



Hunger effects on option quality for hedonic and utilitarian food products

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ABSTRACT

Multiple studies have examined the extent to which consumers' hunger levels predict their food choices and preference patterns. These investigations often involve making binary choices between hedonic foods (e.g., ice cream) that primarily serve to provide sensory pleasure, and utilitarian foods (e.g., bread) that mainly fulfill functional purposes. However, most consumers entering a grocery store are not restricted to solely selecting *either* hedonic *or* utilitarian foods. Rather, they typically choose *both* hedonic *and* utilitarian food options. Moreover, little is known about the effects of hunger on consumers' option quality (i.e., the degree of match between actual food choices and stated preferences) or their cognitive performance in food contexts. To address these gaps, the current study explored (1) whether experimentally induced hunger (vs. satiation) influences the option quality of consumers' chosen food items; (2) whether this potential interplay is contingent on the food category (hedonic vs. utilitarian); and (3) whether hungry (vs. satiated) consumers' performance may differ on cognitively challenging tasks. The results revealed that hunger did not lead to a generalized decrease in consumers' option quality. However, option quality was inferior for utilitarian—but not hedonic—foods among hungry consumers, whereas no such differences were found for satiated consumers. Hungry (vs. satiated) consumers also performed significantly worse on cognitively demanding tasks, underscoring the far-reaching consequences of hunger on consumers' decision-making. Further research should test the generalizability of these results in ecologically valid settings, such as in actual supermarkets.

1. Introduction

The popular saying is that sensible shoppers “should never go to a grocery store hungry,” presumably because hunger is thought to yield suboptimal food choices. Research suggests that there is a grain of truth in this quote (Otterbring, 2019; Read & Van Leeuwen, 1998), although consumers' weight status (normal weight vs. overweight) seems to play a role in shaping such findings (Mela, Aaron, & Gatenby, 1996; Nisbett & Kanouse, 1969). Orquin and Kurzban (2016) meta-analyzed how low blood glucose—a signal to the brain to increase the sensation of hunger¹—affects decision-making in food and non-food contexts. Low blood glucose was associated with lower discount rates (i.e., increased impatience) in both contexts, and with increased intuitive (vs. deliberate) decision-making in contexts unassociated with food (Orquin & Kurzban, 2016).

Acute hunger reduces people's self-efficacy in adhering to a weight-loss diet, such that they set less ambitious weight loss goals and show less confidence in achieving such goals (Nordgren, van der Pligt, & van Harreveld, 2008). Additionally, excessive hunger (vs. satiation) increases ratings of food palatability, especially for foods high in fat (Lozano, Crites, & Aikman, 1999). In fact, brief exposures to hunger warnings, such as videos showing impending famine, have been shown to increase preferences for high-energy (vs. low-calorie) foods, many of which are unhealthy (Folwarczny et al., 2021, 2022). Existing research on the influence of hunger on food choices has also found that hungry (vs. satiated) people buy more food when shopping for groceries, even after controlling for body mass index (BMI) and indicators of impulsiveness (Nederkoorn, Guerrieri, Havermans, Roefs, & Jansen, 2009).

One characteristic of the foods selected by consumers is whether they are hedonic or utilitarian. Hedonic foods (e.g., ice cream, potato chips,

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¹ However, absolute glucose concentrations are not directly indicative of hunger (Elbæk, Mitkidis, Aarøe, & Otterbring, 2022; Orquin, Dalgaard Christensen, & Lagerkvist, 2020); a potentially better way to measure hunger is capturing short-term declines in blood glucose levels; see de Graaf, Blom, Smeets, Stafleu, and Hendriks (2004) for a discussion of different biomarkers that can be used to measure hunger.

