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TO SAVOUR CONSUMPTION OR TO CONFRONT DREAD: THE HEDONIC OPPORTUNITY COST OF ATTENTION*

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People face a fundamental trade-off between savouring consumption in the present and processing information. Both require attention, which is limited. As a result, directing attention to one necessarily comes at the expense of the other. We study this attentional opportunity cost, focusing on cases where information concerns potentially distressing future outcomes. Across four experiments, we find that higher present consumption reduces demand for such information and increases willingness to pay for risk mitigation. These findings have implications for models of anticipatory utility, self-regulation under limited attention and the political economy of distraction—helping to explain, for instance, why political actors might suppress demand for information by offering 'bread and circuses'.

JEL codes: C91, D80, D91

Suppose that you are vacationing this weekend. Before departing, you visit your doctor for a routine exam. She notices a lump. It is not painful, but it causes some concern. The doctor says that it could be serious or benign. It is most likely benign, but there is still some risk. She takes a sample and tells you that the test results will be ready this coming weekend during your vacation. She asks, 'Would you like the phone call during the weekend or after the weekend?'

Now suppose that the scenario is identical, however, instead of going on vacation this weekend, you are doing household chores. Would you like the phone call during the weekend or after the weekend?

Without immediate results as an option, we suspect that most people would prefer not to have their vacation spoiled by potentially distressing news, and would likely choose to delay receiving such information. In contrast, during mundane activities like household chores, earlier information is preferred. Our central claim is that there is an interaction between people's preferences for consumption and information. The logic is as follows: attention is essential for information processing and consumption. Because what a person attends to can cause positive or negative feelings, there is an opportunity cost to attention. A person can either wholly engage with their current consumption, or process information about the future. This opportunity cost to attending to the present, or 'being present' in common parlance, implies an information-consumption substitutability (Tasoff and Madarász, 2009; Ganguly and Tasoff, 2017; Bolte

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and Raymond, 2023). The higher one's current consumption utility, the lower the demand for information about a disturbing future as it distracts from one's current pleasurable activity.

Information about the future can also create a present-future consumption complementarity. Information about a negative future outcome will shift attention to the future. However, actions that sufficiently mitigate future risk may allow one to feel carefree. The value of being carefree is higher when one is currently engaged in high consumption rather than low consumption, and thus the demand for this risk mitigation is increased by current consumption. For example, perhaps there is a procedure to eliminate the lump that can be accelerated at some cost. We suspect that more people will accelerate the procedure prior to an exciting upcoming vacation rather than prior to mundane chores. We predict that increasing consumption at the time of information receipt induces greater demand to improve the expected future outcome.

In this paper, we test for these attention-based consumption and information preference interactions. In our first experiment, subjects are informed that they have a 50% chance of receiving a series of painful electric shocks at the end of the experiment. The shocks represent a negatively valenced future event. We confirm that the shocks are real by administering a demonstration shock at the beginning of the experiment. During the experiment, subjects are informed that they will be given either a slice of bread or an elaborate ice cream sundae to consume, and they will also receive a signal indicating whether they will receive the shocks. The food items represent current consumption, while the signal represents information about a negatively valenced future event. Subjects are then asked, conditional on receiving *each food item*, whether they want to receive the signal while eating, after eating or if they are indifferent. After making their choices, subjects are randomly given either the bread or the ice cream sundae, which is placed in front of them. Before consuming their food, we ask for their willingness to pay (WTP) for a 'shock block', which provides full protection against the shock and can be seen as a form of future consumption or risk mitigation.

The consumption-information substitutability hypothesis is that high consumption in the present (the ice cream versus the bread) will lead to a lower demand for information (the signal) about a dreadful future (the shocks). We find that in the ice-cream condition subjects are 12.4 percentage points (126%) more likely to delay information than in the bread condition ($p < .01$). The present-future consumption complementarity hypothesis is that, as consumption goes up in the present, the demand for future consumption relevant to the information goes up as well. We find that the ice-cream condition increases people's WTP for the shock block ($p < .05$), but this statistically modest effect emerges primarily in transformed specifications that account for the non-normal distribution of valuations. Interestingly, the ice-cream condition appears to significantly reduce the variance in valuations compared to the bread condition, suggesting heterogeneity in individual's preferences for current consumption and anticipatory utility.

The first experiment shows that increasing current consumption decreases demand for information about a potentially negatively valenced future event, and increases future risk mitigation. To see if the relationship operates in reverse, in our second experiment, we manipulate the presence of information about a potential negative future event and observe the impact on consumption. As before, subjects have a 50% chance of receiving electric shocks at the end of the experiment. In the control condition, subjects receive no information about whether they will be shocked. In contrast, in the treatment condition, subjects have an envelope placed prominently in front of them and are informed that there is a signal in the envelope that is correlated with receiving the shock. We elicit subjects' valuations for immediate consumption including ice cream, the shock block, as well as several other goods. Contrary to our expectations, we find no effect of the salient

information about a future negative event on present consumption. The results of Experiment 2 indicate that the effect of consumption on information is more complex than the straightforward bi-directional effect we originally anticipated.

Our third experiment attempts to address the unexpected null finding from the previous experiment while also serving several other purposes. Unlike the first two experiments that use stylised contexts with meaningful stakes, in the third experiment we use hypothetical questions, a larger online sample size and more contextually relevant scenarios. We present five separate hypothetical questions, each question has both a control and treatment condition, and each subject responds to only one of the five questions.

Questions 1 and 2 attempt to replicate the first experiment. They present a medical scenario akin to our introductory example. Subjects choose between receiving test results over the weekend or after, while we vary the weekend consumption. We find strong evidence that higher consumption causes information avoidance, increasing delay by 16.9 percentage points (pps) and decreasing early demand by 15.4 pps (both $p < .01$). Question 2 replicates the shock block in the first experiment. Subjects can purchase medication to protect against a future health risk. Higher consumption marginally raises medication demand. Question 2′ is identical, but explicitly states that subjects are unlikely to worry over the weekend. We predict that weekend worry mediates treatment effects. Supporting this, Question 2′ shows no effect when worry is eliminated, suggesting that worry is the key mechanism linking consumption to future consumption demand (risk mitigation). Questions 3 and 4 attempt to replicate the second experiment. In Question 3 the manipulation is whether the information is received during the weekend or after, and the outcome is whether a desirable celebration is postponed or not. In Question 4 we manipulate the salience of information about a potential disease and ask WTP for a health-risk-mitigating medication. In both questions, we find null treatment effects replicating our null effects in the second experiment, again contrary to our hypotheses.

The perplexing asymmetry—consumption reduces demand for information, but information has no detectable effect on consumption—led us to speculate that the results may be driven by an asymmetry in the sensitivity of choice. Information may be very sensitive to consumption, but consumption may be relatively insensitive to information. We may also have unintentionally introduced a status-quo bias (Samuelson and Zeckhauser, 1988; Dean *et al.*, 2017) in Question 3 of our hypothetical-choice experiment. As in Question 3 from the third experiment, in our fourth experiment, subjects receive health information on a given day and then choose one of two days to have a celebration. However, we remove any day of celebration that could be interpreted as a default or as a status-quo plan. In the control condition, subjects receive information on Friday and choose the celebration on either Monday or Tuesday. In the treatment conditions, subjects receive information on either Monday or Tuesday and choose the celebration on either Monday or Tuesday. We find that whereas in the control condition 79% of subjects are indifferent about when to celebrate, in the treatments, subjects largely choose to celebrate on the day on which they will *not* receive information, as hypothesised. This supports our intuition that consumption choice may exhibit a substitution effect with information, but the effect is relatively insensitive as it appears to be shut down by a default.

This paper provides evidence that consumption and information can act as substitutes. It also provides evidence that current consumption can act as a complement to unrelated future risk mitigation. Past empirical work on attention-based anticipatory utility demonstrated information preferences related to the expected valence (good news or bad news) of the information, but, to

the best of our knowledge, no study has addressed preference interactions between consumption and information.

Identifying the existence of preference interactions between consumption and information is important for several reasons. First, the substitution may lead to self-reinforcing avoidance traps. High consumption now leads to lower demand for information, which may lead to worse outcomes in the future, which may further discourage information acquisition, and so on.[1] For example, people self-medicate their anticipatory worries with drugs, alcohol and opiates, which are pleasurable immediately and can substitute for thinking about the future. Dee (2001) documented that binge drinking and alcoholism are higher for the unemployed and Dávalos *et al.* (2012) showed that they increase during economic downturns. Likewise, people may use escapist media, such as engrossing television and video games, to distract from worries about the future. Second, when embedded in a strategic environment, consumption-information preference interactions may lead firms and governments to supply consumption as a means to manipulate consumers' information demand. As Juvenal, the Roman poet, is famously quoted, *'bread and circuses'* distract the public from more important matters. Third, the presence of preference interactions allow for testing behavioural theories. For example, this interaction is predicted by models that have a hedonic opportunity cost of attention, unlike other models in the anticipatory utility literature lacking this feature.

We propose that attention mediates the experience of consumption, be it from physical goods, like food, or intangible ones like information. Because attention is limited, there is a *hedonic opportunity cost* when attending to one experience over another. We conjecture that the concept of the *hedonic opportunity cost* will lead to valuable future insights, and establishing evidence for this concept is the main contribution of this paper.

Our research has similarities to several strands in the extant literature. In the context of anticipatory utility, Loewenstein (1987) was the first to ask people their preferences over receiving electric shocks in a framework of anticipatory utility. He elicited people's optimal timing for hypothetical electric shocks and the results provided the first experimental evidence for the anticipatory utility model. Berns *et al.* (2006), Engelmann *et al.* (2019) and Falk and Zimmermann (2024) used real electric shocks in their experiments in the context of anticipatory utility.[2] Our design is inspired by Falk and Zimmermann (2016; 2024), whose subjects had a one-half chance to receive real electric shocks at the end of a waiting period. During the waiting period, their subjects made binary information choices under a variety of conditions. However, we are unaware of any papers that connect consumption to information preferences, which is the main focus of our study.

