

# The satiating power of sustainability: the effect of package sustainability on perceived satiation of healthy food

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## Abstract

**Purpose** – This research investigates the influence of package sustainability on food satiation perception.

**Design/methodology/approach** – Research hypotheses were tested through three experimental studies.

**Findings** – Three experimental studies show that food quality is associated to higher perceived food satiation (preliminary study); that a food packaged in a sustainable package is perceived as more satiating than the same food packaged in a non-sustainable package and that this effect is explained by the higher perceived quality triggered by the presence of a sustainable package (Study 1); and that the positive relationship between higher perceived quality and perceived satiation is verified only for healthy but not for unhealthy foods (Study 2).

**Originality/value** – The present research advances knowledge on the highly debated issue of sustainable food packages. By proposing that consumers might perceive a healthy food presented in a sustainable package as more satiating, the authors show another extrinsic packaging cue modifying consumers' perception, namely package sustainability.

**Keywords** Sustainability, Package, Healthy food, Perceived satiation

**Paper type** Research paper

## 1. Introduction

Packaging sustainability is an increasing concern for both policymakers, companies and research (Vila-Lopez and Küster-Boluda, 2020), as large amounts of packaging materials produced every year are used and then simply thrown away. In 2017, plastic and glass packaging material, respectively, generated 14.5 million tons and 14 million tons of waste materials in the EU; the same year, 173 kg of packaging waste per inhabitant were registered [1]. As a result, the European Commission set the goal of replacing all plastic packaging with recyclable materials by 2030 [2]. At the same time, companies are starting to realize that the ability to meet stakeholders' and communities' demands cannot forego the consideration of sustainability issues (Mancini *et al.*, 2017; Steenis *et al.*, 2017; Hoek *et al.*, 2017a), thus recognizing the key role played by packaging in sustainable development. Consequently, retailers such as the French supermarket chain Carrefour are planning to gradually replace



non-recyclable plastics by alternative, more environmentally friendly materials [3]. Furthermore, sustainable packaging has been a major topic of discussion in sustainability and marketing literature (e.g., Lindh *et al.*, 2016; Magnier and Cri , 2015; Steenis *et al.*, 2017; Steenis *et al.*, 2018). Indeed, its role is particularly relevant in relation to consumer-packaged goods and especially food.

On this topic, prior research has shown that package is an important information driver in food evaluation, as its shape, color and material implicitly generate inferences about its content in terms of aspects such as taste or calories (e.g., Ares and Deliza, 2010; Becker *et al.*, 2011; Chandon, 2013; Krider *et al.*, 2001, Koo and Suk, 2016; Kunz *et al.*, 2020). Moreover, according to Wansink and Chandon (2006), consumers' expectations about food's ability to satiate their appetite can be modified by the presence of extrinsic cues such as nutrition labels. Conversely, less is known about whether and to what extent other features of food packaging affect consumers' perceptions of satiation. In this sense, as consumers show an increasing concern about green consumption (e.g., Olsen *et al.*, 2014; Magnier and Schoormans, 2015) and their demand for sustainability continues to grow (Kronthal-Sacco and Whelan, 2019), understanding whether package sustainability – in the sense of packages owning intrinsic and/or extrinsic attributes aiming at reducing the product's environmental footprint (Magnier *et al.*, 2016) – affect consumers' perception of satiation and consequently their food consumption appears to be particularly relevant. Few recent papers explored this issue and showed that food presented in packages containing sustainable cues (i.e., logos, color) and food packaged in sustainable packaging are more positively evaluated because of higher perception of quality and naturalness (e.g., Magnier *et al.*, 2016; Marozzo *et al.*, 2020). However, there is no evidence about how packaging sustainability affect consumers' perceived satiation.

Nevertheless, the investigation of this issue must account for the trade-off inherent to the choice between healthy and unhealthy foods (e.g., Talukdar and Lindsey, 2013; Tal and Wansink, 2015; Ivanic, 2016), as consumers believe that healthy food is less satiating than unhealthy alternatives (Finkelstein and Fishbach, 2010; Suher *et al.*, 2016) such that even fast-food meals are believed to be less caloric when advertised as healthy (Chandon and Wansink, 2007). As a result, demand for junk food to the detriment of healthy food choices has been growing in recent years (Fryar *et al.*, 2018), with obesity increasing from 11.7% in 2012 to 13.2% in 2016, and with a total of 2.6 billion of people being overweight globally in 2018 (FAO, 2018) [4].

Hence, building on evidence about the effect of package sustainability on consumers' perceptions (e.g., Magnier *et al.*, 2016) and on results from prior research showing that extrinsic cues affect satiation perceptions (i.e., Wansink *et al.*, 2004; Miraballes *et al.*, 2014), we argue that food packaged in a sustainable (vs. not sustainable) package is perceived as more satiating than food presented in a non-sustainable package. More specifically, we argue that this effect is a *halo effect* deriving from higher perceptions of food quality associated with the use of a sustainable package.