candy) primarily serve to provide sensory pleasure, whereas utilitarian foods (e.g., bread, fruits, vegetables) typically have a more instrumental value (Cramer & Antonides, 2011). Consumers often buy hedonic foods spontaneously, primarily for their high reward value, whereas the act of purchasing utilitarian foods tends to require more deliberation to achieve goals and fulfilling certain choice criteria (Cramer & Antonides, 2011; Dhar & Wertenbroch, 2000). When consumers have less cognitive resources available for decision-making (e.g., when visceral states such as hunger, thirst, and sexual desire have been activated), their decisions are more strongly driven by spontaneous affective reactions, which facilitate the choice of hedonic foods (Otterbring, 2020; Shiv & Fedorikhin, 1999). However, when they can devote considerable cognitive resources to their decisions, the long-term consequences of food choices become more important, thereby shifting preferences toward utilitarian foods (Shiv & Fedorikhin, 1999). Supporting this notion, Otterbring (2019) found that hungry (vs. satiated) individuals were more inclined to choose hedonic rather than utilitarian foods, with this effect largely driven by hungry individuals putting a stronger focus on present pleasures (e.g., indulging in a calorie-dense chocolate cake) and downplaying the importance of more future-focused benefits (e.g., staying physically fit). Hunger may also shift choices within product categories. For example, Kauffman, Herman, and Polivy (1995) found that hungry participants drank more (less) of good-tasting (bad-tasting) milkshakes than their counterparts who snacked before tasting the milkshakes.

In the current research, we use multi-attribute choice theory (Keeney, Raiffa, & Meyer, 1993) and combine questionnaires regarding preference ratings of various product attributes to measure how well hungry (vs. satiated) consumers' chosen food products fit their stated preferences. We refer to this fit as option quality, which is an established way of judging the quality of consumers' choice outcomes (cf. Gidlöf, Anikin, Lingonblad, & Wallin, 2017). Conceptually, option quality can be thought of as resembling the idea of maximizing expected utility. Beyond this metric, we also examine whether hunger (vs. satiation) influences consumers' performance on cognitively challenging tasks. Whereas previous studies in this domain have revealed profound insights, some salient shortcomings should be acknowledged. First, many of these studies lack ecological validity in that they rely on forced choices between utilitarian and hedonic food items. However, consumers in grocery stores can usually choose between a wide range of both hedonic and utilitarian food items. Second, hunger is often measured rather than manipulated, thus raising questions regarding the validity of conclusions and their causal nature (Otterbring, 2019; Zhou, Chen, & Li, 2021). Third, it remains unclear whether hunger (vs. satiation) influences consumers' option quality and whether such a potential effect is category specific or applies across both hedonic and utilitarian food items. Finally, little is known regarding whether hungry (vs. satiated) consumers generally perform worse on tasks linked to cognitive abilities, which can have a considerable impact on their food selection process.

Because hunger is associated with a less deliberate decision-making style (Orquin & Kurzban, 2016), it is plausible that hungry participants may indeed perform worse on cognitively demanding tasks and make choices that are less characteristic of their stated preferences. Indeed, while hungry people are usually motivated to obtain foods that satisfy their physiological need for energy, research shows that hunger sometimes elicits choices that are unaligned with achieving this overarching goal (Eiselt et al., 2021). In other words, hungry (vs. satiated) individuals may show a greater discrepancy between the foods they choose and the foods they prefer.

Given the lack of explicit findings related to the above-stated possibilities, we refrained from specifying formal hypotheses. Instead, to address the aforementioned gaps in the literature, the current study experimentally aimed to examine the following three research questions (RQs):

RQ1: Does hunger (vs. satiation) influence the option quality of consumers' chosen food items?

RQ2: Does hunger (vs. satiation) exert a differential impact on option quality depending on the product category (hedonic vs. utilitarian)?

RQ3: Does hunger (vs. satiation) influence consumers' general cognitive capacity in terms of performance on cognitively challenging tasks?

2. Method

2.1. Participants and design

A total of 102 undergraduates ($M_{\text{age}} = 25$ years, $SD = 5.61$; 58% female) were recruited for a lab-based experiment at Lund University, Sweden. The experiment was part of a larger data collection, which aimed to examine the impact of hunger on consumers' attitudes, attention, and choice behavior (cf. Gidlöf, Lahm, Wallin, & Otterbring, 2021; Gidlöf, Ares, Aschemann-Witzel, & Otterbring, 2021). Participants were informed prior to the experiment that a condition for taking part in the study was that they entered the lab in the morning without having breakfast, as they would receive a breakfast meal during the study. Participants also received generic information about the study purpose and were told that the study sought to investigate customers' attention and choice behavior in a supermarket setting. The study used a mixed design, with hunger (hungry vs. satiated) as the between-subjects factor and food category (hedonic vs. utilitarian) as the within-subjects factor (for similar mixed designs, see Lazzarini, Visschers, & Siegrist, 2017; Nadricka, Millet, & Verlegh, 2020; Otterbring, 2018).

