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Light or Regular, Now or Later:
The Impact of Advance Ordering and Restrained Eating on Choices and Consumption of Light and Regular Vice Food

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Abstract

Research has shown that an effective way of stimulating consumers to make healthier food choices is to have them choose early (i.e., advance ordering). However, the effectiveness of advance ordering remains unknown when consumers choose between regular and light versions of unhealthy food (e.g., regular and low-fat chips), a common situation in daily consumption. We thus investigated the effect of advance ordering on both food choices and consumption of light and regular vices and compared its impact with that of chronic restrained eating. Two experiments demonstrated that advance ordering did not influence calorie intake or encourage consumers to substitute a regular vice with a light vice. Rather, individual differences in restrained eating consistently predicted both choices and consumed calories. We also discuss the implications of our findings for consumer well-being and advance ordering in the context of lighter-vice options.

Keywords Nudge; Advance ordering; Healthy eating; Food choices

Data and materials for this manuscript are available at 10.17605/OSF.IO/69WG2

Light or Regular, Now or Later:
The Impact of Advance Ordering and Restrained Eating on Choices and Consumption of Light and Regular Vice Food

More than 1.9 billion people around the world are overweight (WHO 2021). In response to this acute health threat, numerous healthy eating nudges have been proposed (Cadario and Chandon 2020). These include *advance ordering*, which decouples the moment of choice from the moment of consumption. Theoretically, temporal distance can make consumers more focused on the abstract, high-level goal of healthy eating (Fujita et al. 2006), discount the pleasure of eating unhealthy food (Soman et al. 2005), and reduce the influence of food cravings (Loewenstein 1996).

Research has documented the effectiveness of advance ordering in various settings. As summarized in Table 1, these studies differ by population (children or adults), design (experimental or observational), duration of consumption delay (hours to days), and other factors. Critically, the criteria for healthy eating also vary considerably across studies. Some studies have focused on whether consumers order healthy items. For instance, Hanks, Just, and Wansink (2013) classified lunch entrée orders as healthy or not according to nutrient density and found that ordering in the morning improved the choice share of the healthy entrée. Similarly, Read and van Leeuwen (1998) investigated whether people who chose healthy snacks (fruits) in advance switched to unhealthy snacks (chocolate bars and chips) before consumption, and showed that choosing in advance increased the choice share of healthy (decreased that of unhealthy) snacks compared with choosing immediately. Bucher-Koenen and Schmidt-Koenen (2011) also contrasted fruit (an apple) and an unhealthy snack (a Smarties bar) and discovered a similar pattern in young children. Miller et al. (2016) found that ordering lunch in advance increased the selection of vegetables and fruits. Other studies have measured the overall nutrient value of orders. Milkman, Rogers, and Bazerman (2009) estimated the "should minus want" scores of grocery orders (i.e., the extent to which an item is what people think they should eat versus what they want to eat) and observed that the score increased for more advanced orders. VanEpps, Downs, and Loewenstein (2016) calculated the calories of ordered meals and found fewer calories in advance orders.

Despite these findings, it remains unclear whether advance ordering encourages people to substitute unhealthy foods (“vice” food) with their lighter versions, which have similar flavors but are less tasty and lighter on the body (e.g., low-fat and low-sugar items). Consumers are faced with a wide range of light substitutes of their favorite indulgences on the market (see Web Appendix for a rich set of examples), making this question important to understand. For example, a consumer might consider whether to choose regular or low-sodium potato chips when standing in a shopping aisle full of chips or in front of a vending machine for a snack break. In the movie theater, one might need to decide whether to have regular popcorn covered in butter or less greasy popcorn. At party gatherings, festivals, and holiday markets, one could be offered an abundance of desserts and deep-fried snacks, some heavy and others lighter. If advance ordering leads to wiser choices in this context, consumers do not have to entirely sacrifice their enjoyment to cut unhealthy calories. They can either substitute unhealthy options with healthy options composed of healthy ingredients or with lesser vice options, both of which can result in an overall healthier order. Although research has established that advance ordering nudges the healthy–unhealthy substitution (Read and van Leeuwen 1998; Bucher-Koenen and Schmidt 2011; Hanks et al. 2013), it is unknown to what extent advance ordering encourages choosing lighter vices.

