

From Glossy to Greasy: The Impact of Learned Associations on Perceptions of Food Healthfulness

Ning Ye 
Stockton University

Maureen Morrin 
Rutgers University Camden

Kristina Kampfer
University of Applied Sciences Kufstein Tirol

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We demonstrate that consumers have learned that unhealthy snacks such as potato chips tend to be sold in glossy packages, whereas healthier snacks such as crackers tend to be sold in matte packages (in studies 1–3). As a result, consumers who see a snack food package with a glossy [matte] surface will infer lesser [greater] healthfulness of its contents (study 4), consume less [more] of it (study 5), and be more likely to choose a glossy [matte] package from an assortment of snack packages if motivated to engage in tasty [healthful] eating (study 6). Theoretical and managerial implications as well as future research opportunities are discussed.

Keywords Food packaging; Learned associations; Glossy surface; Healthfulness inferences; Consumption; Choice

Packaging has been referred to as the “silent salesman” (Tangeland, Schulte, & Boks, 2008) due to its strong but often underappreciated influence on purchase decisions at the point of sale. With shoppers exposed to as many as 1,000 different products a minute in a grocery store (Hine, 1995), packaging often makes the “final sales pitch” (Hine, 1995, p. 3), so understanding better how it impacts consumers is of critical importance (Krishna, Cian, & Aydinoglu, 2017).

Marketers’ view of the role of product packaging has evolved from one that focuses on its functional role in the value delivery chain (e.g., safe transportation; extending shelf life of perishables) to one that focuses on its communicative role in parlaying specific product attributes (Krishna et al., 2017)—either explicitly via verbal claims on the pack (Chandon, 2013; Cornil, Chandon, & Krishna, 2017) or more implicitly via the package’s shape, color, texture, transparency, etc. (Deng & Srinivasan, 2013; Krishna & Morrin, 2008; Raghurir & Greenleaf, 2006; Raghurir & Krishna, 1999; Szocs, Biswas, & Borges, 2016; Table 1).

We examine an aspect of packaging that has only recently begun to receive attention from researchers—the extent to which the surface is matte or glossy. Meert, Pandelaere, and Patrick (2014) found that consumers prefer glossy surfaces due to an innate preference for fresh water. More recently, however, Marckhgott and Kamleitner (2019) found that for foods perceived to be artificial (e.g., ketchup and soda), a *less* glossy package surface enhances consumer response, in terms of perceived naturalness, tastiness, and purchase intent. Interestingly, Marckhgott and Kamleitner (2019) found that naturalness perceptions were associated with tastiness, which is somewhat inconsistent with prior research (Raghunathan, Naylor, & Hoyer, 2006). Although Marckhgott and Kamleitner (2019) do not propose a specific underlying process for their results, they state that packaging “appears to send its subtle signals of naturalness implicitly” (Marckhgott & Kamleitner, 2019, p. 9).

The current research similarly examines the effect of glossy versus matte packaging but, in the context of perceived healthfulness, demonstrates important downstream consequences on consumption and sales. Moreover, the current research provides

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Correspondence concerning this article should be addressed to Ning Ye, School of Business, B-122.1, Stockton University, 101 Vera King Farris Drive, Galloway, NJ 08205-9441, USA. Electronic mail may be sent to Ning.Ye@stockton.edu

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Table 1
Illustrative Summary of Prior Research on Product Packaging

Packaging attribute	Author(s)	Some key findings
Package color	Sugrue and Dando (2018)	Cider tinted green was perceived as colder than the control; cider tinted red was perceived as having more body. Cider with a red label was perceived as sweeter and fruitier than cider with a green label
	Deliza, MacFie, and Hedderley (2003)	Orange versus white packaging influenced expectations regarding juice sweetness
	Milosavljevic et al. (2012)	The visual salience of packaging (triggered by packaging brightness, etc.) had a stronger influence on product choice than preferences. The effects of packaging visual salience on product choice were more pronounced when cognitive load was high
	Piqueras-Fiszman, Alcaide, Roura, and Spence (2012)	People perceived mousse served on a white (vs. black) plate to be sweeter and more intense. People liked mousse served on a white (vs. black) plate more. However, shapes of plates did not have an effect
	Piqueras-Fiszman and Spence (2012)	Hot chocolate served in orange- or dark-cream-colored (rather than white or red) cups tasted more intensely chocolate and was more positively evaluated
	Risso, Maggioni, Olivero, and Gallace (2015)	Red and blue cups tended to be associated with carbonated water, whereas white cups tended to be associated with still water and freshness
	Mai et al. (2016)	Products in light-colored (vs. dark-colored) packaging were perceived as healthier but less tasty. The negative effects of light-colored packaging on taste were more salient among people who did not actually taste the product or were less health conscious
	Tu, Yang, and Ma (2015)	Food presented on a red plate was perceived as spicier than food presented on a white or green plate
	Schulte-Holterhoek, Verastegui-Tena, Goedegebure, Fiszman, and Smeets (2017)	Yogurt in a darker, saturated, red (vs. blue) package created expectations of less healthy, more intense flavor, and sweeter taste. Red (blue) packaging also increased (decreased) skin conductance response
	Huang and Lu (2016)	Cool colors (e.g., blue) rather than warm colors (e.g., red) on food packaging communicated healthfulness. The packaging color had stronger effects for utilitarian foods (e.g., cereal), presumably because hedonic foods (e.g., potato chip) were perceived as more sensory/pleasure/unhealthy-related
	Cavallo and Piqueras-Fiszman, (2016)	Extra virgin olive oil in dark bottles performed better among Italian respondents, and in transparent bottles among Dutch respondents. Cold processing claims (yes, no) had no effect on evaluations. Italian origin had largest effect
	Piqueras-Fiszman, Velasco, and Spence (2012)	People have learned to associate packaging colors with chip flavors
	Mead and Richerson (2018)	Food in highly color-saturated rather than less color-saturated packaging was perceived as less healthful

Table 1.
Continued

Packaging attribute	Author(s)	Some key findings
Package shape	Raghubir and Krishna (1999) Folkes and Matta (2004)	People perceived greater volume in more elongated packages and consumed more from such packages Packages with unusual shapes attracted more attention and were perceived as having greater volume than those with same-sized, but usual shapes, which attracted less attention. Habituation to an unusual package or a disliked content inside the package reduced the effects
	Raghubir and Greenleaf (2006)	The ratio of the sides of rectangular packages affected purchase decisions, product preference, and market share. Ratio effects on purchase intentions were more pronounced in relatively serious (vs. more frivolous) shopping contexts
	Chandon and Ordabayeva (2009)	People perceived a size change as smaller when the three dimensions (height, width, and length) of the package changed than when only one dimension of the package changed. As a result, the dimensionality changes of the product package affected people's willingness to pay and consumption dosage of the product
	Fenko, Lotterman, and Galetzka (2016)	Products in angular versus round packaging were perceived as healthier. Some evidence of cross-modal congruency effects emerged (e.g., a butter cookie in a round package was expected to taste better)
	Becker, van Rompay, Schifferstein, and Galetzka (2011)	An angular (vs. rounded) packaging shape or a more (less) saturated packaging color increased perceived taste intensity of the product inside. Shape-color congruency enhanced product evaluation. The effects of packaging color and shape on taste perceptions and product evaluations were more pronounced among those participants more sensitive to the design (i.e., who scored higher on the Centrality of Visual Product Aesthetics scale)
Package size	Reimann, Zaichkowsky, Neuhaus, Bender, and Weber (2010)	Aesthetic package designs enhanced the activation in the reward system in the human brain and increased reaction times when people were making choices
	Scott, Nowlis, Mandel, and Morales (2008)	Restrained eaters consumed more smaller foods from small-size packages, but unrestrained eaters consumed more larger foods from large-size packages. The effects of package sizes on restrained eaters' consumption were reduced when the cool system was engaged; system focus did not affect unrestrained eaters' consumption behaviour
	Yan, Sengupta, and Wyer (2014)	Same products in smaller (vs. larger) packages were perceived to have higher quality due to people's belief that smaller-size packaged products had higher unit prices. The effects of small packages on perceptions of product quality were reversed when people's cognitive load was high
	Rolls, Roe, Kral, Meengs, and Wall (2004)	People consumed more foods from the package as the package size increased
	Argo and White (2012) Ilyuk and Block (2016)	Individuals with low appearance self-esteem consumed more from small (vs. large) packages Consuming the same amount of product from a single-serve versus multi-serve package created feeling of "consumption closure," which enhanced efficacy-adequacy perceptions