2.2. Pretest

To ensure that the products intended for use in the main study differed significantly on the desired utilitarian-hedonic continuum, we conducted a pretest on 30 participants ($M_{\text{age}} = 22$ years, $SD = 2.86$; 33% female). Participants were asked to indicate the extent to which they associated each of the products (i.e., Swedish crispbread, pasta, candy, and potato chips) with either virtuous/utilitarian or vice/hedonic aspects on a semantic differential scale anchored at 1 (virtuous/utilitarian) and 7 (vice/hedonic). Items with at least five response categories whose answers meet the assumptions for parametric tests can be treated as continuous (Harpe, 2015). Therefore, consistent with multiple other studies (e.g., Banovic & Otterbring, 2021; Griskevicius et al., 2007), we treated our outcome variables as continuous. As expected, a repeated-measures ANOVA revealed that candy and chips ($M = 6.23$, $SD = 1.16$) were evaluated as significantly more hedonic than crispbread and pasta ($M = 3.57$, $SD = 0.95$; $F(1, 29) = 102.83$, $p < .001$, $\eta^2 = 0.78$). Moreover, one-sample t -tests revealed that the two utilitarian products were evaluated as significantly more utilitarian compared to the scale midpoint of 4 ($t(29) = -2.49$, $p = .019$), whereas the two hedonic products were evaluated as significantly more hedonic compared to the scale midpoint ($t(29) = 10.57$, $p < .001$), thus indicating that the evaluations of these products differed considerably on the utilitarian-hedonic continuum and that the products would be suitable for use in the main study.

2.3. Procedure and measures

Participants were randomly assigned to the hungry ($n = 53$) or the satiated ($n = 49$) condition. Those in the satiated condition were offered a breakfast meal while completing several tasks (e.g., selected items about sleep quality from the Pittsburgh Sleep Quality Index; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), which took around 20 min to complete (i.e., the time needed from eating to feeling satiated; Briers, Pandelaere, Dewitte, & Warlop, 2006; Gidlöf, Ares, et al., 2021).

Participants in the hungry condition completed the same tasks and were not offered the breakfast meal until the end of the experimental session, when all other tasks had already been completed. Included among the initial tasks was a test measuring cognitive reflection abilities (cf. Frederick, 2005) through four riddles (e.g., “A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?”), which served to test whether participants would differ in general cognitive reflection abilities depending on their assigned condition². Importantly, this test was included in the end of the task set, suggesting that our experimental manipulation should have already induced a difference in participants’ levels of hunger (vs. satiation).

After completion of the introductory tasks, participants were taken to an adjacent room and were informed that their eye movements would be recorded through an eye tracker while they were looking at a series of planograms depicting various supermarket shelves. Participants were asked to select an option they could consider buying from each of these shelves using a hypothetical choice paradigm. The shelves included eight different product categories, of which four were related to food and hence included for the purpose of the current study (i.e., Swedish crispbread, pasta, potato chips, and candy). Swedish crispbread and pasta served as the utilitarian food options, whereas potato chips and candy acted as hedonic food options (as confirmed by our pretest). The planograms were presented one product category at a time, with a randomized presentation order (for details, see Gidlöf, Lahm, et al., 2021).

Right after the eye-tracking recordings had stopped, participants provided demographic information and indicated how hungry they felt (1 = not at all; 7 = very), with this latter measure serving as a manipulation check. We included the hunger measure after, as opposed to before, exposure to the food-related stimuli to reduce the impact of demand effects, such as the saliency of the hunger manipulation and hypothesis guessing (cf. Rosenthal & Rosnow, 2009). Importantly, participants also indicated the extent to which various product attributes from the target categories of Swedish crispbread, pasta, potato chips, and candy had influenced their choice decisions on scales ranging from +5 (“affects my decision positively”) to −5 (“affects my decision negatively”). These product attributes were used to compute participants’ unique option quality scores for each target category. Among the attributes were things such as the brand name, calorie content, ingredients, weight, labels, and other similar characteristics of the products available on the virtual shelves that participants were exposed to. Depending on the level of match between participants’ hypothetical choice in each target category and their stated preferences across the different product attributes, we normalized the option quality scores to get an easily interpretable measure. Thus, consistent with previous research (Gidlöf et al., 2017), a normalized option quality score can range from 0 (no match between actual food choice and stated preferences) to 1 (perfect match between actual food choice and stated preferences), and thus reflects the extent to which participants’ stated preferences match their hypothetical food choices across our target categories.