To fully evaluate the effectiveness of advance ordering on lighter-vice substitutions, one should ask not only whether the lighter vice has been selected but also how many unhealthy calories have been consumed. Although some studies have included visual estimates of consumed quantities (Hanks et al. 2013) and self-reported food waste (VanEpps et al. 2016), the respective consumed amounts of healthy and unhealthy food remain unclear. Because consumers often do not enjoy healthy food as much as unhealthy food (Raghunathan, Naylor, and Hoyer 2006), they might regret their early choices of healthier alternatives and ultimately consume more of the ordered unhealthy items. Indeed, recent research on pre-ordering systems has shown that these systems may increase uncollected orders and food waste, indicating prevalent consumer regret (Migliavada, Ricci, and Torri 2021). In the case of substitution with lighter vices, if the taste of regular snacks is preferred to that of light alternatives, advance ordering should limit unhealthy calorie intake by encouraging the selection of light vices.

Another way to evaluate the practical value of advance ordering in the lighter-vice context is to examine its impact alongside established predictors of choices and consumption of lighter vices. One such factor is restrained eating: a chronic behavioral tendency that influences eating behavior in parallel with situational prompts (Liu and Haws 2020) and predicts less consumption of "bad" nutrients (e.g., fat and sugar; van Strien et al. 1986), partially due to substitutions with lighter vices (Elfhag, Tynelius, and Rasmussen 2007; Liu and Haws 2020). Restrained eaters tend to self-impose restraints on food intake for weight loss (Polivy, Herman, and Mills 2020). While nudges promise to overcome chronic behavioral patterns, the effects of such low-cost interventions can be weak and ephemeral in various domains (e.g., Colby, Li, and Chapman 2020; Gravert and Collentine 2021). Thus, it is possible that advance ordering has a relatively weak effect on choices and consumption of lighter vices compared with individual differences in restrained eating. However, if advance ordering is effective in conjunction with restrained eating, it could be a powerful technique to reduce unhealthy eating.

In summary, the current study aimed to improve understanding of the effectiveness of advance ordering when people choose between regular and lighter vice food. Specifically, we evaluated the practical value of advance ordering by answering three empirical questions: 1) Does advance ordering encourage the choice of lighter vices? 2) What is the impact of advance ordering on consumption and does it reduce the consumption of unhealthy calories through lighter-vice substitution? 3) Does advance ordering predict choices and consumption alongside restrained eating? To answer these questions, we conducted two experiments to examine the impact of advance ordering on choices and consumption of regular versus light snacks, while controlling for individual differences in restrained eating. Table 1 summarizes the differences between prior studies and our research.

OVERVIEW OF EXPERIMENTS

We conducted two experiments (data and materials are available at 10.17605/OSF.IO/69WG2), one with salty chips and the other with sweet M&Ms, which reflect the popularity of savory and sweet snacks among consumers (The Nielson Company 2018). Both experiments manipulated order timing and measured restrained eating. We restricted the participants to young female college students to minimize the heterogeneity of food choices and consumption. Moreover, research has shown that females are more likely to adopt (Migliavada et al. 2021) and benefit from (Read and van Leeuwen 1998) advance ordering. In a pilot study, we also found that females more frequently considered light substitutes (see Web Appendix). Thus, only including females should increase the likelihood of detecting any effects of advance ordering. In both experiments, we pre-determined the time period for data collection and conducted analyses only after all participants had finished the study. A sensitivity power analysis (Faul et al. 2009) indicated that our studies had 80% power to detect a small-to-medium effect of advance ordering with a significance level of .05 (following the effect size documented in Study 3 by VanEpps et al. 2016, which also used a between-subjects experimental design).

We specified a structural equation model to examine the effects of advance ordering and restrained eating and to account for their sequential effects on choices and consumption (Muthén 2011). We found that advance ordering did not increase the choice share of lighter vices or influence calorie intake. However, restrained eating predicted preferences for lighter vices, which subsequently cut calorie intake. In addition to the results of significance testing, we reported the Bayes factor ($BF_{01} = e^{(BIC_{H_1} - BIC_{H_0})/2}$; Jarosz and Wiley 2014) to examine the strength of our null evidence. BF_{01} is the ratio of the likelihood of a null hypothesis to the likelihood of the alternative hypothesis for a given dataset. There is evidence for the null hypothesis when $BF_{01} > 1$ with the strength of the evidence increasing with the value of BF_{01}. Based on Jeffreys's (1961) criteria, $BF_{01} > 10$ indicates strong evidence for the null hypothesis and $BF_{01} > 100$ suggests decisive evidence.