Table 1.
Continued

Packaging attribute	Author(s)	Some key findings
Package material	Werle, Balbo, Caldara, and Cornelle (2016)	Plain packaging (plastic bags with white labels) reduced intention to consume peanut M&M's, but increased actual snack food consumption among males, not females
	Deng and Srinivasan (2013)	Transparent (vs. opaque) packages increased food consumption when the food was small and visually attractive; transparent (vs. opaque) packages decreased food consumption when the food was large and visually plain
	White, Lin, Dahl, and Ritchie (2016)	Superficial damage to packaging acted as a contamination cue that automatically prevented people from purchasing a product with a superficially damaged package (e.g., a ripped label on the package). The effects of superficial packaging damage on product attitudes were more pronounced when people's cognitive resources were constrained
	Biggs, Juravle, and Spence (2016)	Foods (e.g., cookies and jelly beans) were perceived as rougher (smoother) when sampled from a plate with a rough (smooth) finish
	Krishna and Morrin (2008)	The firmness (vs. flimsiness) of a product package (clear, plastic cup) increased the perceived quality of mineral water. Such effects were more pronounced among people low in autotelic need for touch
	Patrick, Atefi, and Hagtvædt (2017)	Packaging that called for unveiling led to the belief that the product inside was more pristine and therefore more valuable
Package weight	Binninger (2017)	Natural packaging enhanced perceptions of food product quality, credibility, attractiveness, and purchase intentions
	Steenis, Herpen, van der Lans, Ligthart, and van Trijp (2017)	Consumers judged plastic and metal to be least sustainable, whereas glass and bioplastic were judged as most sustainable, followed by cartons. Such beliefs might differ from actual sustainability of packaging materials in terms of environmental impact
	Herbes, Beuthner, and Rame (2018)	The most important characteristics driving perceptions of sustainable packaging were as follows: package made from renewable materials, reusable package, biodegradable package, and recyclable package
	Jerzyk (2016)	The most important aspects of sustainable packaging were whether it was recyclable and whether it was made of safe materials; less important was the use of resources to create the packaging
	Steenis, van der Lans, van Herpen, and van Trijp (2018)	Consumers responded more positively to packaging reflective of circular design strategies (e.g., made of renewable or recyclable material), especially biological versus technical, than to packaging reflective of a linear redesign strategy (e.g., used less material in making the package). Communicating multiple strategies was not more effective than single strategies
	Maggioni, Risso, Olivero, and Gallace (2015) Szocs et al. (2016)	Water in heavier plastic cups seemed less pleasant but more carbonated Drinking beverage from lighter (vs. heavier) containers enhanced positive feelings, offset negative feelings, and increased perceived intoxication
Package sound	Kampfer, Leischnig, Ivens, and Spence (2017) Spence, Shankar, and Blumenthal (2011)	Heavier packaging increased perceptions of flavor intensity for chocolates and a soft drink Individuals perceived the potato chips as crispier when listening to the sound of opening a package of Kettle's or Walker's chip package than the sound of opening a tube of Pringles

Table 1.
Continued

Packaging attribute	Author(s)	Some key findings
Package font	Schroll, Schnurr, and Grewal (2018) Gmuer, Siegrist, and Dohle (2015) Karnal, Machiels, Orth, and Mai (2016) Lyons and Wien (2018)	Handwritten typefaces created perceptions of human presence, which led to emotional attachment and more favorable evaluations Wine that was tasted was liked better when its label carried an easy-to-read font In pretesting, red was found to be a heavier color than yellow, and a bolder typeface (SunSplash) was found to be heavier than a more delicate (AncientScript) typeface. A fictitious soft drink was judged to be heavier and less healthy when it was in a red (vs. yellow) can and had heavier (vs. more delicate) font For a hedonically positioned product, congruency between its positioning (healthy or delicious) and its package color (green or red) led to more premium perceptions, but incongruency led to more premium perceptions for a utilitarian product
Package claims	Kozup, Creyer, and Burton (2003) Dachner, Mendelson, Sacco, and Tarasuk (2015) Wilson, Miao, and Weis (2018) Fajardo and Townsend (2016)	Health claims and nutritional information on packages increased product attitude and purchase intentions The packages of 66 functional beverages such as energy drinks, sports drinks, and vitamin waters sold in Canada were examined over time and were found to often contain on-package micronutrient claims (e.g., vitamin B content) that consumers were unlikely to benefit from (due to sufficient micronutrient consumption levels in the population) Consumers perceived "best by" labels to refer to taste attributes and "use by" labels to refer to safety. There was some confusion regarding the meaning and application of such labels. A marketing claim on a package was more believable than one in a print ad. The results were driven by perceptions of proximity, with the product perceived to be closer to the package than to the advertisement, making the claim seem more verifiable and thus the marketer more trustworthy Smaller label sizes made people eat more but they perceived they ate less
Objects on package (other than claims)	Aydinoglu and Krishna (2010) Hagtvedt and Patrick (2008) Deng and Kahn (2009)	The presence of an art image (vs. a nonart image) on packaging improved product evaluations due to increased perceptions of luxury People expected objects located on the bottom (top), on the right (left), or on the bottom-right (top-left) of the package to be heavier (lighter). The match between the pictorial object's location on packaging and product heaviness influenced product preferences. People preferred the product with the product picture on the "heavy" locations when heaviness was considered a positive product attribute (e.g., for cookies); people preferred the product with the product picture on the "light" locations when heaviness was considered a negative product attribute (e.g., for bulbs). When consumers were primed with a health goal (vs. no goal), the preference for packages with a product image on the "heavy" location was mitigated. The location effects on product heaviness perceptions disappeared in an assimilating context when the locations of products on the other packages were similar; the location effects on product heaviness perceptions became more salient in a contrasting context when the locations of products on the other packages were different
	Velasco, Woods, and Spence (2015) Sundar and Noseworthy (2014)	People preferred a downward pointing triangle on a wine bottle label versus an upward pointing triangle People preferred more (vs. less) powerful brands with the brand logo placed high (vs. low) on the brand's packaging. The interaction between logo location and brand power on brand preferences was mediated by processing fluency resulting from a metaphorical link between verticality and power. Priming state of power—making people feel powerful (or powerless) moderated the logo location effects
	Gvili et al. (2015)	Foods that were depicted in motion were more appealing due to an increase in perceived freshness

Table 1.
Continued

Packaging attribute	Author(s)	Some key findings
Review papers	Krishna et al. (2017)	This is a review of prior research on how the sensory aspects of packages (color, shape, graphic positioning, etc.) influenced consumer experience
	Spence and Velasco (2018)	This is a review of prior research on packaging color, including how it could be used to optimize shelf standout, to reflect cultural meanings, to create customer expectations, and to influence the consumption experience (e.g., taste)
	Spence and Wang (2015)	This is a review of prior research concerning the sound of opening and pouring liquids from different types of vessels (bottles, cans, etc.) and what consumers can discern (e.g., temperature and carbonation level) from the sounds
	Chandon (2013)	This is a review of previous research on how packaged-based marketing claims (e.g., health claims) and package design (e.g., package shape and size) influenced product evaluations, consumption behavior, and public policy making
Packaging gloss	Skaczkowski, Durkin, Kashima, and Wakefield (2016)	The authors reviewed several papers showing evidence of sensation transfer from packaging, labeling, and branding
	Marckhgott and Kamleitner (2019)	Matte package surface enhances consumer response, such as perceived naturalness, tastiness, and purchase intention, but only for foods perceived to be artificial (e.g., ketchup and soda)
	Current research	People learned to associate package gloss with food unhealthfulness. Thus, they consume more [less] of food and be more likely to choose a matte [glossy] package from an assortment of snack packages if motivated to engage in healthful [tasty] eating

Note. Several papers examined more than one packaging attribute, but were listed under just one topic area.

evidence of the underlying process. Our results suggest that learned associations regarding package gloss are created through repeated exposure in the marketplace, which creates expectations regarding the tastiness and healthfulness of packaged foods. Consumers have learned that unhealthy snack foods, such as chips, tend to be sold in glossy packages, whereas healthier snack foods, such as crackers, tend to be sold in matte packages. As a result, seeing a snack food in a matte (vs. glossy) package elicits healthfulness (tastiness) inferences, which impact subsequent consumption and choice behavior.

