Paper or Plastic?

Packaging Material Affects Health Perception and Consumption

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SUMMARY

This paper explores whether packaging material biases health perception and consumption. We propose that paper (vs. plastic) can lead to higher health perceptions of the package and hence decrease the consumption amount due to health goal activation.

Study 1 shows that health perception of paper is higher than the one of plastic. Study 2A and study 2B investigate the influence of packaging material on consumption. Study 2A shows that paper packaging leads to lower consumption compared to plastic packaging. Study 2B seeks generalizability of the previous effect by replicating the findings of study 2A in a setting that differs in procedure and stimuli. Finally, study 3 shows that the effect between packaging material and consumption disappears when the package is strongly associated with unhealthy food. The results of study 2A, study 2B and study 3 provide initial evidence that healthy packages lead to decreased consumption. We propose that health goal activation underlies this effect and are currently investigating this in an ongoing study. These findings offer substantive relevance for product designers, retailers, public policy makers, and consumers to tackle the worldwide obesity problem.

Keywords:

Consumption, food packaging, health perception, health goal, packaging material.

EXTENDED ABSTRACT

Public policy makers have been taking measures to drive back unhealthy food consumption and stimulate healthy food choices because of the worldwide obesity problem (OECD Obesity Update, 2017). As up to 75% of purchase decisions are made in-store, packaging plays an important role in promoting these healthy food choices (Cameron, Charlton, Ngan, & Sacks, 2016; Swinburn et al., 2011). Before consumption, especially when consumers have no experience with a product, potential consumers heavily rely on packaging to evaluate the product (Bloch, Brunel, & Arnold, 2003; Crilly, Moultrie, & Clarkson, 2004).

Until now, research on packaging especially focused on graphical and verbal design elements such as logos and colors (Grunert, Bolton, & Raats, 2008; Kiesel, McCluskey, & Villas-Boas, 2011). However, next to graphical and verbal design elements, also structural design elements such as materials, shape and formats (Ampuero & Vila, 2006) may have great impact on consumers' perceptions too (Festila & Chrysochou, 2018; Steffen, 2016). Surprisingly, insights into the impact of these structural design elements are limited. To help fill this void in literature, this paper focusses on how packaging materials bias health perception (HP) by looking at paper vs. plastic. These two packaging materials were chosen because they are by far the most common in the European and American food market (De Temmerman, De Bondt, & Van Kerckhove, 2017; Künnapas, 1955).

Not only brands and products (Geuens, Weijters, & De Wulf, 2009; Keller & Aaker, 1998), materials may have a symbolic meaning too (Underwood, 2003). In the context of packaging material, research shows that observed naturalness of products is higher when products are presented in sustainable packaging (e.g., paper) than when they are presented in conventional packaging (e.g., plastic) (Magnier, Schoormans, & Mugge, 2016). Consumers strongly associate paper with nature (Magnier et al., 2016) and natural materials are strongly

associated with healthiness (Maller, Townsend, Pryor, Brown, & St Leger, 2006). These findings allow consumers to see paper as a more healthy packaging material. Therefore, we put forward the following hypothesis:

H_1: Health perception of paper is higher than the one of plastic.

Furthermore, research shows that consumers often underestimate the number of calories from what they perceive as healthy food (Chandon, 2013; Chandon & Wansink, 2007) leading consumers to increase their consumption from those products. Hence, if packaging material has an impact on HP of the product, in other words, when packaging material would create a health halo (Peloza, Ye, & Montford, 2015; Steenis, van Herpen, van der Lans, Ligthart, & van Trijp, 2017), we could expect that healthy packages increase consumption (Bui, Tangari, & Haws, 2017; Chandon & Wansink, 2007). However, an alternative process could be at play: healthy packages could activate a health goal leading to decreased consumption (Belei, Geyskens, Goukens, Ramanathan, & Lemmink, 2012). According to the latter, any cue in the marketing environment that makes the concept of health highly accessible in consumers' minds and thus activates a health goal leads to lower consumption (Belei et al., 2012; Raghunathan, Naylor, & Hoyer, 2006). Applied to packaging, this means that healthy packages could lead to decreased consumption due to health goal activation. Based on these two opposing predictions, we put forward two distinct hypotheses:

H_{2a}: Consumption is higher when products are packaged inside a paper (vs. plastic) package.

H_{2b}: Health perception of a food product which is affected by health perception of the package underlies the effect of packaging material on consumption.

H_{3a}: Consumption is higher when products are packaged inside a plastic (vs. paper) package.

H3b: Health perception of the package which leads to health goal activation underlies the effect of packaging material on consumption.

We also put forward that the package effect –in whatever direction– will not always occur. Some packages are strongly related to specific products. To illustrate, the not so healthy fish and chips are traditionally wrapped in (news)paper and most fast-food hamburgers are served in typically shaped cardboard boxes. We suggest that the effect of packaging material on consumption will disappear when consumers associate the package with unhealthy food. When the attribute (i.e., package) is no longer considered healthy, no health goal will be activated (Belei et al., 2012) or no health halo will be created (Bui et al., 2017; Steenis et al., 2017). Because of this association, there will no longer be any difference in consumption between paper and plastic packages. We put forward the following hypothesis:

H4: The effect of packaging material on consumption disappears when consumers associate the package with unhealthy food.

