The Mental Budgeting of Calories: How Nutrition Information Influences Food Consumption Day By Day, Not Meal By Meal

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Based on a six-nation survey (N=3,150), we find that, in line with dietary guidelines, many consumers set daily mental budgets for calories. A field experiment manipulating availability of nutrition information demonstrates such day-level mental budgeting. Consumers who set budgets adjust dinnertime consumption in response to information about past calorific consumption.

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Contemporary Issues in Healthier Food Choice

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Paper #1: The Mental Budgeting of Calories: How Nutrition Information Influences Food Consumption Day by Day, Not Meal by Meal

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Paper #2: Healthy-Shopping Dynamics: The Relative Healthiness of Food Purchases Throughout Shopping Trips

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Paper #3: 'Low Fat' but High in Sugar: Consumer Response to Misleading Nutrition Claims

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Paper #4: Can Children Still Be Happy If 160 Calories Are Cut Out of the Happy Meal? Reinforcing Effects of Toys on Portion Choices

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SESSION OVERVIEW

Health problems caused by excessive food intake are increasing. Millions of people across the world are suffering from being overweight or obese (Ng et al. 2014; WHO 2014). Overwhelming food choice enviroments like supermarkets and fast-food restaurants increase the relevance for research about how consumers make healthier food choices and, more importantly, how consumers can be motivated to do so (Chandon and Wansink 2012). The purpose of this session is to report and discuss new insights from different perspectives on healthier food choices and to expand the body of knowledge: first, the various findings from the four papers contribute to consumer research by showing new behavioral mechanisms and dynamics, but also potential implementation strategies, which are relevant for healthier food choices. Hence, consumer researchers will gain insights into how to achieve win-win situations for both consumers and food suppliers. The four papers apply different methodologies to answer novel research questions and will, therefore, provide a promising foundation for a vivid discussion. The papers are summarized as follows:

In Paper #1, Oh, Huh, and Mukhopadhyay present a field experiment, manipulating availability of nutrition information, and reveal that consumers set day-level mental budgets for calories. They found that consumers who set budgets adjust dinnertime consumption in response to information about past calorific consumption. The authors demonstrate that such mental calorie budgets interact with calorie information provision and can influence subsequent decisions. Hence, their results provide evidence about transmitting effects of calorie information, and emphasize the importance of considering these insights when evaluating nutrition disclosure effectiveness.

In Paper #2, van der Heide, van Ittersum, and van Doorn report how the healthiness of a series of sequential purchases evolves throughout a shopping trip. Their research combines results from an online study and a lab experiment and, their findings show healthy-shopping dynamics: overweight consumers purchase healthier options in the first half of the shopping trip, while making unhealthier choices during the second half. Normal weight consumers did not show any choice patterns during the shopping trip. These results highlight how focusing on single purchases and end-of-trip baskets can fail to capture individual differences regarding healthy-shopping decisions.

In Paper #3, Elshiewy, Jahn, Doering, and Boztug combine results from supermarket purchase and experimental survey data to investigate how consumers respond to voluntary front-of-pack nutrition labels. Experimental results reveal an overall increase in brand trust, while product attitude increases (decreases) for healthy (unhealthy) products. Interestingly, results show that nutrition labels only affect sales and purchase intention for products with potentially misleading nutrition claims (i.e., 'low fat' products with high sugar content).

In Paper #4, Reimann and Lane show how healthier food choices can be motivated in fast-food restaurants. Their findings reveal that including an inexpensive non-food item (toy) with a smaller-sized meal incentivizes children to choose the smaller-sized "Happy Meal" instead of the regular-sized version without non-food item. This effect even holds among children with overweight and obesity. Their findings matter for both food marketers and public policy makers, who aim to stimulate healthier food choices.