However, based on Cue Consistency Theory – according to which under uncertainty consumers are more likely to rely during their evaluations on the presence of multiple cues providing corroborating (vs. disparate) information (Maheswaran and Chaiken, 1991) – we argue and demonstrate that this effect holds only for healthy (vs. unhealthy) foods. Thus, through this research we build on and contribute to the literature on how consumers use packaging to make inferences about food content, finding another source of food estimation bias, i.e., *package sustainability*. In doing so, we conducted three experimental studies with the objective of testing the proposed causal relationship between package sustainability and perceived food satiation.

The remainder of this paper is organized as follows. First, we discuss how package sustainability positively influences perceived food satiation via food quality and present the

associated hypotheses. Second, we present three empirical studies aimed at testing the hypothesized mechanism. Finally, we conclude with discussion of findings and presentation of implications for managers and policymakers.

## 2. Conceptual framework

### 2.1 Package sustainability and food satiation

Product packaging serves multiple logistical functions, including simplified transportation of goods, efficient product storage and product protection (Rundh, 2005). Packaging is also acknowledged as an important tool in the marketing communications strategy, through the transmission of information about product benefits, the construction and/or the reinforcement of the brand image, and the supply of visual cues that facilitate associations with other elements of the communications mix (e.g., Underwood and Klein, 2002). However, product packaging is also one of the main contributors to municipal solid waste (EPA, 2019), with detrimental effects on the environment (Hall, 2017). This suggests the need for more sustainable solutions, in the sense of packaging production and development, whereby the needs of the present generation will not compromise the ability of future generations to meet their own needs [5] and with new packages developed consistently with the goals of sustainable development, from cradle to grave (Martinho *et al.*, 2015). At the same time, this shift raises the question of how and to what extent these new solutions affect consumers' perception. As a result, several authors (e.g., Magnier and Crié, 2015; Magnier and Schoormans, 2015; Magnier *et al.*, 2016; Seo and Scammon, 2017; Steenis *et al.*, 2017; Rees *et al.*, 2018; Ketelsen *et al.*, 2020) have recently focused their efforts on the understanding of the effect of package sustainability on consumers' perceptions and evaluations of the related packaged products. More specifically, sustainable packages have been defined as packages evoking via their structure or graphical elements eco-friendliness to customers, as for example through the usage of biodegradable materials, or eco-friendly logos (Magnier and Crié, 2015). In this sense, a sustainable package – e.g., a paper-based package entirely made from biodegradable material – is expected to be beneficial, safe and healthy for individuals and communities throughout its life cycle [6]. Coherently, a consistent stream of consumer research highlights that the usage of more sustainable packages positively influences consumers' attitude and choice behavior (Martinho *et al.*, 2015; Prakash and Pathak, 2017; Rokka and Uusitalo, 2008; Van Biergelen *et al.*, 2009; Rees *et al.*, 2019) and that packages sustainability can affect consumers' likelihood of purchase and willingness to pay (Magnier and Schoormans, 2015; Nordin and Selke, 2010; Pancer *et al.*, 2017).

The usage of sustainable packages also plays a key role in consumers' perceptions of food, not only for their primary functions such as food preservation and transportation, but also because they allow consumers to draw inferences about the product or its attributes using both intrinsic (e.g., labels and logos) and extrinsic (e.g., package material; Magnier *et al.*, 2016) attributes. For example, Van Biergelen *et al.* (2009) showed that consumers are willing to trade off almost all products attributes, except for taste and price, in favor of environmentally friendly packaging. In the same vein, Lee *et al.* (2013) and Magnier *et al.* (2016) demonstrated that the perceived quality of food products is more positive when they are packaged in a sustainable packaging. Moreover, Marozzo *et al.* (2020) found that packages that adopt *au naturel* colors evoking natural elements (i.e., beige) increase perceptions of products authenticity, and therefore higher consumers' willingness to pay. According to previous research (Huber and McCann, 1982; Pinson, 1986), consumers are not aware about these inferences, as they implicitly transfer the impressions generated from one element (i.e., packaging material) to another (i.e., packaged food). Building on these findings we propose another *food estimation* bias generated by the usage of sustainable packages. More

specifically, we argue that food packages that signal sustainability using extrinsic properties such as material (i.e., beige paper-based) positively influence the perception of food satiation.

