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An (Un)healthy Poster:

When Environmental Cues Affect Consumers' Food Choices at Vending Machines

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Abstract

Environmental cues can affect food decisions. There is growing evidence that environmental cues influence how much one consumes. This article demonstrates that environmental cues can similarly impact the healthiness of consumers' food choices. Two field studies examined this effect with consumers of vending machine foods who were exposed to different posters. In field study 1, consumers with a health-evoking nature poster compared to a pleasure-evoking fun fair poster or no poster in their visual sight were more likely to opt for healthy snacks. Consumers were also more likely to buy healthy snacks when primed by an activity poster than when exposed to the fun fair poster. In field study 2, this consumer pattern recurred with a poster of skinny Giacometti sculptures. Overall, the results extend the mainly laboratory-based evidence by demonstrating the health-relevant impact of environmental cues on food decisions in the field. Results are discussed in light of priming literature emphasizing the relevance of preexisting associations, mental concepts and goals.

Key words: environmental cue, healthy nutrition, food choice, priming, mental concept

An (Un)healthy Poster:

When Environmental Cues Affect Consumers' Food Choices at Vending Machines

Apple or chocolate? Water or lemonade? Food choices seem to be among the simplest decisions. However, as today's global obesity epidemic reveals, food decisions are complex and driven by many factors (Köster, 2009; World Health Organization, 2014). Food decisions depend on motives such as hunger, pleasure, sociability, weight control, and health (Renner, Sproesser, Strohbach, & Schupp, 2012) but also on our environment. Environmental cues can influence *how much* people eat (e.g., Brunner, 2010). A poster promoting a slim figure can result in a reduced amount of test snacks being eaten (Papies & Hamstra, 2010). More subtly, consumers eat less chocolate when there is a body-weight scale or a picture of skinny human-like Giacometti sculptures in the laboratory (Brunner, 2010; Brunner & Siegrist, 2012).

This paper is not focused on the influence of environmental cues on the amount of consumption but on the influence on consumption choice. The main question is whether environmental cues can influence the preference for healthy or unhealthy food. Two field studies with vending machines examine whether posters with a health-evoking but not directly food-related image lead to more sales of healthy over unhealthy foods compared to no poster or a poster with a hedonic-evoking motif.

When Environmental Cues Determine Food Decisions

The homeostatic system is an internal signal structure that maintains a person's energy homeostasis. In contrast, the non-homeostatic system is driven by environmental cues. It is well known that the latter system particularly facilitates overindulgence and adds to today's increasing obesity rates (Berthoud, 2006; Hill & Peters, 1998; Seeley & Woods, 2003; Wadden, Brownell, & Foster, 2002).

Environmental cues can affect *how much* and *what* people eat or drink (see Wansink, 2004, for a review). A poster promoting a slim figure, or an experimenter stating that chocolate makes people happy but fat, decrease consumption volume (Brunner, 2010; Papies & Hamstra, 2010) and fruit odor brings people to prefer meals with fruits or vegetables (Gaillet, Sulmont-Rossé, Issanchou, Chabanet, & Chambaron, 2013). As shown by these examples, environmental cues influence people in various manifestations. Besides sensory cues such as odors (Gaillet et al., 2013), light (Areni & Kim, 1994), and music (North, Hargreaves, & McKendrick, 1999), normative cues such as ideal weight-reminders (Brunner, 2010; Papies & Hamstra, 2010), plate size (Van Ittersum & Wansink, 2012), and eating companions (Brunner, 2010; Herman Koenig-Nobert, Peterson, & Polivy, 2005) also influence eating (see Wansink & Chandon, 2014, for an overview). For example, chocolate tasters tend to eat as much or as little as their companions do. Since our environment is full of cues, these can overpower each other. This becomes evident when the chocolate tasters of the previous illustration are additionally influenced by a body-weight scale and thus eat little regardless of their companion's food intake (Brunner, 2010). All in all, these examples imply that existing associations and concepts are considerable factors in determining which environmental cue is decisive in food choice situations (Bargh, 2006).

The Role of Priming, Associations and Concepts

Environmental cues can serve as primes, activate mental concepts and thereby influence decisions (see Bargh, 2006, for a review). As the example of reduced food intake after subtle exposure to Giacometti sculptures illustrates, applying the priming paradigm to the food consumption area has been proven to be effective (Brunner & Siegrist, 2012). Similar to Kay, Wheeler, Bargh, and Ross' (2004) activation of a competition concept by related objects (e.g., business suits), the Giacometti effect leads to the conclusion that body-weight or figure related

cues activate corresponding concepts such as dieting. A similar mechanism occurs when the unconscious perception of fruit odor activates a fruit and vegetable concept and thus causes people to more frequently opt for meals with than without fruits or vegetables (Gaillet et al., 2013). Likewise, a diet recipe poster on a butcher's store door led customers with but not without a dieting goal to eat fewer test snacks, suggesting the activation of a motivational dieting concept (Papies & Hamstra, 2010). In line with priming research (see Bargh, 2006, for a review), these examples imply that environmental cues can activate various types of mental concepts such as traits, stereotypes, schemata or goals and thus induce a subsequent process or behavior (e.g., Bargh, 1990; Bargh & Gollwitzer, 1994; Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Custers & Aarts, 2005, 2007; Förster, Liberman, & Friedman, 2008; Sela & Shiv, 2009). Specific to the food consumption area, the idea of activating mental concepts by means of related environmental cues (see Bargh, 2006, for a review) implies that health-related or hedonic-related cues can increase the accessibility of healthy or hedonic dieting concepts. Notably, activating a certain diet-relevant concept requires a sufficiently strong associative cue-concept-link (Gaillet et al., 2013). Since people have both healthy and hedonic concepts, a person's association between an environmental cue and a health concept must be sufficiently strong in order to cause a healthy behavior.

In conclusion, two major generalizations can be drawn about the conditions under which environmental cues are effective in encouraging healthy food choices: First, a mental concept of healthy dieting should preexist. Second, the mental ties of these mental representations with the environmental cue must be sufficiently strong (cf. Gaillet et al., 2013).

Note that most of the existing findings stem from laboratory experiments (e.g., Brunner, 2010; Brunner & Siegrist, 2012; Harris et al., 2009), but not from naturalistic settings (e.g.,

Papies & Hamstra, 2010). In order to learn more about the practical application of environmental cues, empirical attention should be given to the effectiveness of environmental cues in the field.

