Acting Wastefully but Feeling Satisfied: Understanding Waste Aversion

Ro'i Zultan[1], Ori Weisel[2], and Yaniv Shani[2]
[1]Ben-Gurion University of the Negev
[2]Tel Aviv University

Paying more than one could have paid to obtain the same outcome is wasteful. In four experiments we show that waste aversion can lead people to prefer a *more wasteful* outcome over a more frugal outcome, as long as it eliminates the *feeling* of wastefulness. In Study 1 we measured participants' satisfaction with lottery outcomes to find that they are less satisfied with their obtained outcome relative to an inferior, dominated, outcome—if they are aware of a counter-factual in which they could have paid less to achieve the dominant outcome. Study 2 revealed that responsibility for the decision that led to the outcome does not intensify the effect, suggesting that wastefulness is a more prominent explanation for the effect than regret. Study 3 extended the results from outcome satisfaction to decisions. Participants altered their choice of whether to continue or terminate searching for an apartment based on their awareness of a counterfactual that renders the process leading to the outcome as wasteful or not. Waste aversion leads participants to extend their search beyond what they would do based purely on their preferences and expectations. Study 4 replicated these findings with payoff-relevant decisions. Taken together, these four studies establish that waste aversion leads to higher satisfaction with dominated outcomes in real-world experiences. The effect does not rely on decision regret, and may lead to sub-optimal decisions.

Keywords: waste, regret, counterfactuals.

Introduction

Imagine that you are looking for a new apartment. There is a large database offering two payment plans. In the pay-as-you-go plan, the cost of receiving details of a single apartment is $4. Alternatively, a subscription costs $40 and provides you with details of 20 apartments. Assume that you opt for the $40 subscription. How would you feel about "closing a deal" and finding an apartment after seeing seven apartments? With pay-as-you-go, you could have paid only $28 for seeing seven apartment. The extra $12 you paid for the subscription would be wasted, possibly making the (objectively positive) experience of finding an apartment quickly less pleasant compared to a scenario in which the pay-as-you-go plan was never offered, but is identical in terms of the apartments you saw and the apartment you agreed on renting. Furthermore, you might be inclined—in order to avoid this feeling of waste—to try and find possible faults that would justify rejecting the first apartments that you visit, until you reach the "break

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even" point, where the subscription is no longer more expensive than pay-as-you-go (the first nine apartments in the example above).

Zultan et al. (2010) tested this intuition by using four different hypothetical scenarios, all involving a choice of paying a fixed lump sum price over a piece-rate price for some service rendered. In their research, participants were asked to indicate their preference between two possible outcomes. In one outcome the protagonist achieved her desired objective (e.g., finding the "apartment of her dreams") quicker. This outcome clearly dominates the alternative where the same objective is reached after a larger expenditure of time and effort (e.g., finding the perfect apartment after *more* time-consuming outings). Zultan et al. (2010) manipulated the *awareness* that a counterfactual cheaper alternative was available. Their results showed that a significant proportion of participants expressed a preference for the dominated outcome—only when aware of the counterfactual option. Thus, the dominant outcome is perceived as less attractive when it could have been obtained for less.

Arkes (1996) introduced the notion of *waste aversion*. According to Arkes, wastefulness occurs when "a person spends more on an item than is necessary" (p. 214). Not to spend more than necessary is a sound maxim, but when overgeneralized may lead to suboptimal behavior. This definition is consistent with the cases studied by Zultan et al. (2010), in which the dominant outcome is perceived as wasteful only when participants were aware that it could have been obtained for a lower price. Paradoxically, the outcome which objectively entails a *greater* expenditure in terms of time and effort—i.e., was more wasteful—did not carry this burden of wastefulness, and thus was evaluated as more attractive.

Arkes (1996) argued that feelings of waste are aversive because "wastefulness may include a component of regret" (p. 218), where regret is defined in a broad sense, following Landman (1993), to include negative feelings associated with misfortunes as well as past decisions. Current research on regret emphasizes the role of *decision* responsibility in generating feelings of regret (Zeelenberg & Pieters, 2007). Thus, while wasteful feelings are more oriented toward the final outcome (I could have spent less), regret does not require negative outcomes and focuses on the decision itself (I should have decided differently). Furthermore, we can differentiate between "outcome regret" (my decision lead to a bad outcome ex-post) and "process regret" (the bad outcome cast doubts on the ex-ante wisdom of my decision; Connolly & Zeelenberg, 2002; Pieters & Zeelenberg, 2005).

Feelings of wastefulness arise when people are aware that their situation could have been better. Such a comparison may lead to feelings of regret, if the outcome came about through an active choice; or disappointment, if resulting from some exogenous process (Zeelenberg et al., 1998, 2000). Thus, a wasteful outcome can be associated with regret or disappointment. Is waste aversion a form of regret or a more general phenomenon? In Zultan et al. (2010), feelings of waste were always associated with having made an ex-post sub-optimal choice. Zultan et al. (2010) found that the effect of the cheaper counterfactual option was correlated with self-reported feelings of waste but not of regret, suggesting that regret is not a necessary condition for feelings of wastefulness to emerge. They, however, did not manipulate regret directly.

The current paper. The previous experiments by Zultan et al. (2010) and Arkes (1996) had several limitations, which we address in the current paper. First, in terms of *methodology*, the previous experiments relied on participants' responses to *hypothetical* scenarios. Responses to hypothetical scenarios are sometimes susceptible to demand characteristics as well to manifestations of irrationality that are mitigated when decisions become consequential, e.g., in value elicitation (Harrison & Rutström, 2005) and risky choice (Beattie & Loomes, 1997).[1] In contrast, we study the phenomenon in real, payoff-relevant sit-

[1] See also reviews and discussion of the role of incentives in experiments by Camerer and Hogarth (1999) and Hertwig and Ortmann (2001).

uations (studies 1, 2, and 4).

Second, in terms of the *outcomes of interest*, we go beyond the emotions and cognitions studied in Zultan et al. (2010) to determine whether the emotional effect of waste aversion also affects choices and behavior (studies 3 and 4). Table 1 presents schematically how our new studies fit in the framework created by considering the factors of methodology (hypothetical scenarios vs. real experience) and outcome (feelings vs. behavior).