Food satiation can be defined as resulting from the “associative learning between the food’s sensory properties, mainly the visual cues, and the remembered satiation after eating” (Labbe *et al.*, 2017, p. 311). Previous research found that perceived food satiation is strongly correlated with the perceived food energetic content (Brunstrom and Rogers, 2009; Brunstrom and Shakeshaft, 2009), and with food familiarity (Brunstrom *et al.*, 2008) but also with unrelated food factors such as nutrition labels (e.g., Miraballes *et al.*, 2014). In this research, we propose and investigate a novel extrinsic attribute influencing consumers’ perceived food satiation, namely *package sustainability*.

In particular, we propose that consumers transfer a higher capability to satiate their appetite to foods presented in a sustainable (vs. non-sustainable) package. We posit that this effect is a *halo effect* of the higher perceived quality that consumers attribute to food packaged in sustainable packages. As extensively shown by prior research (e.g., Chandon and Wansink, 2007; Schuldt *et al.*, 2012; Sundar and Kardes, 2015), the *halo effect* is the phenomenon in which the presence of an external cue leads consumers to form favorable overall evaluations of a product, which in turn guides inferences about specific missing or unknown attributes. Similarly, we propose that consumers form a higher quality evaluation toward food presented in sustainable packages (i.e., external cues), which in turn leads to inferences about perceived satiation. More specifically, we propose that the higher quality attributed to the food presented in a sustainable package (Magnier *et al.*, 2016) will unconsciously lead consumers to misattribute a higher food satiation capability to the food. In this sense, the superior quality deriving from the presence of the sustainable package is implicitly translated into a perception of satiation. Conversely, this effect does not hold for food presented in a non-sustainable package as the non-sustainable package is not associated to superior food quality; as a result, the implicit satiation association will not be perceived. It is important to note that the perceived superior food quality that does not derive from a sustainable package (i.e., external cue) is not able to generate a satiation *halo effect*, because consumers consciously attribute the perceived quality to food properties, and as a result, they are conscious about the food ability to satiate their appetite. Formally:

- H1. Food packaged in a sustainable (vs. non-sustainable) package is perceived as more satiating due to the higher quality attributed to the food packaged in a sustainable package.

## 2.2 The moderating role of food healthiness

In practice, sustainable packages often protect healthy foods (e.g., fruit, vegetables), that generally are perceived as less satiating than unhealthy foods (e.g., junk food; Finkelstein and Fishbach, 2010; Suher *et al.*, 2016; Raghunathan *et al.*, 2006). Building on Cue Consistency Theory (CCT, Maheswaran and Chaiken, 1991), we propose that the misperception of package sustainability on perceived food satiation holds only for healthy (vs. unhealthy) foods. CCT theory states that in low motivation situations, as those situations involving food purchases (Dahlén *et al.*, 2000), consumers use both high (i.e., systematic) and low (i.e., heuristic) diagnostic cues for processing product quality. When the cues are both congruent in their communication, subjects engage in an *additive* evaluation process; when the cues are not congruent (i.e., one is positive, the other is negative), an *attenuation* evaluation processing takes place.

We argue that sustainable package and healthy food are perceived as congruent cues by consumers: first, because they are both virtuous cues (Hoek *et al.*, 2017b); second, because in practice healthy foods are often packaged in sustainable packages. Indeed, whereas plastic and functional packaging is needed to preserve the nutritional quality of products such as

meat and regular produce, organic and high-quality produce is commonly sold in supermarkets in sustainable packages such as paper-based bags. Similarly, sustainable packaging is commonly used to suggest healthiness when selling snacks rich in fat and with poor nutritional quality. All these evidences strengthen the implicit association between sustainable package and healthy foods. Finally, the combination of healthy food and sustainable packages can often be observed in the activities of organic retailers; this is, for instance, the case of the Dutch supermarket chain Ekoplaza, that in 2018 opened a plastic-free pop-up store offering more than 700 organic food packaged using more sustainable materials [7].

We argue that while the presence of a sustainable package will improve the perceived quality of both healthy and unhealthy food, the *halo effect* of perceived quality on perceived satiation will be verified only for food that is conceptually congruent (vs. non-congruent) with sustainable package. Therefore, we expect an *additive evaluation process* to occur only for healthy foods presented in sustainable packages, such that the higher perceived quality deriving from the presence of a sustainable package will lead to perceptions of higher satiation. Conversely, sustainable packages and unhealthy foods are not conceptually congruent (i.e., in terms of the extent to which they can be perceived as virtuous cues the sustainable package has a positive valence, the unhealthy food has a negative valence); as a result, an *attenuation evaluation process* will take place such that the higher perceived quality determined by the sustainable package will not result in a higher perceived satiation (see Figure 1). Formally:

- H2. The higher perceived quality generated by the presence of a sustainable (vs. non-sustainable) package on perceived satiation holds only for healthy foods. For unhealthy foods the usage of a sustainable (vs. non-sustainable) package does not generate differences in terms of perceived satiation.