The Mental Budgeting of Calories: How Nutrition Information Influences Food Consumption Day by Day, Not Meal by Meal

EXTENDED ABSTRACT

Does the presence of calorie information influence food consumption? Over the last decade or so, calorie labels have been mandated across several jurisdictions worldwide, in the hope that they will help curb the obesity epidemic. However, the emerging evidence reveals that these measures have had a disconcertingly weak effect, if at all (Downs et al. 2013). We suggest that these observed null effects may, in part, be attributable to the paradigm that has been used. Almost all research on nutrition labeling has studied how the provision of nutrition information about a given food item affects consumers' choices of that specific item. However, given that most consumers make multiple food decisions a day (Cutler, Glaeser, and Shapiro 2003) and decisions may not be independent of preceding decisions (Khare and Inman 2009), examining the effect of nutrition information within a narrowly defined choice context may not adequately capture how consumers use such information.

We propose instead that, consistent with public health messaging, consumers have day-level calorie consumption limits (i.e., mental budgets of calorie consumption), which affect their food decisions more broadly. Much research has shown that consumers use mental accounts to keep track of financial expenses (e.g., Thaler 1985, 1999; Heath and Soll 1996; Cheema and Soman 2006). They set budgets for a certain period of time (e.g., weekly food and entertainment budgets) and regularly monitor the balance to avoid overspending (Read, Loewenstein, and Rabin 1999). We propose that, like these monetary budgets, consumers have a budget for calorie consumption, which is set daily. Since the calorie content of any single food item is usually much lower than a daily budget, the provision of calorie information will not have a major influence on one-off decisions unless the information reveals an unusually high calorie count. However, this information may well have an observable effect across consumption situations at a day level. If so, a consumer's decision regarding dinner may well be influenced by the nutrition information processed at lunch.

Who is likely to have a mental budget for calories? Restrained eaters (Herman and Polivy 1980) care about and pay attention to food-relevant information. Therefore, restrained (vs. unrestrained) eaters should (a) be more likely to have such mental budgets, which (b) are generally smaller. Consequently, we predict that the effect of calorie information disclosure should be apparent at a day level, for consumers who are restrained eaters.

Study 1 tested for the existence of mental calorie budgets. 3,150 respondents participated from Australia, Hong Kong, India, South Africa, UK, and USA (minimum 500 respondents from each country). Participants were asked to indicate the acceptable calorie range for them to eat for a normal day by typing the minimum and the maximum calories, in an open response format with an option to indicate if they did not normally watch the number of calories they ate. 47% of respondents reported having daily consumption budgets. Broken down by country, the US reported the highest proportion, 63%, followed by UK, 59%, Hong Kong, 48%, India, 40%, Australia, 40%, and South Africa, 32%. On average, consistent with public health messaging, daily calorie budgets ranged from 1,425 calories to 2,683 calories.

Study 2 tested whether the size of the mental budget varies depending on dietary restraint. MTurkers (N=200) first indicated their acceptable range of daily calorie consumption with an option to express that they did not have limits on food consumption. Then, we measured dietary restraint (Herman and Polivy 1980). As predicted, more restrained eaters were more likely to have daily budgets ($p < .001$), and have smaller budgets ($p < .05$).

Based on the evidence of existence of daily calorie budgets especially for restrained eaters, Study 3 tested how these budgets interact with the provision of calorie information at a day level. Calorie information provided for meals on the same day (e.g., breakfast and lunch) enables restrained eaters to track how much of their budget has been used and how much budget is left for dinner. Therefore, when calorie information is provided for the prior intake, restrained eaters should "balance" the remaining budget at dinner (i.e., eat less [more] when the remaining budget is tight [ample]). Study 3 was a field experiment that tested these predictions.

Participants (N=190 undergraduate students) recorded their food diaries for an entire day. In the late afternoon, half the participants received accurate and itemized feedback about how many calories they had consumed till then. The other half, control, got no feedback. As predicted, there was an interaction such that restrained eaters who had consumed relatively high calories prior to feedback (one SD above the mean of average pre-feedback calorie intake) decreased calorie consumption at dinner (vs. control; $p = .06$). Conversely, restrained eaters who had consumed relatively less calories (one SD below the mean of average pre-feedback calorie intake) during the day subsequently increased their dinnertime calorie consumption (vs. control; $p < .01$). Providing feedback did not influence the dinnertime consumption for unrestrained eaters (ns).