In addition to addressing the methodology and outcome issues mentioned above, we disentangle the respective roles of waste aversion and outcome regret. The new experimental paradigm that we developed (see Methods section) allows us to explicitly control whether the participant chooses the payment scheme, potentially triggering feelings of regret. Conversely, we can rule out regret by taking the choice of payment scheme out of the participants' hands.

Waste aversion is closely related to the phenomenon of the sunk cost effect, by which past investments increase the desire to continue an endeavor even when terminating it—giving up the past investments—is objectively better (Arkes, 1996; Arkes & Ayton, 1999; Arkes & Blumer, 1985). Indeed, Arkes (1996) argued that waste aversion drives the sunk-cost effect, as terminating the endeavor would render past investments wasteful. For example, Arkes and Blumer (1985) found that spending a large sum on a new product reduces the willingness to purchase a cheap yet superior replacement.

Note, however, that the phenomenon studied in Zultan et al. (2010) and in the current paper is distinct from the sunk cost effect. While the sunk cost effect focuses on the absolute *actual* past investment, we are interested in the effect of a *counterfactual* alternative. While sunk cost may play a role in participants' decisions, it is constant across our experimental conditions, which manipulate the *awareness* of a cheaper counter-factual option (studies 1,2 and 4), or the *cost* of a counter-factual option (study 3).

Overview of the experiments. We conducted four studies. Study 1 develops a new experimental paradigm to conceptually replicate the results of Zultan et al. (2010) with real experiences while ruling out regret as a potential explanation. Study 2 builds on the paradigm introduced in Study 1 to test the additional effect of regret over and beyond that of waste. We do so by fixing the wasteful outcome and manipulating whether the payment scheme was determined exogenously as in Study 1 or by the participant's choice, while carefully controlling for potential selection effects. Studies 3 and 4 extend the previous findings from self-reported and attributed feelings and emotions to decisions in a hypothetical scenario (Study 3) and in payoff-relevant decisions (Study 4). Replication materials for all studies are available at https://osf.io/mhnfx/?view_only=8643a3f7421d4dbda7910c1ccd6377cc.

Study 1

Study 1 extends the waste aversion effect due to Zultan et al. (2010) in two important ways. First, the participants in the experiment report their satisfaction with real, experienced outcomes (as opposed to participants in Zultan et al. (2010) who reported satisfaction with hypothetical scenarios). Second, rather than allowing participants to choose the payoff scheme, which confounds waste aversion and regret (as discussed in the introduction), a random mechanism determines the choice between the two options. Thus, the new study is able to establish the existence of the waste aversion effect in actual satisfaction with real events, while eliminating decision regret as a potential confound.

Our experimental paradigm is designed to capture the following essential features of the hypothetical scenarios studies in Zultan et al. (2010):

- A costly (in terms of time and effort) action is taken repeatedly in order to reach a well defined goal.
- The number of repetitions required to reach the goal is determined by chance.

Table 1

Overview of studies

		Outcomes	
		Feelings	*Behavior*
Methodology	*Scenario*	(Zultan et al., 2010)	Study 3
	Experience	Studies 1 & 2	Study 4

- The actions carry a monetary cost, depending on one of two available payment plans.
- One payment plan is preferable to the other if it turns out that a small number of repetitions is needed in order to reach the desired goal, but is inferior otherwise.

Method

Participants. Participants were 156 students recruited from the subject pool of the Max Planck Institute of Economics in Jena using ORSEE (Greiner, 2015). The hypothetical scenarios of Zultan et al. (2010) stipulated that the protagonist opted for the expensive payment plan and reached the desired goal. Due to the chance element in our experiment, forty-two participants participated under the cheap payment plan or did not reach the goal, and are thus not part of the analysis, leaving 114 participants in our data.

Design. Participants could win a prize by rolling a 6 in a computerized die roll. Each participant rolls a die repeatedly until she rolls a 6 (and wins the prize) or reaches a predetermined number of rolls. More rolls provide a better chance to win the prize of 100 ECU.[2] To make the rolls costly in time and effort (mimicking real life scenarios, such as apartment hunting), the participant had to perform a simple yet effortful addition task before each roll.

Overall, there were two possible payment plans:

- **Cheap:** Three attempts to roll a 6 at a cost of 30 ECUs.
- **Expensive:** Nine attempts to roll a 6 at a cost of 60 ECUs.

In the *Control* condition, participants were only offered the Expensive plan, and were unaware of the Cheap plan. In the *Aware* condition, participants were informed about both plans, after which the computer randomly assigned them to one of the two plans. The probability of receiving the Expensive plan was 0.8. Participants knew that the choice was random, but did not know the exact probabilities assigned to the different payment plans. Our analysis is restricted to the participants assigned the *Expensive* plan.

Procedure. We conducted the sessions for Study 1 and Study 2 (see below) jointly. In total, there were 10 sessions with 32 participants each. We randomly assigned participants in each session to a study and an experimental condition.[3] After the participants entered the laboratory and were assigned to isolated cubicles, the experimenters handed out the general instructions and read them aloud (See Appendix A for the translated instructions). The general instructions explained the procedure of the experiment excluding the way in which the number of attempts is to be determined. Once all of the participants indicated that they understand the instructions, the experiment proceeded on the computer terminal independently for each participant. The computerized experiment was programmed using z-Tree (Fischbacher, 2007, see Appendix B for the onscreen instructions).

[2] ECU stands for Experimental Currency Units, which were converted to cash at the end of the experiment (100 ECU = 4 Euro).

[3] The number of participants assigned to each condition slightly changed from session to session to approach equal numbers of participants participating under the Expensive payment plan.

To start the experiment, the participants rolled twice in order to acquaint themselves with the rolling procedure, which is described below. The two practice rolls were identical for all participants, and did not result in a win. Before each roll, the participant had to solve four simple addition problems correctly. Each problem involved adding up five randomly chosen numbers between 1 and 10. Once the participant provided the correct solution for a problem, the next problem appeared on the screen. After the participant solved the last problem correctly, a "Click to roll" button appeared on the screen. Rolling continued either until the participant rolled a 6 and won the prize, or until the allotted number of rolls was exhausted without winning the prize.