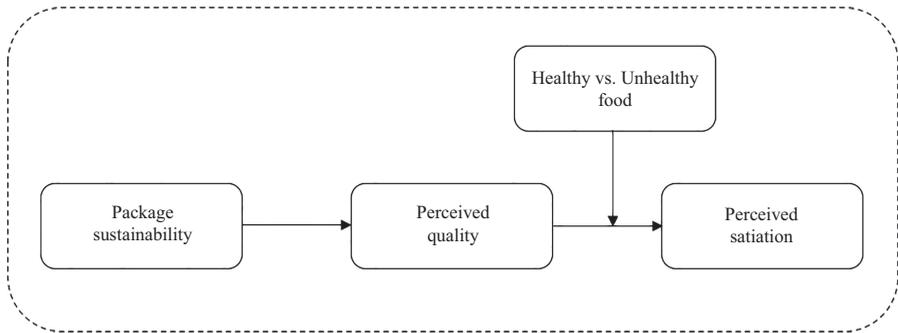


Figure 1. Theoretical framework

### 3. Method

We tested our conceptual framework in three experimental studies. First, a preliminary study was conducted to gain some insights about the proposed *halo effect* of food quality on perceived satiation. Second, Study 1 tested H1, whereas Study 2 tested H2. In each study, package sustainability was operationalized by manipulating the package material (paper vs. plastic-based). Package shape was varied in each experiment to rule out possible alternative explanations related to package shape.

#### 3.1 Preliminary study

We conducted a preliminary study to gain initial evidence of our rationale, that is that of the proposed relationship between food quality and perceived food satiation. More specifically,

we asked 72 subjects (58% female;  $M_{\text{age}} = 31.80$ ,  $SD = 8.45$ ) recruited through a social network to first indicate in their opinion what are the characteristics of a satiating food. Then, they were explicitly asked to rate the extent to which they perceived a high-quality food and a food packaged in a sustainable package respectively as satiating (1 = not at all; 7 = a lot). Coding of the provided answers it was found that indeed participants believe that satiating foods should be of high quality (39.1%), should have several nutrients (e.g., vitamins, proteins, carbohydrates), should be provided in high quantity (21.7%), should be tasty (39.1%) and should be rich of calories (7.2%). Moreover, in line with our expectations, results of a pair-sample  $t$ -test revealed that participants on average perceived a high quality food as more satiating than a food packaged in a sustainable package ( $M_{\text{quality}} = 4.47$ ,  $SD = 1.52$ ,  $M_{\text{sust\_pack}} = 4.03$ ,  $SD = 1.50$ ,  $t(71) = 2.53$ ,  $p = 0.01$ ), giving therefore a first confirmation to our hypothesis.

### 3.2 Study 1

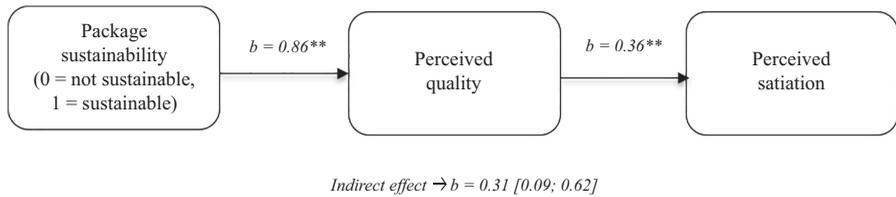
Study 1 was aimed at providing evidence for **H1**, demonstrating that the use of a sustainable (vs. non-sustainable) food package increases consumers' perceived satiation via higher perceived quality.

Eighty-one volunteers (58% female;  $M_{\text{age}} = 27.11$ ,  $SD = 11.11$ ) recruited by a research assistant through a snowball sampling procedure were randomly assigned to one of two conditions within a two-cell, between-subjects experiment. Specifically, participants were informed that they had to evaluate a snack offered by an anonymous cafeteria and depending on the condition they were exposed to a Turkey Sandwich packaged in a sustainable vs. a non-sustainable package. In both conditions, the Sandwich was presented with a list of ingredients (i.e., grilled Turkey, salad, low-fat cheese) and presented in the same package shape (i.e., a triangular Sandwich container), but with a different material (i.e., paper vs. plastic-based, see [Appendix 1](#)).