Research Overview

The aim of the studies was to examine whether one's actual food choice can be influenced by environmental cues in a naturalistic setting. Contrary to previous studies, the present research focused on actual food choices (e.g., cookies vs. apples) rather than on quantitative decision aspects (e.g., one vs. two snacks). Whether specific snacks were presumed to be healthy or unhealthy was determined by people's perception rather than by actual nutritional value.

Two field studies tested the hypothesis that visual environmental cues with an associative link to (un)healthy food lead to choices of (un)healthy food alternatives. Both field studies were conducted using vending machines. The environmental cues were posters with a healthy or a hedonic motif, which were placed beside the vending machines. Thus, the field studies tested whether a poster with a healthy motif results in healthy snack choices whereas a poster with an unhealthy motif leads to unhealthy snack choices.

Field Study 1

Method

Sample. A total of 634 snack purchases from vending machines at three locations of a European University of Applied Sciences were registered. Snack decisions were measured retrospectively by the amount of sales and not individually. Hence, no demographics for the sample were obtained. However, an independent survey with ten individuals at each of the three vending machine locations was conducted, giving a better notion of the sample. Data from these 30 individuals (25 females, M_{age} = 29.60, SD_{age} = 9.77) suggest that a campus sample can be

assumed. Purchases of several non-food products (i.e., chewing gum or beverages) were excluded. Due to a daily altering assortment, sandwiches were also not considered for the analysis. The exclusion of these 106 purchases bypasses the ambiguity of classifying the products as healthy or unhealthy snacks. A final sample of 528 snack purchases remained for the analysis.

Design and Procedure. The field study employed a one-factorial within-subjects design with four conditions. One of four options (a nature, activity, or fun fair poster or no poster) was placed next to the vending machine, with each option displayed for one fourth of the time. According to a Latin-square design, the four poster conditions were permuted and counterbalanced across the three test locations. In a period of one month (from April 28 to May 25, 2014), poster conditions were systematically combined with the vending machine at each test location in weekly intervals. Each poster-location combination was tested once.

Consumers were primed with a poster placed next to a vending machine. All testing occurred during the regular term time, that is, during a period with no exams or holidays and with a constant opening time. All snack purchases were registered in collaboration with the owner of the vending machines, a regional bakery. This was conducted in line with the usual and periodic vending machine restock. Specifically, the number of healthy and unhealthy snack purchases was subsequently measured by a daily inventory of snack sales for each condition and location.

Materials.

Posters. In the treatment conditions, a nature poster, an activity poster, or a fun fair poster was placed in the consumers' visual line. No poster was placed for the control condition. All poster motifs were chosen by means of an exploratory pilot study. An accumulation of potential

motifs was determined by unstructured single in-depth interviews with male and female students, asking what they associate with healthy and hedonic nutrition. All associations were collected in the form of key words. Frequently stated key words were discussed in expert groups. After that, two health-relevant and one hedonic motif were extracted. Specifically, nature and activity were considered to evoke associations with a healthy diet. In contrast, a fun fair was perceived as representative of hedonic needs.

The results of the pilot study served as the basis for the poster selection. Therefore the nature poster showed grassland, trees and a blue sky with clouds. In the activity condition there were running legs in sport shoes with asphalt in the background. In contrast, the fun fair poster showed two carousels with a summery blue sky in the background. All poster motifs were retrieved from an online database of free stock photos (http://www.fotocommunity.de/). Posters did not show text or food. The Web version of this paper offers an appendix with an example situational view of the test locations.

Snack Choice. Consumers selected among a large variety of snacks (approximately 15 products). At each location, these were arranged and cooled in equally sized compartments on a ten-level carousel vending machine. The composition of the snack display was adapted for the field study. All vending machines offered a constant snack display. Since the snack offer was maintained in order to adhere to the usual naturalistic setting, individual vending machines offered a slightly different snack assortment. Likewise, snack displays in the individual vending machines and prices were held constant.

Each snack of the assortment was categorized as healthy or unhealthy. The categorization resulted from an independent pretest with 97 participants evaluating all snack alternatives from 1 (*very unhealthy*) to 7 (*very healthy*). Ratings were used to measure *snack choice*, that is, coding

snack purchases as healthy ($M \geq 4$) or unhealthy ($M < 4$). The Web version of this paper offers an appendix with an overview of the snack display and perceived healthiness for all snacks.

Results and Discussion

The trend of the results is in line with the hypothesis. Based on a 4 x 2 (poster [nature vs. activity vs. fun fair vs. control] x food [healthy vs. unhealthy]) contingency table, a chi-square test revealed an association between poster exposure and snack choice ($\chi^2(3, 528) = 10.45$, $p < .05$). While in the nature condition, 34% (or 46 out of 135) of the chosen snacks were healthy (vs. 66% unhealthy snacks), in the activity condition, 28% (or 33 out of 118) of the selected snacks were healthy (vs. 72% unhealthy). In contrast, the percentage of healthy snacks in the control condition was 22% (or 28 out of 128; vs. 78% unhealthy snacks) and in the fun fair condition 18% (or 27 out of 147; vs. 82% unhealthy snacks).

A post-hoc analysis with six separate 2 x 2 (poster x food [healthy vs. unhealthy]) comparisons revealed three significant relations, indicating poster-related differences in snack choices. As expected, when consumers were exposed to the nature poster rather than to the fun fair poster healthy snacks were chosen more frequently than unhealthy snacks ($\chi^2(1, 282) = 9.05$, $p < .01$). Furthermore, when consumers were exposed to the nature poster rather than to no poster healthy snacks were chosen more frequently than unhealthy snacks ($\chi^2(1, 263) = 4.84$, $p < .05$). Consistent with the hypothesis, when consumers were exposed to the activity poster rather than to the fun fair poster healthy snacks were selected marginally more frequently than unhealthy snacks ($\chi^2(1, 265) = 3.44$, $p = .06$). In line with the hypothesis, when consumers were exposed to either the nature poster or the activity poster no differences in the chosen amount of healthy or unhealthy snacks occurred ($\chi^2(1, 253) = 1.09$, $p = .30$). Likewise, when consumers were exposed to either the activity poster or to no poster no differences in the chosen amount of

healthy or unhealthy snacks was observed ($\chi^2(1, 246) = 1.22$, $p = .27$). Finally, when consumers were exposed to the fun fair poster or to no poster no differences in the chosen amount of healthy or unhealthy snacks appeared ($\chi^2(1, 275) = 0.53$, $p = .47$).

Figure 1 illustrates the frequencies of healthy and unhealthy snack choices in all poster conditions, accentuating those poster conditions that did not result in different influences on snack choice.