After the rolling stage ended, participants rated their satisfaction with their actual outcome on a 7-point Likert scale. Additionally, participants who were assigned the Expensive plan rated their satisfaction with (hypothetically) rolling a 6 on the third roll and on the fourth roll. These participants also stated their preference between these two possible outcomes, and explained their preference. Two independent raters coded the explanations provided by assigning explanations to seven predetermined categories, which included the perceived wastefulness of the outcome.[4] The questions appear in Table 2.

Finally, participants could pay for an additional opportunity to win the prize by rolling (up to) nine more times, as in the Expensive plan. We elicited willingness to pay using the BDM mechanism (Becker et al., 1964). Once all participants in the session finished this stage, we calculated the final payoffs and paid participants individually and anonymously.

Table 2

Questionnaire items

Q1	You have [not] won the prize. How happy are you with this outcome?[a]
Q2	How happy would you have been, had you rolled 6 in the third roll?[ab]
Q3	How happy would you have been, had you rolled 6 in the fourth roll?[ab]
Q4	What would have made you happier, to roll a 6 to win in the third roll, or to roll a 6 to win in the fourth roll? Please explain your answer.[b]

[a]Answers were provided on a 7-point Likert scale.
[b]Question appeared only if the participant had nine attempts to roll.

Hypotheses

Our main hypothesis is with regard to actual satisfaction following actual experiences:

Hypothesis 1. Experienced outcome satisfaction. *Awareness of the Cheap option moderates the effect of rolling a 6 early (in the first three attempts) on satisfaction.*

We pose two auxiliary hypotheses. The comparisons of satisfaction with the actual outcome are necessarily made between subjects, as each participant can experience only one outcome. Consequently, we cannot test directly violations of dominance (being more satisfied with the dominated outcome of rolling more times to reach the same goal). The second hypothesis aims to test violations of dominance based on participants' explicit statement that they would be happier with the dominated outcome.

Hypothesis 2. Violations of dominance. *Awareness of the Cheap option increases the likelihood of stating a preference for winning the prize on the fourth roll over winning the prize on the third roll.*

The final hypothesis aims to test whether the hypothesized effect on satisfaction carries over to willingness to pay for repeating the experience.

Hypothesis 3. Propensity for repeating the experience. *Awareness of the cheap option reduces willingness to pay to repeat the experience.*

[4]A typical example of a perceived wastefulness explanation is "The investment of 60 ECU is justified by winning on the fourth roll". The other categories included arguments for frugality on one hand and for enhanced excitement associated with a later win on the other hand, as well as answers indicating indifference, misunderstanding, and missing answers.

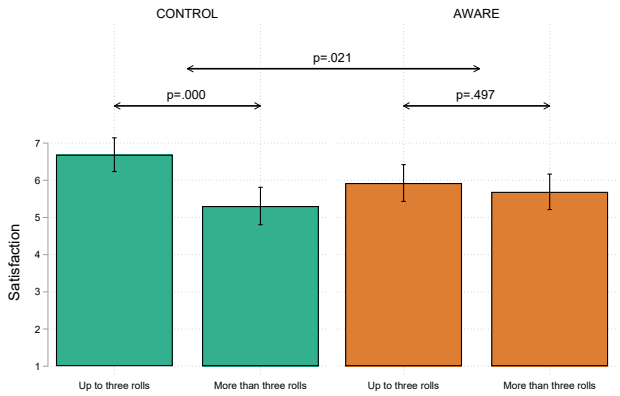

Figure 1

Satisfaction in Study 1.

Results

Experienced outcome satisfaction

We conducted a two-way ANOVA of reported satisfaction by condition and outcome. Figure 1 presents the mean reported satisfaction across condition and outcome with confidence intervals based on the ANOVA results. The ANOVA model is highly significant ($F(3,110) = 5.98, p < .001$). The main effect for outcome is significant ($F(1,110) = 18.49, p = .001, \eta^2 = .091$), indicating that spending more time and effort in order to reach the goal indeed results in lower satisfaction. As hypothesized, awareness of the Cheap option has no significant effect on the satisfaction of people who needed more than three attempts to win the prize ($t(110) = 1.09, p = .277$), but significantly reduced the satisfaction of those who were lucky and won the prize within the first three rolls ($t(110) = 2.25, p = .026$). The moderation effect is significant ($F(1) = 9.26, p = .021, \eta^2 = .048$). This confirms Hypothesis 1.

Violations of dominance

Sixteen of 58 (27.6%) participants in the Control condition indicated that they would be more satisfied with winning the prize on the fourth roll rather than on the third roll. This proportion increased to 21 of 56 (37.5%) in the Aware condition, however this increase is not significant ($\chi^2(1) = 1.28, p = .258$). Thus, we do not find significant support for Hypothesis 2.[5]

The inter-rater reliability for whether the justifications provided by participants for their choices reflects waste aversion is strong ($\kappa = .87, z = 10.93$).[6] We consider a justification to reflect waste aversion if both judges estimated it to be so. Of 37 justifications provided in the Control condition, only one justification (2.7%) reflected waste aversion, compared to 9/39 (23.1%) in the Aware condition ($\chi^2(1) = 6.90, p = .009$). This suggests that the difference in stated preferences, albeit not reaching significance, is associated with feelings of waste aversion when the Cheap option was available.

Propensity for repeating the experience

A previously available cheaper option reduces satisfaction with the dominant outcome. The second part of the experiment was aimed at testing whether this effect extends to the evaluation of the experience and the willingness to pay (WTP) to repeat it. However, WTP is not significantly correlated with the reported satisfaction ($r = .051, p = .588$). A two-way ANOVA of WTP on condition and outcome is not significant ($F(2,111) = 1.59, p = .210$). If at all, the WTP is higher in the Aware condition (43.9 in Aware vs. 38.6 in Control, $F(1,111) = 3.10, p = .081$. Thus, we do not find support for Hypothesis 3.