In summary, we provide evidence for daily mental budgets for calorie consumption. The likelihood of having calorie budgets and the sizes of the budgets vary depending on dietary restraint. We demonstrate that such mental calorie budgets interact with calorie information provision to influence subsequent decisions. Hence, the null effects of calorie information provision observed in past research may be due to the fact that researchers have been looking with too narrow a lens.

Healthy-Shopping Dynamics: The Relative Healthiness of Food Purchases Throughout Shopping Trips

EXTENDED ABSTRACT

Globally, nearly 30% of the world population is now considered overweight or obese (Ng et al. 2014). This obesity epidemic is largely driven by the overconsumption of unhealthy (i.e., energy-dense and nutrient-poor) foods (Asfaw 2011). Surprisingly, while supermarkets account for more than 50% of public food expenditures (Glanz, Bader, and Iyer 2012), we know little about the "healthiness" of people's shopping baskets. Research to date typically focuses on healthiness of single purchases or end-of-trip baskets, investigating for instance the impact of health labels and "fat taxes" (Khan, Misra, and Singh 2016; Wansink and Chandon 2006). However, a growing body of research suggests that the grocery purchase process is more than a series of independent decisions—it is dynamic and evolves in response to earlier purchase decisions (Gilbride, Inman, and Stilley 2015).

Taking these dynamics into account is highly relevant, since the positive immediate effects of health interventions might in fact backfire due to dynamic responses. For instance, while price reductions effectively stimulate healthy food purchases, they may increase the total number of calories purchased in the end-of-trip shopping basket (Waterlander et al. 2012). Therefore, the goal of this research is to examine healthy-shopping dynamics throughout major shopping trips. Do shoppers consistently purchase relatively (un)healthy foods, or do they interchangeably purchase relatively unhealthy and healthy foods?

Existing theories offer support for both accounts: a dynamic interchange of healthy and unhealthy purchases (Khan and Dhar 2006) and the consistent purchase of (un)healthy foods (Williams and DeSteno 2008). These varying dynamics seem to originate from an interplay of licensing effects, "what-the-hell" effects and feelings of pride and/or guilt. First, a healthy food choice may license the purchase of a self-indulgent, unhealthy product (Hui, Bradlow, and Fader 2009; Khan and Dhar 2006). Second, when consumers purchase an unhealthy product, their failure to adhere to health goals may cause a "what-the-hell" response, leading to further unhealthy purchases (Cochran and Tesser 1996). Third, consumers may experience pride after a healthy food purchase (Mukhopadhyay and Johar 2007), facilitating further pursuit of (health) goals (Williams and DeSteno 2008). Fourth, consumers may experience guilt after purchasing an unhealthy product, which may motivate healthier future choices (Chen and Sengupta 2014).

Concluding, existing literature suggests multiple dynamic forces that affect (un)healthy food purchases. Moreover, these dynamics could differ across weight categories. Among others, overweight consumers differ from their normal-weight counterparts in terms of the guilt they experience regarding their eating behavior (Wansink and Chandon 2006). We empirically investigate these notions in two initial studies.

In Study 1, we first conducted an online study on healthy-shopping dynamics involving 160 MTurk participants ($M_{age} = 31.6$; 46% female). Participants made 11 within-category product choices (e.g., diet coke within the coke category). We assessed the relative healthiness of these choices in terms of calories—the number of calories relative to the average number of calories of all presented options. Each product decision involved four options (presented with a picture, price and caloric information) and a no-purchase option. Furthermore, participants were randomly assigned to different real-time caloric feedback conditions (no feedback vs. % GDP feedback vs. total calories feedback).

After classifying participants as normal-weight (BMI < 25) or overweight (BMI ≥ 25), we conducted a repeated measures analysis with polynomial contrast analysis on relative healthiness. The within-subjects effect of relative healthiness was highly significant (F(10, 1540) = 6.80; p < .01), supporting the existence of healthy-shopping dynamics. The between-subjects effects of participants' weight (F(1, 154) = 1.69; p = .20) and feedback condition (F(2, 154) = 0.37; p = .69) were not significant. However, contrast analysis suggests a significant cubic interaction between relative healthiness and weight (F(1, 154) = 13.65; p < .01), indicating that healthiness dynamics differ between normal-weight and overweight shoppers. Among overweight participants, cubic contrasts are significant (F(1, 69) = 43.57; p < .01). They purchase relative healthy options in the first half of the shopping trip, while making relatively unhealthy choices during the second half of the trip. Among normal-weight participants, cubic contrasts were also significant (F(1, 85) = 5.25; p = .02), although less pronounced. No significant contrasts or interactions were found for the caloric feedback conditions (p > .10).

