a label that provides detailed information about food nutrient content (e.g., the amount of fat, sugar, sodium and fiber) that is required on most packaged food. FOP nutrition labels, instead, include symbols and rating systems that summarize *"key nutritional aspects and characteristics of food products"* (Institute of Medicine, 2010, p. 1) in easy formats. The aim of FOP nutrition labels is to simplify consumers' access and process of all the nutrition information in order to make healthy food choices (Ikonen et al., 2020).

Nowadays, displaying NFP is mandatory in most high-income countries, and often a highly regulated subject-matter. For instance, in the United States, all pre-packaged food displays a nutrition label since 1990 (US Food and Drug Administration, 1994). In Canada, nutrition label on almost all pre-packaged foods is mandatory since 2007 (Health Canada, 2017). As for the European Union, although nutrition label had remained voluntary for many years, the new Regulation n° 1169/2011 on the provision of food information mandated the obligation to provide nutrition information from December 2016 (European Commission, 2017). Despite this, consumers still experience difficulties to understand all the information presented on the NFP (Graham, Orquin, & Visschers, 2012), thus highlighting the importance of finding a simpler way to communicate nutritional healthy contents of food products. As a result, many different types of FOP nutrition labels have emerged and been implemented globally. Moreover, the relevance of using FOP nutrition labels is not only recognized by policymakers, but also by food manufacturers and marketers (e.g., Nestlé, Coca-Cola), which are increasingly adopting them to

help consumers make healthier choices. However, evidence suggests that FOP labels do not always work as intended, with companies struggling to find the best label type (Michail, 2017, 2018). One of the main criticisms deals with the lack of a standardized format (Directorate General for Health and Consumer Protection, 2005). It follows that understanding which FOP label type is most beneficial to consumers to make healthy choices is of paramount importance for both policymakers and business firms.

Prior literature suggests that overall food labels have a positive impact on the understanding of nutrition information and selection of healthy food (Cook, Burton, & Howlett, 2013; Hawley et al., 2013; Sutherland, Kaley, & Fischer, 2010). Specifically, more recent studies show a positive effect of FOP labels on consumers' perceptions of foods' healthiness (Ikonen et al., 2020; Newman, Burton, Andrews, Netemeyer, & Kees, 2018), nutritional quality of products (Lim et al., 2020) and consumers' choice (Dubois et al., 2020; Newman, Howlett, & Burton, 2014; Zhu, Lopez, & Liu, 2016;). In addition, FOP labels can help overcome the disadvantages of the mandatory NFP, which is difficult to read and understand (Nikolova & Inman, 2015).

Previous research shows that FOP labels vary in content and structure (Ikonen et al., 2020; Newman et al., 2018), which is likely to lead to differences in their effectiveness in helping consumers determine a product's healthfulness. Specifically, FOP labels can be classified as either (1) reductive labels (e.g., Facts Up Front, Guideline Daily Amounts), which reduce the amount of nutrition information provided in the NFP without offering any interpretation of this information, or (2) interpretive labels (e.g., traffic-light symbols, star-based systems), which provide greater evaluation of information contained in the NFP (Newman et al. 2018).

Among the different types of FOP labels, the traffic-light, which presents absolute nutrient levels (e.g., sodium, sugar) and % "daily value"[1] information while simultaneously offering a color scheme (i.e., green, yellow and red) to indicate nutrient healthfulness (European Food Information Council, 2015), is one of most used (Newman et al., 2018). However, what remains unclear is whether certain FOP labels are more helpful than others in determining consumers' healthy choices. Previous research presents contradictory findings, with some works suggesting traffic-light labels work best (Hawley et al., 2013) and others showing that they may have a negative influence on the perceptions of healthy food products (Temple & Fraser, 2014) and that the effectiveness depends on the context (Newman, Howlett, & Burton, 2016).

Specifically, Temple and Fraser (2014) explain that FOP labels have a critical role in the decisions that consumers make, hence, for consumers to make an educated decision, FOP labels have to be understood. Labels indicating the amount of each ingredient on food items can be misinterpreted if they are not clear. One of the most common labels in the UK is actually that of traffic-lights to indicate the amount of ingredients contained in food items (Food Standards Agency, 2007). As opposed to traffic-lights FOP labels, Temple and Fraser (2014) suggest that there may be simpler way to indicate amounts of each ingredient contained in food items, such as stars or ticks, as they are simpler to comprehend. In line with this, i.e., the importance of simplicity in comprehending the FOP label, we suggest a combination of the stars system with the actual quantity of ingredients in food items. For the purpose of this research, we focus on one food ingredient only – sugar – and we suggest that a simpler way to comprehend sugar amounts in food items and to actually compare food items with each other could be that of sugar

[1] Daily values (DV) are the recommended amounts of nutrients not to exceed each day. The %DV is how much a nutrient in a single serving of an individual packaged food contributes to an individual daily diet. For example, if the DV for a certain nutrient is 300 micrograms and a packaged food has 30 mcg in one serving, the %DV for that nutrient in a serving of the product would be 10% (source: U.S. Food & Drug Administration.

teaspoons. This label would be combining the stars system that eases the quantification of sugar and comparison between different items but would also be using an element – the sugar teaspoon – which is in line with the ingredient we are studying (i.e., sugar).

Based on this, this study aims at reconciling previous findings by suggesting an alternative label to well-known traffic-light system. We focus on sugar level as the ingredient we want to convey information on, and we use sugar teaspoons and traffic-light labels as cues to help consumers process the nutritional content. We suggest that for food categories that rely more on sugar levels, sugar teaspoons can be more effective than traffic-light in signaling the sugar content and in helping towards healthier choices. Formally:

H1: Compared to the traffic-light, the sugar teaspoons system is more effective at favoring consumers' healthy choices (i.e., choice of products low in sugar).