Discussion

Awareness of the counterfactual Cheap option reduced actual satisfaction with the dominant outcome, namely reaching the desired goal while expending fewer resources than in the dominated outcome. The

[5] We restrict the analysis to the direct comparison. The happiness ratings provided separately for the two outcomes were identical for more than 50% of the participants, and were otherwise generally consistent with the direct comparison.

[6] The two independent judges rated all of the justifications provided in Studies 1 and 2 in random order, without being aware of the study or the experimental condition associated with any specific justification. Interrater reliability was calculated across both studies.

results obtained in the experiment support our main hypothesis, thereby strengthening and extending the conclusions of Zultan et al. (2010) in two ways. First, previous results were confined to *projected* satisfaction in *hypothetical* scenarios. Our results show that the waste aversion effect emerges with *actual* satisfaction following *real* experiences.

Second, in terms of the theoretical underpinning of the effect, it is difficult to completely rule out decision regret as a potential driver of the effect in vignette research, as in Zultan et al. (2010). In our laboratory experiment, the choice of payment plan is unequivocally out of the hands of the participant. We can therefore conclude that decision regret is not a necessary condition for replicating the previous results. To the best of our knowledge, this is the first experimental evidence for the effect of waste aversion controlling for decision regret.

Hypothesis 2 aimed to replicate the results with projected satisfaction obtained by Zultan et al. (2010). Although we find some support for this hypothesis—particularly when considering participants' justifications for their preference—the effect is much less pronounced than the equivalent effect found in Zultan et al. (2010) across different contexts and dependent variables. While it is impossible to draw clear conclusions from the comparison of studies conducted with different populations using different methods, one prominent potential explanation for the weaker effect found in the current study is the complete elimination of regret—which may have contributed to the effect in the previous studies. Study 2 explores the implications of regret in our new paradigm.

Study 2

In Study 1 participants did not choose their payment plan. In the *Control* condition they were simply assigned the *Expensive* plan, without any mention of an additional option, and in the *Aware* condition they they were aware of both plans, but were randomly assigned one of them. Thus, the effects of awareness of the counterfactual option did not result from the participant making an active decision. Nonetheless, we may ask whether decision regret plays an additional role or interacts with (outcome-based) waste aversion. Acknowledging that feelings of waste may vary depending on whether a person actively chose to enter a potentially wasteful situation (the *Expensive* plan), or whether the situation was determined exogenously, Study 2 includes a *Choice* condition, where participants actively choose the payment plan—*Cheap* or *Expensive*—they prefer.

Comparing participants who chose the *Expensive* plan in the *Choice* condition with participants who were randomly assigned the same plan in Study 1's *Aware* condition is problematic due to selection problems: it is likely that some of those assigned the *Expensive* plan in the *Aware* condition of Study 1—but not those who explicitly chose it in the *Choice* condition of Study 2—would have preferred the *Cheap* plan had they been given the choice.

To address this problem, Study 2 included a *Preference* condition, in which the plan (*Cheap* or *Expensive*) is chosen randomly as in the *Chance* condition, but participants are *first* asked to state their preference between the two payment plans. Thus, participants in the Preference condition who expressed a preference for the Expensive plan provide a subsample that is comparable to participants who chose the Expensive plan in the Choice condition, yet were *randomly* assigned a payment plan as in the Aware condition of Study 1, such that decision regret should not play a role in their responses.

To sum, Study 2 includes two new experimental conditions, *Choice* and *Preference*. In both conditions, the participants are aware of the Cheap option, hence waste aversion plays a similar role. Decision regret, however, plays a role only in the Choice condition. The comparison between the two conditions thus reflects the additional role that aversion to decision regret may have in waste aversion.

Method

Participants. Participants were 164 students recruited from the subject pool of the Max Planck In-

stitute of Economics in Jena using ORSEE (Greiner, 2015). We excluded 56 participants from the analysis because they were assigned (due to chance) the Cheap payment plan, stated a preference for the Cheap payment plan, or did not reach the goal, leaving 108 participants in our data.

Design and procedure. The experimental design and procedure were identical to those of Study 1 with one alteration. After learning about the two payment plans, participants indicated which payment plan they prefer. Next, the instructions in the *Choice* condition indicated that the participant's choice will determine the implemented payment plan. Conversely, the instructions in the *Preference* condition indicated that the computer will randomly choose the payment plan, as in the Aware condition of Study 1. The rest of the experiment proceeded as in Study 1.

Hypotheses

As in Study 1, our hypotheses address actual satisfaction, projected satisfaction, and willingness to pay for repeating the experience.

Hypothesis 4. Experienced outcome satisfaction. *Actively choosing the payment plan moderates the effect of rolling a 6 early (in the first three attempts) on satisfaction.*

Hypothesis 5. Violations of dominance. *Actively choosing the payment plan increases the likelihood of stating a preference for winning the prize in the fourth roll over winning the prize on the third roll.*

Hypothesis 6. Propensity for repeating the experience. *Actively choosing the payment plan reduces the willingness to pay to repeat the experience.*

Results

Experienced outcome satisfaction

We conducted a two-way ANOVA of reported satisfaction by condition and outcome. Figure 2 presents the mean reported satisfaction across conditions and outcomes with confidence intervals based on the ANOVA results. The ANOVA model is only significant at the 10% level ($F(3,104) = 2.38, p = .074, \eta^2 = .064$). The interaction is not statistically significant ($F(1,104) = 1.53, p = .219, \eta^2 = .015$), and in the opposite direction from Hypothesis 4.[7]

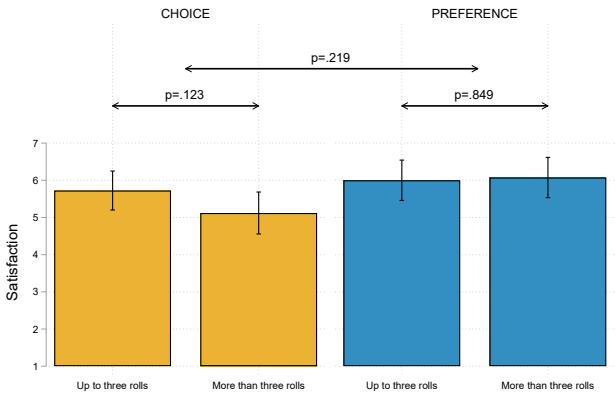

Figure 2

Satisfaction in Study 2.