This study supports the presence of healthy-shopping dynamics, particularly among overweight shoppers. To address some of the study's limitations, Study 2 was conducted.

We next conducted Study 2 as a lab study involving 320 undergraduates (M_{age} = 20.7; 49% female). Participants made 25 (virtual) product choices in randomized order. Product decisions involved three product options (without a no-choice option). Furthermore, to stimulate realistic choices, one of the participants could win a $75 prize package containing the selected products and cash. No caloric feedback was provided in this study. The rest of the design and procedure were identical to Study 1.

Repeated measures analysis again yielded a significant within-subjects effect for relative healthiness (F(24,7632) = 1.51; p = .05). Again, the between-subjects effect of participants' weight was not significant (F(1,318) = 1.43; p = .23). Contrast analysis suggests a significant quadratic interaction between relative healthiness and weight, further indicating that dynamics differ across weight categories (F(1, 318) = 3.92; p = .05). A marginally significant quadratic evolution was found for overweight participants (F(1, 33) = 3.63; p = .07)—they select more low-calorie options (i.e., healthier options) at the start and the end of the shopping trip than half-way through the trip. For normal-weight participants, quadratic, cubic and linear contrasts remained insignificant (p > .10).

This study further supports the existence of healthy-shopping dynamics throughout a major shopping trip and confirms differences across weight categories. Since normal-weight and overweight shoppers did not differ in terms of overall relative healthiness, these results highlight how the currently prevalent focus on single purchases and end-of-trip baskets would fail to capture important individual differences regarding healthy-shopping decisions. Planned follow-up studies will also consider other individual differences and test potential underlying processes.

'Low Fat' but High in Sugar: Consumer Response to Misleading Nutrition Claims

EXTENDED ABSTRACT

Package-based claims and labels have become popular tools to influence consumers' perceived healthiness of food products (Andrews et al. 2014, Chandon 2013). In particular, marketers make use of nutrition claims (e.g., 'low fat') and voluntary nutrition labels (e.g., GDA) posted on the front of the package to emphasize the nutritional advantage of their products (Elshiewy, Jahn, and Boztug 2016; Newman, Howlett, and Burton 2014). Nutrition claims increase the perceived healthiness of food (Andrews, Netemeyer, and Burton 1998; Belei et al. 2012; Geyskens et al. 2007; Wansink and Chandon 2006) and can have a positive impact on sales in supermarkets (Balasubramanian and Cole 2002; Levy et al. 1985; Teisl, Bockstael, and Levy 2001). The downside of these findings is that misleading nutrition claims can be responsible for overeating and obesity (Belei et al. 2012; Wansink and Chandon 2006). The so-called health-halo effect implies a simultaneous overestimation of the food's healthiness and an underestimation of its energy content, which can result in increased consumption (Chandon and Wansink 2007). For nutrition claims such as 'low fat,' consumers may overgeneralize the information from the claim and rate the product as being healthy on other nutrients not mentioned in the claim (Andrews, Netemeyer, and Burton 1998; Roe, Levy, and Derby 1999). The perceived healthiness will be biased if the food product features, for example, a 'low fat' claim but is high in sugar content. Such biased perception is not unlikely as food manufacturers sometimes increase the amount of sugar to compensate for the fat reduction in order to keep the food's tastiness (Brennan and Tudorica 2008).