We describe our conceptual framework, report the results of six studies including a field study, and discuss areas for future research.

Learned Associations

Associations, the fundamental basis for human learning, are mental connections between concepts in memory that develop based on an individual's experiences. Through repeated exposure to stimuli in the environment, a person comes to associate stimuli with particular outcomes. If stimulus outcomes are rewarding, engagement with such stimuli tends to increase, driven by neural mechanisms underlying the reward feedback process (Wimmer, Li, Gorgolewski, & Poldrack, 2018). The reward value of food is based on learned associations (Griffioen-Roose et al., 2013), with pictures of foods eliciting anticipatory responses based on learned associations between visual food characteristics and "post-ingestive consequences" (Charbonnier, Meer, Laan, Viergever, & Smeets, 2016, p. 166). The colors of food packaging, for example, have been shown to be associated with specific flavors (Piqueras-Fiszman, Velasco, & Spence, 2012), and the degree of a pack's color saturation exhibits associations with food healthfulness (Mead & Richerson, 2018).

Drawing from these streams of literature, we propose that consumers repeatedly exposed to unhealthy [healthy] snack foods such as potato chips [crackers] in glossy [matte] packaging will develop mental associations regarding packaging type and food healthfulness. Potato chips account for the largest amount of shelf space allocated to snacks in U.S. supermarkets (Thornton et al., 2013), with linear feet of 42.3. Our own store audit data (study 1) suggest that the majority of potato chips on shelf are in glossy packages, whereas the majority of healthier snacks such as crackers are in matte packages. We propose that as a result of repeated

exposure to such packaging, package gloss has come to act as a cue regarding snack food package contents, with matte [glossy] packaging creating expectations of healthier [less healthy] food, which impacts consumption and choice behavior.

Study 1, a store audit, provides evidence for unhealthy [healthy] snack foods such as potato chips [crackers] sold in glossy [matte] packages. We next demonstrate the existence of learned associations regarding food healthfulness and packaging using explicit (study 2) and implicit (study 3) methods and demonstrate their impact on healthfulness inferences (study 4), consumption (study 5), and choice (study 6).

Study 1: Store Audits

We conducted store checks in six retail outlets selling consumer packaged foods in a major metropolitan market in the United States. We sampled two large discounters (Walmart and Target), two grocery stores (Acme and The Fresh Grocer), and two drug stores (CVS and Rite Aid). We photographed all packages of potato chips and crackers on the store shelves in each outlet and counted the number of glossy and matte shelf facings within each category. We chose two product categories as examples of snack foods that are generally perceived as more (crackers) and less (potato chips) healthy, in accord with prior research (Deng & Kahn, 2009). A total of 2,656 packages were classified in this manner (Figure 1, Appendix A). The majority of potato chips on store shelves were packaged in glossy (76.8%) rather than matte packaging, whereas a minority of crackers were packaged in glossy (4.5%) rather than matte packaging (Figure 1; $\chi^2(1) = 1,387.12, p < .001$). The results support our contention that consumers have likely been repeatedly exposed to snack food packaging that creates and reinforces associations regarding package type and healthfulness (i.e., matte = healthy, glossy = unhealthy). We next assess these learned associations in a survey, in study 2.

Study 2: Survey

We conducted an online survey among Amazon MTurk participants ($N = 211$, median age = 32, 47% female) to see whether consumers associate healthier snacks such as crackers with matte packaging and less healthy snacks such as potato chips with glossy packaging.

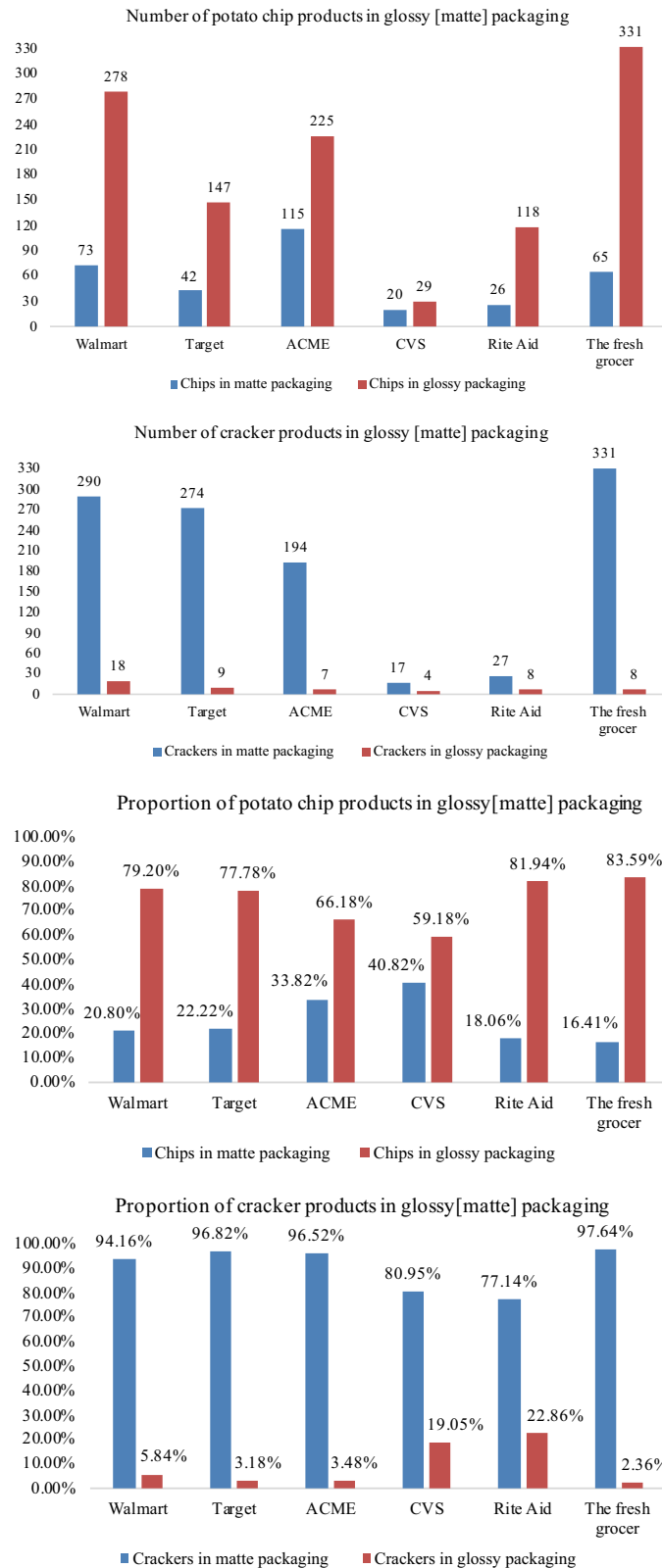


Figure 1. Study 1: Store check results. *Note.* Numbers represent number or proportion of shelf facings devoted to snack packages with glossy or matte surface, within each product category (potato chips and crackers). [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/terms-and-conditions)].