Overall, reported satisfaction is similar to that observed in the Aware condition of Study 1, suggesting that decision regret has no additional effect on satisfaction beyond that caused by feelings of waste.[8] Thus, we do not find support for Hypothesis 4.

Violations of dominance

Thirty-one of 54 (57.4%) participants in the Control condition indicated that they would be more satisfied with winning the prize on the fourth roll rather than on the third roll. This proportion is significantly higher than the 19 of 54 (35.2%) in the Preference condition ($\chi^2(1) = 5.36, p = .021$). Consistent with this finding, we find that 20/39 participants in the Choice condition alluded to feelings of waste when justifying their response, compared to only 9/42 in the Preference condition ($\chi^2(1) = 7.84, p = .005$).

[7] The only significant difference is between the Preference condition compared to the Choice condition, only for participants who required more than three rolls to win the prize ($t(104) = 2.42, p = .017$). This difference is not consistent with regret aversion.

[8] As noted, the selection problem precludes formal comparisons across the two studies.

Thus, while we did not find evidence for decision regret affecting actual satisfaction (Hypothesis 4 was not supported), it appears that our participants did expect such an effect, lending support to Hypothesis 5.

Propensity for repeating the experience

As in Study 1, An ANOVA of WTP on condition and outcome is not significant ($F(2, 105) = 0.03, p = .971$). Thus, The data do not support Hypotheis 6.

Discussion

The results of Study 2 reveal an interesting disparity between projected and actual feelings. The literature on impact bias has shown that people tend to overestimate the intensity of their emotions (Wilson & Gilbert, 2003, 2005). In this study, participants clearly expected to experience stronger adverse feelings if the outcome does not justify their decision in retrospect. That is, they overestimated how much regret they would feel. This expectation, however, was not reflected in the actual reported feelings. That is, participants believed that they would experience a stronger sense of wastefulness and dissatisfaction if they were responsible for the unpleasant outcome, yet practically, having made an active decision did not augment the unpleasant feeling associated with their outcome relative to the preference condition.

Study 3

Studies 1 and 2, as well as the studies in Zultan et al. (2010) looked at feelings of waste. In Studies 3 and 4 we turn to look at whether these adverse feelings lead people to make different *decisions*. Study 3 looks at people's intended choices in hypothetical scenarios and demonstrates the role of outcome (rather than process) regret for satisfaction and sense of wastefulness when acting wastefully. Study 4 will examine actual payoff-relevant decisions.

Method

Participants. Respondents were a convenience sample of 80 students at Ben-Gurion University of the Negev and the College of Management in Israel who volunteered to participate in a brief survey.

Design and procedure. The experiment included a Control condition and a Waste condition. As in the Aware condition of Study 1, respondents in the Waste condition were aware of a counterfactual option that is cheaper if the search ends early. We manipulated perceptions of wastefulness by slightly altering the counterfactual option in the Control condition, so that it is always more expensive.

Participants read the apartment hunting scenario presented in Table 3 and indicated whether they would end the search after seeing a reasonably suitable apartment. The scenario depicts a hypothetical situation in which the respondent purchased a monthly rail ticket for the purpose of searching for a new apartment. The monthly ticket is cheaper than the alternative of purchasing a daily ticket on each day of travel only if the respondent searches for 16 days or more. The question posed is whether to end the search after 15 days, which will render the purchase of the monthly ticket wasteful. The Control condition involved an identical scenario with one difference; The price of the forgone daily ticket is raised from 44 to 54 NIS. The implication is that 13 days of daily travel are already more expensive than the monthly ticket. Hence, feelings of waste when ending the search on the $15th$ day are relevant in the Waste condition, but not in the Control condition.

Hypotheses

Hypothesis 7. *Respondents will be less likely to end the search in the Waste condition.*

Results

Twenty six of the 40 (65.0%) respondents in the Waste condition indicated they would prefer to continue searching, compared to 15/40 (37.5%) in the Control condition. The difference is significant ($\chi^2(1) = 6.05, p = .014$). Figure 3 presents the results with 95% confidence intervals.

Table 3

Scenario used in Study 3.

Apartment hunting scenario, Waste condition
You live in Tel Aviv and are about to begin your studies at Ben-Gurion University this coming October. You plan to rent an apartment in Beer Sheva [where BGU is located] for next year. In order to find an apartment, you will have to travel by train several times to Beer Sheva until you find the right apartment. You have two options: **(a)** Buy a return ticket on each day of travel. The price of the ticket is 44 NIS. **(b)** Buy a monthly ticket at a price of 690 NIS (Just under 16 return tickets). After deliberation you chose the monthly ticket. On your 15th attempt, you find a furnished apartment, with the number of flatmates you wanted, air conditioned and close to the university. The rent is 100 NIS more than you expected to pay, and the bedroom is smaller than you were looking for. The owner is there and is willing to sign a contract on the spot. If you give up the apartment, someone else will surely take it within a day at the most. You do not have time to see more apartments on that day, so if you don't sign on this apartment you will have to continue your search another day. **Which of the two options would you prefer?** **A.** End your search and sign a contract with the owner (and not continue to use the monthly rail ticket). **B.** Continue your search for an apartment.

Note: In the Control condition, the price of a return ticket was 54 NIS. The price of the monthly ticket remained 690 NIS, equivalent to just under 13 return tickets.