EXPERIMENT 1

Participants and Design

Two hundred and twenty female undergraduates from a university in Western Europe (M_{age} = 20, SD_{age} = 1) participated in the study in exchange for course credits. In the study description, we informed them that they would consume chips of their choice in the lab while watching a video of their choice. The participants were randomly assigned to the advance or immediate ordering condition. Based on previous research findings that the desire for snacks increases throughout the day (Reichenberger et al. 2018), we let the participants choose snacks either in the morning or in the late afternoon of the same day.

Selection of Snacks

The choices included a set of four Lay's chips available locally: classic (5.31 kcal/g; 181 g per pack), paprika (5.41 kcal/g; 181 g per pack), classic light (4.8 kcal/g; 176 g per pack), and paprika light (4.9 kcal/g, 176 g per pack). These varieties were chosen because they are both common and popular in local supermarkets. The packaging of the light chips highlights their lower fat (see Web Appendix). A pre-test confirmed that the light chips were viewed as less unhealthy than the regular chips (rated by 43 females from the same subject pool; $M_{\text{light}} = 2.90$ versus $M_{\text{regular}} = 1.95$ on a 7-point scale from 1 = not healthy at all to 7 = extremely healthy, $t(42) = 5.39$, $p < .001$) and less tasty (rated by another 41 females from the same pool on a 7-point scale from 1 = not tasty at all to 7 = extremely tasty; $M_{\text{light}} = 4.21$ versus $M_{\text{regular}} = 5.06$, $t(40) = 4.66$, $p < .001$)

Procedure

The experiment was divided into two parts. In part 1, the participants received a survey link at approximately 9:00 am and had to complete the survey by 11:30 am. In part 2, the participants came to the laboratory from 3:00 pm to 5:30 pm to have the snacks of their choice. The two parts were completed within the same day. In the advance ordering condition, the participants chose the potato chips in part 1 and chose their preferred video to watch while snacking in part 2. The sequence of choices was reversed in the immediate ordering condition. In doing so, we let the participants in both conditions make a choice immediately before consuming the chips, thus eliminating the effect of mere choice on consumption. Figure 1 summarizes the experimental design. The participants chose from a set of four entertaining videos with different names ("*Funniest home videos*"; "*Try not to laugh or grin*"; "*The hilarious moments*"; "*Awesome fails compilation*"), but unbeknown to the participants, all four videos were identical except in name. The choice of video did not influence calorie intake ($F(3, 216) = .22$, $p = .815$).

In the laboratory, each participant was seated individually in a private cubicle in front of a computer. They first made the choice according to their assigned timing condition and then received a full pack of their selected chips. They were told to eat as much as they like while watching the video, as they would behave in their daily life. Because the video was identical for all participants, we ensured that the consumed quantity was not affected by its content or duration. When the video ended, the experimenter removed the remaining chips and asked the participants to complete a questionnaire. The experimenter then weighed the remaining chips with a kitchen scale at one-gram intervals.

The final questionnaire began with filler items on the participants' consumption experience (e.g., tastiness of the chosen snacks). At the end of the questionnaire, the participants completed the Dutch Eating Behavior Questionnaire (DEBQ), which includes a 10-item subscale on restrained eating (van Strien et al. 1986; e.g., "Do you watch exactly what you eat?" from 1 = never to 5 = very often, Cronbach's $\alpha = .90$; M = 2.87, SD = 0.89). The DEBQ also includes subscales of emotional and external eating (Cronbach's $\alpha > .67$). To avoid the carry-over effects of choices and consumption on these measures, we told the participants that we were interested in their eating habits and asked them to indicate how frequently they engage in certain behaviors in *daily life.* In addition, we measured individual differences in self-control (Brief Self-control Scale by Tangney, Baumeister, and Boone 2004; Cronbach's $\alpha = .86$). Covariate testing showed that only restrained eating predicted choices and calorie intake, whereas the other individual difference measures did not. See Web Appendix for detailed results.