After the experimental stimuli exposure, we asked participants to rate the extent to which they perceived the Sandwich to be able to satiate their appetite (1 = "not at all", 7 = "a lot"). Our proposed mediator – perceived quality – was measured using two items from [White et al. \(2016\)](#). More specifically, participants were asked to rate the extent to which they perceived the Sandwich to have bad/good quality and low/high quality on a seven-points scale ( $r = 0.71$ ,  $M = 4.76$ ,  $SD = 1.29$ ). Manipulation check measures were also administered asking participants to rate the extent to which they perceived the package containing the snack shown at the beginning of the study as sustainable (1 = "not at all"; 7 = "a lot"), and the extent to which they perceived the snack (Turkey Sandwich) as healthy (1 = "not at all"; 7 = "a lot"). Finally, demographic information (age and gender) was collected and participants were debriefed and thanked for their participation.

**3.2.1 Results.** Results of two independent sample  $t$ -tests showed that the manipulation was successful, as the paper-based package was perceived as significantly more sustainable than the plastic package ( $M_{\text{sust}} = 5.46$ ,  $SD = 1.36$  vs.  $M_{\text{nonsust}} = 2.25$ ,  $SD = 1.37$ ,  $t(79) = 10.57$ ,  $p < 0.001$ ) while there was no difference in terms of perceived healthiness between the two conditions ( $M_{\text{sust}} = 4.59$ ,  $SD = 1.34$  vs.  $M_{\text{nonsust}} = 4.35$ ,  $SD = 1.08$ ,  $t(79) = 0.87$ ,  $p = ns$ ). We conducted mediation analysis (Model 4 of PROCESS macro; [Hayes, 2013](#)) to test **H1** wherein package sustainability (0 = not sustainable; 1 = sustainable) predicted perceived food quality, which in turn predicted perceived satiation. The results revealed that package sustainability positively affected perceived food quality ( $b = 0.86$ ,  $se = 0.27$ ;  $t = 3.16$ ,  $p < 0.01$ ), which then positively affected perceived satiation ( $b = 0.36$ ,  $se = 0.09$ ;  $t = 3.62$ ,  $p < 0.001$ ). The direct effect of package sustainability on perceived food perceived satiation was not significant ( $b = -0.21$ , boot standard error [SE] = 0.25; 95% confidence interval [CI] =  $-0.71$ ; 0.29). However, the indirect effect of package sustainability on perceived food

**Figure 2.**  
Results of Study 1



satiation turned out to be statistically significant ( $b = 0.31$ , boot standard error [SE] = 0.13; 95% [CI] = 0.09; 0.62). As a consequence, findings of Study 1 provide full support to H1, showing that using sustainable packages leads to higher perceptions of food quality and, in turn, to higher perception of satiation compared to using non-sustainable packages (see Figure 2).

### 3.3 Study 2

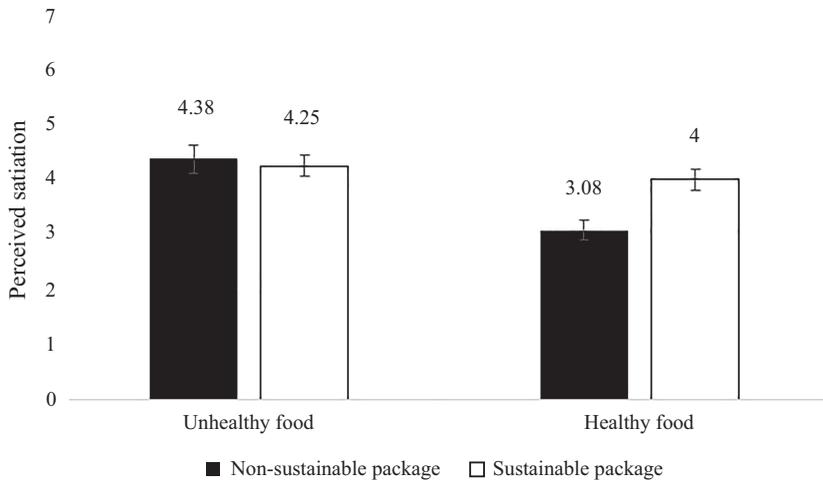
The aim of Study 2 was to test H2, according to which the *halo effect* resulting from the higher perceived quality generated by the presence of a sustainable package on perceived satiation holds only for healthy and not for unhealthy foods.

Two hundred and four volunteers (49% female;  $M_{\text{age}} = 36.31$ ,  $SD = 13.35$ ) recruited by a research assistant through a snowball sampling procedure were randomly assigned to one of four conditions within a four-cell between-subjects experiment in which package material (sustainable vs. non-sustainable) and food healthiness (low: French fries vs. high: apple salad) were manipulated. The package manipulation was very similar to the one used in the previous study, except for the shape that in this case was squared (see Appendix 2). Similar to Study 1, participants were informed that they had to evaluate a snack offered by an anonymous cafeteria, then depending on the conditions they were randomly assigned to one of four scenarios: the picture of a sustainable (i.e., paper-based) package containing either an apple salad or French fries, and a picture of a non-sustainable (i.e., plastic) package containing either an apple salad or French fries. In each condition the same package shape (i.e., a squared bowl) was used, with only the material of the package (i.e., paper-based vs. plastic) being different across the sustainable and non-sustainable conditions. Moreover, in each condition we informed participants about the food weight (250 gr., see Appendix 2).