STUDY 1

Study 1 tests whether paper increases HP of the package (H_1) by means of a within-subjects design. Forty-eight participants (MTurk) each saw eighteen stimuli one by one randomly drawn out of the two categories, that is, paper and plastic. Stimuli varied in different main characteristics of package design elements (e.g., color, size, and shape) to exclude the effects of these elements on HP of the stimuli. To measure HP of the stimulus, participants completed a seven-point semantic differential scale (1 = not at all healthy, 7 = very healthy). The results of a paired samples t-test show a significant effect of packaging material on HP of the package ($t(47) = 5.17$, $p < .001$, Cohen's d = 0.75). Specifically, paper ($M_{paper} = 4.16$, $SD = .96$) has a higher HP than plastic ($M_{plastic} = 3.28$, $SD = 1.05$). This result confirms H_1.

STUDY 2A

Study 2A tests the influence of packaging material on consumption ($H_{2a;}$ H_{3a}). A total of 127 (58% females, M_{age} = 29.80, SD = 15.21) participants were recruited to participate in a between-subjects laboratory study. Participants were randomly given a paper or plastic non-resealable package containing chocolate peanut candies. Participants were instructed that they could consume as much as they want of the chocolate peanut candies while watching a five minute video. To determine consumption amount for each participant, the remaining weight of food is subtracted from the initial weight. The outcome of this calculation serves as the dependent variable. In addition to the consumption data, we also collected other information (socio-demographics, HP of the package, hunger level, etc.) in an online questionnaire before and after watching the video.

To test whether healthy packages create a health halo, we also checked HP of both the package and the product. Participants were required to rate HP of the package (measurement cfr. study 1) and HP of the product within the package by means of a five-item seven-point semantic differential scale (α = .91) (Adams & Geuens, 2007). An independent samples t-test indicates that there is a significant effect of packaging material on HP of the package (t(125) = 7.50, p < .001, Cohen's d = 1.34). Paper packages (M_{paper} = 4.11, SD = 1.60) have a higher HP than plastic packages ($M_{plastic}$ = 2.21, SD = 1.20). This result supports H_1. No difference could be found between paper and plastic packaging in the case of HP of the product (t(125) = -.64, p = .522). This result disconfirms H_{2b}.

Consumption is analyzed with a negative binomial regression model, as we are dealing with overdispersed count data. The sample variance (σ^2 = 135.55) exceeds the sample mean (M = 8.20) which means the index of dispersion is greater than 1, and the confidence intervals of the negative binomial parameter do not include zero (95%; 1.37, 2.37). As Table 1 shows, consumption of products in paper packages is 0.62 times consumption of products in plastic packages at baseline (p = .052), holding hunger level constant. This result confirms H_{3a}.

Table 1

Study 2A: Negative binomial regression model of consumption (N = 127)

	95% Wald Confidence Interval for Exp(B)	Exp(B)
Plastic package		1
Paper package	.38, 1.00	.62*
Hunger level	1.09, 1.42	1.24**

* Significant at p < .1

** Significant at p < .01

STUDY 2B

Study 2B intends to seek generalizability of the effect by replicating the findings of study 2A in a setting that differs in procedure and stimuli. First, consumption time was not fixed. Participants had to answer various filler questions during consumption instead of watching a video. Second, the stimuli used in study 2B differed from those in study 2A. Both healthy (cashew) and unhealthy (coated and fried) nuts were used in resealable packages. We conducted a 2 (packaging material: paper vs. plastic) x 2 (product type: healthy vs. unhealthy) between-subjects laboratory experiment with 119 participants (50% females, M_{age} = 22.56, *SD* = 5.29) recruited through the University's research panel. Participants were randomly presented a resealable package with healthy or unhealthy nuts. Behavioral measures were also included in this study: after completion of the package evaluation, participants were invited to complete several other unrelated tasks and were told that they could eat as many nuts as they liked. The consumption amount serves as the dependent variable (measurement cfr. study 2A).

Also in this study we check HP of the package and the product. The results are the same as in study 2A. An ANOVA shows a significant main effect of packaging material on HP of the package (M_{paper} = 4.47, *SD* = 1.49 vs. $M_{plastic}$ = 2.72, *SD* = 1.44; $F(1) = 40.84$, $p < .001$, $\eta^2 = .26$). A one-sample t-test also shows that both paper ($t(68) = 2.66$, $p = .010$, Cohen's d = -

0.32) and plastic ($t(49) = -6.27$, $p < .001$, Cohen's d = -0.89) packages are significantly different from test value four (i.e., middle of the HP of the package scale). This indicates that across different product types (i.e., healthy and unhealthy) paper is seen as a healthy package and plastic is seen as an unhealthy package. Further, there is no significant effect of packaging material on HP of the product ($t(117) = .78$, $p = .435$).