In both part 1 and part 2, we measured the hunger level of the participants by asking them to indicate when and what they last ate. With respect to broadly defined food categories, the meal contents between the morning and the lab session did not vary between conditions or predict choices and calorie intake (see Web Appendix for detailed results).

Results

We specified a model as shown in Figure 2. The model was estimated with the maximum likelihood approach in Mplus 7.0, including a probit link for the choice of chips (0 = regular, 1 = light). Calorie intake (*M* = 199.28 kcal, SD = 98.40) was the product of the consumed grams (*M* = 38.79 g, *SD* = 18.67) and the calorie content of the selected chips. We regressed calorie intake and choices onto advance ordering and restrained eating (see Web Appendix for the independence between the two factors). Path estimates and standard errors are summarized in Figure 2. For null effects in the model, we reported both *p* values and Bayes factors (BF_{01}; calculation following Wagenmakers 2007).

Advance Versus Immediate Ordering. The timing of choice did not predict the choice of chips

($p = .442$, $BF_{01} = 11.02$). In both conditions, approximately half of the participants selected the light chips (57 out of 111, or 51% in the advance condition, and 50 out of 109, or 46% in the immediate condition). Furthermore, the timing of choice did not have an overall ($p = .856$, $BF_{01} = 124.21$) or direct effect on calorie intake ($p = .331$, $BF_{01} = 11.28$). The null results remained robust when we replaced the timing condition with the time gap between choice and consumption (0 and > 4 in the immediate and advance conditions, respectively; see Web Appendix for the robustness check).

Restrained Eating. More restrained eaters were more likely to choose light chips ($Z = 2.54$, $p = .011$), which subsequently reduced calorie intake ($t(211) = -3.89$, $p < .001$). Overall, restrained eaters consumed fewer calories ($t(211) = -2.23$, $p = .026$) and the indirect effect of the choice of light chips accounted for 63% of the total variance. There was no direct effect of restrained eating on calorie intake ($p = .311$, $BF_{01} = 8.88$).

Understanding the Choice–Calorie Relationship. To better understand how choosing the light chips reduced calorie intake, we conducted ancillary analyses to examine the total grams of chips that the participants consumed. Consistent with the pre-test, participants who chose light chips rated the chips as less tasty ($M_{\text{light}} = 5.69$ versus $M_{\text{regular}} = 6.15$, $t(218) = 3.59$, $p < .001$) and thus consumed fewer grams than those who chose regular chips ($M_{\text{light}} = 35.15$ versus $M_{\text{regular}} = 42.23$, $t(218) = 2.86$, $p = .005$). Tastiness ratings were positively correlated with consumed grams (Pearson's $r(220) = .16$, $p = .015$).

The Role of Hunger. We estimated the hunger level of the participants before choosing their chips by calculating the time difference in minutes between their last meal and their choice of chips, which was self-reported both in the morning survey and the lab session. The assumption was that the longer the elapsed time since the last meal, the hungrier the participant. Supporting this premise, the time lapse between snacking and the last meal predicted consumed calories in the lab ($t(218) = 3.24$, $p = .001$), and thus served as a covariate with consumed calories in the structural equation model. Notably, hunger prior to choice-making did not vary between conditions ($p = .742$) or predict choices of light chips ($p = .421$). This is consistent with prior research showing that hunger does not predict the desire for salty and sweet snacks (Reichenberger et al. 2018) and cannot fully explain the choice of lower-calorie options (e.g., VanEpps et al. 2016).

Discussion

Experiment 1 showed that advance ordering did not nudge the participants toward the light version of an unhealthy snack. According to Jeffreys (1961), there is strong evidence for the null effect of advance ordering on the choice of the lighter vice (BF_{01} between 10 and 20) and decisive evidence for its null effect on calorie intake ($BF_{01} > 100$). In contrast, restrained eating increased the choice of the lighter vice (i.e., the light chips) and lowered overall calorie intake. We sought to replicate the results with a sweet snack in Experiment 2.