The literature on information avoidance has grown considerably in recent years. See Golman *et al.* (2017) for a review in economics, and Sweeny *et al.* (2010) for an older review of the psychology literature. Since those reviews, there have been a few other papers that have examined information preferences in novel domains. For example, Huck *et al.* (2017) studied information avoidance in the domain of precision work and 'choking', and Gigerenzer and Garcia-Retamero (2017) showed hypothetical survey evidence on information avoidance about provocative questions such as learning the time of one's death.

[1] We have in mind that this future outcome is in the relatively distant future as a terminal period, and the information and consumption choices are in the interim. An alternative model in which there are multiple ongoing future outcomes (e.g., every next period) might have very different implications.

[2] Other papers in economics have used electric shocks in their experimental design for applications other than information choices and anticipatory utility (Berns *et al.*, 2007; 2008a,b; Cohn *et al.*, 2015).

Our hypotheses are motivated by attention-based anticipatory utility models. These models make predictions regarding valence: ceteris paribus, people prefer information about positive topics (e.g., success, leisure activities) over negative topics (e.g., suffering, death). Several experiments have already demonstrated information preferences as a function of valence (Ganguly and Tasoff, 2017; Charpentier *et al.*, 2018; Kobayashi and Hsu, 2019; Golman *et al.*, 2022).[3] Though the effect of valence on information demand is not the subject of our paper, the findings of these previous experiments lend support to the attention-based anticipatory utility models. The paper of Karlsson *et al.* (2009) is perhaps the first that connected attention to anticipatory utility. They modelled investors as experiencing anticipatory utility upon learning about market conditions. Investors in their data set exhibited an 'ostrich effect' in which they were less likely to check their portfolio when the market was doing poorly compared to when it was doing well. This was expanded upon in Sicherman *et al.* (2016) and Quispe-Torreblanca *et al.* (2025), the latter of which found that investors log in more often when stock positions are unusually high, even on market closure days, such as the weekend, when there is no new information. Similarly, Olafsson and Pagel (2025) found that individuals were less likely to check their bank account balances when they were low, overdrawn, with consumer debt, and more likely to check their balances after the arrival of income. People may avoid information even due to bad associations. Zanella and Banerjee (2016) found that a breast cancer diagnosis caused female colleagues in the workplace to reduce the take-up of mammographies.

The only paper we found that connects information preferences to consumption is Thunström *et al.* (2016). The authors showed that people who wished to consume a high-calorie meal avoided nutritional information. However, this differs from the phenomenon that we investigate. In their study, the information was specifically about consumption. In our study, we examine how contemporaneous consumption affects the demand for information about some future utility-relevant outcome.

1. Conceptual Framework

1.1. *Model*

To motivate our main hypotheses, we present a simple model of attention-based anticipatory utility that has a hedonic opportunity cost to attention (Tasoff and Madarász, 2009; Ganguly and Tasoff, 2017; Bolte and Raymond, 2023). We assume that there are two periods and in both periods there is consumption x_t, and, for simplicity, we assume quasilinear utility in money m. In our model, the agent experiences anticipatory utility in the first period based on her expectations about the second period. We assume that there is an attention function $a(s)$ that weights this anticipatory utility, where s represents the salience of the second period from the perspective of the first period. Utility in $t = 0$ is represented as

$$U_0 = [1 - a(s)]u(x_0) + a(s)E[u(x_1)] + m,$$

where $u(\cdot)$ represents a Bernoulli instantaneous consumption utility function in period t. We assume that $u(\cdot)$ is strictly increasing and differentiable. Utility in the second period is purely

[3] Masatlioglu *et al.* (2017) examined preferences for information based on the skewness of the signal. They found that people have a preference for positively skewed information; that is, people prefer signals that perfectly reveal high-value outcomes, but maintain uncertainty regarding low-value outcomes. Though this is different from preferences for positively valenced information, there could be overlap, depending on context. For example, they showed that people prefer to learn that they rank above a certain quantile on an IQ test, rather than below a certain quantile.

consumption utility,

$$U_1 = u(x_1).$$

We assume that the agent discounts the future with discount factor β. Thus, the $t = 0$ objective function of the agent is given by

$$V_0 = U_0 + \beta U_1 = [1 - a(s)]u(x_0) + [a(s) + \beta]E[u(x_1)] + m.$$

For our experiment, we make several additional assumptions. We assume that there are two consumption levels in period 1, the disaster outcome x_1^d (e.g., cancer) and the good outcome x_1^g (e.g., no cancer), where $x_1^g > x_1^d$. We compare two possible levels of consumption in period 0: the high consumption is x_0^h (e.g., vacation) and the low consumption is x_0^l (e.g., household chores), where $x_0^h > x_0^l$.

Our key assumptions are regarding salience and the attention function. We assume three salience levels $s \in \{0, 1, 2\}$, representing different degrees of intensity of thinking about the future. We interpret $s = 0$ to be 'out of mind', $s = 1$ as 'in the back of one's mind' and $s = 2$ as 'front of mind', but other interpretations capturing this monotonic intensity may be sensible. Furthermore, we assume that receiving information about the future maximises salience, $s = 2$. When the future has the potential to be very bad, $\Pr(x_0^d) > \bar{p}$, and the agent does not receive information, salience is intermediate at $s = 1$, and when the future is not sufficiently bad, $\Pr(x_0^d) < \bar{p}$, salience on the future is $s = 0$.[4] This latter assumption captures the intuition that even when the environment presents no indicators or reminders of the likely bad future, the future may still be in the back of one's mind. In contrast, when there is a sufficiently low probability of a bad future, one can place the future fully out of mind, and hence place full attention on the present. We assume that $a(\cdot)$ is monotonically increasing in s, with $a(0) = 0$, $a(1) = \alpha_1$ and $a(2) = \alpha_2$, where $0 < \alpha_1 < \alpha_2 \leq 1$.

The model is set up such that information is instrumentally useless. An expected-utility maximiser would be indifferent between information and no information. We show that increasing consumption in the present decreases demand for information about the future.[5] Assume that the risk of disaster is sufficiently high (i.e., $\Pr(x_0^d) > \bar{p}$). The WTP for instrumentally useless information is given by $WTP(\text{info}) = (\alpha_2 - \alpha_1)\{E[u(x_1)] - u(x_0)\}$. This value is positive if the expected consumption utility from the future is higher than the current consumption utility, and negative otherwise. If the expected future is worse than the present, the agent will pay money to avoid information. Furthermore, this WTP has a higher magnitude the larger the consumption utility in the present: $\partial WTP(\text{info})/\partial x_0 = (\alpha_1 - \alpha_2)u'(x_0) < 0$.[6]

PROPOSITION 1 (CONSUMPTION-INFORMATION SUBSTITUTABILITY). *Increasing the consumption utility in the present decreases the demand for information about the future.*

[4] We do not wish to claim that one cannot worry or think about the future without information. The model aims to capture the comparative statics, which simply means that information about the future will, on average, increase attention to the future.

[5] In a richer model, information may have instrumental value. In such a model there could be a tension between acquiring information to make better decisions and the hedonic effects of information.

[6] To be clear, demand for information about the future should be decreasing in present consumption, even if the expected future outcome is very desirable. However, in this context, either information avoidance or seeking is possible, depending on the relative expected consumption utility of the future compared to the expected consumption utility of the present. When the expected consumption utility of the future exceeds that of the present, the model predicts information seeking. Because of the potential ambiguity in information preferences, we set up the model and the experiment to have only an undesirable or negative expected future outcome. We also think that the most important contexts in which the consumption-information substitutability may play a role are with undesirable expected future outcomes.

This result works in reverse. If the agent receives information, thereby increasing the saliency of the future, the demand for consumption in the present is diminished. The WTP for x_0^h, assuming the person otherwise gets x_0^l, is given by $WTP(x_0^h) = [1 - a(s)][u(x_0^h) - u(x_0^l)]$, and is therefore decreasing in s.

PROPOSITION 2 (INFORMATION-CONSUMPTION SUBSTITUTABILITY). *Receiving information about the future reduces the demand for consumption in the present.*

There is also a relationship between present consumption and the demand for insurance against a future disaster. Suppose that there is a product that can mitigate the harm from a disaster (e.g., a medical product that significantly reduces cancer risk). Specifically, the initial risk of disaster $p > \bar{p}$, and the product reduces the risk so that the new risk p' is below $\bar{p}$. The WTP for the insurance product is given by

$$WTP(\text{insure}|\text{no info}) = \alpha_1[u(x_0) - (1-p)u(x_1^g) - pu(x_1^d)] + \beta(p - p')[u(x_1^g) - u(x_1^d)].$$

The second term represents the increase in expected consumption utility from risk mitigation. The first term is the additional anticipatory utility from being able to put the future from 'back of mind' to 'out of mind', via reducing the risk below $\bar{p}$. Notably, WTP is increasing in $u(x_0)$.

PROPOSITION 3 (PRESENT-FUTURE CONSUMPTION COMPLEMENTARITY). *Increasing the consumption utility in the present increases the demand for future risk mitigation.*

A similar result can be derived from the effect of information on risk mitigation. Information in the present increases attention on the future, and thus directly increases the importance of reducing future risk. The WTP for the insurance product with information is

$$WTP(\text{insure}|\text{info}) = \alpha_2[u(x_0) - (1-p)u(x_1^g) - pu(x_1^d)] + \beta(p - p')[u(x_1^g) - u(x_1^d)],$$

and the difference between the two is

$$WTP(\text{insure}|\text{info}) - WTP(\text{insure}|\text{no info}) = (\alpha_2 - \alpha_1)[u(x_0) - (1-p)u(x_1^g) - pu(x_1^d)].$$

Thus, as long as $u(x_0) > (1-p)u(x_1^g) - pu(x_1^d)$, that is, utility from the present exceeds expected utility from the risky future, information increases WTP for the insurance product.