3.2. The mediating role of processing fluency

Processing fluency refers to varying degrees of effort and speed in information processing (Alter & Oppenheimer, 2009; Graf, Mayer, & Landwehr, 2018; Reber, Schwarz, & Winkielman, 2004). Processing fluency is defined as the subjective feelings of ease (vs. difficulty) with which external information can be processed (Schwarz, 2004), thus leading individuals to adopt the quick, effortless and spontaneous judgment rendering process. In contrast, lack of fluency, due to the experienced difficulty during the processing, leads to systematic processing and elaboration (Alter & Oppenheimer, 2009).

Fluency can arise from either the processing of the physical characteristics of a stimulus such as modality or shape (perceptual fluency) or its meaning (conceptual fluency) (Lee &

Labroo, 2004; Tulving & Schacter, 1990; Whittlesea, 1993). Prior research suggests that the ability to process information fluently can influence consumer evaluations (Brakus, Schmitt, & Zhang, 2014; Lee & Labroo, 2004), purchase intentions (Labroo & Lee, 2006), and choices (White, MacDonnell, & Dahl, 2011). Fluency has also been shown to be positively related to product judgments (Shen, Jiang, & Adaval, 2010), brand attitudes (Lee & Aaker, 2004), and product extension evaluations (Torelli & Ahluwalia, 2012).

In this research, we propose that alternative types of FOP nutrition cue (i.e., sugar teaspoons vs. traffic-light) lead to varying levels of processing fluency, which in turn affects consumers' healthy food choices. Previous research on FOP has mainly focused on how labels can be used to grab the attention of consumers (Bialkova & van Trijp, 2010). In this research, we focus on the role of processing fluency. This is because for attention to have an effect on consumers, they need to allocate processing capacity to the stimulus (Guido, 2001). For this to occur, the stimulus, in this case, the FOP label, has to be in line with the consumer goals (Bialkova & van Trijp, 2010). We suggest that a visual stimulus that is closely connected to the amount of sugar contained in a food item (vs. a more general one, like the traffic-light label) would be more in line with consumer goals of being healthy, hence, would allow for more fluent processing, and hence, lead to a consumer reaction (i.e., choice). Specifically, we argue that compared to traffic-light, sugar teaspoons increase the fluency of a product's health-related information, by providing an easier way to use the information on the content of sugar, which in turn positively impact consumers healthy choices. By looking at the number of sugar teaspoons in one food item (e.g., showing 3 teaspoons) compared to another one (e.g., showing 6 teaspoons), it is easier for the consumer to understand that the first one is healthier, in that it

contains half the sugar content of the second one. By contrast, this quantification would more difficult with the traffic-light labels. Formally, we predict:

> **H2:** Processing fluency mediates the relation between FOP label systems (i.e., sugar teaspoons vs. traffic-light) and consumers' healthy choices (i.e., choice of products low in sugar).

3.3. The moderating role of simplicity of the food item

Previous research has provided evidence that complexity and simplicity can affect processing fluency. Specifically, using art as a context, Hagtvedt and Vohs (2017) have found that simplicity in arts favors processing fluency of spectators. The authors refer to complexity when the object to be evaluated contains challenging, ambiguous, and complex qualities that do not allow for one-dimensional and straight-forward thinking, but instead, request the combination of several pieces of information together. As such, simplicity favors processing fluency more than complexity does (Hagtvedt & Vohs, 2017). This positive relation between simplicity of cues and processing fluency has been confirmed in other contexts too. For instance, Herrmann, Zidansek, Sprott, and Spangenberg (2013) provide empirical support for the relation between simple and complex scents and information processing. The authors show that scents that are easier to process – hence perceived as simpler – favor processing fluency, and thus, actual spending. While the effect is significant and positive for simple scents, it does not persist for complex ones. This is easily explained by the fact that simpler cues lead to less cognitive effort to be processed and hence, it is easier to process any judgmental tasks (Schwarz, 2004).

The context used by Herrmann et al. (2013) is particularly important to our theoretical background. Just like food, scents are composed of different ingredients, and their complexity depends on the combination of different elements: ingredients in food, and dimensions in scents. For instance, a simple scent is considered to be one that mainly depends on one dimension (e.g., lemon), and a complex one is considered to be one that depends on different dimensions (e.g., a blend of citrus ingredients; Herrmann et al., 2013). Similarly, a simple food is one that relies mostly on one ingredient (e.g., plain chocolate), while a complex one is one that hosts many different ingredients (candy bar with chocolate and nuts; Weijzen, Zandstra, Alfieri, & de Graaf, 2008). Given the findings of previous research on the effects of simplicity of cues on processing fluency, we would expect that simple food - those that rely on less ingredients - should lead to greater processing fluency compared to more complex ones that rely on several ingredients. Moreover, given the relevance of the sugar ingredient in this research, we would expect that relation between FOP labels and processing fluency is facilitated for simple food items (vs. complex ones) that heavily rely on sugar to make any healthiness cues. Hence, we formally predict the following:

H3: Simplicity (vs. complexity) of food ingredients moderates the relation between FOP label systems and processing fluency.