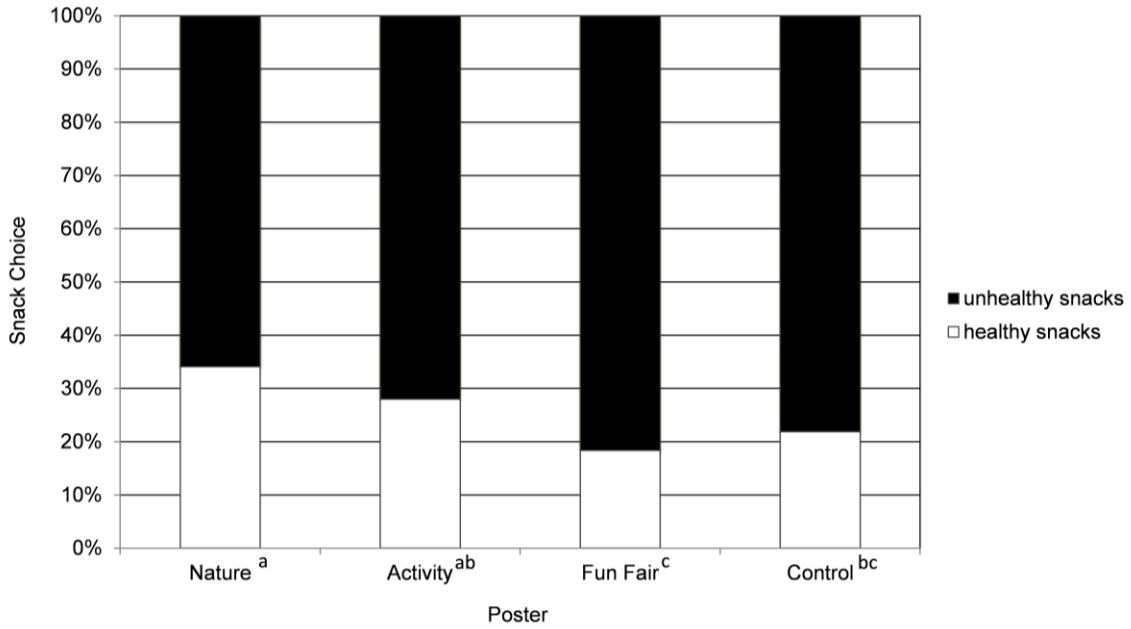

Figure 1. Number of healthy versus unhealthy snack purchases in the four poster conditions of field study 1. Snack choices in the conditions marked with the same letter did not differ.

In conclusion, exposure to a poster affected the choice between healthy and unhealthy snacks. Importantly, the extent of this influence differed between the tested posters. Whereas individuals with a nature poster chose a healthy snack more often than individuals exposed to a fun fair or no poster, individuals in the activity condition were more likely to choose healthy

snacks than those in the fun fair condition. No difference was found for consumers in the control condition compared with consumers primed by activity and fun fair posters. As assumed, consumers primed by the activity and nature poster did not differ in their snack choice. Overall, the trend of the results is in line with the hypothesis.

In order to improve generalizability and further demonstrate ecological validity, a replication study was designed. Thus, field study 2 aimed at replicating the previously observed effect, but with a different sample and an additional environmental cue.

While field study 1 was limited to the nature, activity and fun fair posters, field study 2 included an additional poster. Since the added poster showed the Giacometti sculptures, which are assumed to address a weight-related concept, consumers should theoretically respond by more frequently choosing healthy compared to unhealthy food. Thus, field study 2 examined whether the Giacometti effect is limited to quantitative food decisions as shown in research by Brunner and Siegrist (2012) or can be expanded to food choice. Furthermore, the validity of the impact of the Giacometti sculpture on food decisions was studied in a naturalistic setting.

Field Study 2

Method

Sample. A total of 253 purchases from a vending machine at the National Office of Public Health was registered. As in field study 1, the data gathering was conducted retrospectively by the amount of sales, and consumers were not individually registered and actively assigned to conditions. Thus, no demographics were available for the main study. However, an independent survey with 34 employees of the National Office of Public Health provided a rough estimate of the sample composition (21 females, M_{age} = 42.53, SD_{age} = 10.34). Similar to field study 1, one ambiguous purchasing option (soft drink produced from milk whey)

was not included in the sample. Thus, a final sample of 252 snack purchases was included in the analysis.

Design and Procedure. A similar design and procedure to that in field study 1 was used. That is, a one-factorial within-subjects design with four conditions was employed. One of four options (the Giacometti sculptures, activity or fun fair poster or no poster) was placed above the vending machine, with each option displayed for one fourth of the time. The poster conditions changed in weekly intervals for one month (from June 2 to June 30, 2014).

The primed consumers all chose from the provided food display under natural and constant environmental conditions. Their purchases were registered by means of the electronically controlled stock monitoring system of the vending machine operator. All transmitted data allowed the frequency of healthy and unhealthy purchases for each condition to be determined.

Materials.

Posters. As in field study 1, the treatment conditions consisted of three posters, which were placed in consumers' visual line. No poster was used for the control condition. While the activity and fun fair posters remained identical to field study 1, the Giacometti motif was chosen on the strength of Brunner and Siegrist's (2012) demonstration of its food-reducing influence.

Snack Choice. Consumers selected among healthy and unhealthy foods. The arrangement and prices of all food were employed unmodified and held constant. To measure food choice as a dependent variable, each purchase was coded as either healthy or unhealthy. Based on the online pretest of field study 1, sub-categories of healthy and unhealthy foods were extracted and used to either classify purchases as healthy (natural snacks and natural drinks) or unhealthy (chocolate,

pastries, chips, and soft drinks). The Web version of this paper offers an appendix with an overview of all purchased food and its categorization.

Results and Discussion

The results are in line with the hypothesis. As in field study 1, a chi-square test revealed a relation between poster exposure and food choice ($\chi^2(3, 252) = 16.94$, $p < .001$). The percentage of healthy snack purchases in the Giacometti condition was 58% (or 42 out of 73; vs. 42% unhealthy snacks), 44% (or 37 out of 85; vs. 56% unhealthy snacks) in the activity condition, 29% (or 19 out of 66; vs. 71% unhealthy snacks) in the fun fair condition and 21% (or 6 out of 28; vs. 79% unhealthy snacks) in the control condition.