PROPOSITION 4 (INFORMATION FUTURE-CONSUMPTION COMPLEMENTARITY). *Receiving information about the future increases the demand for future risk mitigation.*

1.2. *A Comment on Bottom-Up versus Top-Down Processes*

A key feature of attention is that it is affected by both bottom-up and top-down processes (Theeuwes, 2010; Sussman *et al.*, 2016; Moore and Zirnsak, 2017). For example, a loud noise is attention grabbing, as are rapidly approaching objects in one's field of view. These are bottom-up processes. Certain stimuli in one's sensory field may command attention because they are associated with important outcomes, either in the evolutionary environment (e.g., a rapidly approaching predator) or in the modern environment (e.g., a rapidly approaching vehicle). Likewise, memories and thoughts of the future can bottom-up capture one's attention. We have all experienced thinking about a possible future event, as if by accident (e.g., a feeling of hunger might cause one to imagine dinner that evening). There are also top-down processes that affect attention. For example, you may have felt the urge to navigate on your browser or check your messages as you

read this paper, and you may have exerted some willpower to continue reading (we applaud your dedication). This would be an example of top-down attention. A person exerts control to direct their focus from one stimulus to another.

Our model is a bottom-up model of attention. Information about the future or the high risk of a bad outcome both cause an increase in attention to the future. We ignore top-down processes to keep the model only as complex as it needs to be to help understand our experiment. The agent cannot directly allocate her attention. However, the agent can manage attention by choosing the stimuli in her environment; in our case, the agent chooses information and future risk mitigation. For a more complete model of attention that includes both bottom-up and top-down processes, we direct the reader to Bolte and Raymond (2023). Their model is primarily top down, but the model allows for the environment to impose bottom-up constraints on the agent's attention.

2. Experiment 1: The Effect of Consumption on Information

2.1. *Design*

Our experiment is designed to test Proposition 1, that higher current consumption decreases demand for information about the future, and Proposition 3, that higher current consumption increases demand for future risk mitigation. The experiment simulates a possible bad future outcome (e.g., developing cancer) by confronting participants with a chance of receiving a series of painful electric shocks at the end of the session determined by a pre-flipped coin. The information is about whether participants will receive electric shocks. Current consumption (e.g., taking a vacation) is operationalised as literal consumption, either a slice of bread (low consumption) or an indulgent ice cream sundae (high consumption). Participants are given the option to select when they would like to receive information regarding the outcome of the coin toss: while eating, after eating or indifference.

We use electric shocks in our experiment because it is the best lab stimulus we are aware of for inducing strong anticipatory emotions (e.g., fear and anxiety). Nothing fundamental about the theory requires the second period to have low consumption utility. However, the real-world examples that motivate the experiment, such as medical testing, have the risk of an imminent low consumption-utility event. Also, the behaviour of information avoidance is of economic interest as it violates the classical expected-utility model, and this too requires a low consumption-utility event. We therefore develop our experiments with an analogous risk of electric shocks.

Figure 1 depicts the timing of decisions during an experimental session. Upon arrival, participants were informed about the procedures and rules governing the experiment. The experimenter explained that the shocks were safe, but could be painful. In addition, we ran a shock demonstration, 'demo shock', to show that the shocks were real and to remove curiosity about what an electric shock feels like. In the demonstration, a one-time electric stimulation at 100 V was administered to the participant's wrist. We used the electric stimulator module STM100C with a STMISOC stimulus isolation adaptor and an MP150 (Biopac Systems, Inc., CA). This equipment is controlled by the Biopac software, AcqKnowledge, and is often used to generate painful, yet medically harmless stimuli for scientific use in laboratory contexts. We also informed participants that, if they were to get the series of shocks at the end of the experiment, the voltage would be significantly higher than 100 V and the shock would be conducted ten times in rapid succession. After the demo shock procedure, the participants were asked to rate the scariness of the shocks and were led to sit before a computer screen for the remainder of the session. Detailed

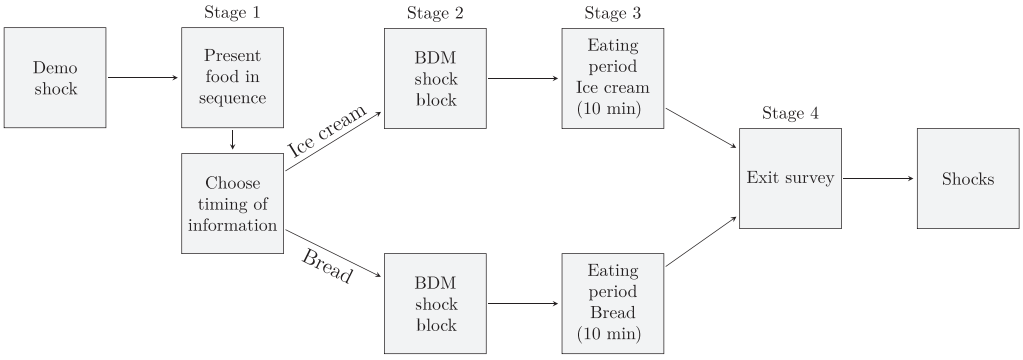

Fig. 1. *Timing of Experiment 1.*

instructions are provided in Online Appendix B.1, as well as screenshots of the electric stimulator and the electrodes attached to a participant's wrist. Our experimental design and our hypotheses for all three experiments were pre-registered at the American Economic Association's Social Science Registry: AEARCTR-0004181.[7] All the regressions in our main-text regression tables for Experiment 1 were specified in the pre-analysis plan (PAP) except for columns (4)–(6) of Table 1, which could be interpreted as placebo tests for robustness.

As shown in Figure 1, the experimental session consisted of four decision stages after the demo shock. In Stage 1, the experimenter presented to the participants a slice of bread and an ice-cream platter sequentially.[8] Participants were informed that one of the items would be served during the subsequent eating period (Stage 3). It was explained that they would receive information about whether they would be shocked at the end of the experiment, and that they would choose when to receive this information. This question was asked *conditional* on receiving each food item. Participants chose when they would be informed about whether they would receive a shock at the end of the experiment. They had three options: during the eating period while eating, after the eating period or letting the computer randomly decide and receive \$0.20. After the participants chose the timing of information for each food item, the experimenter removed the item. Subsequently, each participant was randomly assigned to either the high-consumption (Ice cream) or low-consumption (Bread) conditions.

At the beginning of Stage 2, participants were given a chance to purchase a shock block, which fully insured them against the shocks. We used the Becker-DeGroot-Marschack (BDM) procedure to elicit WTP for the shock block.[9] A choice list was presented in the form of twenty-one rows, with each row asking the participants to choose between 'A: Receive the Shock Block' and 'B: Do not receive the Item, but receive \$x' instead. On the first row 'x' equalled zero, and increased in increments of 50 cents with each row. Participants were asked to choose the row number to switch from choice A to choice B. They were allowed to enter 0 if they did not want to choose Choice A for any of the selections. To ensure that participants fully understood the

[7] To find the pre-analysis plan for Experiments 1 and 2, go to the Analysis Plan tab. For the third experiment, click Pre-Analysis Plan of Hypothetical Scenarios.

[8] For each participant, we randomised the order of the presentation to control for order effects.

[9] The WTP for the shock block was elicited after assigning each subject to either the ice-cream or bread conditions. The between-subject design for the WTP contrasts the previous within-subject design for the information choice. We made this design decision because we were concerned that participants would anchor their valuations, given that the shock block is an unusual good. Ariely *et al.* (2003) showed that valuations can be arbitrary for novel, unusual goods.

Table 1. *The Effect of Ice Cream on Information Choice.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Info Avoid	Info Avoid	Info Avoid	Info Seek	Info Seek	Info Seek	Timing of Info
Ice cream	0.124***	0.124***	0.124***	−0.017	−0.017	−0.017	3.122**
	(0.042)	(0.042)	(0.042)	(0.033)	(0.034)	(0.033)	(1.812)
Hunger		0.030			−0.061***		
		(0.021)			(0.019)		
Fear		0.082**			0.013		
		(0.036)			(0.031)		
Eat more when nervous		−0.100*			−0.050		
		(0.052)			(0.058)		
Order (bread first)		0.041			−0.034		
		(0.056)			(0.061)		
Think before eating		0.021			0.051*		
		(0.028)			(0.029)		
Think during eating		−0.017			−0.032		
		(0.024)			(0.028)		
Mean dep. var.	0.194	0.194	0.194	0.182	0.182	0.182	2.012
Person FEs	No	No	Yes	No	No	Yes	Yes
R^2	0.0245	0.0971	0.6681	0.0005	0.0828	0.7782	
Pseudo R^2							0.5145
Clusters	121	121	121	121	121	121	121
Observations	242	242	242	242	242	242	242

Note: The variables 'Info Avoid' and 'Info Seek' represent the choice to consume information after and during the eating period, respectively. Columns (1) through (6) use OLS on dichotomous information choice with robust SEs clustered at the individual level (in parentheses). Column (7) uses ordinal logit regression of information choice (information soon, random or delay information) on high consumption, with the coefficient displayed as an odds ratio. * $p < .10$, ** $p < .05$, *** $p < .01$.

BDM procedure, we required them to answer a set of practice questions before making their final bid for the shock block. We also elicited the WTP for a mechanical pencil to control for individual thriftiness. This method was shown to reduce SEs in WTP experiments (Ericson and Fuster, 2011).

The eating period, Stage 3, lasted 10 minutes. In this stage, each participant consumed a single food item (either ice cream or bread), which was randomly assigned to them. If in Stage 1, the participant chose to receive information *during the eating period* for that food item, the coin toss outcome was revealed to them 30 seconds into this period. This information would remain on the screen for the rest of the eating period. If in Stage 1 the participant chose to receive information *after the eating period*, the coin toss result would not be revealed until the end of this period. Those who chose to let the computer decide were randomly assigned to one of these two options.

It is important to note that our design measures participants' ex ante preferences for information contingent on consumption rather than their in-the-moment decisions while consuming. Participants make judgements about when they would want information before eating the food. This approach captures participants' meta-cognitive predictions about their own attention allocation and preferences, which may differ from decisions made during actual consumption.

