

Consequences of regret aversion: 2. Additional evidence for effects of feedback on decision making

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Consequences of Regret Aversion 2: Additional Evidence for Effects of Feedback on Decision Making

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We discuss the effects of anticipated and experienced regret on decision making under uncertainty. In previous research, using the standard, context-free, gamble paradigm, we found that decision makers anticipate the regret they can experience as a result of post-decisional feedback on forgone outcomes (Zeelenberg, Beattie, van der Pligt, & de Vries, 1996). In the present research we move away from the gamble paradigm, on to richer contexts. In Experiments 1 and 2, involving investment decision making and decision making in the ultimatum game, it is shown that the expectation of feedback on forgone outcomes influences decision making and can promote more risk seeking behavior. Experiment 3 focused on effects of retrospective regret and shows that actual feedback on foregone outcomes influences the experience of regret and subsequent decision making. The results of these studies support our earlier work on regret aversion. © 1997

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Jane Beattie died from cancer on March 25, 1997, at the age of 36. The research presented in this article was a real joint effort. Because of her illness and her untimely death Jane was never able to read the final version of this paper. This research was supported by a European Community Marie Curie Fellowship (ERBFMBICT961052) awarded to Marcel Zeelenberg. Preliminary data of this paper were presented at IAREP-21, held from 11 to 14 September 1996, in Paris, France, and at SPUDM-16, held from 17 to 21 August 1997, in Leeds, United Kingdom. Thanks are due to Ian Todd for his help in collecting the data of Experiment 1, and to Henk Aarts, Rosie Murray, and two anonymous reviewers for their helpful comments on an earlier draft of this article.

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Negative emotional states often evolve in response to unfavorable outcomes of decisions. Regret is experienced when it turns out, in retrospect, that you should have chosen something different. For example, when you invested your uncle's inheritance in a particular option and find out that another option would have provided you with a much larger profit, or when you, while negotiating, decided to make the other party a too generous offer and learn later that they would also have accepted a much lower offer.

Regret is an aversive state, and it is therefore not surprising to see that we do not sit and wait for this emotion to occur. To the contrary, we are apt to choose in such a way that we minimize our future regrets. In the present paper we focus on how this *regret aversion* influences our decisions under uncertainty.

Although ideas about the role of regret were long present in decision research (e.g., Savage, 1951), it was not until the early 80s before the anticipatory aspects of regret were explicitly incorporated in Bell's (1982) and Loomes and Sugden's (1982) "regret theory." In regret theory it is assumed that people compare the actual outcome with what the outcome would have been, had a different choice been made, and that they experience regret when the foregone outcome would have been better, and rejoicing when the foregone outcome would have been worse. It is also assumed that these emotional consequences of decisions are *anticipated* and taken into account when making decisions.

Obviously, not all our decisions are influenced by the anticipation of regret, and an important question in regret research is therefore concerned with the boundary conditions under which regret exerts its influence. Recent research showed that the expectation of feedback on the rejected options is one of the prime determinants of whether people anticipate regret or not (Josephs Larrick, Steele, & Nisbett, 1992; Larrick & Boles, 1995; Ritov & Baron, 1995; Ritov, 1996; Zeelenberg, Beattie, van der Pligt, & de Vries, 1996). We discuss here primarily our own work on the effects of expected feedback, because the present research is a follow up on these studies. In our former work we showed that the anticipation of regret can promote both risk avoiding and risk seeking tendencies, whereas earlier research suggested that it would only promote risk aversion (see for details, Zeelenberg *et al.*, 1996).

The design of the experiments reported in Zeelenberg *et al.* (1996) was as follows. Participants were given a choice between two gambles, one being relatively risky and the other being relatively safe. Participants always knew the outcome of the riskier gamble and the probability of winning it. For example in our Experiment 1 the riskier gamble would result in a gain of 130 Dutch Guilders with a probability of 35%, or in no gain with a probability of 65%. In the safer gamble they could gain an unknown amount X with a probability of 65%, or no gain with a probability of 35%. It was the participants task to write down the value of X for which they found the gambles equally attractive. Next, feedback on one of the gambles was manipulated orthogonally to the riskiness of the gambles. In all three experiments we had a Safe Feedback condition, in which the safer gamble would always be resolved, and a Risky Feedback condition, in which the riskier gamble would always be resolved. In addition, all participants expected to learn the outcome of the chosen gamble. Participants

in Safe Feedback condition were predicted to choose the safer gamble. The safer gamble would provide them with feedback on the chosen gamble only, and protect them from threatening feedback on the riskier gamble. Likewise, participants in the Risky Feedback condition, who would always learn the outcome of the riskier gamble, were predicted to opt for the riskier gamble. This predicted pattern was found in all three studies, in both high and low variance gambles, and in gambles involving both gains and losses. These studies thus show that the anticipation of regret influences behavioral choice and can promote risk averse *and* risk seeking tendencies.

In this paper we present three extensions of Zeelenberg *et al.* (1996). The first extension has to do with the fact that we used a choice between matched gambles paradigm in our former studies. Because participants made the gambles equally attractive, they would be indifferent when choosing between the two. The expectation of feedback then pushed participants' preferences either in the direction of the riskier gamble or in the direction of the safer gamble. One might argue that the influence of regret on decision making is exaggerated in such a paradigm, because of the initial indifference between the two gambles, and that our experiments only show that anticipated regret can be a tie-breaking mechanism. Experiment 1 of the present paper goes one step further and shows that expected feedback can also influence preferences when there is no initial indifference between the options.