Subsequently, a post-hoc analysis with separate 2 x 2 (poster x food [healthy vs. unhealthy]) comparisons revealed five significant relations, indicating poster-related differences in food choices. Specifically, consumers were found to be influenced in all health-related poster conditions. As expected, when consumers were exposed to the Giacometti poster rather than to the fun fair poster, healthy compared to unhealthy snacks were chosen more frequently ($\chi^2(1, 139) = 11.63$, $p < .001$). Likewise, when consumers were exposed to the Giacometti poster rather than to no poster, healthy snacks compared to unhealthy snacks were purchased more frequently ($\chi^2(1, 101) = 10.58$, $p = .001$). In line with the hypothesis, when consumers were exposed to the activity poster rather than to no poster, healthy snacks compared to unhealthy snacks were selected more frequently ($\chi^2(1, 113) = 4.6$, $p < .05$). Additionally, when consumers were exposed to the activity poster rather than to the fun fair poster, healthy snacks compared to unhealthy snacks were chosen marginally more frequently ($\chi^2(1, 151) = 3.46$, $p = .06$). When consumers were exposed to the Giacometti poster rather than to the activity poster healthy snacks compared to unhealthy snacks were chosen marginally more frequently ($\chi^2(1, 158) = 3.46$, $p = .08$).

Finally, when consumers were exposed to either the fun fair poster or to no poster, no difference in the amount of chosen healthy or unhealthy snacks occurred ($\chi^2(1, 94) = 0.54$, $p = .46$). The frequencies of healthy and unhealthy snack choices in all poster conditions are illustrated in figure 2.

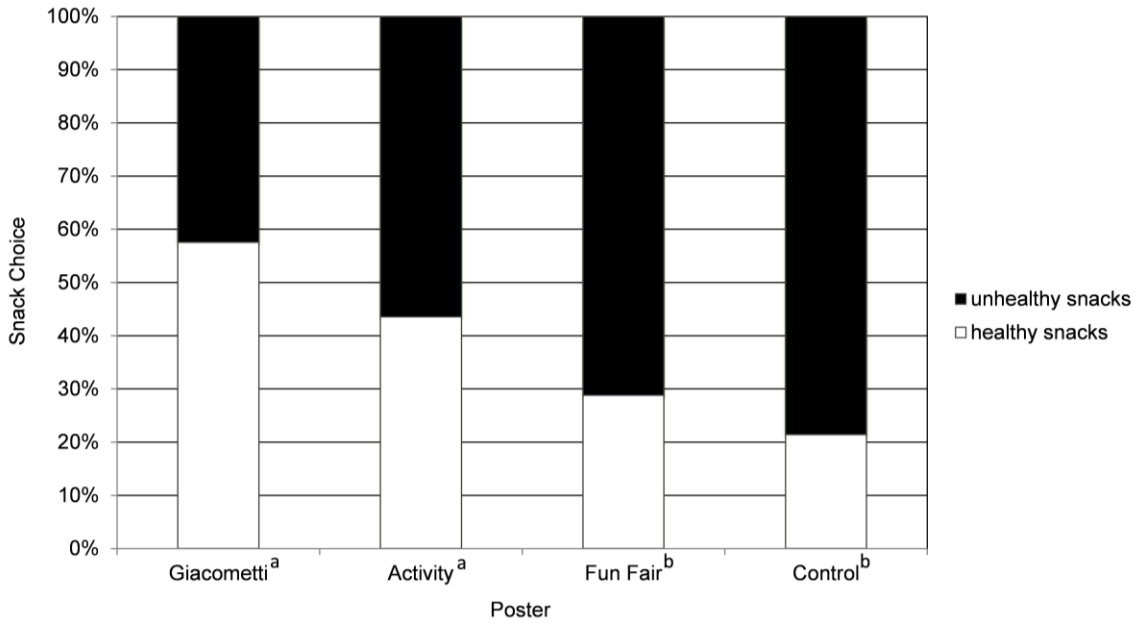

Figure 2. Number of healthy versus unhealthy snack purchases in the four poster conditions of field study 2. Snack choices in the conditions marked with the same letter did not differ.

In conclusion, the results indicate that a poster can influence the choice between healthy and unhealthy foods and hence support the hypothesized effect. As in field study 1, the effects of poster images were substantial. That is, the three tested posters influenced food choices differently. Compared to the hedonic-related fun fair poster, the health-related Giacometti and activity posters were more likely to influence food choices.

General Discussion

Environmental cues can affect food decisions (see Wansink, 2004, for a review). While laboratory research has repeatedly demonstrated the food-reducing or food-increasing influence of environmental cues (e.g., Brunner & Siegrist, 2012), less is known about environmental cues' impact on actual food decisions. The present studies asked whether environmental cues can direct consumers' real world food choices in favor of healthy or unhealthy snack alternatives. Overall, present findings are in line with priming research, revealing that environmental cues in the form of posters with content associated with (un)healthy diet influence food choices in favor of (un)healthy snacks. Specifically, while nature and activity posters increased preferences for healthy snacks, a fun fair poster increased preferences for unhealthy snacks (field study 1). The effect in favor of healthy food choices reoccurred for a poster with the Giacometti sculptures (field study 2). Moreover, findings contribute to previous research examining the impact of the environment on food decisions by indicating that environmental cues with only slight health or diet associations can be effective in influencing one's food decisions.

Growing Evidence for Environmental Influences on Food Decisions

Past research has demonstrated that environmental cues such as Giacometti sculptures influence consumption volume decisions, that is, *how much* people eat (Brunner, 2010; Van Ittersum & Wansink, 2012). The present research adds to this by revealing that visual environmental cues are likewise able to influence food choices, that is, *what* people choose to eat. Thereby, evidence of the Giacometti effect was extended by showing that it appears not to be limited to reducing food intake but also occurs when choosing between healthy and unhealthy foods.

So far, the specific food consumption literature lacks a deep understanding of the effectiveness of environmental cues in shaping one's food decisions. This may be eliminated by an intensified consideration of more general findings of the priming research focusing on associations (e.g., Dijksterhuis et al., 2000; Dijksterhuis & Smith, 2005), concepts (e.g., Bruner 1957; Higgins, Rholes, & Jones, 1977), goals (e.g., Aarts, 2007; Bargh et al., 2001), and the level of awareness (e.g., Aarts 2007; Chartrand, 2005).

The Power of Priming, Associations, Concepts and Goals

The influence of environmental cues depends on associative links to a relevant concept (Aarts & Dijksterhuis, 2003). On one hand, the present findings imply an associative link between health and nature, activity, or Giacometti sculptures. On the other hand it supports the idea of an associative link between indulgence and a fun fair.