Participants indicated the extent to which they agreed with these statements: Potato chip [cracker] packages usually have a glossy surface; I have come to expect potato chips [crackers] to be sold in glossy packaging; and most potato chips [crackers] are sold in shiny packs (1 = disagree completely to 5 = agree completely; $\alpha = .82$). As predicted, participants believed that potato chip (vs. cracker) packages were more likely to have a glossy (vs. matte) surface ($M_{\text{potato chips}} = 3.81$, $M_{\text{crackers}} = 2.48$, paired $t(210) = 15.24$, $p < .001$, Cohen's $d = 1.05$). Participants were also asked what percent of potato chips [crackers] in the marketplace they believed were sold in glossy (vs. matte) packages. Participants estimated that 65.3% of potato chips (38.7% of crackers) were sold in glossy rather than matte packaging (paired $t(210) = 13.81$, $p < .001$, Cohen's $d = 0.95$).

In the next study, we assess the relative strength of these associations at an implicit level.

Study 3: Implicit Association Test

We used the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) to assess the relative strength of associations between healthfulness concepts and package type. The IAT is a computer-based approach that uses response times from categorization trials to assess the relative strength of associations in memory (Perkins, Forehand,

Greenwald, & Maison, 2008), with faster times indicative of stronger associations.

Method

Sample and design

Undergraduates ($N = 42$, median age = 20, 40% female) completed this study in a laboratory for partial course credit. We used iatgen software (Carpenter et al., 2018; <https://iatgen.wordpress.com/materials/>) to administer the IAT. Two participants were omitted due to excessively rapid response times (i.e., >10% of trials under 300 ms; as recommended by Carpenter et al., 2018).

Materials and procedure

Participants were told their task was to categorize pictures of foods and packages that appeared in the middle of the screen by rapid keypress (Table 2). We used pictures from the following four categories as visual stimuli to be categorized: (a) unhealthy foods, (b) healthy foods, (c) glossy packaging, and (d) matte packaging (Appendix B). In line with established protocol (Greenwald et al., 1998), participants completed seven blocks of trials (Table 2). In each trial, a fixation cross appeared on screen for 250 ms, followed by a picture of a food item (healthy or unhealthy) or package type (glossy or matte), which stayed on screen until a keypress

Table 2

Study 3 Schematic Design of Implicit Association Test (IAT)

Block	Number of trials	Function	Left-key assignment (E)	Right-key assignment (I)
1	20	Practice	Healthy food	Unhealthy food
2	20	Practice	Matte package	Glossy package
3	20	Practice (congruent combination)	Healthy food or matte package	Unhealthy food or glossy package
4	40	Critical (congruent combination)	Healthy food or matte package	Unhealthy food or glossy package
5	40	Practice	Glossy package	Matte package
6	20	Practice (incongruent combination)	Healthy food or glossy package	Unhealthy food or matte package
7	40	Critical (incongruent combination)	Healthy food or glossy package	Unhealthy food or matte package

Note. In line with Greenwald et al. (2003), the IAT included seven blocks of trials. The test started with two practice blocks familiarizing participants with the stimuli and categorizing procedures. The results of blocks 3, 4, 6, and 7 were combined for analysis. Blocks 3 and 6 were practice blocks (Greenwald et al., 1998), and blocks 4 and 7 were the critical blocks. The left–right starting positions of the labels were counterbalanced, and participants were randomly assigned to starting block (there were four possible starting configurations: healthy food or glossy package on the left initially [incongruent combination]; healthy food or glossy package on the right initially [incongruent combination]; healthy food or matte package on the left initially [congruent combination]; healthy food or matte package on the right initially [congruent combination]). Following Carpenter et al. (2018) and Greenwald et al. (2007), participants exhibiting more than 10% of responses under 300 ms in length were dropped from the sample ($n = 2$). The estimated IAT reliability, based on the split-half with the Spearman–Brown correction (De Houwer & De Bruyker, 2007), was = .87. There was no error penalty, and participants had to correct their errors to proceed. The D -score was calculated as follows: calculate the difference in mean response times for the critical combination blocks (block 4 and 7) and divide by the pooled standard deviation for that pair of blocks; and calculate the difference in mean response times for the practice combination blocks (block 3 and 6) and divide by the pooled standard deviation for that pair of blocks. Average the two difference scores, weighting the differences equally, for the D -score.

to classify it as belonging to one of two categories represented by words in the upper left or upper right corner of the screen (Appendix C).

If it is true that participants have learned to associate healthy foods with matte packaging and unhealthy foods with glossy packaging, they should categorize the visual stimuli more quickly when the category labels are congruent ("Healthy—Matte" and "Unhealthy—Glossy") rather than incongruent (e.g., "Healthy—Glossy" and "Unhealthy—Matte"). We report the *D*-score of Greenwald, Nosek, and Banaji (2003), a measure similar to Cohen's *d* (1977), as a standardized measure of the relative difference in response times for the congruent versus incongruent trials. A positive *D*-score indicates faster response latencies for congruent versus incongruent trials.

Results

As predicted, the data yielded a positive *D*-score ($D = 0.171$, $SD = .36$, $t(39) = 3.02$, $p = .004$, 95% $CI_{D\text{-score}} [0.06, 0.29]$, Cohen's $d = 0.48$), indicating learned associations between matte packaging and healthy foods and between glossy packaging and unhealthy foods, as predicted.

In the next study, we examine the influence of these learned associations on healthfulness inferences.

Study 4: Healthfulness Inferences

In this study, we ask consumers their perceptions about the healthfulness of potato chips in a glossy or matte package.

Method

Sample and design

Amazon MTurk participants ($N = 156$, median age = 32, 49.7% female) received a small cash payment and were randomly assigned to view a matte or glossy package of potato chips in an online questionnaire.

Materials and procedure

A package of potato chips from a relatively unfamiliar brand was photographed and served as the matte package stimulus. The package was then sprayed with clear, high gloss enamel and photographed again, to serve as the glossy version (Appendix D).

Participants were informed they would be asked to evaluate a snack food. A package of chips appeared on screen (in a glossy or matte package), and participants indicated "how much each word below accurately describes this snack food" (on slider scales from 0 = not at all to 100 = very much): fattening, high calorie, healthy, greasy, and oily (order of items randomized). Participants completed a manipulation check (shown the package again, participants indicated how glossy and shiny it appeared on scales from 0 = not at all to 100 = very much, $r = .86$, $p < .0001$), demographic questions, and a hypothesis probe (no one guessed the true purpose).

Results

Manipulation check

We conducted an ANOVA on the two-item glossy-shiny measure as a function of package type ($M_{\text{matte}} = 24.81$, $M_{\text{glossy}} = 68.29$, $F(1, 154) = 116.75$, $p < .0001$; $\eta^2 = .43$) which was significant (Note: Appendix E contains tests of gender effects for all studies in which gender was measured).

Healthfulness perceptions

We combined the healthfulness items (healthy, fattening [reverse-scored], high calorie [reverse-scored], greasy [reverse-scored], and oily [reverse-scored], $\alpha = .89$) to create a measure of food healthfulness perceptions. Combining these items is supported by prior research, which shows that perceived healthfulness of pictured foods is highly correlated with perceived calories (Charbonnier et al., 2016). An ANOVA on healthfulness perceptions as a function of package type was significant ($M_{\text{matte}} = 51.04$, $M_{\text{glossy}} = 39.94$, $F(1, 154) = 9.01$, $p = .003$; $\eta^2 = .07$), as predicted.

In the next study, we see whether consumers eat more of a snack food packaged in a matte versus glossy package, presumably due to healthfulness inferences such as those demonstrated here.

Study 5: Consumption Quantity

In this study, participants were given a snack food, potato chips, in a white, unmarked package. We expected that participants would pour out more for themselves (given a caloric objective) and consume more if the package had a matte versus glossy surface.

*Method**Sample and design*

Undergraduates ($N = 203$, median age = 20, 39.9% female) participating for course credit were randomly assigned to a matte or glossy packaging condition.