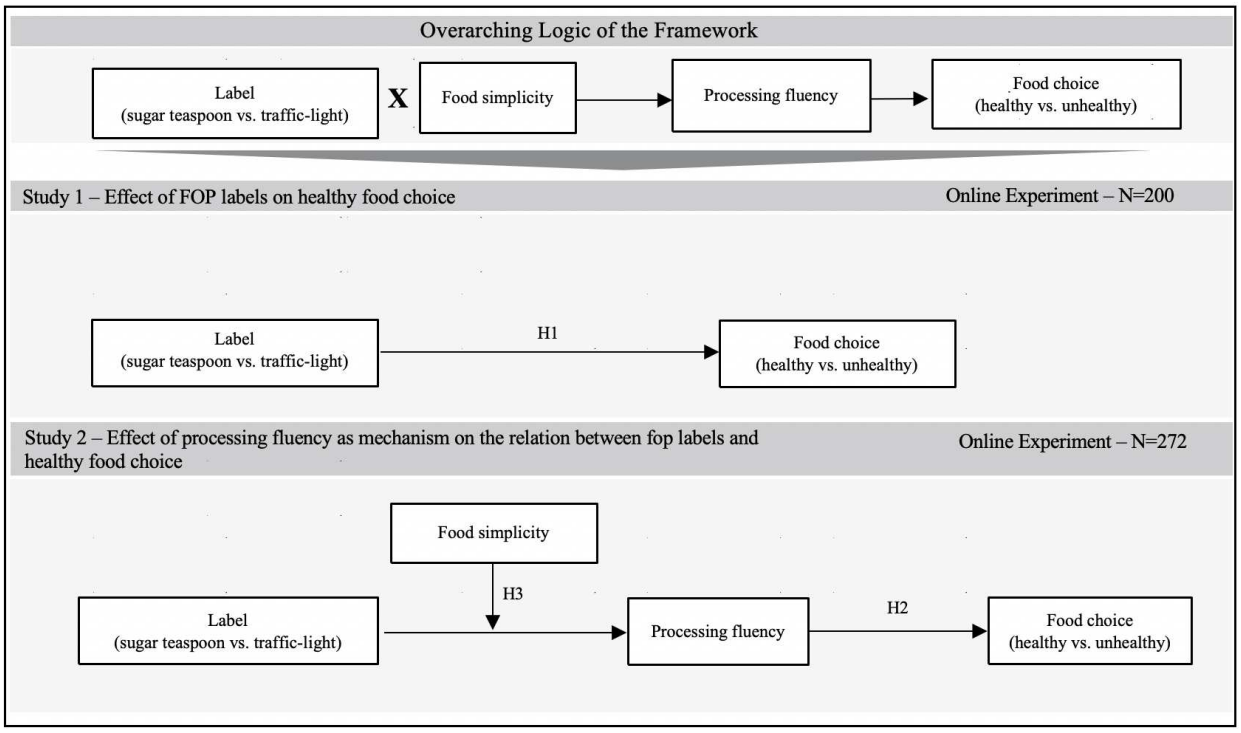
4 OVERVIEW OF THE STUDIES

Figure 1 shows the overarching logic of our studies. This research presents two experimental studies to test the relationships among the variables we included in the conceptual model. Study 1 aims to investigate the prediction made in H1 regarding the relation between

FOP labels (sugar teaspoon vs. traffic-lights) and the likelihood of making healthy choices. The study uses a real consumption context where participants are asked to make a choice that will reflect the item that a sample of them will really get afterwards. Study 2 replicates the findings of Study 1, but also aims to investigate what has been predicted in H2 and H3 regarding the mediating effect of processing fluency in the relation between FOP labels and food choice and the moderating effect of simplicity of the food item. For this, we employ food items of 3 different categories that range from simple (smoothies) to more complex (ready meals) in terms of ingredients. This study provides further evidence of the predicted effects.

We use a sample of UK respondents in the first online study, recruited through the online platform of Prolific Academic, which is in line with the institutional intentions of policy makers to eventually introduce a system similar to the sugar teaspoons in the country. However, to increase the generalizability of our findings, in Study 2 we use a European sample, recruited through snowballing.

Figure 1. Conceptual Framework



5 STUDY 1 – EFFECT OF FOP LABELS ON HEALTHY FOOD CHOICE

5.1. Participants

Two hundred respondents participated in an online study on the Prolific Academic platform in return for monetary compensation for their time. One of them was excluded prior to the analyses for taking over twelve minutes to complete the study, which was estimated to take approximately one minute. The rest of the analyses were conducted with the remaining one hundred and ninety-nine participants (M_{age}=35.94, SD=11.50, 33.17% male).

5.2. Material and designs

Participants were selected based on two criteria: their age (i.e., over 18) and their current country of residence (i.e., United Kingdom). We chose United Kingdom as the basis for our sample given that the traffic-light system in FOP labels is quite common in this country. Participants were invited to participate in a very short study about food preferences. Before

starting, participants read the following: “It is common in food items to signal the sugar intake that the item contains. We will be reporting the sugar intake using a label that distinguishes between lower and higher sugar amount contained in the food item”. To make the study behavioral and consequential, participants read the following: “In the next page, you will be shown 2 combinations of smoothies and you will be asked which one of them would you choose. 5 of the respondents of this study will be randomly selected to receive a voucher of the value of a smoothie (or a Prolific bonus of the same amount). Hence, please make a choice that really reflects your preferences as you may be selected to receive that choice for free as a thank you note for participating in the study”.

We chose two fruit and vegetable smoothie combinations (Smoothie 1 consisted of cucumber, avocado, and apple; Smoothie 2 consisted of coconut, lime, and ginger) from an online store that sells them (https://www.shakeawaystore.co.uk/). It is important to note that while we refer to them as Smoothie 1 and Smoothie 2 in the manuscript for clarity, they were not named as Smoothie 1 and Smoothie 2 in the study. We created four blocks that combined the two smoothie combinations with the different FOP labels and sugar levels:

- block 1 consisted of Smoothie 1 with 2 sugar teaspoons to indicate low sugar level (8 grams) and Smoothie 2 with 6 sugar teaspoons to indicate greater sugar level (24 grams);
- block 2 consisted of Smoothie 1 with 6 sugar teaspoons and Smoothie 2 with 2 sugar teaspoons;
- block 3 consisted of Smoothie 1 with a green traffic-light to indicate low sugar level (8 grams) and Smoothie 2 with a red traffic-light to indicate greater sugar level (24 grams);
- block 4 consisted of Smoothie 1 with a red traffic-light label and Smoothie 2 with a green traffic-light label.