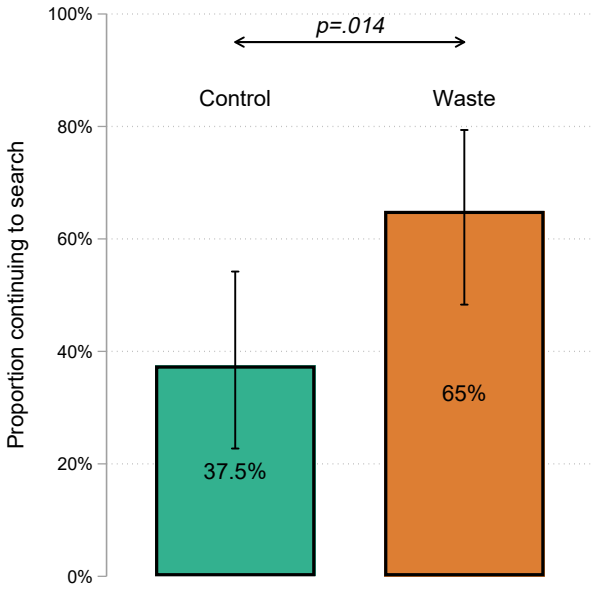

Figure 3

Preference for continuing search in Study 3.

Discussion

The results indicate that people anticipate feelings of waste, and are willing to extend a costly search in order to avoid such feelings. The result is both stronger and weaker than what we observed in Study 1 and in Zultan et al. (2010). It is stronger because it addresses decisions and not only feelings. At the same time it is weaker, as the extended search is not dominated in the current study. In Study 1, the prize is the same regardless of when it was won. In Study 3, a future apartment may be better than the one described in the scenario. Nonetheless, there is no reason to think that the price of the (counterfactual) daily ticket has any effect on the apartments that respondents expect to encounter in a future search. Therefore, anticipated feelings of waste lead people to choose an option that is otherwise suboptimal.

Study 4

Study 4 extends Study 3 by examining actual payoff-relevant decisions rather than hypothetical decisions. The study tests the effect of awareness of a counterfactual alternative on participants' engagement in wasteful behavior. In Study 1, we showed that participants who are aware of a counterfactual reality—in which they could have invested less to achieve the same outcome—are less satisfied with their outcome. In certain cases—e.g., the scenario in Study 3—further utilizing a service paid for even when an acceptable outcome has already been reached, may help eliminate this negative feeling of

wastefulness.

In Study 4 participants sequentially search boxes for a prize. Similar to the scenario in Study 3, searching is costly, and can be paid for either per-box or with a global one-time payment. As in Study 1, the payoff scheme is implemented randomly, eliminating the effect of regret. We predict that awareness of the per-box option leads participants to extend their search in order to justify the expenditure associated with the one-time payment.

Method

Participants. Participants were 195 students at the faculty of management in Tel Aviv University who were required to complete a quota of lab credit points. Participants received 15 lab credit points as a participation fee and could increase their earnings by collecting additional points.

Design and procedure. The experimental task involved sequentially opening boxes that contain prizes of various sizes. Participants open up to three boxes one after the other. When opening a box, the participant observes the prize within the box, an integer amount between one and 20 credit points. After observing the prize amount, the participant decides whether to accept the amount in the box or continue to open the next box. If they choose to continue, they cannot return to the forgone box. Participants could open up to three boxes. The third prize, if reached, must be accepted.

Two payment plans were available:

- **Per Box:** Pay five credit points to open each box.
- **Global:** Pay nine credit points to open up to three boxes.

In the *Control* condition, participants paid according to one of the two plans without being aware of the other plan. In the *Aware* condition, we informed participants of the two plans, after which the computer randomly assigned them to one of them.

To control for experience, we focus on the decision whether to accept the credit-point prize in the first box (as opposed to continuing to search the second/third boxes). To avoid floor and ceiling effects due to a low or high number of points in the first box (e.g., nearly all participants stop searching after the first box if the prize is high, or opt for another box if the prize is low), the number of points in the first box was randomly drawn from a central subset of the entire $[1, 20]$ range. In the Global plan, the range was $[10, 12]$, and in the Per-Box plan $[8, 10]$. The difference between the two plans is due to the different incentives to continue: in the global plan, the cost of opening boxes is sunk, hence the expected payoff from continuing is higher than in the per-box plan.[9] Note that this difference between the Global and Per-Box payment plans is inconsequential to our hypotheses and analysis, as we are interested in the difference between the *Control* and *Aware* conditions *within* each payment plan. The prizes in boxes two and three were randomly drawn from a uniform distribution between 1 and 20.[10]

Participants' final payoff was composed of the initial endowment of 20 credit points, minus the search costs, plus the prize in the chosen box (or the third box if the first two were not chosen). After the search was over, participants reported their final earnings, and indicated their satisfaction with their earnings and the extent to which they regret opening additional boxes on a 7-point Likert scale.

Hypotheses

Our main hypothesis pertains to the participants assigned to the Global payment plan. This option is, in retrospect, more expensive than the Per-Box plan if the participant chooses to accept the prize in the first box, but is cheaper otherwise. We therefore predict that participants who are aware of the Per-Box plan are more likely to reject the first prize.

[9] The range in each condition is set so that moderately risk-averse utility-maximizing participants who believe that the amount is drawn from a uniform distribution over 1 to 20 points are indifferent between accepting and continuing.

[10] The instructions stated that the prizes are between 1 and 20 credit points, which was true for all boxes.

Hypothesis 8. Extending the search to avoid feeling wasteful. *For participants assigned to the Global payment plan, the proportion of those choosing to accept the first box is lower in the Aware condition.*

Feelings of waste may also affect participants who were assigned the Per-Box payment plan, but in the opposite direction. Participants who pay Per Box, and choose to continue searching beyond the first box, end up paying more than they would had they been assigned the Global payment plan. Hence, adverse feelings of wastefulness may lead them to settle for the first box when they are aware of the Global plan.

Hypothesis 9. Stopping search to avoid feeling wasteful. *For participants assigned to the Per-Box payment plan, the proportion of those choosing to accept the first box is higher in the Aware condition.*

The possible feelings of waste for participants who pay Per Box (Hypothesis 9) are not as immediate as those behind the hypothesized effect for participants who pay with the Global plan (Hypothesis 8). Our dependent measure is the decision to accept or reject the first box. For participants deciding under the Global plan, the decision to accept the first box is wasteful. In contrast, participants deciding to continue under the Per-Box plan *may* experience waste only in the future, after learning the contents of the second and/or third box. We therefore expect a weaker effect for Hypothesis 9 than for Hypothesis 8.