In Stage 4, participants answered a survey that included socio-economic questions, whether they tended to eat when nervous, how appealing they found the food item, whether they were familiar with the Stanley Milgram experiment[10] and how frequently they thought of the shocks

[10] In these experiments, which are often taught in introductory psychology classes, the electric shocks are famously fake. We worried that participants may have applied their knowledge of those experiments to our experiment, in which the shocks are not fake. This is why we conducted the demo shock on all participants.

before and during the eating period. Ideally, we would measure attention in subjects' minds directly; however, this is an enormously difficult metric to obtain. Eye tracking, a commonly used approach for tracking attention, would not work in this context because our purpose is not to track visual attention, but instead attention to an imagined future, and this is independent of eye gaze. Self-reported frequency of thinking about the shocks is our proxy for attention. We also elicited time-preference factors based on a time-staircase procedure (Falk *et al.*, 2023). The survey was followed by the shock implementation. In the event of a 'heads' outcome and no shock block purchase, the participant received a series of ten electric shocks at 110 V each in rapid succession. In the event of a 'tail' outcome, the participant received no shocks. Afterward, we paid the participants and dismissed them.

The experiment took place in the Center of Neuroeconomics laboratory at Claremont Graduate University. A total of 121 students were recruited through the SONA system and participated in individual sessions. Each session lasted about 35 minutes and earnings ranged from $14 to $28. It was labour intensive as only an experimenter with expertise with the electric stimulator and the procedures was permitted to conduct the experiment, and only one participant was allowed in each session. Since the recruitment letter had informed participants about the potential for electric shocks, only two students decided to withdraw from the experiment due to fear of these shocks before the session began and were consequently excluded from our sample. Among the sixty-two participants who received ice cream fifty-one finished eating the ice cream (82%), and of the fifty-nine participants who received bread thirty-two finished eating the bread (54%). This difference is statistically significant ($p < .001$).

2.2. *Hypotheses*

The model of attention-based anticipatory utility in Section 1 posits that increasing the consumption utility in the present decreases demand for information about the future, and increases demand for future risk mitigation. In the context of this experiment, we derive the following main hypotheses.

HYPOTHESIS 1 (CONSUMPTION-INFORMATION SUBSTITUTABILITY). *Participants are more likely to delay information about the shocks when presented with an ice-cream platter compared to a slice of bread.*

HYPOTHESIS 2 (PRESENT-FUTURE CONSUMPTION COMPLEMENTARITY). *The demand for the shock block is higher when participants are presented with an ice-cream platter compared to a slice of bread.*

Apart from the two main hypotheses mentioned above, we have several ancillary hypotheses. We acknowledge that there are other motivations in food choice when under stress. Some people cope with their anxiety by increasing consumption, whereas others consume less. To control for this confound, we hypothesise that the treatment effect in Hypothesis 1 will be weaker for those who eat more when nervous. Consequently, the treatment effect for the non-nervous eaters will be larger.

We also hypothesise that the effect of the treatment will be mitigated for those who do not find the shocks scary and those who do not find the ice cream appetising. For an experiment to effectively test an economic theory, the experimental stimuli should represent their purported role in the theory. We aimed to pick a stimulus that would be universally anxiety provoking (electric

shocks), and a consumption good that would be universally highly valued relative to bread (ice cream). That said, we acknowledge that our chosen stimuli may fall short of universality. Naturally, for subjects for whom these objects fail to represent their purported role in the theory, we expect attenuated treatment effects.

The model predicts that people may delay information because it costs them the opportunity of 'being present' to enjoy a consumption good. But what if people are already not present? What if the threat of future shocks is so salient that most attention is already directed to the future? These people do not pay a hedonic opportunity cost to receive information, and hence information demand should be higher. Thus, those who think about the shocks more during the instructions and decisions should choose to receive information about the shocks sooner.

Finally, the model assumes that receiving information about the future causes a person to think more about the future. This is testable if we accept the idea that *self-reported* thought frequency is positively correlated with the true frequency.

2.3. *Results*

Online Appendix Table A1 presents the summary statistics from our experiment. Hypothesis 1 states that, compared to bread, ice-cream consumption will increase the likelihood of delaying information about the shock. Table 1 shows the results of regressing the information choice on the treatment and other variables using a linear probability model. Columns (1)–(3) have 'Info Avoid' as the dichotomous outcome representing the choice to receive the information after the eating period, and columns (4)–(6) have 'Info Seek' as the dichotomous outcome representing the choice to receive the information during the eating period. Because each subject makes a choice conditional on both food items (bread and ice cream), there are two observations per person. SEs are clustered at the individual level.

The estimated coefficient of the treatment variable *ice cream* shown in columns (1)–(3) of Table 1 is positive and statistically significant, supporting the hypothesis. Indeed, receiving the ice-cream platter increases the likelihood of delaying information by 12.4 percentage points compared to receiving bread. This relationship holds when we include self-reported attributes related to the shocks (scariness of shocks and frequency of thinking about the shocks), and those related to the food (hunger, the order of food presentation and eating more when nervous), and when we control for individual fixed effects. Column (2) shows the effects of the covariates—only fear of the shocks is positively correlated with the likelihood of delaying information—and column (3) uses individual fixed effects (there are two observations per person). Columns (4)–(6) show results for the choice of receiving information about the shock earlier. None of the coefficients are significant, suggesting that there is no effect of higher consumption on the propensity to seek information.[11] In column (7) we use an ordered-logit specification regressing the timing of information (soon, random, or later) on ice cream. The results show that the treatment significantly increased information delay. We conceptually replicate this finding in a hypothetical stake environment (see Table 5 in Section 4 below).

Hypothesis 2 states that ice cream increases the valuation of the shock block. In Table 2 we regress WTP for the shock block on the ice-cream treatment. Column (1) shows no significant effect. In column (2) we include WTP for a mechanical pencil to control for heterogeneity in thriftiness, and self-reported fear of the shocks, which were elicited prior to

[11] We also run logistic regressions, which are consistent with linear probability model results here; see Online Appendix Table A5.

Table 2. *The Effect of Ice Cream on the Valuation of the Shock Block.*

	(1) WTP	(2) WTP	(3) log(WTP + 1)	(4) log(WTP + 1)	(5) asinh(WTP)	(6) asinh(WTP)
Ice cream	0.386	0.308	0.237*	0.216*	0.318**	0.292**
	(0.580)	(0.540)	(0.124)	(0.117)	(0.155)	(0.146)
WTP for pencil		0.515**				
		(0.213)				
Fear		1.008***		0.196***		0.240***
		(0.293)		(0.070)		(0.089)
log(pencil + 1)				0.224		
				(0.137)		
asinh(pencil)						0.211
						(0.131)
Mean dep. var.	5.812	5.812	1.748	1.748	2.224	2.224
R^2	0.004	0.141	0.031	0.135	0.035	0.136
Observations	121	121	121	121	121	121

Note: All columns use OLS to regress WTP for the shock block on ice cream received during the eating period. Robust SEs are reported in parentheses. * $p < .10$, ** $p < .05$, *** $p < .01$.

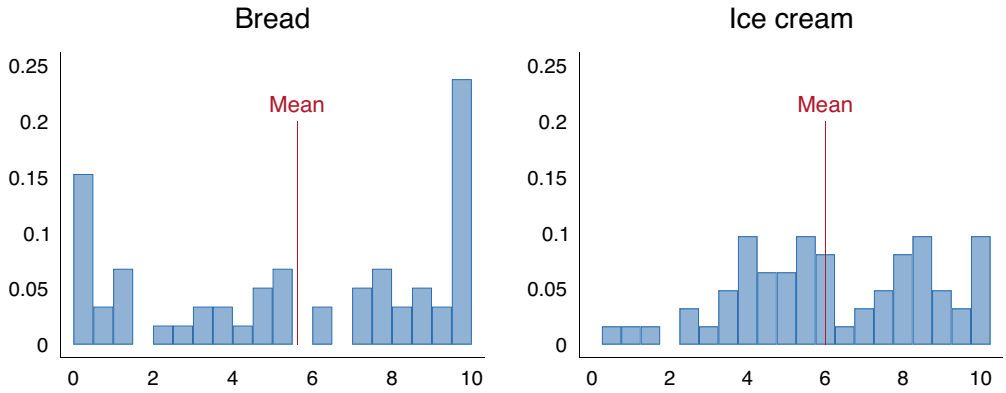

Fig. 2. *WTP for the Shock Block by Treatment.*

condition assignment, to control for individual heterogeneity on that dimension. Columns (3) and (4) use a log(WTP + 1) specification as stated in our pre-analysis plan, and columns (5) and (6) use an inverse hyperbolic sine transformation of WTP. The coefficients on the ice-cream treatment under these specifications are positive and marginally significant, indicating that participants are willing to pay more to eliminate the chance of being shocked at the end of the experiment, though the results appear tenuous.

Inspecting these results deeper, Figure 2 displays the histograms of WTP for the shock block by treatment. The control group (bread) has a mean WTP of $5.61 compared to the treatment group's (ice cream) mean of $6. The difference in means are small, but notably the ice-cream condition appears to have much less variance than the control condition. Specifically, the bread condition has a much higher mass of individuals with both the minimum valuation and maximum valuation. As an exploratory analysis, we conduct a Levene's test for the equality of variances between the two conditions.[12] The bread condition has a significantly higher SD than the ice-cream condition

[12] We thank an anonymous referee for this observation and recommendation.

(3.72 versus 2.51; $p = .0027$). To include our control variables, we also try regressing WTP on the pencil valuation and fear and then test the residuals for equality of variances between the two conditions. The difference between the SDs remains significant (3.35 versus 2.48; $p = .0217$). The analysis reveals that the primary effect of the treatment was rather to shift those with extremely low and high valuations of the shock block up and down, respectively. Our interpretation is that there is heterogeneity in the population. Some exhibit a present-future consumption complementarity, as we predicted, and others exhibit the reverse, substitutability, contrary to our predictions. In other words, some people take ice-cream consumption as a distractor from the imminent shocks and feel less of a desire to block them. We discuss this point on heterogeneity in Section 5.2 below.

In Online Appendix A we present regression tables testing our ancillary hypotheses. Online Appendix Table A2 shows the effect of eating more when nervous, fear, appetising ratings and frequency of thinking. We find no relationship between information preferences and eating when nervous, fear and frequency of thinking. However, we do find that those who found the ice cream more appetising had significantly larger treatment effects—that is, they were more likely to avoid information in the presence of ice cream, consistent with the notion that consumption is a substitute with information. Online Appendix Table A3 shows that those who get the information during the eating period think about the shocks more during the eating period, consistent with our theorised attention mechanism, though the effect is marginal ($p < .10$). Finally, using a hypothetical elicitation of time preferences, we find no correlation between the discount factor and information preference. The results are presented in Online Appendix Table A4.