EXPERIMENT 2

Participants and Procedure

Three hundred and fifty-six female undergraduates from the participant pool of Experiment 1 ($M_{age} = 20$, $SD_{age} = 1$) participated in the experiment in exchange for course credits. To generalize the results of Experiment 1 to a different snack, we asked the participants to choose between regular M&Ms (chocolate flavor, 4.80 kcal/g) and light M&Ms (same flavor, 4.58 kcal/g). As opposed to Experiment 1, light M&Ms were actually not available on the local market; they were sold as the same product as regular M&Ms and the caloric difference between the two versions was incidental. We presented the two options in the same container with the same portion size (213 g) but different labels ("light" and "regular"). A pre-test confirmed that the light M&Ms were viewed as less unhealthy (rated by 40 females from the same subject pool, $M_{light} = 1.75$ versus $M_{regular} = 1.27$ on the same scale as in Experiment 1, $t(39) = 4.69$, $p < .001$) and less tasty (rated by another 43 females from the same pool, $M_{light} = 4.93$ versus $M_{regular} = 5.53$ on the same scale as in Experiment 1, $t(42) = 2.90$, $p = .006$). See the Web Appendix for the presentation of the choice set.

Experiment 2 also tested whether the accessibility of the health goal influenced calorie intake. We manipulated the health goal accessibility with a scrambled sentence task (using sentences either related to health or not) after the participants made their choices in the lab but before their consumption. Because priming did not affect or moderate the effect of other factors on consumption (ps > .7), we collapsed the data across the priming conditions and followed the same analyses as in Experiment 1. Because prior research has cast doubt on the validity of this priming procedure (e.g., McCarthy et al. 2018), we do not discuss it hereafter. The remaining procedure followed that of Experiment 1. As in Experiment 1, the choice of video did not affect calorie intake ($F(3, 345) = 0.14$, $p = .938$).

Results

We used the same model as in Experiment 1 and summarize the results in Figure 2 (see Web Appendix for the independence between restrained eating and timing condition). Again, hunger before the lab session predicted consumed calories ($t(340) = 2.33$, $p = .020$) and thus served as a covariate in the model. As in Experiment 1, hunger before choice-making did not vary between conditions ($p = .309$) or predict choices or calories (*p*s > .49). On average, participants consumed 66.26 g of M&Ms (SD = 56.60) and 312.21 kcal (SD = 266.61).

Advance Versus Immediate Ordering. Consistent with Experiment 1, choice timing did not influence the choice of M&Ms ($p = .570$, $BF_{01} = 15.90$; 66 out of 173, or 38%, versus 77 out of 176, or 44%, chose the light option in the advance versus immediate conditions). It also did not have an overall ($p = .760$, $BF_{01} = 291.93$) or direct effect on calorie intake ($p = .857$, $BF_{01} = 18.35$). The null results remained robust when we replaced the timing condition with the time gap between choice and consumption (0 and > 4 in the immediate and advance conditions, respectively; see Web Appendix for the robustness check).

Restrained Eating. Restrained eating (M = 2.75, SD = 0.93) increased the preference for light M&Ms ($Z = 8.44$, $p < .001$). Choosing light M&Ms resulted in a non-significant reduction in calorie intake ($t(340) = -1.40$, $p = .163$, $BF_{01} = 7.07$). Overall, more restrained eaters consumed fewer calories ($t(340) = -2.03$, $p = .042$) and the indirect effect of the choice of light M&Ms accounted for 74% of the total variance. There was no direct effect of restrained eating on calorie intake ($p = .485$, $BF_{01} = 14.61$).

Recall that the “light” and “regular” M&Ms are sold as the same product on the market (despite their incidental difference in caloric density) and should be undifferentiable in terms of tastiness. Indeed, post-consumption tastiness ratings did not differ by version ($p = .314$), and the participants who chose the light option consumed as many grams as those who chose the regular option ($p = .620$).

Discussion

Experiment 2 replicated the results of Experiment 1; however, the participants who chose the light option did not consume fewer grams as the two versions did not differ in taste. Nonetheless, the overall effect of restrained eating on calorie intake remained significant. Experiments 1 and 2 collectively provided strong to decisive evidence for the null effect of advance ordering on the choices of lighter vices, while consistently supporting the impact of restrained eating on both choices and calorie intake.