Consumption is analyzed with a negative binomial regression model, as we are dealing with overdispersed count data. The sample variance ($\sigma^2 = 377.02$) exceeds the sample mean ($M = 16.61$) and the confidence intervals of the negative binomial parameter do not include zero (95%; 1.08, 1.84). In total, consumption from paper packages is 0.59 times consumption from plastic packages at baseline ($p = .026$), holding hunger level constant. When looking more in detail, we see that consumption of unhealthy nuts in paper packages is 0.50 times consumption of unhealthy nuts in plastic packages at baseline ($p = .033$), holding hunger level constant. As for healthy nuts, there is no such difference in consumption ($p = .282$). These results suggest that paper packaging activates a health goal, limiting the intake of unhealthy food.

STUDY 3

Study 3 tests whether the effect between packaging material and consumption disappears when the package is associated with unhealthy food (H_4). A total of 119 participants (52% females, $M_{age} = 20.43$, $SD = .70$) who were following a master program at a large Belgian University participated in a 2 (packaging material: paper vs. plastic) x 2 (product type: healthy vs. unhealthy) between-subjects laboratory study. They received course credit for their participation. The procedure and measures of this study are the same as in study 2A, but the stimuli differed. Healthy (cashew) and unhealthy nuts (coated and fried) were now packed inside a paper or plastic box that is typically used to serve Belgian fries. Next to monitoring consumption, we also checked to which type of food the participants associated the used

packages via an open question. Afterwards, this question was re-coded. This manipulation check indicates that 70.6% of the participants associated the package with unhealthy food compared to 29.4% who did not ($\chi 2(1) = 17.13$, $p < .001$). Thus, our manipulation is successful.

As in the previous studies, an ANOVA indicates that there is a significant main effect of packaging material on HP of the package ($M_{paper} = 3.66$, $SD = 1.50$ vs. $M_{plastic} = 2.02$, $SD = .99$; $F(1) = 49.47$, $p < .001$, $\eta^2 = .30$). A one-sample t-test also shows that both paper ($t(61) = -1.77$, $p = .081$, Cohen's d = -0.23) and plastic ($t(56) = -15.11$, $p < .001$, Cohen's d = -2.00) packages are significantly different from test value four (i.e., middle of the HP of the package scale). This result supports our manipulation. Again, no difference is found between paper and plastic packaging in the case of HP of the product ($t(117) = -.52$, $p = .605$, Cohen's d = .10).

Consumption is analyzed with a negative binomial regression model, as we are dealing with overdispersed count data. The sample variance ($\sigma^2 = 555.90$) exceeds the sample mean ($M = 18.16$) and the confidence intervals of the negative binomial parameter do not include zero (95%; 1.44, 2.47). Consumption from paper packages is not significantly lower than consumption from plastic packages at baseline ($p = .325$), holding hunger level constant. This result confirms H_4.

ONGOING STUDY

The results of study 2A, study 2B and study 3 provide initial evidence that healthy packages lead to decreased consumption. We propose that health goal activation underlies this effect (H_{3b}). According to previous research, food attributes that have a strong connotation of health should make the concept of health highly accessible in consumers' minds and thus activate a health goal leading to lower consumption (Belei et al., 2012; Raghunathan et al., 2006). Currently, we are still investigating the underlying process involved with those different consumption patterns using a lexical decision task in which faster recognition of health-related

words indicates goal activation (Belei et al., 2012; Fishbach, Friedman, & Kruglanski, 2003). The results of this study will be presented at the conference.

DISCUSSION

Prior research on packaging especially focused on graphical and verbal design elements such as logos and colors (Grunert et al., 2008; Kiesel et al., 2011). However, less is known about structural design elements such as materials, shape and formats (Ampuero & Vila, 2006). This gap raises the question: How do packaging materials (paper vs. plastic) bias HP and influence consumption?

The current research delivers a theoretical contribution to the understanding of (un)healthy food consumption in our contemporary society by investigating HP of packaging material and uncover why packaging material can affect consumption. The first study provides initial evidence that packaging material affects HP of the package. Results of the second study show that these HP biases prompt consumers to consume more or less food in realistic consumption situations. The notion that the packaging material could affect HP and consumption of (un)healthy products offers substantive relevance for product designers, retailers, public policy makers, and consumers to tackle the worldwide obesity problem.

In an ongoing study we are still investigating the underlying process of health goal activation involved with those different consumption patterns. The relationship between (HP) perceptions and consumption and the corresponding underlying processes still deserve more attention though. First of all, a clear distinction should be made between perceptions specific to the food and perceptions of extrinsic cues (e.g., packaging). In previous literature we noticed that these perceptions may or may not influence each other. Second, more research is needed into the possible relationship between these perceptions and the underlying processes that play a role in influencing consumption.

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