Regarding the stronger tendency to opt for healthy snacks in the nature compared to the activity condition as observed in field study 1, two explanations may be proposed. First, the nature compared to the activity poster might have been more likely to activate a healthy diet concept because of its stronger health-relevant associations. Second, it may be possible that both posters activated a diet concept, but that the nature concept more intensively fostered a healthy diet.

In respect to the importance of the activated associations, one can likewise argue that concepts other than a health or hedonic concept became activated. For instance, the Giacometti sculptures in field study 2 could have activated a body-weight concept (Brunner & Siegrist, 2012). However, it intuitively seems that a body-weight concept and health concept share some associations. It is also possible that the Giacometti sculptures primed other concepts such as culture or art. Nevertheless, this seems unlikely since there is no reason to expect an association

between culture or art and eating behavior. Of course, this is speculative and future research should include the diversity of activatable associations.

Note that although the influence of environmental cues on food choices by priming seems plausible, the present study did not explicitly test this. Future research could apply lexical decision tasks (Wyer & Srull, 1989) to prove whether environmental cues effectively cause priming effects. By way of example, individuals exposed to nature, activity, or Giacometti posters are assumed to be faster in recognizing health-relevant words than individuals primed by a fun fair or no poster. Similarly, they should be more likely to complete word fragments with health-relevant instead of hedonic-relevant words (Kay et al., 2004; Tulving, Schacter, & Stark, 1982). This line of research could thus enable researchers to specify activated associations and to further investigate underlying processes.

While it is a general characteristic of mental concepts (e.g., traits, stereotypes, schemata and goals) to become activated by environmental cues, goals possess the specific characteristic of opening the doors for such priming effects by increasing the accessibility of environmental cues (Aarts, 2007; Aarts et al., 2005; Aarts, Dijksterhuis, & de Vries, 2001; Bargh et al., 2001; Bargh, 2006; Bruner, 1957; Custers & Aarts, 2010). In field study 2, health-related posters were more effective than a hedonic-related poster in influencing consumers' choices. Since data was collected in a health context, one could speculate that this is due to the health sensitivity of the sample. Indeed, National Office of Public Health employees are constantly concerned with matters of health. Assuming that the sample has a prevailing health goal, one could speculate that the accessibility of health-relevant cues is relatively likely. In fact, this would conform to the pattern showing that health-motivated people are relatively likely to respond to health-related cues (Fedoroff, Polivy, & Herman, 2003; Herman et al., 2005). Here, the idea of selective

attention is pivotal. According to this, one's active goal causes selective perception of goal-relevant environmental cues which make corresponding associations more likely to be activated (Aarts et al., 2001; Bruner, 1957).

Interestingly, when considering the influences of the posters in the two field studies, the activity poster appeared to be more effective in field study 2 than in field study 1. Specifically, in field study 2, differing consumer responses were found between the activity and control poster as well as between the activity and fun fair poster. Meanwhile, in field study 1, differing consumer responses only occurred between the activity and fun fair poster, but not between the activity and control poster. A speculative interpretation of this might be that the sample of field study 2 compared to the sample of field study 1 is more likely to pursue a health goal and thus to respond to a health-relevant cue. This study was not meant to analyze whether the different extent of the influence of the activity poster mirrors the interaction of environmental cues and consumers' goals. Still, this issue seems to be of practical relevance and further academic interest.

Considering that one might have both a health and a hedonic goal, one could speculate that people are influenced by environmental cues in terms of a compromise. For example, when primed by a nature poster, one may be more likely to choose the healthier chocolate cereal bar than the unhealthier pure chocolate bar and thus partially cope with both health and hedonic goals. Future research might incorporate this aspect in the definition of the dependent variable by measuring the effect on another level of extremeness. For example, participants could be faced with the choice between a relatively healthy cereal-chocolate bar and a pure, unhealthier chocolate bar instead of the usual healthy apple and the unhealthy chocolate bar.

Conscious Versus Unconscious Influences of Environmental Cues

While both consciously and unconsciously perceived cues can trigger reactions (Bargh, 2006; Schacter, Chiu, & Ochsner, 1993), the influence of environmental cues is primarily thought to occur outside of one's awareness (Dijksterhuis et al., 2000). People are usually not consciously aware of the presence of environmental cues and almost never aware of the unconsciously activated processes or behavior patterns (Chartrand, 2005). For example, Giacometti-primed people do not consciously perceive that their food intake has been influenced (Brunner & Siegrist, 2012).

Importantly, the influence of environmental cues can vanish when cues are consciously perceived, but not when they are unconsciously perceived. For instance, when seeing a photo with a bottle of mineral water in the background, people are less likely to subsequently choose a bottle of the same brand when remembering the bottle compared to when not remembering it (Ferraro, Bettman, & Chartrand, 2009). This relates to the fact that whereas consciously perceived cues are controllable, unconsciously perceived cues are not (Chartrand, 2005; Daza, Ortells, & Noguera, 2007). Therefore, the influence of environmental cues on food decisions seems to be more effective when underlying processes are implicit, unconscious, and automatic rather than planned, conscious, and rational (Brunner & Siegrist, 2012; Ferraro, Bettman, & Chartrand, 2009). It is meaningful that the manipulation in the present studies was done in an unobtrusive rather than in a clearly unconscious way. Hence, it is unclear to what degree the cue's impact occurred outside of conscious awareness. The present results must, therefore, be interpreted with caution regarding underlying processes of the found effects. Future field research could test to what level of consciousness subtle environmental cues are perceived and processed and whether the effectiveness is higher when occurring on an unconscious rather than on a conscious level. Since unconscious influence requires nearly no cognitive resources,

researchers could compare people's response to the exposure of cues with and without additional cognitive load (e.g., remembering numbers). Additional cognitive load reduces one's cognitive resources, and thus the ability to consciously perceive environmental cues declines. If the influence of environmental cues is conscious and thus cognitively costly, then the attenuated cognitive resources should lead to a reduced or no effect (McFerran, Dahl, Fitzsimons, & Morales, 2010). As the influence of environmental cues is assumed to be mainly unconscious, an influence irrespective of additional cognitive load seems more likely (McFerran et al., 2010; Uhlmann, Pizarro, & Bloom, 2008).