3. Experiment 2: The Effect of Information on Consumption Choice

The first experiment shows that increasing current consumption decreases demand for information about the future, and increases future risk mitigation. To see if the relationship operates in reverse, in our second experiment, we manipulated the presence of salient information and observed the impact on demand for consumption. As before, subjects have a 50% chance of receiving electric shocks at the end of the experiment. In the control condition, subjects receive no information about whether they will be shocked. In the treatment condition, subjects have an envelope placed prominently in front of them during the waiting period and are informed that there is a signal in the envelope that is correlated with receiving the shock. We elicit subjects' valuations for immediate consumption including ice cream, the shock block, as well as several other goods. Contrary to our hypotheses, we find no effect of the salient information on demand for goods.

3.1. *Design*

The second experiment is designed to test Proposition 2, that receiving information about the future reduces demand for consumption in the present, and Proposition 4, that receiving information about the future increases the demand for future risk mitigation. The structure of the experiment is similar to the first experiment in which we manipulated present consumption and observed information choice. In this experiment, we manipulated information and observed consumption choices. Subjects faced a 50% chance to receive a series of electric shocks at the end of the experiment. Control subjects received no subsequent information, but treatment subjects received an informative signal correlated with being selected for shocks. We then elicited

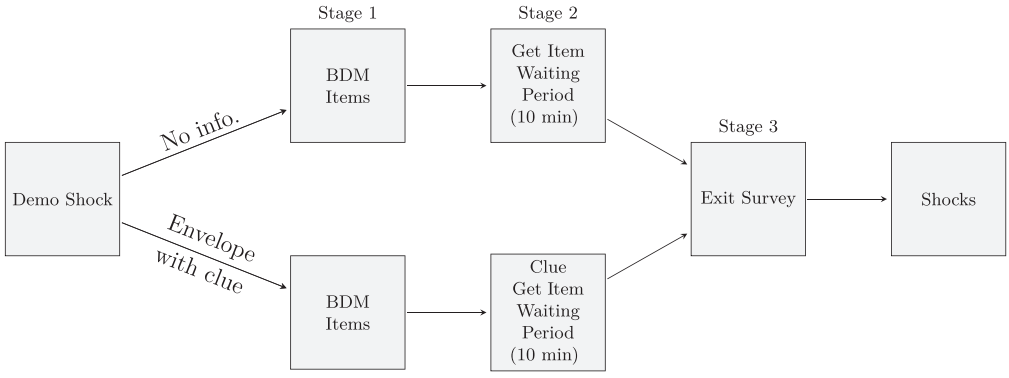

Fig. 3. *Timing of Experiment 2.*

subjects' valuations for several items before the waiting period. Detailed instructions are provided in Online Appendix B.2.

Figure 3 shows the timing of decisions. Just like in the first experiment, the session started with a demo shock. After receiving a 100 V demo shock to their wrists, participants were randomly assigned to either the control (no information) or the treatment (information) group. These two groups differed in that after the demo shock, the treatment group received a sealed envelope with a clue about the possibility of future shocks. The envelope was saliently placed on a wall in front of the participant's computer station and remained there throughout the experimental session.

In Stage 1 we measured the subjects' WTP for a series of items, including full information about whether they would be shocked, ice cream, game apps on an iPad and a shock block. The ice cream is meant to represent consumption, whereas the games are meant to represent an alternative form of consumption that needs focused attention. Though the theory states that the treatment should affect any consumption, we were curious whether the treatment might only affect an activity that requires focused attention. The shock block represents future consumption, or, more precisely, future risk mitigation. We elicited valuations for these items using the BDM procedure explained in Section 2 and one of the items was later randomly selected to be purchased. If full information was purchased in Stage 1, the participant would be informed of the coin toss result with 100% certainty. As for the ice cream, we presented participants with a menu of five flavours and their corresponding descriptions and we elicited participants' WTP for each of these five flavours sequentially. If the ice cream was purchased, one of the flavours would be randomly given to the subjects during the waiting period. For those who purchased game apps, the experimenter would bring an iPad with a few game apps installed during the waiting period. The shock block played the same role as that in Experiment 1 described in Section 2. That is, those who purchased this item would avoid being shocked, regardless of the coin toss result. The results of the BDM procedure were revealed at the end of Stage 1.

At the beginning of the waiting period in Stage 2, the experimenter opened the envelope for the treatment group. The envelope had a card inside of it with a 'clue' that contained a card that stated whether the coin flipped heads and was 90% accurate.[13] The card was then prominently

[13] We thought carefully about whether the information signal, the clue, should be perfectly informative or have some noise. Our concern with a perfectly informative signal was that certainty may push the future outcome away from the person's mind. Tversky and Kahneman (1986) famously showed that people's preferences under risk exhibit a certainty

placed in front of the person for the remainder of the waiting period. Next, participants received one of the purchased items from the WTP elicitation: ice cream, game apps, full information or a shock block. Subjects then remained seated for the next 10 minutes.

The last part of the experiment was identical to that of Experiment 1. In Stage 3, participants filled out an exit survey. The coin toss result was revealed. If the coin landed 'heads' and the subject had not purchased the shock block, the subject received a series of electric shocks to their wrists at 110 V. Participants were paid a $7 show-up fee, received their earnings from correctly answering the BDM example questions and were charged for the price of purchasing an item if one was purchased. A total of 122 participants were recruited for this experiment. Total earnings ranged between $14 and $24 and each session lasted about 35 minutes.

Experiment 2 was the first experiment we ran.[14] In contrast to Experiment 1, which tested Proposition 1 in a within-subject design, Experiment 2 is entirely between subjects. Because the manipulation, salient information, is presumed to affect consumption choice via shifting attention, a within-subject design did not seem feasible. In Experiment 1, we could counterfactually ask subjects what they would do under different levels of consumption (bread versus ice cream) using the strategy method. However, we worried that people would not be sufficiently self-aware or 'sophisticated' enough to accurately represent their choices under different signal realisations.[15]

3.2. *Hypotheses*

The results from Experiment 1 support our hypothesis that increasing consumption in the present decreases demand for instrumentally useless information about the future. The model of anticipatory utility we discuss in Section 1 shows that this effect should also work in reverse; that is, salient instrumentally useless information about the future should diminish consumption in the present. Furthermore, information in the present increases attention on the future, and thus increases the importance of reducing future risk.

HYPOTHESIS 3 (INFORMATION-CONSUMPTION SUBSTITUTABILITY). *Participants who receive salient information about the shocks have a lower valuation of consumption items (ice cream and games) compared to those who do not receive salient information.*

HYPOTHESIS 4 (INFORMATION-FUTURE CONSUMPTION COMPLEMENTARITY). *Participants who receive salient information about the shocks are willing to pay more for the shock block than those who do not receive salient information.*

effect, and we were concerned that something similar might exist with attention. As an anecdote, upon receiving a cancer diagnosis, one of the authors found the initial period of uncertainty to be the most anxiety producing. Once the medical team outlined a clear treatment plan, anxiety levels dropped noticeably. On the other hand, we acknowledge that a perfect signal could have aided comprehension. Ultimately, our larger concern was the possibility of the certainty effect.

When it came to Experiment 1, however, information choice was the outcome instead of the manipulation. The subject must choose amongst a set of information alternatives, and keeping the alternatives simple aids in decision-making and avoids issues of choice overload (Iyengar and Kamenica, 2010). Importantly, the model does not make any distinction between a perfect signal and a noisy signal so these are predicted to play the same role (i.e., substitute with present consumption, complement with future consumption). To summarise, we made slightly different design choices due to practical and extra-theoretical concerns. Our concern that certainty about the future, something rare for our real-world motivations (e.g., cancer outcome), would allow the subject to shift their attention elsewhere.

[14] We ran it prior to registering our pre-analysis plan.

[15] The null results in this experiment highlighted for us the importance of statistical power. As with Experiment 1, subjects could only participate one at a time, and the experimenter had to be an expert in the equipment and procedures. This costly processing puts constraints on sample size. After estimating null effects in this experiment, we redesigned Experiment 1 to be within subjects (which was also entirely between subjects in our initial design sketch) to increase statistical power.

Table 3. *The Effect of Salient Information on Valuations.*

	(1) Full info	(2) Ice cream	(3) Games	(4) Shock block
Salient info	−0.121	−0.183	−0.014	−0.225
	(0.143)	(0.222)	(0.131)	(0.619)
Mean dep. var.	0.927	1.882	0.632	3.904
R^2	0.0060	0.0056	0.0001	0.0011
Observations	122	122	122	122

Note: All columns use OLS on WTP for consumption items. Robust SEs are reported in parentheses.

The main cost of receiving information about the future is the opportunity cost of attending to consumption in the present. However, if one's attention is already on the future, there is no opportunity cost. We hypothesise that receiving salient information will increase demand for more information.

For our experiment to work, we need people who fear shocks and believe that they are going to get shocked, as described in the experimental instructions. However, some people may not be fearful of the shocks or may simply not have believed the experimenter that the electric shocks were real. To control for these confounds, we included in our exit survey (Stage 3) questions to assess credibility: 'Did you believe, as the instructions stated, that if selected you would be shocked?' We also asked for the perceived scariness of the shocks. In addition, we were concerned that people who eat more when nervous might have a different reaction to the information, so we had subjects self-report their tendency to eat when nervous.

3.3. *Results*

In Online Appendix Table A6 we present the summary statistics from our experiment. Table 3 shows the results of regressing the valuation of the four consumption items: full information, ice cream, games and a shock block on the treatment. The valuations for ice cream and games were calculated by averaging the WTP for all flavours and games, respectively.