We took several steps to increase the internal validity of the study. Because hunger has been linked to more shortsighted decision-making, with a stronger focus on immediate rewards (e.g., Otterbring, 2019), and considering that hunger effects seem to be contingent on the weight status of consumers (e.g., Mela et al., 1996), participants indicated their weight in kg and height in cm (which we used to calculate their BMI) and replied to the time orientation items from Rojas-Rivas et al. (2020) on a 7-point scale (1 = strongly disagree; 7 = strongly agree). We averaged the seven present-orientation items ($\alpha = 0.84$) into an index variable,

which we used as a proxy for impulsiveness. This index variable and participants’ BMI served as two theoretically relevant control variables in our robustness checks.

2.4. Exclusion criteria, statistical power, and analyses

We screened the data for missing responses and extreme values, resulting in the exclusion of 15 participants from the analyses. Participants were excluded due to the following reasons: missing data on the option quality items ($n = 4$), self-reported fasting for more than three days ($n = 1$), extreme values falling more than two standard deviations away from the group means (cf. Otterbring, 2019) on the option quality scores for the hedonic and utilitarian product categories ($n = 8$) or the cognitive reflection task ($n = 2$). As such, our final sample consisted of 87 participants ($M_{\text{age}} = 25$ years, $SD = 5.72$; range: 19–44 years; $n = 46$ in the hungry condition and $n = 41$ in the satiated condition). Based on our set alpha level of $\alpha = 0.05$, this sample size has a statistical power of 0.80 to detect main and interaction effects of hunger corresponding to a moderate effect size of $r = 0.30$, given the mixed design (Cohen, 2013). Attrition was not systematic across conditions ($\chi^2 < 1$) and including the extreme values in the option quality comparisons between hedonic and utilitarian products for hungry and satiated participants, respectively, did not change the nature or significance of the results, nor did it influence the outcome on the test measuring cognitive reflection abilities.

To analyze the data on option quality, we performed a 2 (experimental condition: hungry vs. satiated) $\times$ 2 (food category: utilitarian vs. hedonic; within-subjects) mixed analysis of variance (ANOVA), with experimental condition as the between-subjects factor and food category as the within-subjects factor. For the test measuring cognitive reflection abilities as well as the manipulation check of hunger, we conducted single-factor ANOVAs with experimental condition (hungry vs. satiated) as the between-subjects factor. These parametric tests are robust to violations of normality (Blanca Mena, Alarcón Postigo, Arnau Gras, Bono Cabré, & Bendayan, 2017; Schmider, Ziegler, Danay, Beyer, & Bühner, 2010). Of note, all main results are also robust to non-parametric analyses using Mann-Whitney’s U test. As further robustness checks, we included participants’ present orientation and BMI as covariates in a series of analyses of covariance (ANCOVAs). The data were analyzed in IBM SPSS Statistics Version 25, and we used the ggplot package in R for figure purposes (Wickham & Wickham, 2007).

3. Results

3.1. Manipulation check

A one-way ANOVA on our hunger measure revealed a statistically significant difference between conditions ($F(1, 85) = 139.43$, $p < .001$, $\eta^2 = 0.62$). Participants in the hungry condition ($M = 4.85$, $SD = 1.37$) reported substantially higher hunger scores than participants in the satiated condition ($M = 1.80$, $SD = 0.98$). Thus, our hunger manipulation was successful.