Our research seeks to explore how consumers react to food products featuring a nutrition claim after the introduction of a front-of-pack (FOP) nutrition label. We do not expect a generally healthier choice behavior, but contend that it depends on the combination of claim content with the amount of other nutrients disclosed on the FOP nutrition label. We argue that FOP nutrition labels alter the perception of food products only when expectations are disconfirmed (Burton et al. 2015, Burton, Howlett, and Tangari 2009). If consumers overestimated the healthiness of a product before nutrition label introduction due to a nutrition claim, we predict aversion behaviors toward this product. That is, nutrition label introduction should lead to decreased consumption of food that claims to be, for example, 'low fat' but is high in sugar.

We combine results from supermarket purchase data and an experimental survey to investigate how consumers respond to such potentially misleading nutrition claims. Our purchase data analysis uses supermarket scanner data for 24 yogurt products covering a two-year period, one year before and one year after a voluntary FOP nutrition label introduction. The label displays the amount of calories (in kcal) as well as sugar, fat, saturated fat and salt (in g) per serving together with the percentage of recommended daily amount. After label introduction, sales volume did not decrease for unhealthier products in general. Sales volume did decrease, however, for yogurts with low fat content (and the corresponding 'low fat' claim), but only when they also contained high amounts of sugar.

To investigate the underlying mechanism, we conducted an experimental survey as a follow-up analysis. We used a 2 ('low fat' claim absence vs. presence) x 2 (low vs. high sugar content) design with repeated-measures (before and after nutrition content disclosure). Four different yogurts were constructed as stimuli, two of which fulfilled FDA requirements to feature a 'low fat' claim (less than 3 g fat per 100 g). We averaged the fat and sugar content of yogurts typically available at supermarkets to create four distinct conditions: a *'low fat' claim/ low sugar* natural yogurt (.6 g fat/5.8 g sugar), a *no claim/low sugar* Greek yogurt (10.8 g fat/ 6.7 g sugar), *no claim/ high sugar* fruit yogurt (4.5 g fat/13.8 g sugar) and a *'low fat' claim/ high sugar* fruit yogurt (1.5 g fat/13.8 g sugar).

For our online experiment we recruited 405 respondents using MTurk. First, participants answered questions about their dietary concerns and nutrition proficiency, and were then randomly assigned to one of the four conditions. They were presented an image of a fictitiously branded yogurt product; in two of the conditions the product featured a 'low fat' claim. Importantly, other information about the nutrition content was not revealed. Respondents were asked about their product attitude, brand trust, and purchase intention. Following these evaluations, participants were presented the same yogurt again, but this time with additional FOP nutrition information (calories, sugar, fat, saturated fat and salt per 100 g and the percentage of recommended daily amount). As before, we asked about product attitude, brand trust, and purchase intention.

Results from ANOVA and mediated moderation analysis provide strong support for the proposed mechanism. Product attitude and purchase intention increased for a low-sugar yogurt featuring a 'low fat' claim after FOP nutrition label provision. Interestingly, product attitude for yogurts without the claim decreased significantly, while the purchase intention was not affected by the FOP nutrition information. In line with our prediction and the results from the purchase data analysis, purchase intention significantly decreased for the *'low fat'/high sugar* yogurt after FOP nutrition label exposure. Product attitude worsened as well. We used dietary concerns and nutrition proficiency as control variables in our models. Taken together, results suggest that FOP nutrition labels can correct for biased healthiness perceptions, but do not promote healthier choices per se. With respect to misleading nutrition claims, comprehensive nutrition information appears to mitigate the health halo and reduce choice. Importantly, label introduction had a positive effect on brand trust across all four conditions. It appears that voluntary FOP nutrition disclosure still works as a brand-perception improving food marketing strategy.

In summary, our research reveals aversion behavior towards food products with potentially misleading nutrition claims. The combination of results from supermarket purchase data and an experimental survey greatly enhances external and internal validity of our findings. Our results, therefore, contribute to the growing literature in healthier food choice, with relevance to consumer research, food marketing and public policy.