GENERAL DISCUSSION

This research examined the effectiveness of advance ordering on choices and consumption of regular and light vices. While advance ordering has been found to improve the choice share of healthy food (e.g., Hanks et al. 2013) and the overall healthiness of orders (Milkman et al. 2009; VanEpps et al. 2016), we found strong to decisive evidence for its null effect on choices of lighter vices. Similar to previous studies, the null effect could not be explained by hunger (e.g., Read and van Leeuwen 1998) or attributed to floor or ceiling effects, as neither the choice shares of light alternatives (ranging between 38% and 51%) nor the calorie intakes (26% to 30% of the total calories in one portion) were extreme. Most importantly, the consumption delay (four to nine hours) was within the effective range of advance ordering in previous research, which varies from hours to a week. The null effect was thus unlikely to be an empirical artifact.

In addition, we examined whether advance ordering helps with post-choice consumption, and both experiments demonstrated that advance ordering had no overall or direct effect on calorie intake. Consistent with our prediction, we found that when the light alternative had a compromised taste, participants consumed fewer grams (Experiment 1). Notably, calorie intake is also a better proxy for healthy eating than food choices when a choice set consists of unhealthy items. Although a greater amount of consumed calories does not necessarily imply lower healthiness when the choice set includes both healthy and unhealthy food (e.g., 100 g of almonds contain more calories than 100 g of chips), it is more closely linked to unhealthiness when all available options are unhealthy (e.g., regular and light chips). The null effect of advance ordering on calorie intake thus further corroborated that advance ordering does not encourage healthy eating when lighter vices can substitute regular vices.

Lastly, we asked whether the effect of advance ordering is comparable to that of chronic restrained eating. Unlike the null effects of advance ordering, more restrained eating predicted choices of lighter vices and lower calorie intake. This is broadly aligned with the notion that nudging may fail to override persistent behavioral patterns (Volpp and Loewenstein 2020). Although restrained eating encouraged substituting vices with lighter vices, it did not have any direct effect on calorie intake, suggesting that consumption in the context we studied was more determined by environmental cues (e.g., food tastiness) than by self-monitoring.

Implications

To the best of our knowledge, this study is the first to show that advance ordering may not always help with healthy eating. The experimental design allowed us to balance realism (having intervening meals between orders and consumption; snacking while watching entertaining videos) and control (same duration of eating; weighed instead of self-reported food leftovers). Furthermore, this research is a first attempt to model both the overall and direct effects of independent factors on the sequence of choices and consumption, thus revealing more nuanced insights into how advance ordering and restrained eating exert different influences. Future research may follow our analytical approach to compare the effectiveness of healthy-eating nudges against known predictors of food choices, and to better understand choice and consumption as chain effects.

Overall, our findings offer important insights to policymakers and managers who intend to improve healthy eating. First, consumers not only choose between healthy and unhealthy food but also substitute unhealthy food with lighter vices. In the latter case, we show that advance ordering is unlikely to be an effective intervention. As with other interventions, advance ordering is not a panacea and should be used in combination with other more robust behavioral interventions (VanEpps et al. 2016). Miller et al. (2016), for instance, found that advance ordering was more effective when combined with educational information. In addition, policymakers should carefully consider whether the benefit of forcing people to order their food in advance can offset the cost. Our findings caution against the implementation of advance ordering systems before thoroughly testing their effectiveness.

Our research suggests that it is equally important to monitor not just what consumers eat but how much they eat. We found that when the lighter vice had a compromised taste, participants consumed fewer grams (Experiment 1). When the taste was similar (Experiment 2), restrained eaters did not eat less but still consumed fewer unhealthy calories due to the caloric difference between the light and regular snacks. In addition, the calorie intake was more determined by food choices than by chronic restrained eating. Thus, the actual consumption greatly depends on consumer evaluation of lighter snacks; focusing on choices alone risks misjudging the overall healthiness of eating. For instance, it is possible that when the lighter vice tastes surprisingly good, people end up consuming more of this item than expected.