Sugar teaspoons labels did not have any guidelines attached to it, because it is a hypothetical label inspired by the UK's proposal to include additional visual elements in relation to free sugars on packaged food and drinks. We have designed a label counting the teaspoons of "total sugars" contained, not "free sugars" or "added sugars"[2]. The values for the teaspoon amounts were computed considering that a teaspoon roughly equals 4 grams of sugar. The sugar levels were retrieved from the nutrition facts table of the product on Tesco's website. The order of Smoothie 1 and Smoothie 2 inside each block was randomized, and each participant was randomly exposed to only one of the four blocks listed above. We coded it as condition "sugar teaspoon" if participants were exposed to block 1 or block 2, and as condition "traffic-light" if they were exposed to block 3 or block 4. Please see labels stimuli used in the Web Appendix.

After participants made a choice, they were asked about the extent to which they liked smoothies in general (1 = far too little and 7 = far too much) and about the extent to which they paid attention to their food intake (1 = far too little and 7 = far too much). These two questions were included as controls in the hypotheses testing. Finally, participants indicated their gender and age, they were debriefed about the purpose of the study and they were thanked for participation.

5.3. Findings and results

Results indicate an overall marginal effect of FOP label (sugar teaspoon vs. traffic-lights) on food choice ($\chi^2 = 3.22$, $p = .073$). However, our hypothesis is focused on the effect within

[2] This choice was driven by some considerations. First, definitions of these concepts are not standardized, nor there exist nutrient databases for this piece of information. Second, although some governments have recommended to consumers as low as 5% of total calories from "free sugars", a research by Erickson and Slavin (2015) found that such guidelines would demand a strict dietary compliance that is seldom achievable by the general public, and would bring about avoidance of nutrient-rich foods such as yogurt and whole grains. Moreover, the same authors found that meal plans proposed by United States Department of Agriculture (USDA) had an average of 8.7% of calories from "free sugars", which was above what they had suggested in their general guidelines.

condition, predicting that using a sugar teaspoon as a label would lead to greater likelihood of choosing a healthier product (i.e., less sugary) than a less healthy one (i.e., more sugary). Hence, we tested our predictions that participants who are exposed to the sugar teaspoon would most likely choose the healthiest option among one with a little (8 grams per 100 grams) versus more (24 grams per 100 gram) sugar. We do not expect such result to persist for those exposed to the traffic-lights FOP label to indicate the extent of sugar contained in the product (green vs. red label for 8 grams vs. 24 grams of sugar respectively).

Consistent with our predictions, the test of proportion results suggested that within the sugar teaspoon FOP label condition, participants chose the smoothie that had a lower sugar content (66%), as opposed to the one with greater sugar content (34%; $z = -3.20$, $p = .001$). Such difference in proportions did not persist for those that were exposed to the traffic-lights FOP label. The results did not suggest a statistically significant difference between the likelihood of choosing the smoothie with lower sugar content (46.46%) and the one with greater sugar content (53.54%, $z = -0.70$, $p = .481$). We did not observe any effects of age and gender in these estimations ($p > .620$). Including the controls in the analyses did not significantly change the results obtained without including them.

Overall, the results of this study provide support for H1, which predicts that compared to the traffic-light, the sugar teaspoons system is more effective at favoring the choice of products low in sugar. We do so by using a context that proxies a real consumption one, by offering a number of participants the opportunity to actually receive a voucher to purchase the smoothie they choose in the study. We expect this to put participants in the condition of making a choice that resembles one that they would make in a store, rather than simply an intentional one. In the

next study, we investigate the effects of the mechanism and a boundary condition for the relation between FOP labels and choice of healthy food items.

6 STUDY 2 – EFFECT OF PROCESSING FLUENCY AS MECHANISM ON THE RELATION BETWEEN FOP LABELS AND HEALTHY FOOD CHOICE

6.1. Participants

Two hundred and seventy-two adults participated in the experiment that was distributed through the Qualtrics platform with an anonymous link aiming at a convenience sample. Respondents were European residents, mainly from United Kingdom and Italy, as they have to comply with European regulations about food labelling on which the whole discussion of this study is based on (71.7% female; 68.6% between 18 and 24 years old, 27.6% between 25 and 34).

6.2. Material and design

To test out predictions, we used three product categories: smoothies, yogurts, and ready meals. Within each category, three flavor variants were available e.g., “mango and passion fruit”, “berrie veggie” and “strawberry, banana and blueberry” smoothie. The three alternatives have identical nutritional profiles, apart from the sugar level which is either “low”, “medium” or “high”. As a result, one option is the healthiest (“low”), one the least healthy (“high”), and the third is in the middle (“medium”).

The images of the products have been taken from Tesco.com online grocery shop and have been edited so that each contains only: (i) an imaginary brand name (“Firefly”), described as a supermarket-owned brand offering a wide variety of products; (ii) product name and description; (iii) product image (“package”). We have excluded factors having a strong influence

on the choice, such as differing prices, brands, and quantities. Moreover, we have eliminated existing health claims to reduce the "halo effect" they sometimes create around the product (e.g., Wansink & Chandon, 2006).

To test whether the label format had an impact on the choice, participants were randomly assigned to one of the following conditions: *traffic-light label*, *sugar teaspoons label*, or *control* (products with no label). In order to enhance comparability of available options and prevent confusion, we presented all nutrition information in terms of "100g" instead of "portion size", because not all individuals are familiar with the latter concept. Moreover, because the threshold values for the color codes change if "portion size" is used instead of "100g", interpretation becomes harder.