Materials and procedure

Before arriving at the laboratory, participants were informed they would be taking part in a taste test. They were randomly assigned to receive a package of potato chips in either a glossy or matte package (Appendix F). The unmarked packages, identical in appearance except for surface gloss, were purchased from a manufacturer for the explicit purposes of the study. Each package was filled with 20 g of chips (approximately 113 calories) in advance and sealed with a single staple. After receiving their package, participants were instructed to put about 50 calories worth of chips into a bowl for the tasting. Participants then tasted the chips, eating as much or as little as they liked. We measured the remaining contents of each package and bowl to calculate the amount taken out and consumed by each participant. Participants indicated perceived price (e.g., "What do you think is the retail price of the bag of these chips in front of you (in dollars)?") and how shiny and glossy the package looked (slider scales from 0 = not at all to 100 = very much), as a manipulation check ($r = .91$, $p < .0001$). To rule out alternative explanations, such as other sensory characteristics of the package (Biswas, Szocs, Krishna, & Lehmann, 2014), we asked participants to evaluate the package on other attributes (e.g., To what extent do you agree this snack food package is: rough, smooth, hard, soft, heavy, cold, warm, environmentally friendly, and stable; 1 = Disagree Completely; 5 = Agree Completely). Finally, participants completed demographic questions and a hypothesis probe (no one guessed the true purpose).

*Results**Manipulation check*

We conducted an ANOVA on the two-item glossy-shiny score as a function of package type ($M_{\text{matte}} = 27.68$, $M_{\text{glossy}} = 66.78$, $F(1, 201) = 125.83$, $p < .0001$; $\eta^2 = .39$) which was significant. Similar ANOVAs on the other package attributes (rough,

Table 3
Study 5 ANOVA Results for Packaging Evaluation and Perceived Price

Items	Mean _{glossy}	Mean _{matte}	F(1, 201)	p-Value
Rough	1.85	1.88	0.04	.84
Smooth	3.95	3.70	1.89	.17
Hard	2.18	2.33	0.97	.33
Soft	2.20	2.21	0.003	.96
Heavy	1.74	1.78	0.06	.81
Cold	2.32	2.52	1.37	.24
Warm	1.79	1.74	0.12	.73
Environmentally friendly	2.27	2.27	0	1.00
Stable	3.12	3.27	0.87	.35
Price (in Dollars)	1.56	1.52	0.22	.64

Note. ANOVAs were conducted as a function of package surface (glossy vs. matte). Please see question wording in Appendix S1.

smooth, hard, soft, heavy, cold, warm, environmentally friendly, and stable) as well as perceived price were not significant (all $ps > .15$, Table 3).

Food taken out and consumed

An ANOVA on amount of food taken out as a function of package type showed participants took out more food from the matte (vs. glossy) package ($M_{\text{matte}} = 11.77$ g, $M_{\text{glossy}} = 10.21$ g, $F(1, 201) = 4.86$, $p = .028$; $\eta^2 = .024$), as predicted. A similar ANOVA on amount consumed showed that participants ate more food from the matte versus glossy package ($M_{\text{matte}} = 5.63$ g, $M_{\text{glossy}} = 3.85$ g, $F(1, 201) = 6.74$, $p = .01$; $\eta^2 = .033$), also as predicted. Participants consumed more from the matte versus glossy pack, controlling for amount taken out ($M_{\text{matte}} = 5.36$ g, $M_{\text{glossy}} = 4.16$ g, $F(1, 200) = 3.50$, $p = .06$; $\eta^2 = .02$).

The next study examines whether restaurant patrons tend to choose snack foods packaged with surfaces in accord with their consumption motivations (i.e., tasty vs. healthy eating).

Study 6: Field Study

We conducted a field study in which a display containing 36 packages (18 matte and 18 glossy) of single-serving snack foods was placed at the exterior of each of two food trucks (a hamburger truck and a salad truck) on a large state university campus for several weeks. We expected that patrons of the food truck associated with serving more (less) caloric meals would be more (less) likely to purchase

snack foods packaged in glossy (vs. matte) packaging, exhibiting a caloric congruency effect. More specifically, consumers who chose to buy their lunch at a hamburger (vs. salad) truck should be more motivated by taste (vs. healthfulness). If so, then hamburger (salad) truck patrons should be more (less) likely to select a snack packaged in glossy packaging, in accord with their taste (health)-related motivations for consumption.

Method

Pretests

We conducted three pretests for the field study (see details in Appendix G). In pretest 1 ($N = 105$ undergraduates), participants saw a picture of one of the food trucks on campus (of which there are many, perhaps 50 or more). Participants saw a photograph of a food truck and its menu from either a food truck which sold primarily: (a) large hamburgers or (b) salads and similar lighter fare. We chose these two food trucks as we believed consumers would generally perceive that meals from the hamburger truck would have more calories than meals from the salad truck. The food trucks differed on perceptions of how caloric and tasty their meals were (hamburger truck > salad truck), but not on other dimensions such as familiarity and convenience, as desired. Pretest 2 ($N = 34$ undergraduates) showed that two potato chip packages from the set included on the food truck displays (one glossy and one matte, from the same manufacturer) differed in healthfulness perceptions, as expected (the glossy package of chips was perceived as less healthy than matte package; Paired $t(33) = 2.13$, $p = .04$). Pretest 3 ($N = 31$ convenience sample of food truck patrons on campus) showed that participants who rated themselves as more motivated by taste than healthfulness when choosing where to eat lunch were more likely to choose the burger truck rather than the salad truck for their lunch. This result is in accord with prior research, showing that consumers interested in healthful eating tend to buy foods based on their healthfulness versus taste qualities (Lähteenmäki, 2013).

Materials and Procedure

We arranged 36 packages of single-serve snack foods (potato chips, corn chips, and popcorn) on each of two chip display units (with clips to hold each package). Half of the 36 packages in a display had glossy packaging, and the other half had matte

packaging. We controlled for mean calories, mean fat grams, and mean grams of saturated fat across the two sets of package type (glossy and matte; Appendix H). Neither truck sold packaged snacks before taking part in the study.

Sampling

The field study was conducted during lunch hours over a period of 25 days (Monday–Friday, 10 a.m. to 2 p.m.). At the start of each day, an experimenter provided each food trucks with one full (36-pack) display (identically arranged), which was then hung on the outside of each food truck. At the end of each day, an experimenter retrieved the snack food package displays and tabulated which items had been sold from each truck's display. The display was then refilled according to the specified plan and returned to each truck the next morning. The arrangement of snack packages on display was counterbalanced, that is, rotated regularly such that on some days, the matte packs were on top and glossy packs were on bottom, or vice versa; on other days, the matte packs were on the left and the glossy packs were on the right, or vice versa, to control for location effects.

Results

A smaller proportion of snack food packages sold from the salad truck consisted of glossy packages ($M_{\text{saladtruck}} = 33.96\%$, $M_{\text{burgertruck}} = 72.72\%$, $\chi^2 = 40.15$, $p < .0001$). A linear mixed model on the proportion of snacks sold in a glossy package across the 25-day test period showed that, compared to burger truck patrons, salad truck patrons purchased proportionately fewer glossy packs over time ($b = -.37$, $SE = .06$, $t = -6.33$, $p < .0001$; 95% CI: -0.48 to -0.25), in support of the caloric congruency effect (Figure 2, Tables 4). Thus, individuals presumably motivated to eat more healthfully (i.e., choosing the salad vs. burger truck) were more likely to select snack foods in matte rather than glossy packages.

General Discussion

The current research demonstrates that consumers have learned, presumably through repeated exposure, to associate specific aspects of product packaging, such as surface gloss, with specific product attributes, such as tastiness and healthfulness, with downstream consequences on consumption and

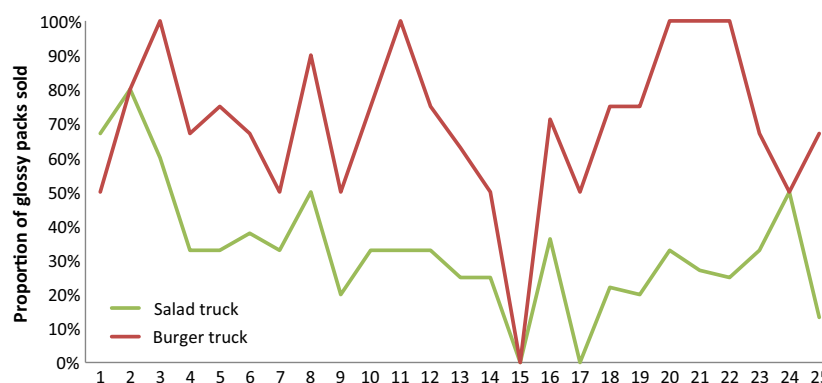


Figure 2. Study 6: Daily proportion of glossy snack food packages sold at burger versus salad truck. *Note.* Day 15 of the field study was a very rainy day, which may explain why no snack packages were sold from either food truck on that day (i.e., when the packages exhibited some damage). [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com).]

sales. Utilizing both implicit and explicit methodologies, we provide evidence that learned associations likely drive these effects.