3.2. Option quality

A two-way mixed ANOVA on option quality, with experimental condition (hungry vs. satiated) as the between-subjects factor and food category (utilitarian vs. hedonic) as the within-subjects factor, found no significant main effect of hunger on participants’ option quality scores ($F(1, 85) = 1.28$, $p = .260$, $\eta^2 = 0.01$), but revealed a statistically significant main effect of food category ($F(1, 85) = 7.81$, $p = .006$, $\eta^2 = 0.08$). Participants generally had higher option quality scores for hedonic food products ($M = 0.75$, $SD = 0.17$) compared to utilitarian ones ($M = 0.67$, $SD = 0.22$). Interestingly, however, this main effect was qualified by a significant two-way interaction ($F(1, 85) = 7.88$, $p = .006$, $\eta_p^2 = 0.08$). Satiated participants’ option quality scores did not differ between the

² It should be noted that the association between skipping breakfast and performing worse on cognitively demanding tasks may not necessarily be robust across study settings, sample types, and paradigms (Hoyland, Dye, & Lawton, 2009; but see Loeber, Grosshans, Herpertz, Kiefer, & Herpertz, 2013; Maridakis, Herring, & O’Connor, 2009; Rummel & Nied, 2017).

utilitarian ($M = 0.73$, $SD = 0.19$) and hedonic food categories ($M = 0.73$, $SD = 0.18$; $F(1, 40) = 0.00$, $p = .994$). In contrast, hungry participants' option quality scores differed significantly across these categories ($F(1, 45) = 16.26$, $p < .001$, $\eta^2 = 0.27$), with lower option quality scores for the utilitarian foods ($M = 0.62$, $SD = 0.24$) compared to the hedonic ones ($M = 0.77$, $SD = 0.16$). Presented another way, hungry and satiated participants did not differ in terms of their option quality scores for the hedonic foods ($F(1, 85) = 1.22$, $p = .272$, $\eta^2 = 0.01$); however, hungry (vs. satiated) participants had significantly lower option quality scores for the utilitarian foods ($F(1, 85) = 5.71$, $p = .019$, $\eta^2 = 0.06$). Thus, as depicted in Fig. 1, hungry participants appeared to make worse decisions in the utilitarian food domain, although option quality in the hedonic food domain did not seem to be strongly influenced by hunger. Supporting this notion, replacing the group variable (hungry vs. satiated) with participants' individual hunger ratings again revealed that hunger was not significantly associated with option quality for hedonic foods ($r = 0.10$, $p = .235$), but was significantly negatively associated with option quality for utilitarian foods ($r = -0.24$, $p = .025$).

The horizontal lines at the centers of the boxplots indicate the medians. The top and bottom lines at the edges of the boxplots indicate the interquartile ranges of the responses. The whiskers extending the boxplots represent the largest and smallest (extreme) values within 1.5 times the interquartile range above and below the 75th and 25th percentiles, respectively. The shaded areas on the right side of the box plots represent the response densities. The dots on the left side of the boxplots represent individual data points. The thick black dots around these points correspond to the group means, and the whiskers emanating from these points represent the standard deviations. The means are also shown in written form on the left side of the corresponding points (cf. [Hehman & Xie, 2021](#)).

3.3. Cognitive reflection abilities

A one-way ANOVA on participants' cognitive reflection scores yielded a statistically significant impact of hunger on the number of correct responses ($F(1, 85) = 8.98$, $p = .004$, $\eta^2 = 0.10$), with hungry participants ($M = 2.20$, $SD = 1.28$) solving fewer riddles than their satiated counterparts ($M = 2.95$, $SD = 1.05$). Moreover, replacing the group variable (hungry vs. satiated) with participants' individual hunger ratings showed that hunger was significantly negatively associated with performance on these riddles ($r = -0.22$, $p = .041$).

3.4. Robustness checks

Including participants' present orientation and BMI as covariates in a 2 (experimental condition: hungry vs. satiated; between-subjects) $\times$ 2 (food category: utilitarian vs. hedonic; within-subjects) mixed ANCOVA on option quality did not change the nature or significance of the two-way interaction obtained in the ANOVA reported above, thus ruling out these potentially confounding variables as main drivers of our results. Moreover, these variables did not significantly interact with our hunger factor and were consistently unassociated with participants' option quality scores. Similarly, adding participants' present orientation and BMI as covariates in a single-factor ANCOVA, with experimental condition (hungry vs. satiated) as the between-subjects factor, did not change the nature or significance of the cognitive reflection results and none of these variables were significantly associated with participants' cognitive reflection abilities, thus demonstrating robustness of our findings and further ruling out these alternative accounts³. Table 1 presents the zero-order correlations between the variables examined

³ An anonymous reviewer further requested us to control for participants' age when analyzing the data on cognitive reflection abilities. Adding age as a third covariate did not change the nature or significance of the results and age was not significantly associated with participants' performance.

herein.