Practical Relevance

The limited success of public awareness campaigns and health warnings to prevent obesity requires additional measures to damp strong affective impulses such as temptation and self-control conflicts (Downs, Loewenstein, & Wisdom, 2009; Fedoroff et al., 2003; Fishbach & Shah, 2006). As the present research proposes, more subtle approaches can be meaningful. That is, environmental cues can be applied as interventions for policy makers to shape people's behavior toward a healthier diet. Clearly, one may question the marginal benefit of choosing yogurt instead of a Twix bar. Indeed, it seems implausible that somewhat more than 100 calories can improve society's health and lower healthcare costs. Nevertheless, an accumulation of effective applications of environmental cues can help people to shed their extra calories and moreover to obtain the required intake of healthy nutrients over a long time.

Health professionals are therefore encouraged to complement current measures with subtle, less cognitive strategies. This can include structuring public places such as stores, restaurants, or schools. In doing so, literature suggests that monitoring and directing people's health-related and diet-relevant associations, concepts and goals are essential and an effective

way of support a healthy diet. Future research should provide a more comprehensive understanding of the interaction of associations, concepts, goals and the level of awareness of subtle environmental cues in the food consumption area and thus help to implement more efficient health measures.

Conclusion

The present research indicates that environmental cues influence food choices in a naturalistic setting. While posters with an associative link to health lead to an increased choice of healthy food, environmental cues with an associative hedonic link increase the choice of unhealthy food. Overall, these findings offer a basis for improving society's food-related health.

References

Aarts, H. (2007). Health and goal-directed behavior: The nonconscious regulation and motivation of goals and their pursuit. *Health Psychology Review*, *1*(1), 53–82. http://dx.doi.org/10.1080/17437190701485852

Aarts, H., Chartrand, T. L., Custers, R., Danner, U., Dik, G., Jefferis, V. E., & Cheng, C. M. (2005). Social stereotypes and automatic goal pursuit. *Social Cognition*, *23*(6), 465–490. http://dx.doi.org/10.1521/soco.2005.23.6.465

Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: Environment, situational norm, and social behavior. *Journal of Personality and Social Psychology*, *84*(1), 18. http://dx.doi.org/10.1037/0022-3514.84.1.18

Aarts, H., Dijksterhuis, A., & de Vries, P. (2001). On the psychology of drinking: Being thirsty and perceptually ready. *British Journal of Psychology*, *92*(4), 631–642. http://dx.doi.org/10.1348/000712601162383

Areni, C. S., & Kim, D. (1994). The influence of in-store lighting on consumers' examination of merchandise in a wine store. *International Journal of Research in Marketing*, *11*(2), 117–125. http://dx.doi.org/10.1016/0167-8116(94)90023-X

Bargh, J. A. (1990). Goal and intent: Goal-directed thought and behavior are often unintentional. *Psychological Inquiry*, *1*(3), 248–251. http://dx.doi.org/10.1207/s15327965pli0103_14

Bargh, J. A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behavior. *European Journal of Social Psychology*, *36*(2), 147–168. http://dx.doi.org/10.1002/ejsp.336

Bargh, J. A., & Gollwitzer, P. M. (1994). Environmental control of goal-directed action: Automatic and strategic contingencies between situations and behavior. *Nebraska Symposium on Motivation*, *41*, 71-124.

Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, *81*(6), 1014. http://dx.doi.org/10.1037/0022-3514.81.6.1014

Berthoud, H.-R. (2006). Homeostatic and non-homeostatic pathways involved in the control of food intake and energy balance. *Obesity*, *14*(S8), 197S–200S. http://dx.doi.org/10.1038/oby.2006.308

Bruner, J. S. (1957). On perceptual readiness. *Psychological Review*, *64*(2), 123. http://dx.doi.org/10.1037/h0043805

Brunner, T. A. (2010). How weight-related cues affect food intake in a modeling situation. *Appetite*, *55*(3), 507–511. http://dx.doi.org/10.1016/j.appet.2010.08.018

Brunner, T. A., & Siegrist, M. (2012). Reduced food intake after exposure to subtle weight-related cues. *Appetite*, *58*(3), 1109–1112. http://dx.doi.org/10.1016/j.appet.2012.03.010

Chandon, P., & Ordabayeva, N. (2009). Supersize in one dimension, downsize in three dimensions: Effects of spatial dimensionality on size perceptions and preferences. *Journal of Marketing Research*, *46*(6), 739–753. http://dx.doi.org/10.1509/jmkr.46.6.739

Chartrand, T. L. (2005). The role of conscious awareness in consumer behavior. *Journal of Consumer Psychology*, *15*(3), 203–210. http://dx.doi.org/10.1207/s15327663jcp1503_4

Custers, R., & Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology*, *89*(2), 129. http://dx.doi.org/10.1037/0022-3514.89.2.129

Custers, R., & Aarts, H. (2007). In search of the nonconscious sources of goal pursuit: Accessibility and positive affective valence of the goal state. *Journal of Experimental Social Psychology*, *43*(2), 312–318. http://dx.doi.org/10.1016/j.jesp.2006.02.005

Custers, R., & Aarts, H. (2010). The unconscious will: How the pursuit of goals operates outside of conscious awareness. *Science*, *329*(5987), 47–50. http://dx.doi.org/10.1126/science.1188595

Daza, M. T., Ortells, J. J., & Noguera, C. (2007). Negative semantic priming from consciously vs. unconsciously perceived single words. *Psicologica: International Journal of Methodology and Experimental Psychology*, *28*(2), 105–127.

Dijksterhuis, A., Aarts, H., Bargh, J. A., & van Knippenberg, A. (2000). On the relation between associative strength and automatic behavior. *Journal of Experimental Social Psychology*, *36*(5), 531–544. http://dx.doi.org/10.1006/jesp.2000.1427

Dijksterhuis, A., & Smith, P. K. (2005). What do we do unconsciously? And how? *Journal of Consumer Psychology (Lawrence Erlbaum Associates)*, *15*(3), 225–229. http://dx.doi.org/10.1207/s15327663jcp1503_7

Downs, J. S., Loewenstein, G., & Wisdom, J. (2009). Strategies for promoting healthier food choices. *The American Economic Review*, 159–164. http://dx.doi.org/10.1257/aer.99.2.159

Fedoroff, I., Polivy, J., & Peter Herman, C. (2003). The specificity of restrained versus unrestrained eaters' responses to food cues: General desire to eat, or craving for the cued food? *Appetite*, *41*(1), 7–13. http://dx.doi.org/10.1016/S0195-6663(03)00026-6

Ferraro, R., Bettman, J. R., & Chartrand, T. L. (2009). The power of strangers: The effect of incidental consumer brand encounters on brand choice. *Journal of Consumer Research*, *35*(5), 729–741. http://dx.doi.org/10.1086/592944