Results

Decision to accept the first box

Figure 4 presents the share of participants who chose to accept the first box by condition and payment plan. In line with Hypothesis 8, in the Global condition the proportion of participants who chose to keep opening boxes after seeing the content of the first box was higher for participants who were aware of the counterfactual Per-Box option than for participants who were not aware of it (31.8% vs. 52.1%, $\chi^2(1) = 3.860, p = .049$). Qualitatively in line with

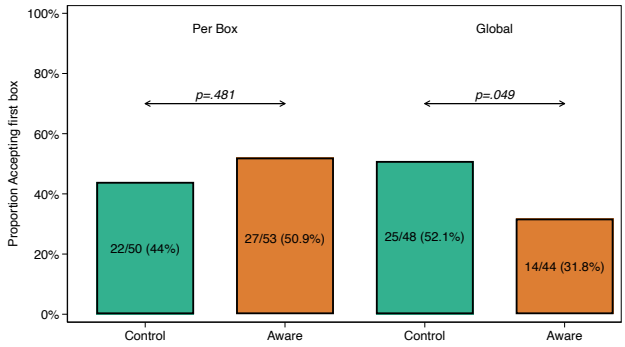

Figure 4

Acceptance of first box.

Hypothesis 9, within the Per-Box condition, awareness of the counterfactual option had the opposite effect, decreasing the preference to keep opening boxes from approximately 50.9% to 44.0%, however this difference was not statistically significant ($\chi^2(1) = 0.497, p = .481$).

A logistic regression predicting the probability of continuing to open boxes based on the condition (payment scheme and awareness) while controlling for the observed amount in the first box confirms these results. Participants were, on average, 8.9 percentage points more likely to accept the first box for each additional credit point in the box. Awareness of the counterfactual option increased, on average, the probability of continuing to open boxes in the Global treatment by 18.8 percentage points ($z = 1.87, p = .062$) and had a non-significant negative effect in the Per-Box condition (5.7 percentage points; $z = 0.59, p = .555$).

Outcome satisfaction

Table 4 presents the results of logistic regressions with outcome satisfaction as the dependent variable. The regression in Column (1) reveals a significant difference based on payment scheme, with higher satisfaction reported in the Global condition. This difference, however, is explained away by adding the collected amount from the chosen box as a control in Column (2). Thus, participants who earn more report higher satisfaction. Because the global option

provides, on average, more credit points, it leads to higher satisfaction than the Per-Box option.

These results are consistent with studies 1 and 3, suggesting that participants are more likely to act wastefully in order to overcome a counterfactual sense of waste. However, this wasteful behavior does not reduce satisfaction.

General Discussion

In the current research we replicated and extended previous findings by Zultan et al. (2010), who demonstrated using hypothetical scenarios that individuals believed they would feel more satisfied if fully utilized a paid service. Our studies demonstrate that reduced satisfaction due to lack of utilization of a service may exist even within real life decisions with real outcomes and is not limited to hypothetical scenarios. Our studies also further specified the role of regret for wastefulness and individuals' satisfaction. The results reveal that it is outcome regret that plays a more relevant role for wastefulness and the dissatisfaction that is associated with it, rather than process regret. Study 1 showed that participants' awareness to a counterfactual reality, in which they could pay less to achieve a dominated outcome, reduced their reported satisfaction if they did not fully utilized the number of die rolls that were available to them. Participants which intuitively should have been pleased by achieving the same outcome quickly and with less effort were less satisfied if they knew that they could spend less.

The results further contribute to the work done by Zultan et al. (2010) by clarifying the process that encourages individuals to act wastefully. Study 1 demonstrated that awareness to the counterfactual option reduced actual satisfaction, implying that outcome regret plays a role (e.g., I could have paid less to achieve a similar outcome). The decision that led to the wasteful choice was set randomly and not by participants themselves, hence excluding process regret as part of the mechanism. Furthermore, Study 2 revealed that process regret did not intensify the effect of wastefulness over satisfaction. Our results suggest that counterfactual, outcome regret is a more relevant factor that serves as a prime determinant for a sense of wastefulness. Study 2 further demonstrated that, making the choice of payment plan did not affect satisfaction, participants erroneously believed that they would experience a stronger sense of wastefulness and dissatisfaction if the unpleasant outcome was the result of their decision, presumably as it amplified their sense of (process) regret.

In Study 3 we extended the vignette paradigm to show that the effects of feeling wasteful goes beyond satisfaction, potentially leading people to keep searching to avoid these averse feelings. While the extended search is not strictly dominated, as in the previous studies, the participants' response to the slight change in the counterfactual alternative clearly shows that it is sub-optimal compared to their desired choice when the aspect of wasteful feelings is absent.

Finally, study 4 replicated these findings in a laboratory study with actual payoff-relevant decisions, demonstrating that being aware of a counterfactual reality in which one could have paid less, can increase the sense of wastefulness and encourage individuals to act wastefully (i.e., work harder and take more risks) in order to feel less wasteful and more satisfied.

The findings of the current studies clarify the complex nature of waste aversion and the ways in which the perception of waste influences satisfaction and decision-making processes. One of the key insights emerging from the experiments is that the feeling of "waste" may be reduced and even become a source of satisfaction when participants feel they have fully "utilized" the process that led to the outcome, even if this involves a greater expense of resouces (i.e., objective waste). This insight highlights the subjective nature of the feeling of waste.

From a practical standpoint, these findings can serve as a basis for improving consumer experiences within organizations. By creating processes that allow customers to experience a sense of fulfillment, their satisfaction can be enhanced, leading to more positive feelings, even when objective waste is in-

Table 4

Regressions on outcome satisfaction.