4. Discussion

The current research tested whether experimentally manipulated hunger (vs. satiation) influenced consumers' performance on cognitively challenging tasks as well as the option quality of their chosen food items in hedonic and utilitarian categories. At a general level, the option quality of hungry consumers' food choices was comparable to that of satiated consumers, meaning that both these groups made choices that matched their stated preferences. Importantly, however, hunger interacted with product category to influence option quality, such that option quality scores among hungry (vs. satiated) consumers were lower for utilitarian but not hedonic foods. Additionally, hungry (vs. satiated) consumers performed significantly worse on cognitively demanding tasks.

Why did option quality scores for utilitarian—but not hedonic—foods differ as a function of hunger? One possibility is that the experience of hunger makes people more intuitive and impatient ([Orquin & Kurzban, 2016](#); [Skrynka & Vincent, 2019](#)); consequently, they may rely more on heuristics in their food choices ([Ares, Mawad, Gimenez, & Maiche, 2014](#); [Wästlund, Otterbring, Gustafsson, & Shams, 2015](#)). For instance, hungry consumers' inferior option quality scores for the utilitarian food items may be an indicator of their attempt to rely on the satisficing heuristic in this product category ([Otterbring, 2021b](#); [Simon, 1955](#)) to preserve cognitive resources and make more optimal decisions in the hedonic food category.

There are at least some potential strategies that can be employed to enhance hungry consumers' option quality of purchased products and thus help to circumvent their reduced cognitive reflection abilities, as demonstrated herein. Previous research has found that hungry (vs. satiated) consumers have higher accessibility of acquisition-related concepts and a stronger desire to acquire not only food products but also objects with no clear connection to food, like a wireless mouse, a spa visit, or an apartment with a nice view rather than an apartment close to work ([Otterbring, 2019](#); [Xu, Schwarz, & Wyer, 2015](#)). Because more than half of all shopping trips are rapid, without the need for carrying equipment such as shopping carts or baskets ([Larsen, Sigurdsson, Breivik, & Orquin, 2020](#)), and considering that consumers who have not eaten lunch when visiting cafeterias report a stronger urge to acquire both food and non-food items compared to those who have eaten lunch ([Xu et al., 2015](#)), it seems likely that hunger can indeed result in sub-optimal decision-making. Therefore, to help hungry consumers make better food choices when seeking utilitarian foods, it appears advisable to facilitate their in-store navigation by, for example, in-store signs depicting utilitarian food options or a clear presentation format of these foods in shelf configurations, organized and grouped in an easily understandable way according to aspects such as packaging size, price, or the amount of salt, sugar, and fat ([Ares et al., 2020](#)).

5. Limitations and future research directions

A fruitful avenue for future research relates to the fact that we did not measure how consumers perceived the time required to prepare their chosen food items. It is plausible that hungry participants' higher option quality scores for hedonic than utilitarian foods emerged because the hedonic foods (potato chips, candy) were ready-to-eat, whereas the utilitarian alternatives (pasta, crispbread) required some preparation time. This interpretation seems reasonable considering previous studies, which have found that hungry (vs. satiated) individuals put a higher importance weight on waiting time ([Hoeftling & Strack, 2010](#)), thus calling for more research to disentangle the specific psychological mechanisms driving our obtained results.