Fishbach, A., & Shah, J. Y. (2006). Self-control in action: Implicit dispositions toward goals and away from temptations. *Journal of Personality and Social Psychology*, *90*(5), 820. http://dx.doi.org/10.1037/0022-3514.90.5.820

Förster, J., Liberman, N., & Friedman, R. S. (2007). Seven principles of goal activation: A systematic approach to distinguishing goal priming from priming of non-goal constructs. *Personality and Social Psychology Review*, *11*(3), 211-233. http://dx.doi.org/10.1177/1088868307303029

Gaillet, M., Sulmont-Rossé, C., Issanchou, S., Chabanet, C., & Chambaron, S. (2013). Priming effects of an olfactory food cue on subsequent food-related behaviour. *Food Quality and Preference*, *30*(2), 274–281. http://dx.doi.org/10.1016/j.foodqual.2013.06.008

Harris, J. L., Bargh, J. A., & Brownell, K. D. (2009). Priming effects of television food advertising on eating behavior. *Health Psychology*, *28*(4), 404–413. http://dx.doi.org/10.1037/a0014399

Herman, C. P., Koenig-Nobert, S., Peterson, J. B., & Polivy, J. (2005). Matching effects on eating: Do individual differences make a difference? *Appetite*, *45*(2), 108–109. http://dx.doi.org/10.1016/j.appet.2005.03.013

Higgins, T. E., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Experimental Social Psychology*, *13*(2), 141–154. http://dx.doi.org/10.1016/S0022-1031(77)80007-3

Hill, J. O., & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science*, *280*(5368), 1371–1374. http://dx.doi.org/10.1126/science.280.5368.1371

Kay, A. C., Wheeler, S. C., Bargh, J. A., & Ross, L. (2004). Material priming: The influence of mundane physical objects on situational construal and competitive behavioral choice. *Organizational Behavior and Human Decision Processes*, *95*(1), 83–96. http://dx.doi.org/10.1016/j.obhdp.2004.06.003

Köster, E. P. (2009). Diversity in the determinants of food choice: A psychological perspective. *Food Quality and Preference*, *20*(2), 70–82. http://dx.doi.org/10.1016/j.foodqual.2007.11.002

McFerran, B., Dahl, D. W., Fitzsimons, G. J., & Morales, A. C. (2010). I'll have what she's having: Effects of social influence and body type on the food choices of others. *Journal of Consumer Research*, *36*(6), 915–929. http://dx.doi.org/10.1086/644611

North, A. C., Hargreaves, D. J., & McKendrick, J. (1999). The influence of in-store music on wine selections. *Journal of Applied Psychology*, *84*(2), 271. http://dx.doi.org/10.1037/0021-9010.84.2.271

Papies, E. K., & Hamstra, P. (2010). Goal priming and eating behavior: Enhancing self-regulation by environmental cues. *Health Psychology*, *29*(4), 384. http://dx.doi.org/10.1037/a0019877

Renner, B., Sproesser, G., Strohbach, S., & Schupp, H. T. (2012). Why we eat what we eat. The Eating Motivation Survey (TEMS). *Appetite*, *59*(1), 117–128. http://dx.doi.org/10.1016/j.appet.2012.04.004

Schacter, D. L., Chiu, C. Y. P., & Ochsner, K. N. (1993). Implicit memory: A selective review. *Annual Review of Neuroscience*, *16*(1), 159–182. http://dx.doi.org/10.1146/annurev.ne.16.030193.001111

Seeley, R. J., & Woods, S. C. (2003). Monitoring of stored and available fuel by the CNS: Implications for obesity. *Nature Reviews Neuroscience*, *4*(11), 901–909. http://dx.doi.org/10.1038/nrn1245

Sela, A., & Shiv, B. (2009). Unraveling priming: When does the same prime activate a goal versus a trait? *Journal of Consumer Research*, *36*(3), 418-433. http://dx.doi.org/10.1086/598612

Tulving, E., Schacter, D. L., & Stark, H. A. (1982). Priming effects in word-fragment completion are independent of recognition memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *8*(4), 336. http://dx.doi.org/10.1037/0278-7393.8.4.336

Uhlmann, E. L., Pizarro, D. A., & Bloom, P. (2008). Varieties of social cognition. *Journal for the Theory of Social Behaviour*, *38*(3), 293–322. http://dx.doi.org/10.1111/j.1468-5914.2008.00372.x

Van Ittersum, K., & Wansink, B. (2012). Plate size and color suggestibility: The Delboeuf Illusion's bias on serving and eating behavior. *Journal of Consumer Research*, *39*(2), 215–228. http://dx.doi.org/10.1086/662615

Wadden, T. A., Brownell, K. D., & Foster, G. D. (2002). Obesity: Responding to the global epidemic. *Journal of Consulting and Clinical Psychology*, *70*(3), 510. http://dx.doi.org/10.1037/0022-006X.70.3.510

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, *24*, 455–479. http://dx.doi.org/10.1146/annurev.nutr.24.012003.132140

World Health Organization. *Controlling the global obesity epidemic*. Accessed 8 December 2014, Available at: http://www.who.int/nutrition/topics/obesity/en/

Wyer Jr, R. S., & Srull, T. K. (1989). Memory and cognition in its social context. Accessed 8 December 2014, Available at: http://psycnet.apa.org/psycinfo/1989-98597-000