Participants in the traffic-light system condition were exposed to the image of the food item accompanied by a red color code to indicate high amount of sugar, a yellow color code to indicate medium amount of sugar, and a green color code to indicate low amount of sugar. Similarly, in the sugar teaspoon condition, participants were exposed to the product with 6 sugar teaspoons to indicate high amount of sugar, 4 sugar teaspoons to indicate medium amount of sugar, and 2 sugar teaspoons to indicate low amount of sugar, coherently with Study 1 (see the Web Appendix for the labels attached to the images that were taken from Tesco's website).

After evaluating the three options, participants had to select the one they would buy. After making a choice, participants evaluated the chosen option with respect to the alternatives, as well as self-reported their perception of the simplicity of the food item and of the processing fluency.

Food item simplicity. We used product category to manipulate the simplicity of the food item ingredients because: (1) smoothies and yogurts are often perceived as "healthy" products,

hence, individuals may feel the need to check whether this is true (Grunert et al., 2010), and (2) ready meals are processed products with "low degree of transparency", and their nutritional profile is not entirely clear (Grunert & Wills, 2007). In addition, these categories can be problematic for health because of their "hidden" sugar content. Participants were shown three alternative food products from the following categories: smoothies, yogurts and ready meals.

Processing fluency. Participants were asked to state whether they would have been able to process with additional nutrition information about the food item (e.g., NFP and ingredients) by choosing between three options: 0 = neither, 1 = ingredients or nutrition facts, and 2 = both. Greater value corresponds to greater processing fluency.

Product choice. Finally, participants were asked to choose between the available options of yoghurt, smoothie, and ready meals, when one was designed as low sugar, one as medium level of sugar, and one as high sugar.

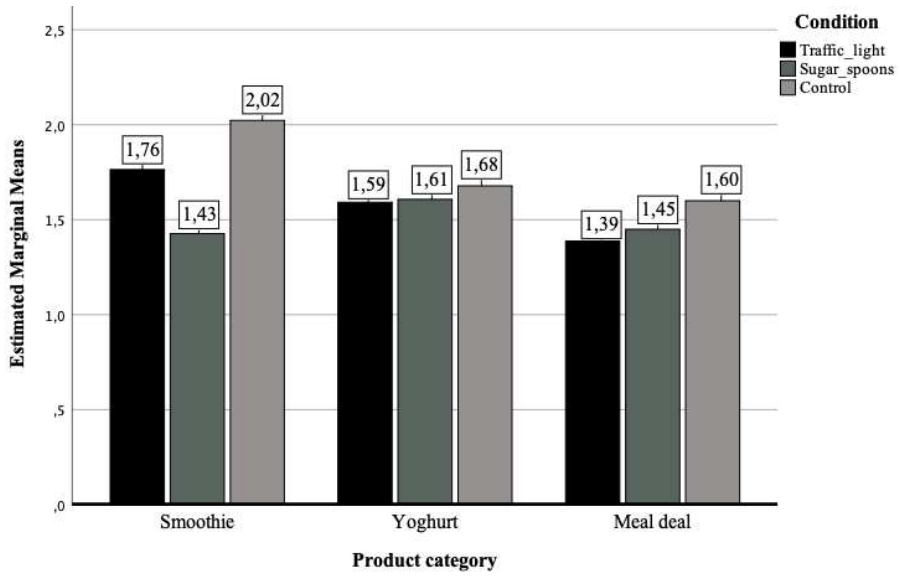
6.3. Findings and results

Product choice. We conducted a repeated measures ANOVA with product choice (on a scale from 1 = low sugar to 2 = medium sugar to 3 = high sugar level) as dependent variable and label format (sugar teaspoons, traffic-light, control) as the independent variable. We specified product category as repeated measure within-subjects and label format as between-subject. The results of the ANOVA (see figure 2) suggest a significant food category and label format condition on product choice overall interaction ($M_{\text{smoothie-trafficlight}} = 1.76$, $SD = 0.81$ vs. $M_{\text{smoothie-sugarspoons}} = 1.43$, $SD = 0.64$ vs. $M_{\text{smoothie-control}} = 2.02$, $SD = 0.87$, $M_{\text{yoghurt-trafficlight}} = 1.59$, $SD = 0.71$ vs. $M_{\text{yoghurt-sugarspoons}} = 1.61$, $SD = 0.73$ vs. $M_{\text{yoghurt-control}} = 1.68$, $SD = 0.70$, $M_{\text{mealdeal-trafficlight}} = 1.39$, $SD = 0.59$ vs. $M_{\text{mealdeal-sugarspoons}} = 1.45$, $SD = 0.66$ vs. $M_{\text{mealdeal-control}} = 1.60$, $SD = 0.75$; $F(2,269) = 3.93$, $p = .004$) and a main effect of food category on product choice ($F(2,269) = 9.51$, $p < .001$),

suggesting, once more, that the type of food plays a role in choosing sugar levels based on the label formatting. The results were confirmed also by the within-subjects' effect ANOVA, suggesting a main effect of food category on product choice ($F(2,269) = 9.39$, $p < .001$) and a within-subjects interaction effect of food category and label format on label understanding ($F(2,269) = 4.14$, $p = .003$).

Investigating more closely at pairwise comparisons between conditions (LSD method), we notice that using a label in general to communicate sugar amounts leads to more accurate product choice with lower levels of sugar than not using one at all ($\Delta_{sugarspoon\text{-}control} = -0.27$, $p < .001$, 95% CI = -0.40 to -0.14; ($\Delta_{trafficlight\text{-}control} = -0.19$, $p = .005$, 95% CI = -0.32 to -0.06). However, no differences in correctly assessing the sugar amounts were noticed between one label format and the other ($\Delta_{sugarspoon\text{-}trafficlight} = -0.09$, $p = .191$, 95% CI = -0.22 to 0.04).