Columns (1)–(3) show negative coefficients for salient information on consumption valuations, which directionally aligns with our substitutability hypothesis (Hypothesis 3). However, for ice cream, the 95% confidence interval of [−0.621, 0.255] spans both negative effects (supporting our hypothesis) and small positive effects. While the point estimates suggest a reduction in willingness to pay relative to the mean dependent variable (1.882), we cannot rule out the absence of an effect. The precision of our estimates does not allow us to definitively conclude that salient information reduces consumption valuations at conventional significance levels. In Online Appendix Table A7, we report the treatment effect of salient information on consumption valuations with both the log(WTP + 1) specification and inverse hyperbolic sine transformation of WTP (asinh(WTP)). The coefficients are negative and are not statistically significant.

For the shock block (column (4)), we observe a larger negative point estimate of −0.225 with a wide 95% confidence interval of [−1.446, 0.996]. Contrary to our hypothesis of complementarity, Hypothesis 4, the point estimate suggests that participants who received salient information were willing to pay less, not more, for the shock block. However, the confidence interval is large and includes both meaningfully negative and positive values. This result does not support our

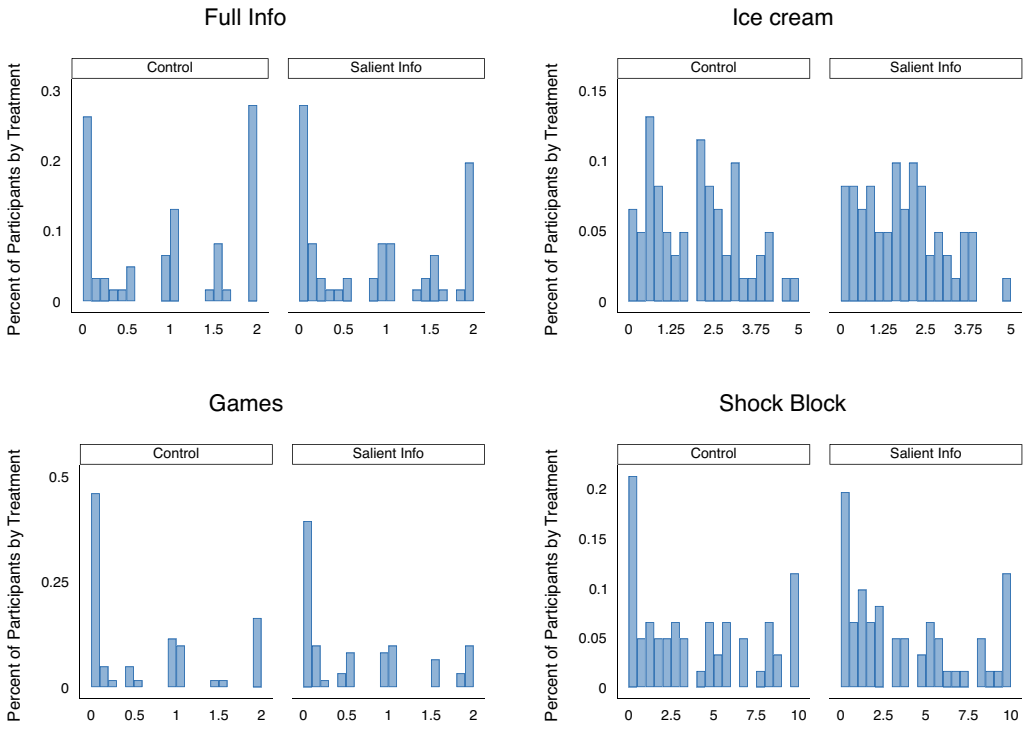

Fig. 4. *WTPs for Goods by Treatment.*

complementarity hypothesis, though we note that our design had limited power to detect small-to-moderate effects, given our sample size of 122 observations.

Figure 4 displays the histograms of the WTP for the four goods. The distributions appear roughly the same across conditions. A Levene's test for the equality of variances reveals that the SDs are the same between conditions, for each good.

The hypotheses in the first experiment are predominantly supported, but the hypotheses in the second experiment are entirely unsupported. Why is there such a dramatic difference in the results? We have some concerns that our manipulation failed to work. Indeed, our design included some manipulation checks: 'How often were you thinking about the shocks [before/during] the waiting period?' We find no statistical difference in the frequency of thinking about the shocks between the control and treatment conditions (thinking before, 2.934 versus 2.787 and $p = .476$; thinking during, 2.459 versus 2.590 and $p = .551$). We also test how scary people think the shocks are and find no difference between control and treatment (3.148 versus 2.901, $p = .213$). We test additional ancillary hypotheses in Online Appendix A.2. Online Appendix Table A8 tests for the moderating effect of credence and fear, Online Appendix Table A9 tests for heterogeneous effects from 'nervous eaters' and Online Appendix Table A10 tests the effects of self-reported attention. The results are almost entirely null. To address these discrepancies, we design additional hypothetical-choice experiments described in Section 4 below. We discuss the null findings in depth in Section 5.1 below.

Table 4. *Summary of Questions.*

Question	Conceptual result/hypothesis	Manipulation	Choices
1	Consumption-information substitutability	Cons: birthday party/boring social	Info (med test result): before, after, indiff.
2	Consumption-future consumption complementarity	Cons: birthday party/boring social	Future cons: WTP for pill
2′	Consumption-future consumption complementarity	Cons: birthday party/boring social	Future cons: WTP for pill
3	Information-consumption substitutability	Info (med test result): during party/after party	Cons: keep party, postpone party, indiff.
4	Information-future consumption complementarity	Info saliency (med test result): frequent info/once	Future cons: WTP for pill
2 vs. 2′	Attention mediates future risk mitigation	Worried versus unworried	

4. Hypothetical-Choice Experiments

4.1. *Design*

Our third experiment attempts to address the unexpected null finding from the previous experiment while also serving several other purposes. Unlike the first two experiments, which used stylised contexts with meaningful stakes, in the hypothetical-choice experiments, we opted to sacrifice real stakes to obtain a larger online sample size and test more contextually relevant scenarios.

We presented five separate hypothetical questions to subjects online, each grounded in a context relevant to our research question. Each question had both a control and treatment condition, participants were randomly assigned to each condition and each subject responded to only one of the five questions. Table 4 summarises the five questions, the proposition that each question tests, the experimental manipulation and the participants' choice set. Table A11 in the Online Appendix A.3 shows the summary statistics of all outcome variables and treatment variables in the five hypothetical scenarios.

The online study included 1,500 participants recruited via Prolific. After successfully completing two attentional checks, participants were randomly assigned to a treatment or a control condition within each scenario and participated in one condition only. It took subjects less than 5 minutes to answer the questions and each participant was paid $0.80. Online Appendix B.3 contains the full instrument. Our pre-analysis plan was registered at the AEA Social Science Registry AEARCTR-0004181 under the document 'Pre-Analysis Plan Hypothetical Scenarios.pdf'. All of the specifications in the main text were included in the PAP except for the log and asinh specifications in Tables 6 and 8 below, which were included for consistency with our analyses of Experiment 1 data in Table 1.

Question 1 replicates Experiment 1. It presents a medical scenario akin to our introductory example. Subjects choose between receiving test results over the weekend, after the weekend or indifferent, while we vary the quality of the weekend consumption. The high consumption was a birthday celebration one would look forward to, while the low consumption was a chore-like social gathering. As shown in Table 5, we find strong evidence that higher consumption causes delayed information acquisition, increasing delay by 16.9 pps and decreasing early demand by 15.4 pps (both $p < .01$).

Table 5. *The Effect of Consumption on Information Choice.*

	(1)	(2)	(3)	(4)
	OLS		Logit	
	Info Avoid	Info Seek	Info Avoid	Info Seek
Birthday	0.169***	−0.154***	2.537***	0.492***
	(0.048)	(0.052)	(0.687)	(0.120)
Mean dep. var.	0.247	0.675	0.247	0.675
R^2	0.038	0.027		
Pseudo R^2			0.035	0.021
Observations	320	320	320	320

Note: OLS regression of information choice on a treatment dummy in columns (1) and (2). Logistic regression of information choice on a treatment dummy in columns (3) and (4). Coefficients are displayed as odds ratios. Robust SEs are reported in parentheses. *** $p < .01$.

Table 6. *The Effect of Consumption on Future Risk Mitigation.*

	(1)	(2)	(3)	(4)	(5)	(6)
	Worried			Not worried		
	WTP	log(WTP + 1)	asinh(WTP)	WTP	log(WTP + 1)	asinh(WTP)
Birthday	3.347	0.308**	0.369**	1.676	0.046	0.047
	(2.533)	(0.141)	(0.163)	(2.129)	(0.122)	(0.141)
Mean dep. var.	21.448	2.573	3.121	18.507	2.524	3.082
R^2	0.006	0.017	0.018	0.002	0.000	0.000
Observations	287	287	287	302	302	302
p-val: worried = not worried				0.613	0.160	0.135

Note: WTP is defined as the midpoint of the selected bin with the highest bin top coded at $100. Columns (1)–(3) correspond to the results of the hypothetical scenario of Question 2. Columns (4)–(6) correspond to the results of the hypothetical scenario of Question 2′. All columns use OLS to regress WTP to insure against future risk on a treatment dummy. Bottom row shows the p-value of a Wald test on the equality of the Birthday coefficient between column (i) and column ($i - 3$) for $i \in \{4, 5, 6\}$. Robust SEs are reported in parentheses. ** $p < .05$.

Question 2 replicates the shock block. Subjects can purchase medication to protect against a future health risk. We created a hypothetical scenario where the potentially aversive outcome was a 50% chance that a medical condition could lead to severe diarrhoea the next week. The future risk mitigation was an oral medication that would prevent diarrhoea symptoms, but had to be purchased and consumed immediately to work. We elicited WTP for the medication using a list of maximum payments, allowing for six different responses with the intention to keep the design simple and to reduce noise ($0, $1–$10, $11–$25, $26–$60, $61–$100, >$100). Importantly, the diarrhoea would not happen on the weekend. We use the midpoint of each bin to assign the WTP and top code the last bin at $100. We find that higher consumption marginally raises medication demand, echoing the shock block increase in Experiment 1 (see column (1) of Table 6). Additionally, we include columns (2) and (3) showing results with transformations of WTP resembling those used for Table 1 in Experiment 1 for consistency, though they were not in the PAP. Column (2) uses a log(WTP + 1) specification, and column (3) uses an inverse hyperbolic sine transformation of WTP. The coefficients are positive and statistically significant in columns (2) and (3).