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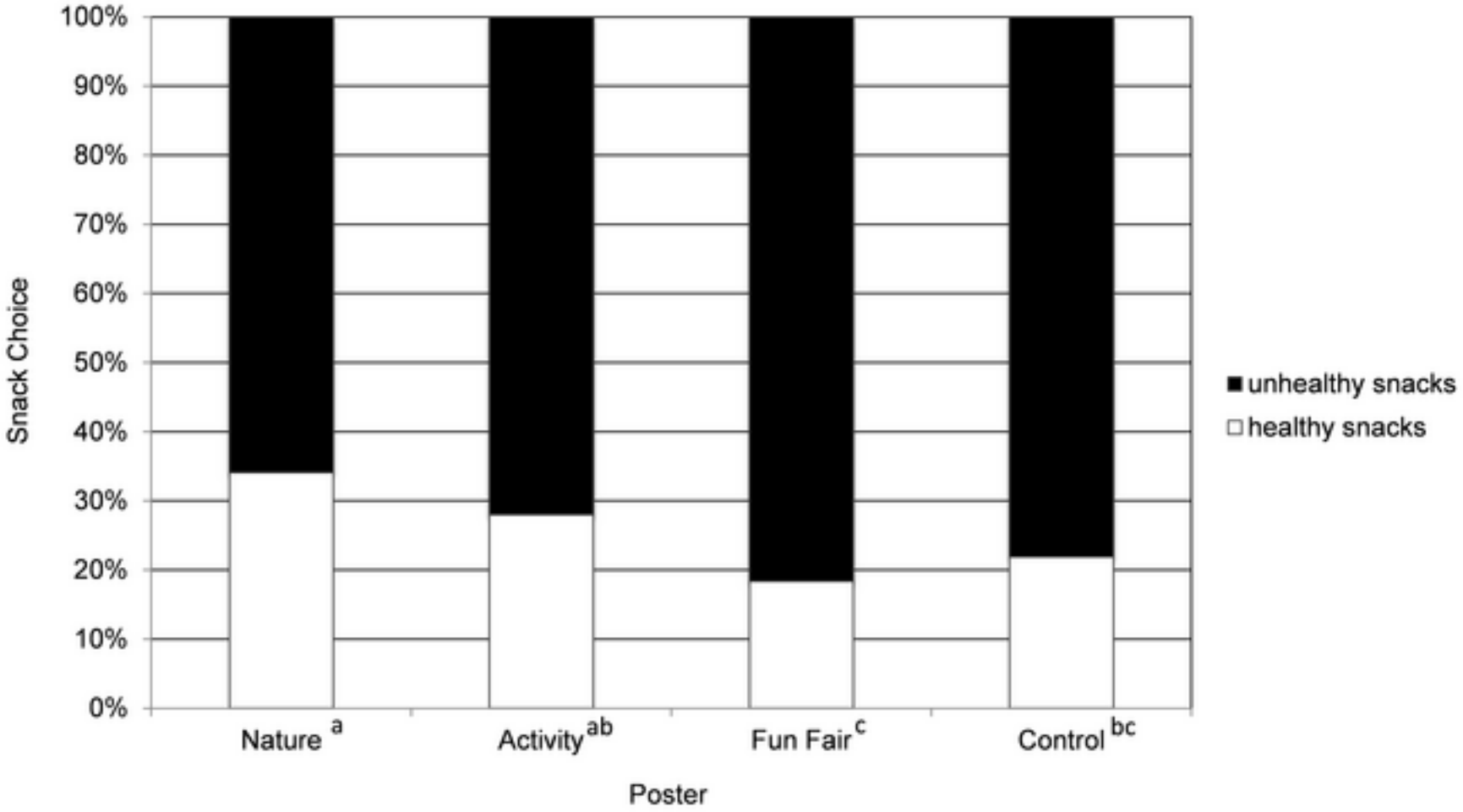

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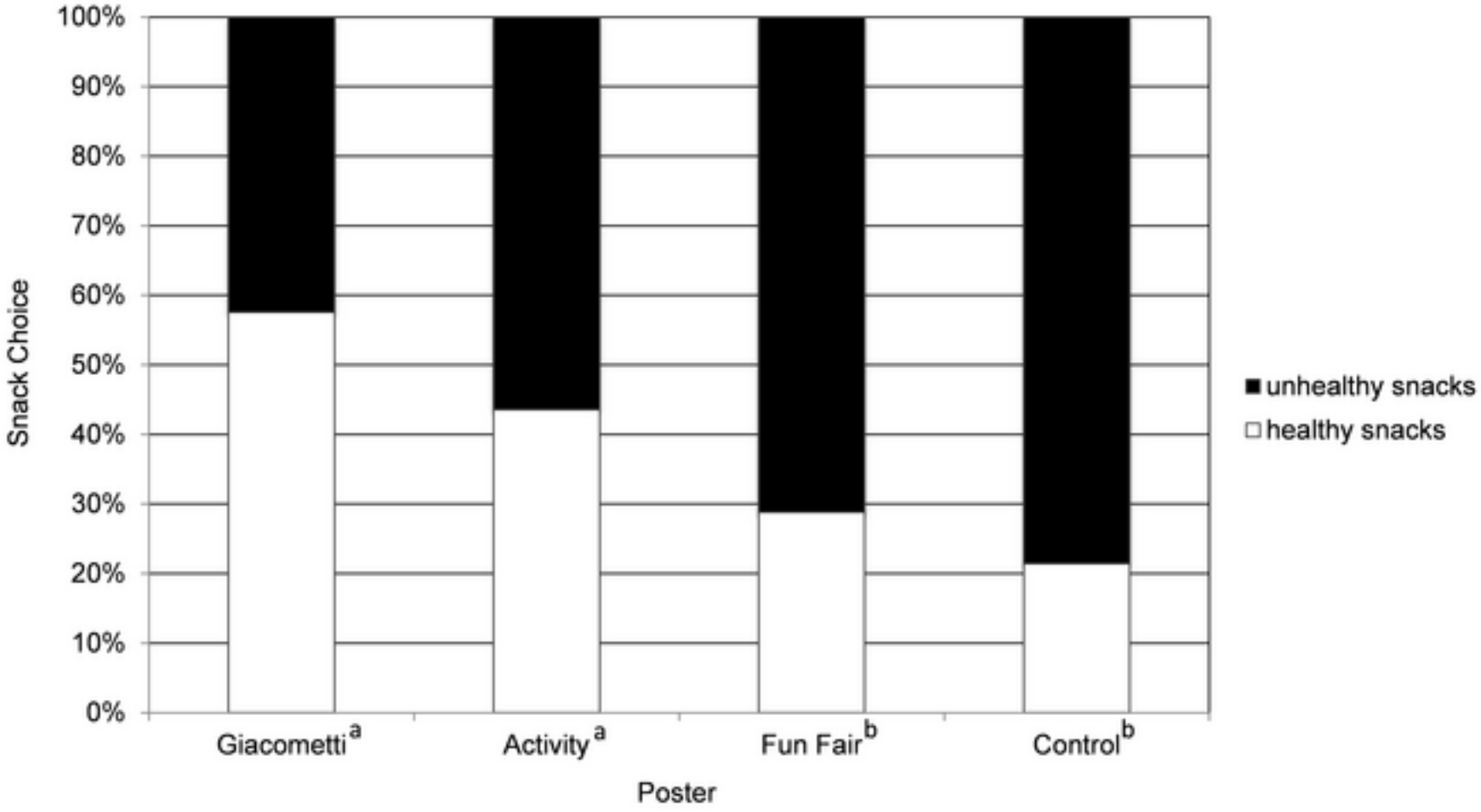

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