After being shown the stimulus, participants were asked to rate the extent to which they perceived the snack as able to satiate their appetite (1 = “not at all”, 7 = “a lot”), to rate perceived food quality using the two items used in previous studies (adapted from White *et al.*, 2016;  $r = 0.84$ ;  $M = 5.06$ ,  $SD = 1.57$ ). Then, we administered manipulation checks asking participants to rate the extent to which they perceived the package containing the snack as sustainable (1 = “not at all”; 7 = “a lot”), and the extent to which they perceived the snack shown at the beginning of the study as healthy (1 = “not at all”; 7 = “a lot”). Finally, demographic information (age and gender) was collected and participants were debriefed and thanked for their participation.

**3.3.1 Results.** Results of two independent sample *t*-tests showed that both manipulations were successful, as participants in the sustainable package conditions perceived the package as significantly more sustainable than participants in the non-sustainable package conditions ( $M_{\text{sust}} = 6.42$ ,  $SD = 1.24$  vs.  $M_{\text{nonsust}} = 1.53$ ,  $SD = 1.05$ ;  $t(202) = 30.31$ ,  $p < 0.001$ ), while participants in the healthy food conditions perceived the snack (i.e., apple salad) as significantly healthier than participants in the unhealthy food (i.e., French fries) conditions ( $M_{\text{healthy}} = 5.66$ ,  $SD = 1.45$  vs.  $M_{\text{unhealthy}} = 2.25$ ,  $SD = 1.33$ ;  $t(202) = 17.43$ ,  $p < 0.001$ ). We then conducted a two-way ANOVA on perceived food satiation in order to provide first evidence to

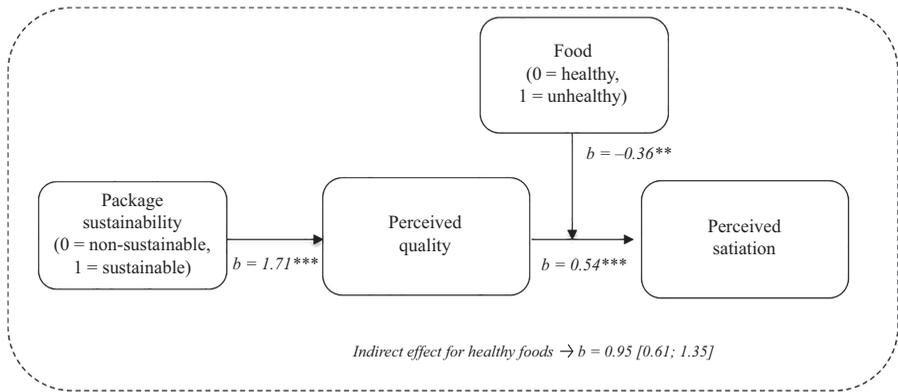
our conceptualization, namely that the proposed halo effect is verified only for healthy (i.e., apple salad) and not for unhealthy food (i.e., French fries). Results revealed a significant effect of package sustainability ( $M_{\text{sust}} = 4.13$ ,  $SD = 1.39$  vs.  $M_{\text{nonsust}} = 3.67$ ,  $SD = 1.64$ ;  $F(1,199) = 3.80$ ,  $p = 0.05$ ) and food healthiness ( $M_{\text{healthy}} = 3.52$ ,  $SD = 1.38$  vs.  $M_{\text{unhealthy}} = 4.31$ ,  $SD = 1.58$ ;  $F(1,199) = 14.43$ ,  $p < 0.001$ ) on satiation, showing respectively that food packaged in a sustainable package is perceived as more satiating and that French fries are on average perceived as more satiating than apple salad. More importantly, the main effects were qualified by a significant interaction between the two independent variables ( $F(1,199) = 10.34$ ,  $p < 0.01$ ). Coherently with H2, planned comparisons indicated that for healthy foods consumer perceived satiation is higher when they are served in a sustainable package ( $M_{\text{sust\_healthy}} = 4.00$ ,  $SD = 1.32$  vs.  $M_{\text{nonsust\_healthy}} = 3.08$ ,  $SD = 1.28$ ;  $F(1,199) = 14.43$ ,  $p < 0.001$ ), whereas for unhealthy foods there is no significant difference in terms of consumer perceived satiation ( $M_{\text{sust\_unhealthy}} = 4.25$ ,  $SD = 1.44$  vs.  $M_{\text{nonsust\_unhealthy}} = 4.38$ ,  $SD = 1.75$ ;  $F(1,199) = 0.19$ ,  $p < \text{ns}$ ; see Figure 3).