More specifically, we show that matte packaging signals healthier products whereas glossy packaging signals tastier products. Our results fit well with Marckhgott and Kamleitner's (2019) findings regarding food naturalness perceptions, as well as with previous findings regarding the "unhealthy = tasty intuition" (Mai, Symmank, & Seeborg-Elverfeldt, 2016; Raghunathan et al., 2006), but contrast somewhat with Marckhgott and Kamleitner's (2019) finding of a negative relationship between package gloss and tastiness. Since perceived naturalness was measured before perceived tastiness in Marckhgott and Kamleitner (2019), perhaps a response bias led to similar responding across items (naturalness and tastiness). Future research could help resolve this issue.

The implications of the current research for sales of snack foods are potentially significant, since the global snack food market is large (Sales of \$374 billion/year) and growing (2022 prediction = \$630 billion; Nielsen, 2014). The strategic use of matte packaging to communicate healthfulness benefits, and glossy packaging to communicate taste benefits, could be impactful. The findings may be particularly significant in shopping contexts where people rely on visual input from package surfaces prior to purchase (e.g., shopping in-store, via catalog, online).

Our results also speak to consumer welfare considerations. Overweight individuals may choose foods based on health-related motivations. For such individuals, seeing snack foods in matte packaging could elicit overconsumption, due to caloric underestimation, thereby hindering efforts to combat obesity (Karnani, McFerran, & Mukhopadhyay, 2016).

However, marketers of diet foods, such as Jenny Craig, could strategically use glossy packaging to enhance their customers' perceptions of tastiness of the food—thereby contributing to individuals' weight loss goals.

The results also suggest several avenues for additional research. Since visual properties of packaging such as color and brightness influence food choices more when decisions are made rapidly or under cognitive load (Milosavljevic, Navalpakkam, Koch, & Rangel, 2012), the impact of package gloss might be greater when shoppers are tired and rushed, such as at the end of the day. In situations such as these, shoppers may be even more likely to rely on learned associations.

Would consumer traits or individual differences such as dietary restraint (Herman & Polivy, 1980; Irmak, Vallen, & Robinson, 2011), the centrality of visual product aesthetics (Bloch, Brunel, & Arnold, 2003), or need for touch (Peck & Childers, 2003) moderate the effects of surface gloss on perceptions and behavior? Given that more and more health-positioned products such as granola bars and organic foods seem to be packaged in matte packaging, will this growing trend strengthen the previously learned associations demonstrated here? And, would the macrostructural properties of product packaging, such as a package's size and shape, interact with its microstructural properties (Spence & Gallace, 2011), such as surface texture, in the form of package gloss? Would the food inside an elongated and glossy package be perceived to have maximal caloric content (Raghubir & Krishna, 1999)?

Although we found evidence for caloric congruence effects, package gloss could elicit opposite responses via within-meal (Chandon & Wansink, 2007) or between-meal (O'Brien, Kahn, Zenko,

Fernandez, & Ariely, 2018; Trier & Johnston, 2012) caloric balancing, if the healthfulness of the entrée was made more salient. Under what other types of situations might the congruency effect observed here reverse itself? Since glossy surfaces can also be associated with water and wetness (Meert et al., 2014), it would be interesting to see whether the effects of glossy (vs. matte) packaging reverse for products that vary in moisture content. For example, would fresh produce in glossy versus matte

packaging be perceived as containing more moisture and thus as being fresher and healthier?

Researchers could examine the inferences from surface gloss in product categories outside of the food domain. Are automobiles with shinier paint finishes perceived as faster, and more luxurious? What income and education inferences might we make about people wearing clothing with a glossier surface? Learned associations regarding surface gloss provide a wealth of future research opportunities.

Table 4
Study 6 Detailed Sales Results

Day	Burger truck						Salad truck					
	Glossy packs Sold	Calories in glossy packs Sold	\$ Sales from glossy packs	Matte packs sold	Calories in matte packs sold	\$ Sales from matte packs	Glossy packs sold	Calories in glossy packs sold	\$ Sales from glossy packs	Matte packs sold	Calories in matte packs sold	\$ Sales from matte packs
1	1	140	\$1	1	120	\$1	4	560	\$4	2	220	\$2
2	4	570	\$4	1	160	\$1	4	580	\$4	1	120	\$1
3	2	220	\$2	0	0	\$0	6	860	\$6	4	590	\$4
4	4	420	\$4	2	280	\$2	2	300	\$2	4	650	\$4
5	6	800	\$6	2	320	\$2	1	140	\$1	2	260	\$2
6	2	280	\$2	1	170	\$1	3	420	\$3	5	640	\$5
7	2	210	\$2	2	340	\$2	1	140	\$1	2	330	\$2
8	9	1,310	\$9	1	120	\$1	1	140	\$1	1	160	\$1
9	1	140	\$1	1	170	\$1	1	150	\$1	4	550	\$4
10	9	1,230	\$9	3	410	\$3	1	140	\$1	3	340	\$3
11	1	150	\$1	0	0	\$0	1	150	\$1	2	330	\$2
12	3	450	\$3	1	160	\$1	1	150	\$1	3	330	\$3
13	5	460	\$5	3	500	\$3	1	150	\$1	3	460	\$3
14	2	290	\$2	2	330	\$2	3	450	\$3	9	1,210	\$9
15	0	0	\$0	0	0	\$0	0	0	\$0	0	0	\$0
16	5	730	\$5	2	270	\$2	4	440	\$4	7	900	\$7
17	1	140	\$1	1	100	\$1	0	0	\$0	6	880	\$6
18	3	430	\$3	1	170	\$1	2	290	\$2	7	1,100	\$7
19	6	870	\$6	2	260	\$2	2	220	\$2	8	1,080	\$8
20	2	2,800	\$2	0	0	\$0	1	140	\$1	2	330	\$2
21	3	450	\$3	0	0	\$0	3	420	\$3	8	1,150	\$8
22	2	280	\$2	0	0	\$0	1	140	\$1	3	440	\$3
23	2	300	\$2	1	120	\$1	4	580	\$4	8	1,080	\$8
24	1	150	\$1	1	160	\$1	6	870	\$6	6	860	\$6
25	4	590	\$4	2	340	\$2	1	140	\$1	7	1,150	\$7
Sum	80	13,410	\$80	30	4,500	\$30	54	7,570	\$54	107	15,160	\$107

Note. All snack food packages were sold for \$1 each. Day 15 of the field study was a very rainy day, which may explain why no snack packages were sold from either food truck on that day (i.e., when the packages exhibited some damage).