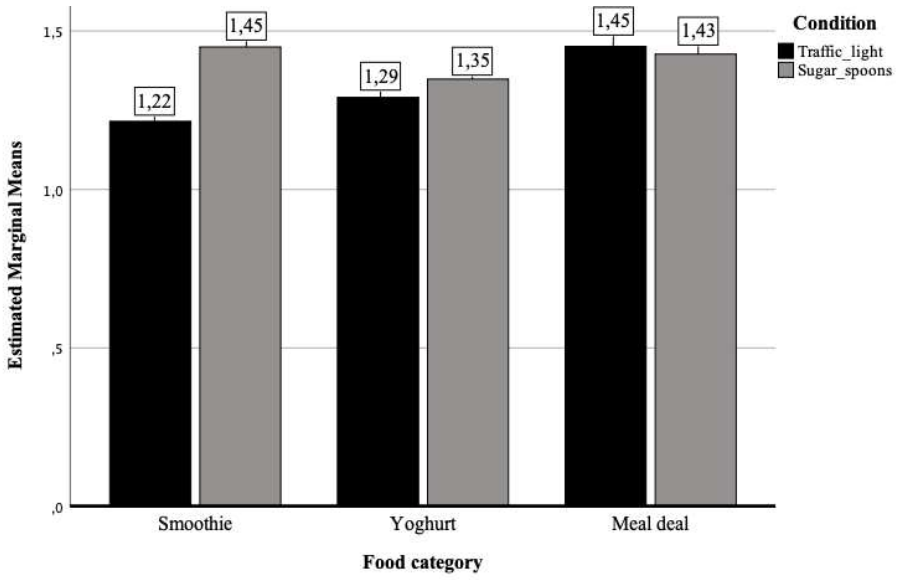
Figure 2. Effect of label formatting on sugar level product choice



Processing fluency. We conducted a repeated ANOVA using food category (smoothie, yoghurt, meal deal) as within-subject repeated measurement and traffic-light as opposed to sugar teaspoons for communicating sugar levels of food as a between-subjects' variable. Also, in this case, we do not have data for the control condition for this variable (label understanding) as it would have been impossible to measure the processing fluency based on the label, when none label was used. Hence, we conducted the rest of the analyses with the above two conditions.

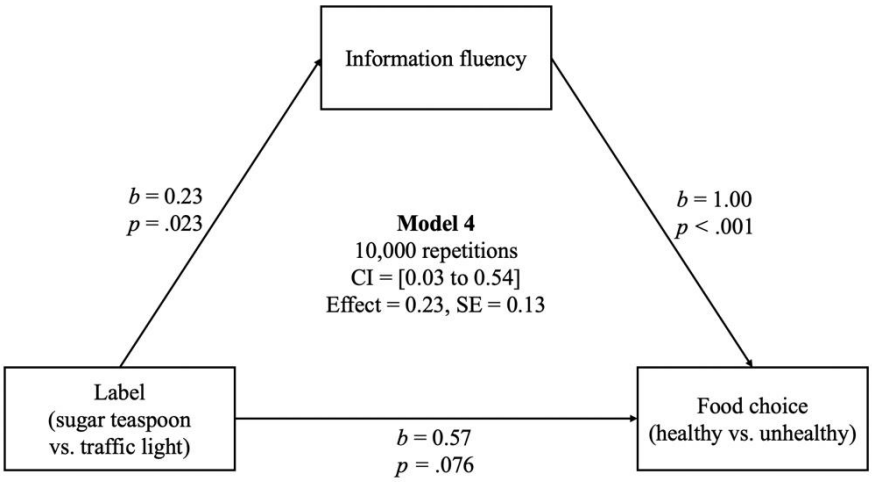
The results of the ANOVA (figure 3) suggest a significant food category and label format condition on processing fluency overall interaction ($M_{\text{smoothie-trafficlight}} = 1.22$, $SD = 0.72$ vs. $M_{\text{smoothie-sugarspoons}} = 1.45$, $SD = 0.66$; $M_{\text{yoghurt-trafficlight}} = 1.29$, $SD = 0.70$ vs. $M_{\text{yoghurt-sugarspoons}} = 1.35$, $SD = 0.71$; $M_{\text{mealdeal-trafficlight}} = 1.45$, $SD = 0.65$ vs. $M_{\text{mealdeal-sugarspoons}} = 1.43$, $SD = 0.72$; $F(1,179) = 3.88$, $p = .022$) and a main effect of food category on processing fluency ($F(1,179) = 3.60$, $p = .029$), suggesting that the type of food plays a role in how easy it is to use information based on the labels. The results were confirmed also by the within-subjects' effect ANOVA, suggesting a main effect of food category on label understanding ($F(1,179) = 4.09$, $p = .018$) and an within-subjects interaction effect of food category and label format on processing fluency ($F(1,179) = 4.13$, $p = .017$).

Figure 3. Effect of label on processing fluency



Mediation testing. We tested the relation between label systems and choice of low sugar product mediated by use of nutrition information and moderated by simplicity of food ingredients (i.e., the extent to which the product ingredients depend on sugar) by separately focusing on the smoothie category, the yoghurt category, and the ready meal category. Hence, we tested H2 and H3 using Model 4 of PROCESS macro for SPSS (Hayes, 2017), instructing to treat the label system as independent variable, choice of low sugar products as binary dependent variable, and processing fluency as mediator. The results suggest that for smoothies, that considerably depend on sugar, there is an indirect effect as predicted (CI = [0.03 to 0.54], Effect = 0.23, SE = 0.13, see figure 4 below). The results do not persist for yoghurt and ready meals, that depend on more complex aspects rather than sugar only (for yoghurt: CI = [-0.07 to 0.15], Effect = 0.02, SE = 0.05; for ready meals: CI = [-0.06 to 0.06], Effect = -0.01, SE = 0.03).