**Figure 3.** Interaction effect of package sustainability and food healthiness on perceived satiation (Study 2)

Then we conducted a moderated-mediation analysis (Model 14 in PROCESS, Hayes, 2013), with package sustainability as independent variable (0 = non-sustainable, 1 = sustainable), perceived food satiation as dependent variable, perceived food quality as mediator, and food healthiness as moderator (0 = healthy, 1 = unhealthy). The results showed that package sustainability positively influences food perceived quality ( $b = 1.71$ ,  $t = 9.23$ ,  $p < 0.001$ ). Moreover, both perceived food quality ( $b = 0.54$ ,  $t = 5.24$ ,  $p < 0.001$ ) and food healthiness ( $b = 2.76$ ,  $t = 4.14$ ,  $p < 0.001$ ) positively influences perceived food satiation, whereas package sustainability does not ( $b = -0.22$ ,  $t = -0.93$ ,  $p = \text{ns}$ ). However, coherently with H2 the effect of the interaction between perceived food quality and food healthiness resulted to be significant ( $b = -0.36$ ,  $t = -2.87$ ,  $p < 0.01$ ), with a significant moderated mediation index ( $b = -0.62$ ,  $[CI] = -1.13, -0.19$ ). More importantly, an analysis of the conditional indirect effects showed that perceived food quality significantly mediated the effect of package sustainability on perceived food satiation for healthy food ( $b = 0.95$ , boot SE = 0.19, 95%  $[C.I.] = 0.61, 1.35$ ), but not for unhealthy ones ( $b = 0.31$ , boot SE = 0.21, 95%  $[CI] = -0.11, 0.73$ ; see Figure 4).

Figure 4.  
Results of Study 2



Findings from study 2 corroborate results of Study 1 according to which the higher perceived quality deriving from the usage of a sustainable package increases consumers’ perceived food satiation. Furthermore, coherently with H2, these results hold only for foods that are perceived as healthy by consumers, whereas for those foods that are perceived as unhealthy the higher perceived quality deriving from the usage of a sustainable package does not lead to higher perceived satiation.

#### 4. General discussion

Across three studies, we showed that the use of sustainable food packages generates a halo effect such that food packaged in sustainable packages (e.g., paper) is perceived to be more satiating than the same food packaged in non-sustainable packages (e.g., plastic), and consistently with results from prior research (Magnier *et al.*, 2016), we show that this effect is driven by perceptions of higher quality associated with food packaged in sustainable packages. Finally, we provide robust evidence that our hypothesized halo effect is verified only for healthy foods. Indeed, whereas both healthy and unhealthy foods are perceived to have higher quality when packaged in sustainable (vs. non-sustainable) packages, only healthy food is perceived to be more satiating. Building on findings from CCT theory (Maheswaran and Chaiken, 1991), we argue that this is the result of an *additive evaluation process* taking place because both sustainability and healthiness are perceived as coherent virtuous external cues, leading consumers to misattribute to the healthy food a higher ability to satiate their appetite. Conversely, this process does not occur for unhealthy foods, as the unhealthiness of the food is not a virtuous cue.

This paper significantly contributes to a better understanding of a research area that has been largely neglected by prior research, namely consumers’ responses toward sustainable food packages. Indeed, our research extends results from Magnier *et al.* (2016) by showing that the higher perceived quality associated with package sustainability increases healthy food perceived ability to satiate consumers’ appetite. In this sense, we add to this stream of literature by identifying a novel downstream effect of package sustainability, that is, perceived satiation. Furthermore, we contribute to literature on how package characteristics impact consumers’ food perception and behavior (e.g., Deng and Srinivasan, 2013; Scott *et al.*, 2008) by focusing on another, largely unexplored, extrinsic package characteristic, that is, package sustainability. Finally, we add to work exploring how marketing factors and psychological processes affect perceptions of food satiation (e.g., Galak *et al.*, 2014; Piqueras-Fiszman and Spence, 2012; Suher *et al.*, 2016; Fiszman *et al.*, 2014).