Appendix A

Study 1: Example of Potato Chip Shelf Facings in Walmart



Appendix B

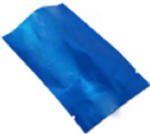









Study 3: Examples of Stimuli Images Used in Implicit Association Test

Healthy foods



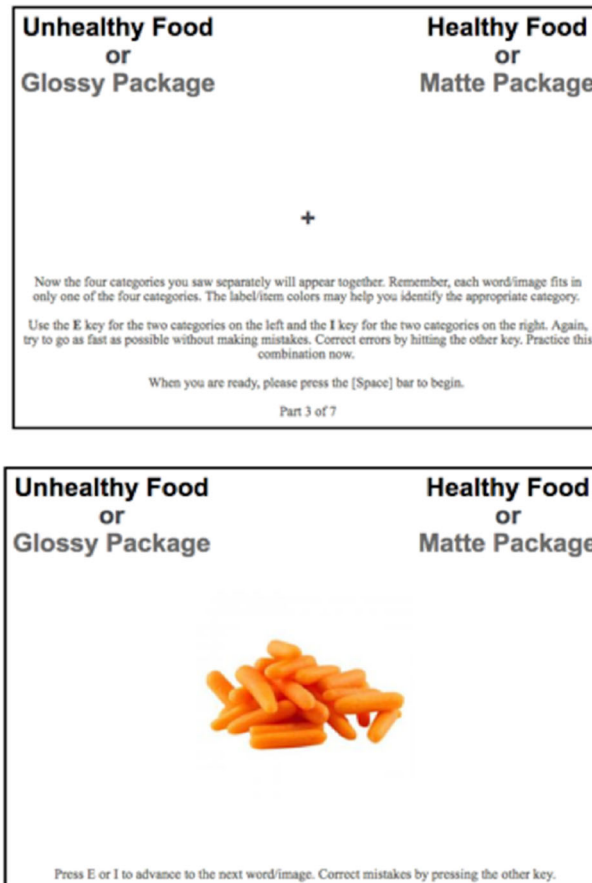
Unhealthy foods



Matte packs	Glossy packs
	
	
	
	
	

Appendix C

Study 3: Example of Congruent Block Instructions and Trial in Implicit Association Test (IAT)



Note. Each participant was seated in front of a 24-inch Dell monitor with a resolution of $1,920 \times 1,080$. In each trial of the IAT, an image of food (healthy or unhealthy) or package (matte or glossy) appeared in the center of the screen. Participants were asked to classify the image (e.g., baby carrots) by pressing a key with the designated hand (e.g., Key E for Unhealthy Food or Glossy Package; Key I for Healthy Food or Matte Package), as quickly and accurately as possible. A red "X" appeared on screen when participants provided a wrong answer. Per the instructions, participants needed to correct the error (e.g., press the correct key) in order to proceed to the next trial.

Appendix D

Study 4: Visual Stimuli



Glossy Package



Matte Package

Appendix E

Study 4: ANCOVA Results for Healthfulness Perceptions and Perceived Glossiness with Gender as a Covariate

	Food healthfulness perceptions	Perceived glossiness
Mean _{glossy}	39.94	68.29
Mean _{matte}	51.04	24.81
<i>p</i> -Value _{Package Surface}	.03	<.01
η^2 _{Package Surface}	.06	.43
<i>F</i> (1, 153) _{Package Surface}	8.92	115.14
<i>p</i> -Value _{Gender}	.84	.72
η^2 _{Gender}	.01	.01
<i>F</i> (1, 153) _{Gender}	0.04	0.13

Note. ANCOVAs on food healthfulness perceptions and perceived packaging glossiness (the manipulation check) as a function of pack- age surface (glossy = 1; matte = 0) with gender as the covariate (female = 1, male = 0).

Study 4: ANOVA Results for Healthfulness Perceptions and Perceived Glossiness with Gender as a Moderator

	Food healthfulness perceptions	Perceived glossiness
Mean _{glossy}	40.08	68.34
Mean _{matte}	51.08	24.89
p -Value _{Package Surface}	.004	<.01
η^2 _{Package Surface}	.06	.43
$F(1, 152)$ _{Package Surface}	8.80	114.93
p -Value _{Gender}	.86	.70
η^2 _{Gender}	.001	.001
$F(1, 152)$ _{Gender}	0.03	0.14
p -Value _{Gender×Package Surface}	.49	.52
η^2 _{Gender×Package Surface}	.003	.003
$F(1, 152)$ _{Gender×Package Surface}	0.49	0.41

Note. ANOVAs on food healthfulness perceptions and perceived packaging glossiness (the manipulation check) as a function of package surface (glossy = 1; matte = 0), gender (female = 1, male = 0), and their interaction.

Study 5: ANCOVA Results for Food Taken Out and Consumed with Gender as a Covariate

	Food taken out	Food consumed
Mean _{glossy}	10.21 g	3.85 g
Mean _{matte}	11.77 g	5.63 g
p -Value _{Package Surface}	.03	<.01
η^2 _{Package Surface}	.02	.03
$F(1, 200)$ _{Package Surface}	4.86	6.74
p -Value _{Gender}	.63	.85
η^2 _{Gender}	.001	.01
$F(1, 200)$ _{Gender}	0.23	0.04

Note. ANCOVAs on food taken out of the package, and food consumed as a function of package surface (glossy = 1; matte = 0) with gender as the covariate (female = 1, male = 0).

Study 5: ANOVA Results for Food Taken Out and Consumed with Gender as a Moderator

	Food taken out	Food consumed
Mean _{glossy}	10.30 g	3.89 g
Mean _{matte}	11.76 g	5.78 g
p -Value _{Package Surface}	.046	.02
η^2 _{Package Surface}	.02	.03
$F(1, 199)$ _{Package Surface}	4.05	5.72
p -Value _{Gender}	.60	.89
η^2 _{Gender}	.001	.001
$F(1, 199)$ _{Gender}	0.28	0.02
p -Value _{Gender×Package Surface}	.48	.47
η^2 _{Gender×Package Surface}	.003	.003
$F(1, 199)$ _{Gender×Package Surface}	0.50	0.52

Note. ANOVAs on food taken out of the package, and food consumed as a function of package surface (glossy = 1; matte = 0), gender (female = 1, male = 0), and their interaction.

Study 5: ANCOVA Results for Packaging Evaluations and Perceived Price with Gender as a Covariate

	Perceived Glossiness	Rough	Smooth	Hard	Soft	Heavy	Cold	Warm	Environmentally friendly	Stable	Perceived price (in Dollars)
Mean _{glossy}	66.78	1.95	3.95	2.18	2.20	1.74	2.32	1.79	2.27	3.12	1.56
Mean _{matte}	27.68	1.86	3.70	2.33	2.21	1.78	2.52	1.74	2.27	3.27	1.52
<i>p</i> -Value _{Package Surface}	<.001	.85	.17	.33	.97	.82	.25	.73	.99	.46	.64
$\eta^2_{\text{Package Surface}}$	.39	.001	.01	.005	.001	.001	.007	.001	0	.004	.001
<i>F</i> (1, 200) _{Package Surface}	125.83	0.035	1.92	0.96	0.97	0.05	1.34	0.12	0	0.85	0.22
<i>p</i> -Value _{Gender}	.20	.18	.30	.71	.20	.47	.18	.62	.45	.10	.84
η^2_{Gender}	.008	.009	.005	.001	.01	.002	.008	.001	.003	.01	.001
<i>F</i> (1, 200) _{Gender}	1.66	1.78	1.07	0.14	2.45	0.49	1.68	0.25	0.58	2.07	0.04

Note. ANCOVAs on packaging evaluations and perceived price as a function of package surface (glossy = 1; matte = 0) with gender as the covariate (female = 1, male = 0).

Study 5: ANOVA Results for Packaging Evaluations and Perceived Price with Gender as a Moderator

	Perceived Glossiness	Rough	Smooth	Hard	Soft	Heavy	Cold	Warm	Environmentally friendly	Stable	Perceived price (in Dollars)
Mean _{glossy}	67.11	1.87	3.96	2.20	2.22	1.78	2.35	1.81	2.25	3.14	1.55
Mean _{matte}	28.24	1.94	3.72	2.34	2.24	1.78	2.54	1.74	2.30	3.30	1.53
<i>p</i> -Value _{Package Surface}	<.001	.81	.20	.40	.92	.99	.28	.58	.77	.34	.82
$\eta^2_{\text{Package Surface}}$	.37	.001	.008	.004	.001	.001	.006	.002	.001	.005	.001
<i>F</i> (1, 199) _{Package Surface}	118.40	0.06	1.68	0.40	0.01	0	1.17	0.31	0.09	0.93	0.05
<i>p</i> -Value _{Gender}	.21	.19	.32	.68	.13	.43	.19	.56	.52	.11	.77
η^2_{Gender}	.008	.009	.005	.001	.01	.003	.009	.002	.002	.01	.001
<i>F</i> (1, 199) _{Gender}	1.57	1.71	1.01	0.17	2.34	0.61	1.72	0.33	0.41	2.59	0.09
<i>p</i> -Value _{Gender×Package Surface}	.70	.77	.77	.59	.78	.27	.81	.29	.13	.74	.61
$\eta^2_{\text{Gender×Package Surface}}$	.001	.001	.001	.001	.001	.001	.001	.006	.01	.001	.007
<i>F</i> (1, 199) _{Gender×Package Surface}	0.15	0.07	0.09	0.59	0.08	1.24	0.06	1.14	2.26	0.11	1.31

Note. ANOVAs on packaging evaluations and perceived price as a function of package surface (glossy = 1; matte = 0), gender (female = 1, male = 0), and their interaction.