Although our findings were robust to the inclusion of multiple control variables, the rigorous conditions characterizing the current research means that future studies are needed to test the generalizability

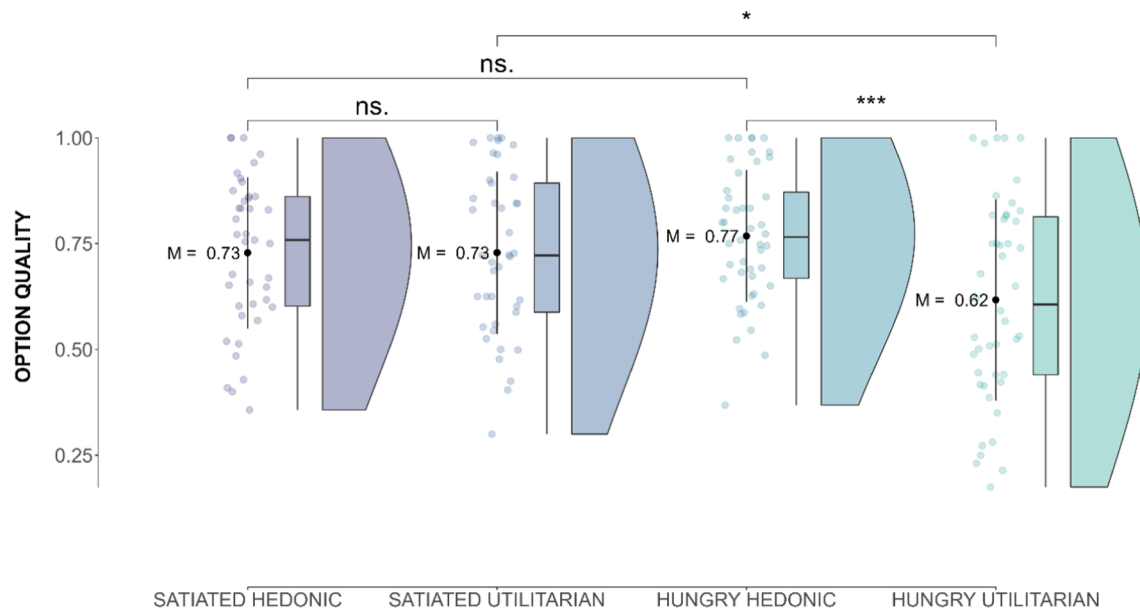


Fig. 1. Option quality scores across conditions and product categories. Note. ns: $p > .05$; * $p \leq .05$; *** $p \leq .001$.

Table 1

Zero-order correlations between studied variables.

Variables	1.	2.	3.	4.	5.	6.	7.
1. Hunger, Manipulated	1	0.79***	0.12	-0.25*	-0.31**	0.18 ⁺	-0.03
2. Hunger, Measured		1	0.10	-0.24*	-0.22*	0.26*	-0.01
3. Option Quality, Hedonic			1	0.13	0.08	0.09	-0.06
4. Option Quality, Utilitarian				1	0.10	0.03	0.16
5. Cognitive Reflection Abilities					1	-0.06	0.03
6. Present Orientation						1	0.30**
7. BMI							1

Note. ⁺ $p \leq 0.10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

of our results. As the primary purpose of our work was to isolate effects and hence test the causal relationships between hunger and option quality as well as cognitive reflection abilities, we opted for maximizing internal validity at the expense of ecological validity. Still, we used real food products, displayed through high-resolution images, and gave participants a realistic shopping task (i.e., to choose products they could consider buying in a regular supermarket), with all such procedures discussed as ways to enhance the ecological validity in lab-based experiments (Morales, Amir, & Lee, 2017). Nevertheless, our hypothetical choice paradigm means that data on actual food choices are needed before the applicability of our results can be ascertained in real-world settings, such as in grocery stores and other similar consumption contexts (Cialdini, 2009; Otterbring, 2021a; Pham, 2013). Indeed, decisions made in front of computer screens are not necessarily congruent with how consumers behave “in the wild,” thus calling for further fieldwork to test the replicability and external validity of our findings on real, observable behavior, including naturalistic consumer choice (Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007), 2007; Doliński, 2018; Otterbring, Sundie, Li, & Hill, 2020).

CRedit authorship contribution statement

Tobias Otterbring: Conceptualization, Methodology, Formal

analysis, Writing – original draft, Writing – review & editing, Project administration, Funding acquisition. **Michał Folwarczny**: Conceptualization, Writing – original draft, Writing – review & editing. **Kerstin Gidlöf**: Investigation, Data curation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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