	(1)	(2)
Aware	−0.000	−0.163
	(−0.001)	(−0.504)
Global	0.868*	0.218
	(2.223)	(0.643)
Aware × Global	−0.481	−0.260
	(−0.866)	(−0.553)
Collected amount		0.244***
		(8.803)
Constant	4.340***	1.912***
	(15.875)	(5.314)
N	195	195

Notes: OLS regressions with outcome satisfaction as a dependent variable. t-values in parentheses, * p<0.05, ** p<0.01, *** p<0.001.

volved. For example, loyalty programs that allow customers to choose from a variety of options, rather than those that restrict customers to a specific path, may enhance their sense of fulfillment and satisfaction.

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Appendix A

General Instructions in Studies 1 and 2.

Welcome and thanks for participating in this experiment. Please remain quiet and switch off your mobile phone. Do not speak to the other participants. Communication between participants will lead to the automatic end of the session with no payment to anyone. Whenever you have a question, please raise your hand and one of the experimenters will come to your cubicle. You will receive 2.50 euros for having shown up on time. The experiment allows you to earn additional money. Since your earnings during the experiment will depend on your decisions, and may depend on chance, the better you understand the instructions, the more money you will be able to earn.

In this experiment you will not interact with any other participant. The decisions of the other participants will not affect your earnings and, similarly, your decisions will not affect the earnings of the other participants.

During the experiment, we shall not speak of euros but rather of ECU (Experimental Currency Unit). **At the beginning of the experiment you receive** 100 **ECU, which are now in your account**. You can win or lose ECUs throughout the experiment, depending on your decisions and on luck.

Description of the experiment

In today's experiment you can earn money by playing a game of luck. In this game, you roll a virtual die for a certain number of times. If you roll a 6, then you will win a prize of 100 ECU and stop rolling. If you use up the allotted number of rolls without rolling a 6, you will not win the prize. The probability of rolling each number 1,2,3,4,5,6 is equal, and is 1/6.

Rolling

Before each time you roll, you must answer correctly three simple addition problems, such as the following:

$$3 + 8 + 5 + 2 + 9 = ?$$

For each problem you must fill in the correct answer and then click the CHECK button. If your answer is correct, the next problem will appear on the screen. After you have answered all of the three problems correctly, you will be able to make the next roll. This will be repeated before each roll, until you have rolled a 6 or have used up your allotted number of rolls.

Further instructions regarding the exact number of rolls that you get will be displayed to you on screen at the beginning of the experiment.

Please remain seated quietly until the experiment starts. If you have any questions please raise your hand now.

Appendix B

On-Screen Instructions for Studies 1 and 2.

You have a limited number of attempts to roll a 6.
If you will not roll a 6, you will not win the prize.
Therefore, the more attempts you have, the higher are your chances of winning the prize.
You will pay for the rolls with the ECUs you have in your account.
Naturally, the more attempts you buy, the more you have to pay.

Study 1, Control condition

You will now pay 60 ECU and will be able to roll nine times.

Study 1, Aware condition and Study 2, both conditions

There are two options:

(a) You pay 30 ECU for three attempts to roll the die.
(b) You pay 60 ECU for nine attempts to roll the die.

Study 2, both conditions

Please indicate, which option you would prefer:

○ You pay 30 ECU for three attempts to roll the die.
○ You pay 60 ECU for nine attempts to roll the die.

Study 1, Aware condition

The computer will randomly choose one of the two options.

Study 2, Preference condition

The computer will randomly choose one of the two options.
The computer's choice is not influenced by your preference.

Study 2, Choice condition

According to your preference, you will now pay 60 ECU and will be able to roll nine times.

Study 1, Aware condition and Study 2, preference condition

The computer determined that you will now pay 60 ECU and will be able to roll nine times.

Appendix C
Instructions for Study 4

<TEXT IN TYPEWRITER FONT APPEARED ONLY IN THE AWARE CONDITION.>

Thank you for taking part in our study.

Please read the instructions carefully and click "Continue" when you understand the rules.

You have 20 Credit Points.

You can accumulate more points by opening boxes. You can open three boxes at most. Each box contains credit points, which you can add to your existing points. Each box contains between 6 and 20 points. Each time you open a box, you will see how many points it contains, and you will be able to chooses either to take these points or to discard them and open another box. It is not possible to return to previous boxes. To receive the points, you must open at least one box.

You have to pay for the possibility of opening additional boxes, using the credit points you already have.

There are two options for paying for opening boxes:

<ONLY ONE OF THE TWO OPTIONS APPEARED IN THE CONTROL CONDITION.>

OPTION 1: You will pay 5 credit points for every box you wish to open. If you open one box, you pay 5 points, if you open two boxes, you pay 10 points, if you open three boxes, you pay 15 points.

After opening each box, you will be able to choose whether to accept the points in that box, or discarding them, pay an additional 5 points and continue to the next box. If you choose to accept the points in the box (or if you have reached the third box), the experiment will end and the points will be added to your point balance.

OPTION 2: You will pay 9 credit points for the possibility of opening up to three boxes. The payment is fixed, that is, you have to pay 9 points whether you choose to open one box or whether you choose to open

two or three boxes.

After opening each box, you will be able to choose whether to accept the points in that box, or discarding them and continue to the next box. If you choose to accept the points in the box (or if you have reached the third box), the experiment will end and the points will be added to your point balance.

<In the following comprehension questions, choosing an incorrect answer triggered a message stating "Try again". A correct answer triggered a message confirming the answer and providing detailed explanation.>

To confirm that you understand, please answer the following questions assuming that the payment is according to OPTION 1:

You saw 16 points in the first box and decided not to continue. What is your payment in credit points?

- ○ 31 points
- ○ 16 points
- ○ 27 points
- ○ 22 points

You saw 3 points in the first box, 14 points in the second box, and 11 points in the third box. What is your payment in credit points?

- ○ 31 points
- ○ 16 points
- ○ 27 points
- ○ 22 points

To confirm that you understand, please answer the following questions assuming that the payment is according to OPTION 2:

You saw 16 points in the first box and decided not to continue. What is your payment in credit points?

- ○ 31 points
- ○ 16 points
- ○ 27 points
- ○ 22 points

You saw 3 points in the first box, 14 points in the second box, and 11 points in the third box. What is your payment in credit points?

- ○ 31 points
- ○ 16 points
- ○ 27 points
- ○ 22 points