Can Children Still be Happy If 160 Calories Are Cut Out of The Happy Meal? Reinforcing Effects of Toys on Portion Choices

EXTENDED ABSTRACT

As childhood overweight and obesity have risen, researchers have started investigating food marketing tactics that may have contributed to the pandemic. For example, toy premiums in children's meals (e.g., McDonald's Happy Meals) effectively motivate children to visit fast food restaurants (Bernhardt et al. 2013). At the same time, children's meal bundles have undergone scrutiny for high energy density (Powell, Harris, and Fox 2013; O'Donnell et al. 2008). Relatedly, two recent systematic reviews found character endorsers (e.g., McDonald's Ronald McDonald) considerably increase children's liking and preference (Smits et al. 2015; Kraak and Story 2015) for energy-dense foods (Kraak and Story 2015). These tactics' popularity among food marketers and meal bundle's link to overweight and obesity have generated suspicions that toy premiums have incentivized over-consumption, even encouraging legal action (Otten et al. 2014). The effects of food marketing tactics on children are especially worrisome because they likely establish and reinforce long-lasting food choice patterns (Connell, Brucks, and Nielsen 2014).

In the present research, we asked whether toy giveaways (henceforth referred to as toy premiums) could be used to incentivize children to choose a smaller-sized meal. Specifically, we tested whether including a toy with a smaller-sized (420 calories), but not with a regular-sized (580 calories), Happy Meal would predict smaller-sized meal choice. On first sight, cutting 160 calories out of a meal may not be an effective strategy, considering smaller-sized food portions are less attention-grabbing (Fisher and Birch 1999) and less desirable (Jansen, Mulkens, and Jansen 2007) than larger-sized ones and are, therefore, often rejected by children (Wansink and Hanks 2014).

We argue that toys can be used as effective substitutes for food. One might expect that substitutes need to satisfy common physiological needs (e.g. both water and juice satisfy thirst) (Green and Freed 1993). Yet, we build on extant research in arguing that even highly different stimuli such as food and toys share a common physiological basis, hence allowing their behavioral substitution. Humans have learned to associate solid and liquid foods with appetitive and survival values, which makes food a vegetative reward (Schultz 2006; Rollins et al. 2014). Because children can be reinforced for the receipt of toys (Bijou and Sturges 1959), toys can represent artificial rewards. Hence, we argue that the reinforcing prowess of the toy can counterbalance the lower reinforcement value of a smaller-sized (compared to a regular-sized) meal. The translation of both food and toy into a common reinforcement value should facilitate choice substitution of food with toy. Indirect evidence for the notion of a common physiological basis of vegetative and artificial rewards comes, for example, from a recent adult study that observed automatic responses (e.g., salivation) for attractive material goods (Gal 2012) similar to those expected for delicious food. Following this novel notion of choice substitution, we argue that toys can be used as positive reinforcers, strengthening children's choice behavior for the smaller-sized meal.

At present, there is no experimental evidence evaluating the potential reinforcing value of toys in smaller-sized Happy Meal choice. The goal of the present work was to test the effectiveness of toys in lowering food portion choice and consumption. The research was conducted in the field with actual Happy Meals, across time (i.e., across two repeated trials) and in regard to BMI. Recent research showed that food cues are more attention-grabbing in individuals with obesity (Castellanos et al. 2009; Davids et al. 2010) and that overweight individuals are more susceptible to larger portion sizes (Burger, Fisher, and Johnson 2011), implying BMI could moderate or even nullify the effect of toy on smaller-sized meal choice. Conversely, other research reports overeating in response to larger portion sizes to occur regardless of BMI (Livingstone and Pourshahidi 2014). We attempt to reconcile these findings by determining if BMI will moderate children's portion choice.

In the present research, inclusion of a toy with a smaller-sized meal, but not with the regular-sized version, predicted smaller-sized meal choice ($B = 2.84$, $SE = .77$, $z = 3.67$, $p < .001$, 95% CI [1.33; 4.36]), suggesting that children can be incentivized to choose less food when such is paired with a toy. BMI neither moderated nor nullified the effect of toy on smaller-sized meal choice ($p = .125$), suggesting that children with overweight and obesity can also be incentivized to choose less. Further, neither age, sex, nor hunger level affected choice.

In conclusion, the findings from this study suggest fast-food restaurant chains should include toys to motivate children to choose less food. Children offered a smaller meal with a toy (vs. regular meal without one) are more likely to choose the smaller meal compared to children that are offered a regular meal with a toy (vs. a smaller meal without one).

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