At the practical level, our research provides useful recommendations for both companies in terms of package design and policymakers. Indeed, buying food is one of the most common activities consumers pursue several times each day, from selecting their lunches or snacks during their work breaks, to grocery shopping. Most of the time these apparently common activities involve several conflicting desires such as the trade-off between unhealthy and healthy alternatives, with the latter generally perceived as less satiating than the former. Consumers' implicit belief that healthy foods are less satiating than unhealthy ones has a twofold negative impact: on the one hand, this belief can lead consumers to choose unhealthy foods over healthier foods, with long-term effects on the individual's health and well-being; on the other hand, it might lead to the paradoxical overconsumption of foods that are perceived as healthy (e.g., Chandon and Wansink, 2007; Wansink and Chandon, 2006). Our results about sustainable packages increasing the perceived ability of healthy foods to satiate consumers' appetite provide an easy solution to these issues to be potentially implemented by both companies promoting healthy eating and policymakers. For instance, food manufacturers and retailers selling healthy food should market healthy foods in sustainable packages (e.g., paper-based) rather than in more traditional, non-sustainable materials such as plastic. Indeed, this solution would increase both consumers' likelihood of choosing healthy foods and the perceived quality of the food, with potential positive consequences for the seller image. Furthermore, our results support the economic convenience of adopting sustainable packaging for selling healthy food. Indeed, while consumers' belief that healthy foods are less satiating than unhealthy ones may lead consumers to choose the latter over the former, we show that sustainable packages overcome this belief, meaning that the perceived satiation of healthy food could be boosted by simply changing the material (sustainable vs. non-sustainable) in which they are packaged. Similarly, policymakers could design directives and regulations for the promotion of healthy eating taking into account package materials. Furthermore, our results show that the positive effect of sustainable packaging on perceived quality holds for unhealthy foods as well; this suggests that the overarching beneficial effects of choosing this route as the quality of food packaged in sustainable materials is more positively evaluated regardless of the food category (healthy vs. unhealthy). From a public policy perspective, our findings about package sustainability and food satiation for healthy food is a pivotal result as it provides policymakers with an unobtrusive and easily manipulation tool to promote consumption of healthy foods.

Considering the environmental challenges that society has to face and the need to develop sales of sustainable products and to promote healthy diet, the relationship between sustainability and healthy foods is a fertile topic for future research. Further research could aim to confirm our results considering different operationalization of healthy (vs. unhealthy) foods (e.g., vice and virtue), or manipulating the number of foods ingredients. Moreover, in our studies we operationalized packaging sustainability as paper-based materials and we did not test for the effect of other sustainable materials such as recycled plastic, or fiber-based materials. Future research could verify if our results can be extended also to alternative sustainable materials. Moreover, we considered only beige paper-based packages without considering whether our results hold also for other package colors (i.e., white paper). Additionally, our studies did not take into account two important variables that could affect both quality and satiation perceptions, namely consumers' knowledge about food nutrition and their educational level. It is possible that the effect shown in our studies is stronger for consumers low in food nutritional knowledge; hence, future research could consider the moderating role of food consumers' knowledge, while controlling for consumer's educational level. Another possible avenue worth investigating by future research is the effect that package sustainability has on the perception of unhealthy food. While our results did not find any effect in terms of food satiation, there might be other processes at play that could impact the way consumers perceive or behave towards unhealthy foods. Finally, further research

could verify the role of attractiveness in the relationship between package sustainability and perceived food satiation.

#### Notes

1. [https://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging\\_waste\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics)
2. <https://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf>
3. [http://www.carrefour.com/sites/default/files/carrefours\\_environmental\\_management\\_policy\\_en\\_2017.pdf](http://www.carrefour.com/sites/default/files/carrefours_environmental_management_policy_en_2017.pdf)
4. <http://www.fao.org/news/story/en/item/1152439/icode/>
5. <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
6. <https://sustainablepackaging.org/wp-content/uploads/2017/09/Definition-of-Sustainable-Packaging.pdf>
7. <https://www.packagingdigest.com/sustainable-packaging/the-emergence-of-the-plastics-free-grocery-aisle-2018-04-30>

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(The Appendix follows overleaf)

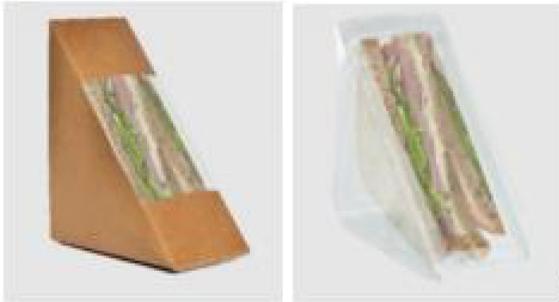
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123,13

Appendix 1

*Stimuli and description used in Study 2*

176

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*INGREDIENTS:*

*Integral bread,  
Smoked Turkey,  
Salad, Low Fat  
cheese*

*INGREDIENTS:*

*Integral bread,  
Smoked Turkey,  
Salad, Low Fat  
cheese*

*Stimuli and description used in Study 2*



FRENCH FRIES,  
250gr.



FRENCH FRIES,  
250gr.



GRANNY SMITH,  
250gr.



GRANNY SMITH,  
250gr.

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