Study 6: Pretest 1 ANCOVA Results for Food Truck Perceptions with Gender as a Covariate

	Perceived calories in a meal	Healthy	Tasty, good, flavorful, satisfying ($\alpha = .89$)	Convenient, local, quick serve ($\alpha = .68$)	Familiar
Mean _{Burger Truck}	734.9 calories	29.02	79.41	74.37	79.86
Mean _{Salad Truck}	633.3 calories	38.52	71.59	76.60	75.19
<i>p</i> -Value _{Truck}	.06	.04	.09	.52	.30
η^2_{Truck}	.03	.04	.03	.004	.01
<i>F</i> (1, 102) _{Truck}	3.55	4.71	2.95	0.43	1.09
<i>p</i> -Value _{Gender}	.49	.36	.12	.95	.53
η^2_{Gender}	.005	.008	.02	.001	.004
<i>F</i> (1, 102) _{Gender}	0.48	0.84	2.44	0.004	0.40

Note. ANCOVAs on food truck perceptions as a function of which food truck participants saw (salad truck = 1, burger truck = 0) with gender as the covariate (female = 1, male = 0).

Study 6: Pretest 1 ANOVA Results for Food Truck Perceptions with Gender as a Moderator

	Perceived calories in a meal	Healthy	Tasty, good, flavorful, satisfying ($\alpha = .89$)	Convenient, local, quick serve ($\alpha = .68$)	Familiar
Mean _{Burger Truck}	746.1 calories	27.28	77.56	72.93	77.32
Mean _{Salad Truck}	640.1 calories	35.53	72.69	76.23	74.14
p -Value _{Truck}	.03	.03	.12	.35	.54
η^2_{Truck}	.04	.05	.02	.009	.004
$F(1, 101)_{\text{Truck}}$	4.69	5.10	2.49	0.90	0.39
p -Value _{Gender}	.37	.41	.15	.87	.32
η^2_{Gender}	.008	.007	.02	.001	.01
$F(1, 101)_{\text{Gender}}$	0.82	0.68	2.12	0.03	1.02
p -Value _{Gender\timesTruck}	.051	.42	.38	.04	.001
$\eta^2_{\text{Gender}\times\text{Truck}}$	.04	.006	.007	.04	.01
$F(1, 101)_{\text{Gender}\times\text{Truck}}$	3.89	0.65	0.76	4.35	11.08

Note. ANOVAs on food truck perceptions as a function of which food truck participants saw (burger truck vs. salad truck), gender (female = 1, male = 0), and their interaction.

Appendix F

Study 5: Packaging Stimuli



Glossy Package



Matte Package

Appendix G

Study 6: Food Truck Pretests

Pretest 1

A pretest was conducted among 105 undergraduates (median age = 21, 39% female) who had eaten at the food truck they evaluated, for partial course credit. In an online survey, they saw a picture of one of two food trucks as well as its menu. Each truck sold primarily: (a) large hamburgers or (b) salads and similar lighter fare. ANOVAs indicated the food trucks did not differ on how familiar/convenient/local or quick they were perceived to be ($ps > .30$; see Table below). However, foods sold from the burger (vs. salad) truck were perceived as less healthy; $F(1, 103) = 4.00, p = .048$ and more caloric; $F(1, 103) = 4.60, p = .03$, as well as more tasty/good/flavorful/satisfying; $F(1, 103) = 4.80, p = .03$; see Table below. This last result is consistent with the finding that consumers tend to associate unhealthy food with being tastier (Raghunathan et al., 2006).

Study 6: Truck Pretest 1 ANOVA Results for Food Truck Perceptions

Items	Mean _{BurgerTruck}	Mean _{SaladTruck}	$F(1, 103)$	p -Value
Perceived calories consumed in a complete meal	734.9 calories	633.3 calories	4.60	.03
Healthy	29.02	38.52	4.00	.048
Tasty, good, flavorful, satisfying ($\alpha = .89$)	79.41	71.59	4.80	.03
Convenient, local, quick serve ($\alpha = .68$)	74.37	76.60	0.44	.51
Familiar	79.86	75.19	0.84	.36

Note. ANOVAs on food truck perceptions as a function of which food truck participants saw (burger truck vs. salad truck). Please see question wording in Appendix S1.

Pretest 2

We conducted an online pretest among 34 undergraduates (median age = 20, 43% female) for partial course credit to measure the perceived healthfulness of two of the packages of potato chips (one glossy and one matte, from the same manufacturer, order rotated; see the Figure below) that were included in the food truck displays in the main study. Participants indicated how healthy, low calorie, caloric, oily, and greasy each potato chip product was (from 0 = not at all to 100 = very much). Paired t -tests indicated that the chips in the matte versus glossy pack were perceived as healthier ($M_{\text{glossy}} = 13.6, M_{\text{matte}} = 19.1, t(33) = 2.13, p = .04$), lower calorie ($M_{\text{glossy}} = 17.3, M_{\text{matte}} = 25.8, t(33) = 2.36, p = .02$), less caloric ($M_{\text{glossy}} = 67.5, M_{\text{matte}} = 55.6, t(33) = 2.44, p = .02$), less oily ($M_{\text{glossy}} = 62.5, M_{\text{matte}} = 53.9, t(33) = -2.21, p = .03$), and directionally less greasy ($M_{\text{glossy}} = 64.3, M_{\text{matte}} = 56.5, t(33) = -1.84, p = .07$), as expected. Note: The chips in the matte package actually contained more calories and fat than those in the glossy pack. Study 6: Pretest 2 visual package stimuli

Study 6: Pretest 2 Visual Package Stimuli



Pretest 3

We conducted a pretest among a convenience sample of food truck patrons, who were given a small gift for completing a very short paper-and-pencil survey (Note: We did not record age or gender of participants to minimize respondents' time to complete the survey). They indicated how important taste (1 = not at all, 5 = very much) and healthfulness (1 = not at all, 5 = very much; reverse code; $r = .63$) were in their decision regarding where to buy their lunch. They then were asked which of two food trucks they would choose for their lunch: the burger truck or the salad truck (pictures of food trucks were depicted in the survey). As predicted, taste (vs. healthfulness) was rated as more important among those who selected the burger truck rather than the salad truck ($M_{\text{burger}} = 3.84$ vs. $M_{\text{salad}} = 2.80$, $t(29) = 3.14$, $p = .004$, Cohen's $d = 1.12$), indicative of a stronger taste [healthfulness] motivation among burger [salad] truck patrons, as proposed.

Appendix H

Study 6: Example of Stimulus Display used in Field Study



Note. The arrangement of snack packages on display was counterbalanced, that is, rotated regularly with matte packs on top and glossy packs on bottom, or vice versa; or matte packs on the left and glossy packs on the right, or vice versa, to control for possible location effects. The photograph above is an example of one of four snack food displays, when matte packs were on top and glossy packs were on bottom. We controlled for mean calories ($M_{\text{Glossy}} = 121.1$ calories across 18 glossy packs, $M_{\text{Matte}} = 127.8$ calories across 18 matte packs), mean fat grams ($M_{\text{Glossy}} = 6.6$ g across 18 glossy packs, $M_{\text{Matte}} = 6.4$ g across 18 matte packs), and mean grams of saturated fat ($M_{\text{Glossy}} = 1.3$ g across 18 glossy packs, $M_{\text{Matte}} = 1.0$ g across 18 matte packs) across the glossy and matte packs displayed.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. Methodological Details.