Question 2′ is identical to Question 2, but explicitly states that subjects are unlikely to worry over the weekend. We predict that weekend worry mediates treatment effects. Supporting this, the results shown in Table 6 show no effect when worry is eliminated, suggesting that worry is

Table 7. *The Effect of Information on Consumption Delay.*

	(1)	(2)	(3)	(4)
	OLS		Logit	
	Consumption later	Consumption sooner	Consumption later	Consumption sooner
Info during consumption	0.036	−0.074	1.261	0.686
	(0.046)	(0.052)	(0.377)	(0.182)
Mean dep. var.	0.190	0.728	0.190	0.728
R^2	0.002	0.007		
Pseudo R^2			0.002	0.006
Observations	294	294	294	294

Note: OLS regression of consumption choice on a treatment dummy in columns (1) and (2). Logit regression of consumption choice on a treatment dummy in columns (3) and (4). Coefficients are displayed as odds ratios. Robust SEs are reported in parentheses.

the key mechanism linking consumption to future consumption demand (risk mitigation). We test whether the treatment effect significantly differs across the two conditions using a Wald test. The bottom row of Table 6 shows the *p*-values comparing the coefficient on Birthday between columns (1) and (4), columns (2) and (5), and columns (3) and (6). We cannot reject the hypothesis that the coefficients are the same in the two conditions. As a whole, we take this as suggestive rather than definitive evidence on the effect of worry.

Questions 3 and 4 attempt to replicate Experiment 2. In Question 3 the manipulation is whether the information (a phone call) is received during the weekend or after, and the outcome is whether a birthday party is postponed or not. We predict that receiving information about severe diarrhoea during a celebration increases the probability of postponing the party compared to receiving information after the celebration. Table 7 shows no evidence for this claim. As shown in columns (1) and (2), the coefficients have the correct sign, but the effect is not statistically significant.[16] Thus, we fail to find a statistically significant effect of information on consumption choice; this is consistent with what we observed in Experiment 2, but contrary to our hypothesis.

In Question 4 we manipulate the salience of information about a potential disease and elicit WTP using a list of maximum payments for a health-risk-mitigating medication (we use the same bins as in Questions 2 and 2', and in the same way define WTP as the midpoints of the bins). In the salient information condition, participants received frequent updates about the potential disease from the news on a daily basis, while in the low-salience condition, the update was received only once from a neighbour. We find null treatment effects. This replicates a null effect in Experiment 2, contrary to our hypothesis. Columns (1)–(3) of Table 8 show that the coefficient associated with the impact of information treatment 'Salient Info' goes in the opposite direction and is not statistically significant.

4.2. *Status-Quo Confounds*

Our null results left us wondering whether we introduced a status-quo bias in Question 3 presenting the options as keeping one's plans constant, like a default, or 'postponing'. In our fourth experiment, we removed the status-quo confound. As in Question 3 from the previous experiment, subjects would expect to receive health information on a given day and then choose when to have a celebration; however, there was no postponing a plan. Celebrations were either on

[16] Results of a logit regression are displayed in columns (3) and (4).

Table 8. *The Effect of Salient Information on the Value of Risk Mitigation.*

	(1) WTP	(2) log(WTP + 1)	(3) asinh(WTP)
Salient info	−0.091	−0.181	−0.222
	(2.616)	(0.135)	(0.155)
Mean dep. var.	21.005	2.563	3.117
R^2	0.000	0.006	0.007
Observations	296	296	296

Note: WTP is defined as the midpoint of the selected bin with the highest bin top coded at $100. OLS regression of WTP to insure against future risk on a treatment dummy in column (1) and transformations in columns (2) and (3). Robust SEs are reported in parentheses.

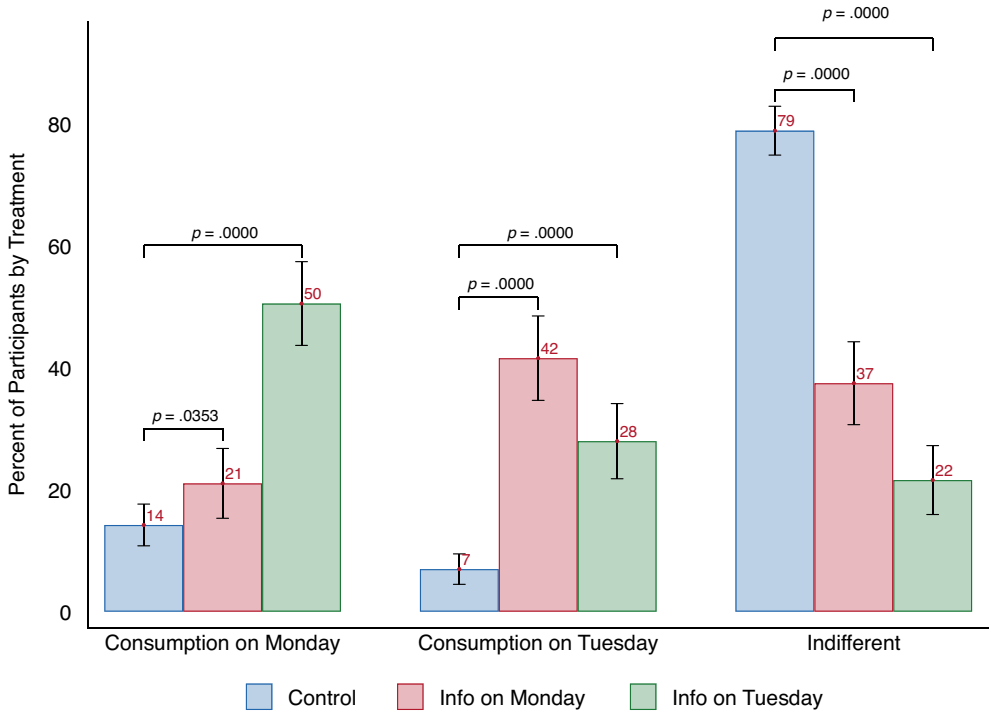

Fig. 5. *Contemporaneous Consumption and Information.*

Monday or Tuesday in all scenarios, and subjects could choose to celebrate on one of those two days or be indifferent. In the control condition, subjects received information on Friday, whereas in the two treatment conditions, subjects received information on Monday or Tuesday. We tested whether receiving a phone call on a given day (i.e., Monday or Tuesday) decreases the willingness to celebrate on that day. We hypothesise that *receiving the phone call on day x will decrease people's choice to have the birthday celebration on day x.* Online Appendix B.4 contains the full instrument.

We recruited a total of 800 subjects from Prolific, 50% of which were allocated to the control condition, and 25% to each of the treatment conditions. Figure 5 shows the percentage of

participants in each condition who chose to celebrate on Monday or Tuesday or were indifferent. In the control, where subjects would receive the phone call on Friday, 79% were indifferent about when they would celebrate their birthday, with the remaining 14% preferring Monday, and 7% preferring Tuesday. In contrast, the plurality of subjects in the treatments preferred to celebrate on the day they would not receive information, as we had hypothesised. When the phone call was on Monday, 42% chose to celebrate on Tuesday (21% chose Monday, 37% indifferent), and when the phone call was on Tuesday, 50% chose to celebrate on Monday (28% chose Tuesday, 22% indifferent). Our interpretation of these findings, in the context of our earlier ones, is that consumption choice may exhibit a substitution effect with information, but the effect is relatively insensitive as it appears that a simple default could shut it down.

Interestingly, the figure also reveals heterogeneity in that some people seem to prefer to celebrate on the same day they get the phone call. In the control condition, when timing information and consumption together is not possible, 14% chose Monday and 7% chose Tuesday. When the phone call is on Monday, the share of subjects who chose to celebrate on Monday increases by 7 pps to 21%, and when the phone call is on Tuesday, the share of subjects who chose to celebrate on Tuesday increases by 21 pps to 28%, suggesting that receiving salient information about aversive future events increases demand for contemporaneous consumption for some. We discuss heterogeneity in preferences in Section 5.2 below.

5. Discussion

5.1. *Null Results*

Our first experiment demonstrates that increasing consumption in the present reduces the demand for information regarding a potentially adverse future outcome. We hypothesised that the effect would also work in reverse. That is, receiving salient information about a possible bad future outcome would decrease current consumption. However, Experiment 2 produced a null result. Our initial hypothetical-choice experiment, designed to replicate this experiment, also produced a null result. However, the subsequent hypothetical-choice experiment, which controlled for status-quo bias, produced a large and highly significant effect of information on consumption choice.

What explains these mixed findings? We offer four candidate explanations. First, Experiment 2 may have a failed manipulation. We find no difference in the self-reported frequency of thinking about the shocks or self-reported fear between the control and treatment conditions. Second, Experiment 2 may have been underpowered, as it was entirely a between-subject design. Third, there could be asymmetric sensitivities between information and consumption. Information demand might be more sensitive, by which we mean that relatively small shifts in a substitute—present consumption—can lead to large shifts in information demand. Consumption demand might be less sensitive, requiring large shifts in salient information to produce even small shifts in consumption. As an analogy, sunglasses and convertibles are plausibly complements. Who wants to drive with the sun in one's eyes? Purchasing a convertible might cause a statistically measurable increase in the number of sunglasses purchased. However, it would be much harder to detect the effect of purchasing sunglasses on convertible purchases. Convertible purchases depend more on other factors.

We believe that all of these explanations could be at play. The failed manipulation checks and low-power from the between-subject design explain why Experiment 2 had null results. The

asymmetric sensitivity can explain the pattern of results in the hypothetical-choice experiments. Regarding the latter, Question 3 in the hypothetical-choice experiment showed a null result, but had a default (keep the party on the scheduled day versus postpone the party). In the follow-up experiment, we updated this question to make it a choice about when to have the party, and there was a large and significant effect. The fact that the effect of information on consumption is large when there are no other considerations, but non-existent in the presence of a default is consistent with the asymmetric-sensitivity interpretation.