Figure 4. Results of the mediation model for smoothies



7 GENERAL DISCUSSION AND IMPLICATIONS

This paper focuses on the use of FOP labels to signal sugar levels on different food categories, such as smoothies, yoghurt, and ready meals, in affecting consumers' healthy choices. The findings suggest that different types of labels affect the likelihood of healthy product choices to different extents, with sugar teaspoon labels having the greatest impact on the likelihood of making healthy choices. This is because of processing fluency: when a sugar teaspoon is used as a cue, it is more fluent and easier to process, leading to more accurate choices in terms of product healthiness (choosing products with less sugar). It is important to note that the sugar teaspoon as a label does not exist yet among the cues currently being used in the market.

In a set of two experiments, we investigate our predictions that using sugar teaspoons, as opposed to traffic-light, would increase the likelihood of making healthy food choices. In this research, we focus on sugar content as the context for healthy food choices. We find that using sugar teaspoons (2 vs. 4 vs. 6 spoons) versus traffic-light (green vs. yellow vs. red) can increase the likelihood of consumers choosing food that contains less sugar (Study 1 and Study 2).

Moreover, we find support for processing fluency as the mechanism for the relation between FOP label and food choice. Given that the sugar teaspoon label leads to greater processing fluency, making a healthier choice becomes more likely (Study 2).

Finally, in Study 2, we provide empirical support for our prediction that there are specific food categories for which these results hold. In particular, we find that these effects are moderated by the simplicity of ingredient composition. Specifically, for products that have a lower number of ingredients composing them (such as smoothies), as opposed to those with a more complex ingredient composition (such as yoghurts and, even more, ready meals), the processing fluency, and subsequently the healthy product choice, is easier to make when a sugar teaspoon label is used to signal the sugar levels.

7.1. Theoretical Implications

Our paper provides at least three clear theoretical contributions. First, our findings contribute to research on the use of FOP labels and their effects on consumer healthy choices (e.g., Guthrie et al., 2015; Hagmann et al., 2018). While previous research has provided evidence that FOP nutrition labels help consumers identify healthier options within product sets (e.g., Ikonen et al., 2020; Lim et al., 2020), it is still unclear which FOP nutrition labels is more effective in determining consumers' healthy choices. In this regard, we advance previous literature by suggesting a new system – sugar teaspoons – to signal healthiness of food items in a way that increases the likelihood of making healthier food choices. To our best knowledge, this is the first study that proves the effectiveness of this label compared to the traffic-light system, by showing to be a simpler and more intuitive labelling system to process and understand.

Second, our findings reply to the call posed by Ikonen et al. (2020) to investigate possible psychological mechanisms underlying the effectiveness of FOP labeling. Drawing from prior research on the role of processing fluency in cue effects (Berger & Fitzsimons, 2008; Lee & Labroo, 2004), we advance the literature on the mechanisms behind customers' healthy food choices by providing evidence for the effect of processing fluency in explaining the relation between FOP labels and healthy consumer decision-making. Specifically, we show that a visual stimulus that is closely connected to the amount of sugar contained in a food item (vs. a more general one, like the traffic-light label) is more in line with consumer goals of being healthy, hence, it allows for more fluent processing, leading to consumer reaction (i.e., healthy choice).

Third, we shed light on boundary conditions that affect the relationship between FOP labels and healthy food choice. Differently from the previous moderators suggested for the effectiveness of FOP labels (e.g., vice vs. virtue categories, brand familiarity; see Ikonen et al., 2020), we show the simplicity of the food item leads to greater processing fluency, making a healthier choice becomes more likely.

7.2. Practical Implications for Policy Makers and Practitioners

While we provide some research contributions with these findings, we aim to also provide insights to policy makers on the use of FOP labels to lead to healthier consumption habits and lower sugar consumption, and to practitioners on the use of these labels to signal healthiness to consumers .

With obesity being considered among the main causes of illness (World Health Organization, 2017) in the world, providing insights on how we can entice consumers to making healthier choices proves a crucial task and objective. The results of this research suggest that by

using sugar teaspoons as FOP label, as opposed to traffic-light label or no label, would lead to a greater likelihood of making a less sugary – and thus, a healthier – consumer choice. This is particularly relevant for those categories of food whose healthiness depends on the levels of sugar contained in them, such as smoothies.

We suggest that policy makers can implement these findings in communicating the sugar content in food categories that respond to this description, with the aim of incentivizing consumers to make healthier choices. Moreover, we suggest a clear design of the sugar indicating label: sugar teaspoons. This label, according to our findings, is an effective one, even more effective than the existing traffic-light label, in increasing the likelihood of making healthier food choices. If this were to be applied, the rest of the ingredients can be displayed in numerical terms as previously done, and sugar content can be displayed using the sugar teaspoon label. This would be in line with the calls and concerns raised by WHO and policy makers according to Food and Agriculture Organization of the United Nations on the importance of a healthy diet and protection against malnutrition. According to these institutions, given that unhealthy choices in the food context can lead to diseases such as diabetes, heart disease, stroke and cancer, it is crucial to promote healthy eating. We believe that our findings provide some light over these concerns, suggesting one of probably many possible ways to address the unhealthy eating issues.