Limitations and Avenues for Future Research

Several features of our study design provide insights into when advance ordering might fail and offer directions for future research. First, advance ordering might have a weak effect when ordered items are central to consumption rather than peripheral to consumption. For example, a prior experiment showed that ordering lunch in advance was effective for secondary items but not for sandwiches (VanEpps et al. 2016, Study 3). The reason may be that consumers hold much more stable preferences across time for central rather than peripheral items. Although snacks are rarely considered as important as meals, they are probably central to the experience of video watching and thus may elicit established preferences that overwhelm the impact of choice timing. Future research could test this by expanding our limited choice set, including both central and peripheral food items in a consumption occasion, or incorporating both large and small portions of focal items. In advance ordering, consumers might maintain their preferred central item but opt for a smaller portion or be more willing to choose a lower-calorie peripheral item.

Time pressure before decision-making may also explain the null effect. Research has shown that consumers make wiser food choices with extended decision time (DeJarnette 2020). While ordering food for immediate consumption in daily life often leaves people little time to decide, those in the lab might feel the opposite. In our morning survey, the participants may have rushed through their snack decision because they were busy or thinking about their upcoming lunch, whereas in the lab they had ample time to make their decisions. The more rapid choice in the morning and the slower choice in the afternoon could synergize to generate the null effect.

Future research should disentangle the effect of choice timing from the perceived time pressure on decision-making.

Regarding the null effect of advance ordering on calorie intake, we note that it could alter what people eat in intervening meals that affect later consumption. Although we did not find that these intervening food choices varied by condition or affected calorie intake (see Web Appendix), more precise measurements (e.g., facilitated dietary recalls and estimation of calorie intake, Liu et al. 2015, Study 5) could nonetheless reveal nuances in these meal decisions. Moreover, our measurement covered what people ate before having their snacks, which included both lunch and other snacks in place of or after lunch. In theory, early choice of snacks could reduce the calories of intervening meals, as consumers are more aware of the upcoming snack consumption. In the advance condition, however, choosing the light snack over the regular snack might allow people to justify consuming more calories in between (i.e., the licensing effect; Khan and Dhar 2006). Examining these second-order consequences is equally important, as healthy eating is determined by intertwined food decisions rather than advance or immediate orders alone. We therefore suggest that future research examines these important questions.

To conclude, our findings suggest that the effectiveness of advance ordering likely varies across contexts and seems limited when people choose between regular and lighter vices. While this null effect is likely determined by multiple factors, the current research serves as a starting point to consider how the effectiveness of advance ordering varies with assortments of food (all vices or mixtures of vice and virtue).

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Figure 1. The Experimental Design.

Figure 2. Estimates (standard errors) of model paths in Experiment 1 (upper) and Experiment 2 (lower). Dashed lines are non-significant paths and black lines are significant at $p < .05$.

Table 1. Comparison of Prior Research and Our Research.

	Methodology	**Time in advance**	**Setting**	**Measures of healthy eating**	**Chronic behavior**
Read and van Leeuwen 1998	Within-subjects observations	1 week	Snack at work	Substitution of unhealthy with healthy items	-
Milkman et al. 2009	Mixed observations	1–5 days	Online shopping	Healthiness of orders	-
Bucher-Koenen and Schmidt 2011	Within-subjects observations	1 day	Snack at school	Substitution of the unhealthy with the healthy item	-
Hanks et al. 2013	Mixed observations	Hour(s)	Lunch at school	Substitution of the unhealthy with the healthy item	-
Miller et al. 2016	Mixed observations	Hours	Lunch at school	Orders with vs. without healthy items	-
VanEpps et al. 2016, Study 1	Mixed observations	0.5–7 hours	Lunch at work	Calories and healthiness of orders	-
VanEpps et al. 2016, Study 2	Experiment	≥ 1 hour	Lunch at work	Calories of orders	-
VanEpps et al. 2016, Study 3	Experiment	80–170 minutes	Lunch at school	Calories of orders	-
This research	Experiment	3.5–9 hours	Snack for entertainment	Substitution of vice with lighter vice and unhealthy calorie intake	Restrained eating

Note. Observational studies examined individual decisions over time (within-subjects), sometimes mixed with non-randomized groups (e.g., one group switched to pre-ordering while the other did not). In contrast, experiments randomly assigned people to advance or immediate conditions.