5.2. *Heterogeneous Attention Management*

Our model assumes that receiving information draws attention away from current consumption and puts it on the future. But, a contrary alternative assumption is that consuming draws attention away from the future and puts it on the present. Under this latter assumption, there is an incentive for a person to consume as a means to distract from the future. Our first experiment yields tentative evidence that there is heterogeneity in the population. Many subjects do not wish to mix their high consumption with bad news, but others do. The strongest evidence on this point is the treatment's reduction in the variance of the WTP of the shock block. In the bread condition, many stated a WTP at the floor ($0) and the ceiling ($10), and in the ice-cream condition, this mass made its way into the interior of the distribution. Clearly, some people raised their valuations and others reduced their valuations. It is as if consuming the ice cream was a treasured experience that demanded greater cultivation in the form of risk reduction for some, but was an anxiolytic for others. Additionally, 34% of the sample self-reported that they eat more food when nervous, a behaviour consistent with using consumption as a means to manage one's attention when facing negatively valenced anticipatory emotions. About 50% say that they eat less when nervous, and the remainder, 14%, say that it does not make a difference.

The second piece of evidence comes from the follow-up hypothetical-choice experiment. When information is to be received on neither Monday nor Tuesday, 79% were indifferent to scheduling a celebration on either of those two days. When information was on one of those days, most people wish to avoid celebrating at the same time. However, approximately 15% of the population prefers to shift their preference from indifference to getting the information and celebrating at the same time. This is a non-negligible and significant result.

In summary, there appear to be heterogeneous preferences in the population. Our interpretation is that some people manage their attention by separating anxiety-provoking signals from their consumption, while others manage their attention by combining them. Future work investigating the heterogeneity in attention management and the underlying heterogeneity in anticipatory utility and attention functions appears promising.

5.2.1. *Amending the Model*

The heterogeneity discussed above may offer a promising direction for enhancing the model. The $t = 0$ objective function in Section 1 could be written instead as

$$V_{i,0} = [1 - a_i(s)]u_i(x_0) + [a_i(s) + \beta]E[u_i(x_1)] + m,$$

in which there is heterogeneity in both attention, $a_i(s)$, and consumption utility, $u_i(x)$. Heterogeneity in $u_i(x)$ is straightforward: people have different preferences over consumption, and importantly, these preferences can be elicited in choice experiments. The more substantive modification is the heterogeneity in $a_i(s)$. Assume, as before, that $a_i(s)$ is monotonically increas-

ing while allowing different functional forms for different individuals to reflect their sensitivity to the external environment.

Although this approach captures individual differences in attention, it is insufficient to explain the observed heterogeneity in the result. Some individuals want their bad news and high consumption separated, whereas others want them together. The latter behave as if the high consumption shifts attention from the bad news. These people eat when nervous, pay less for a shock block when eating ice cream or want their medical test results on the same day as their birthday party. Their behaviour suggests that attention responds to consumption. Information increases the salience of the future s, while current consumption decreases it. Thus, salience would be a function of the signal σ and current consumption x_0 as in $s(\sigma, x_0)$. The attention function could then be rewritten as $a_i(\sigma, x_0)$, and would be monotonically decreasing in x_0 (in the original model, it is constant in x_0). Heterogeneity would be captured by the $\partial a_i / \partial x_0$ term. Unfortunately, this makes elicitation of consumption utility, $u_i(x)$, more challenging as the choice of x may also change attention on current consumption, $[1 - a_i(\sigma, x_0)]$. New experimental and econometric methods may be needed to identify consumption value and relative attention jointly. Another approach is to model attention as a choice variable, as in Bolte and Raymond (2023).

5.3. *Implications*

The information-consumption interaction documented in this paper may have political-economy implications. Juvenal's notion of *'bread and circuses'* is idiomatic for immediate consumption that distracts from important political or social issues. Our findings provide a micro-foundation for this notion. Increasing consumption can change an individual's preferences for information in completely unrelated domains. Actors or institutions who wish to persuade or manipulate could invest in distracting consumption that serves as a substitute for information acquisition.

The interaction may explain several forms of pathological individual behaviour. The practice of self-medication via alcohol, drugs and entertainment products such as gambling, television, social media and video games could be understood in this light. Consuming these goods is a substitute for attention on the future, which could otherwise cause immediate disutility. While a dynamically consistent individual might simply regard this as a typical intertemporal trade-off and make the appropriate decision, dynamically inconsistent individuals may find this challenging (Laibson, 1997; O'Donoghue and Rabin, 1999). A present-biased individual is likely to excessively favour choices that offer immediate benefits and delayed costs, postponing information. In a more complex decision-making environment, in which information is necessary to mitigate a negative future outcome, delaying information may also imply an increased risk of future harm. This could lead to a feedback loop whereby a pattern of information avoidance along with naïve present-oriented consumption leads to higher future risk due to neglect. Consequently, the individual finds him- or herself trapped in a pattern of excessive consumption as a myopic alternative to confronting an increasingly growing future threat.

5.4. *Future Directions*

In this paper, we are focused on the interaction between information about a potential aversive future outcome and consumption in the present. Our subjects faced the choice of savouring consumption or confronting dread, but one could just as well imagine interactions in which the aversive experience is in the present and information is about a potentially positive future. Would

people excessively seek out information about the future? Would decreasing consumption in the present increase demand for information about a potentially good future as a means to find hope? We find this a fascinating potential variation in the design.

The research in this paper can be thought of more broadly as preferences for how to bundle experiences. Neoclassical consumer theory takes preferences as given. This also means that it has little in the way of theory for predicting what those preferences could be. As long as we assume completeness, transitivity, continuity and non-satiation, anything else is permitted (Mas-Colell *et al.*, 1995). However, there may be additional regularities in people's preferences for which one can develop economic theories. Here we show how information and consumption interact, motivated by a model of hedonic attention. This can have implications for the bundling of experiences.[17] Indeed, the amount of attention required to enjoy a good may vary across classes of goods. For example, narratives, including books, audio, television and movies, seem to require focused attention to enjoy. Many games and sports are similarly attention hungry.[18] Other sorts of goods may require little attention, such as the use of a refrigerator. The food is simply cold and preserved. Still, some goods may involve variable amounts of attention, such as the literal consumption of food. One can eat mindlessly, devoting attention to many other things, such as narratives, games or conversation, but focused attention on the food leads to a different experience and one that may be more enjoyable when the food is high quality.[19] Productive tasks also require varying degrees of attention. For an experienced driver, driving a car requires only a limited amount of attention, and can be combined with conversation, music or audiobooks. In contrast, coding or writing a paper might require a limit on distractions, as is processing and understanding information, as in the context of this paper.[20] The bundling of goods and tasks, therefore, ought to depend on their attentional requirements and the marginal utility of attention. For example, people may consume run-of-the-mill food in a distracted setting, with conversation or television, but focus more on the food when it is particularly high quality, as from a fine restaurant, because the marginal utility from attention toward food is higher in the latter case.

An alternative explanation for our findings draws on contamination or 'sewage in wine' effects (Rozin and Fallon, 1987), where even minimal negative information may completely spoil positive experiences rather than competing for attention in a continuous manner.[21] Under this account, the negative utility from anticipating shocks might diminish the enjoyment of consumption regardless of attentional allocation. The key distinction between this hypothesis and our mechanism is that the effect is predicted to be discontinuous for any bad news, and in our model the effect of information is linear in how much attention it shifts to the future. This would suggest that consumers avoid bundling pleasant consumption with even minimal negative information, not

[17] We thank Juan Carrillo for this direction.

[18] Though not universally so because there are some low-attention sports that allow for multi-tasking such as surfing, endurance sports like running, darts, etc.

[19] On this point we offer an anecdote. In the distant past, one of the authors had the routine habit of usually combining his meals with some other activity: conversation, radio or television. His new girlfriend at the time eschewed all distractors while eating, even conversation. We ate mostly in silence. At first, this seemed odd, but once the habit developed it was hard to give up, as full attention on the food enhanced its appreciation.

[20] The reason we chose to study the interaction between information and consumption as opposed to distractions (e.g., loud noises) and consumption is that information is a primitive in many economic models and is relevant to many economic decisions. Distractions are not, but the essence of the trade-off is the same in many contexts. We strive to gain a foothold in the economics discipline for the concept: the *hedonic opportunity cost of attention*, with conventional economic primitives like information and consumption. The concept could thereafter be extended to less economically conventional contexts.

[21] We thank an anonymous referee for drawing our attention to this thoughtful alternative.

because of opportunity costs of attention, but because the negative feeling of processing the information categorically taints the experience. Future research could distinguish between these mechanisms. Consider an experiment that has multiple levels of salience about the negative future experience from minimal indicators (a subtle cue quickly forgotten) to comprehensive 'in-your-face' information (prominent visual displays with countdown timers and auditory cues). The contamination hypothesis predicts a steep decrease in valuing consumption, with no additional decreases as information salience increases. In contrast, our attentional trade-off model would predict a continuous decrease in valuing consumption proportional to the amount of attention directed to the information.

Our view is that attention mediates the effect of all forms of consumption on utility, encompassing both consumption based on physical goods and consumption predicated on information processing. Because attention is a limited resource, this creates trade-offs. Signals about the future represent one form of information-processing good that uses attention.

6. Conclusion

This paper presented the results of an experiment motivated by a model of attention-based anticipatory utility. Our model predicts preference interactions between information and consumption, as well as between present and future consumption. These interactions are mediated by limited hedonic attention. The results of our experiment support consumption-information substitutability and present-future consumption complementarity, with real stakes in the face of dread. Our hypothesised mechanism, limited hedonic attention, aligns with our observations that early information causes people to think more about the shocks while eating (although the effects are only marginally significant) and that the frequency of worrying mediates the complementarity.

We view the main contribution of this paper as establishing evidence for information-consumption interactions. While one can view this solely as an empirical finding, our findings also support the hypothesis that attention mediates the utility derived from consuming both physical goods and information-processing goods. The finite nature of attention implies an opportunity cost associated with focusing on one aspect over another, leading to hedonic effects. We believe that these concepts will generate additional insightful hypotheses in a broad range of domains.

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Additional Supporting Information may be found in the online version of this article:

Online Appendix
Replication Package

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