Furthermore, we hope that our findings can provide practical implications to marketers also. There is an increasing segment of individuals who aim at a heathier way of living, crowing that by making healthier food choices. For this segment, it is important that the healthiness of the food items is clearly communicated, allowing them to make better choices. To ensure this, our findings suggest that marketers would be more effectively address the needs of this segment by

using sugar teaspoon FOP labels rather than traffic-light labels or no labels at all. For practitioners interested in implementing our findings, we suggest a specific design for the sugar labels: sugar teaspoons. We have summarized the contributions of this paper in terms of theory, public policy, and marketing in Table 2.

7.3. Limitations and Future Research

This article is not without limitations. First, the results are strictly dependent on the definition of "healthiness" used in the experiment, which is focused exclusively on sugar content. With simple food categories, cues on a single ingredient are effective, while for more complex food categories, sugar is not the only key ingredient that consumers must evaluate to make purchase choices. Hence, a more comprehensive label needs to be used. Future research can work in collaboration with nutritionists to develop effective cues for complex food categories, but always considering that simplicity and processing fluency play a significant stake in determining consumers' product choice. Moreover, we propose that future research could focus on different food categories that we have not covered in this research.

Second, our measures to test objective understanding of FOP labels were not completely comparable with each other. On the one hand, because the sugar teaspoons label has not been adopted yet, there were no previous studies testing its comprehension. On the other hand, for the traffic-light label we only verified interpretation of color codes and percentages; thus, the understanding score did not include many other aspects which may be important to judge one's comprehension of the label content. Hence, we propose that future research could try to investigate the effectiveness of sugar teaspoons as opposed to other more comparable labels. One idea could be sugar cubes: given our findings, we would not expect a difference in effectiveness

between sugar teaspoons and sugar cubes, but we would expect a difference between sugar cubes and traffic-light labels.

While we provide evidence on one possible mechanism, we do not have empirical evidence for other possible mechanisms, and we have not ruled out other mechanisms in this study. Hence, future research could investigate on further potential mechanisms that explain the relationship between FOP labels and likelihood of making healthy consumer choices. The same applies to other possible moderators and boundary conditions that may alter the relationship and the effectiveness of sugar teaspoons as a label to educate consumers to make healthier choices.

Finally, this study was a further confirmation that, despite the usefulness and apparent intuitiveness of simplified labelling formats, they may not lead to the desired effects (e.g., Chandon & Wansink, 2007; Gomez, Werle, & Corneille, 2017). Therefore, another interesting strand of future research could look into the factors that affect the size of negative and positive biases deriving from the interpretation of FOP labelling formats.

8 CONCLUSIONS

In summary, this study provides an additional step in the research on how to reduce unhealthy food consumption choices and how to elicit healthier choices when it comes to sugar amount contained in food. We propose and find support that FOP labels that present sugar content using sugar teaspoons, rather than traffic-light, increase the likelihood of consumers choosing a food item with less sugar in it. This particularly holds for categories of food that rely heavily on sugar content to determine their healthiness (such as smoothies). We hope that this research stimulates further work in policy making and in marketing on the factors influencing healthy food choices.

Table 2.

Potential Public Policy, Theory, and Marketing Implications and Future Research

		Contributions	Future steps
Theory	Advance research on the use of FOP labels and their effects on consumer healthy choices	We clarify which FOP nutrition labels is more effective in determining consumers' healthy choices.	Test the effects of FOP in different food categories, both simple and complex in terms of ingredient composition.
		We suggest a new system – sugar teaspoons – to signal healthiness of food items in a way that increases the likelihood of making healthier food choices.	Investigate the effectiveness of sugar teaspoons as opposed to other more comparable labels.
		We provide evidence of the higher effectiveness of a new label compared to widely used traffic-light system.	Investigate into the factors that affect the size of negative and positive biases deriving from the interpretation of FOP labelling formats.
		We investigate one possible psychological mechanism underlying the effectiveness of FOP labeling.	Investigate on further potential mechanisms that explain the relationship between FOP labels and likelihood of making healthy consumer choices.
		We provide evidence for the effect of processing fluency in explaining the relation between FOP labels and healthy consumer decision-making.	Investigate on further potential moderators/boundary conditions that can alter the relationship between FOP labels and likelihood of making healthy choices.
		We propose one boundary condition on the relationship between FOP labels and healthy food choice: food composition simplicity.	Test different designs of the sugar FOP labels and test the effectiveness of the same format for other unhealthy ingredients such as saturated fats.
Public Policy	Healthy eating	We provide insights to regulation-making institutions in terms of incentivizing healthier consumer food choices.	

		We suggest that using sugar teaspoons as FOP label, as opposed to traffic-light label or no label, would lead to a greater likelihood of making a less sugary – and thus, a healthier – consumer choice. We suggest a specific design for the sugar labels: sugar teaspoons.
Marketing	Consumer need targeting	We suggest a more effective way to target the needs of consumers that are looking for a healthier lifestyle. We provide evidence for the effect of sugar teaspoons, as opposed to the existing traffic-light signaling, in increasing likelihood of eating in a healthier way. For practitioners interested in implementing our findings, we suggest a specific design for the sugar labels: sugar teaspoons.

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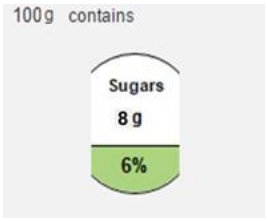
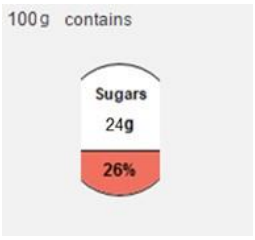
Web Appendix

Study 1 – Sugar teaspoon label

Study 1 – Traffic light label





Study 2 – Example of labels (traffic light vs. sugar teaspoon) used in Study 2