The second extension is that we now focus on decisions that are less context-free. In Zeelenberg *et al.* (1996) we used the standard, context-free, gamble paradigm. Some researchers might argue that this approach has limited generality, and hence propose a move away from the gamble as research methodology, on to richer contexts. The present research attempts to do so. Experiment 1 focuses on a financial decision between two uncertain investment options. Experiments 2a and 2b focus on decision making in an interpersonal context; namely, the ultimatum game (Güth, Schmittberger & Schwarze, 1982).

The third extension is that we now also study *experienced* regret. We argue that not only anticipated future regret affects decision making, but that also experienced retrospective regret has an influence. Anticipated regret is evoked by the expectation of feedback, whereas experienced regret stems from actual feedback. In Experiment 3 we therefore manipulate the actual feedback following a decision and measure the intensity of experienced retrospective regret. By asking participants to make a second decision, after they received feedback and indicated their regret, we assess the influence of this retrospective regret on subsequent decisions.

In sum, the research presented in the present paper attempts to speak to and extend earlier work on regret, feedback, and decision making. The present research tries to show that expected, and actual, feedback does also affect decision making in less context free situations where the choice options are not matched and thus not equally preferable. In these experiments we manipulate the expected or actual feedback on the outcomes of the unchosen options. The prediction is that participants will make regret minimizing decisions.

EXPERIMENT 1: ANTICIPATED REGRET IN FINANCIAL DECISION MAKING

Experiment 1 tested whether the manipulation of feedback could also influence decision making, and cause preference reversals, when the two options are initially not equally attractive. Participants were asked to evaluate two financial investment options that differed in riskiness: The High Interest Account (HIA) and the Government Bond (GB). The HIA was the safer option since it would always provide them with a modest profit. The GB was riskier, it could result in a large profit, or no profit at all.

We expected that in a situation where there is only feedback on the chosen option (Choice Only Feedback condition), people would prefer to invest in the safer option (HIA). This prediction is based on the finding that people are generally risk averse when they choose between possible gains (cf., Kahneman & Tversky, 1979). In the case where there always is feedback on the riskier option (Risky Feedback condition), choosing for the safer option can result in regret when one finds out that the riskier option would have been a better choice. This feedback was manipulated by informing the participants that their sister's money was already invested in the GB.¹ In this case we expected that people would prefer to invest in this riskier option.

Method

Forty-one English undergraduate students volunteered to participate in this experiment and were randomly assigned to one of the two Feedback conditions. There were 20 participants in the Risky Feedback condition and 21 in the Choice Only Feedback condition. Participants in the Risky Feedback condition read the following scenario:

Your uncle has just died and left you £1000. You now have to decide how to invest the money for five years. Your uncle has also left your sister £1000, but her money is already invested for the same five years period in a Government Bond, which is guaranteed to pay back a total sum between £1000 and £1800 at the end of the five years. You can choose to invest your money in this type of investment too. A friend has just told you about another type of investment which you could choose, a High Interest Account, which is guaranteed to pay back a total sum between £1250 and £1350 at the end of the five years. You know that at the end of the five years you will find out how much money you would have made if you had chosen the Government Bond because your sister will tell you.

Participants in the Choice Only Feedback condition read a similar scenario, in which there was no sister and their friend told them about the two options. There was therefore no feedback on the HIA (the risky option), as there was in the Risky Feedback condition. After reading the scenario all participants were asked to indicate the strength of their preference for both investment options. They could do this on two 7-point scales with endpoints labeled *Definitely would not invest* (1) to *Definitely would invest* (7).

¹Information about the outcome of an unchosen alternative provided by a social comparison with a person who does obtain this outcome results in amplified regret, as was shown by Boles and Messick (1995).

Results and Discussion

Figure 1 shows participants' mean willingness to invest in both options for the two feedback conditions. Participants' answers were submitted to a 2 (Feedback: Risky vs Choice Only) \times 2 (Investment: HIA vs GB) analysis of variance with Investment as a within-subjects factor. This analysis yielded a Feedback \times Investment interaction, $F(1,39) = 8.80$, $p < .005$. As expected, participants in the Choice Only Feedback condition showed risk aversion; they were more willing to invest in the safer HIA ($M = 5.10$) than in the riskier GB ($M = 4.05$), $t(19) = 3.05$, $p < .05$. Participants in the Risky Feedback condition showed the predicted opposite pattern; they were more willing to invest in the riskier GB ($M = 5.19$) than in the safer HIA ($M = 3.33$), $t(20) = 2.23$, $p < .05$.

These results clearly indicate that the expectation of feedback on the outcome of a riskier option can promote risk seeking choices, even if the initial preference was for the safer option. In a choice between two investment options participants preferred the safer investment over the risky investment if there was only feedback on the chosen option. However, when participants expected that there would always be feedback on the riskier option they preferred riskier investment over the safer investment.

These findings corroborate and extend those reported in Zeelenberg *et al.* (1996). They also show that expected feedback can cause a preference for risk seeking in situations where the general preference is risk averse. These data were obtained using a somewhat more ecologically valid paradigm, that is, having participants make choices they could encounter in their own lives, instead of using the traditional gamble paradigm.

EXPERIMENTS 2a AND 2b: ANTICIPATED REGRET IN THE ULTIMATUM GAME

The present experiments explored another extension of our earlier findings. Experiment 1 and our earlier experiments studied purely individual decision

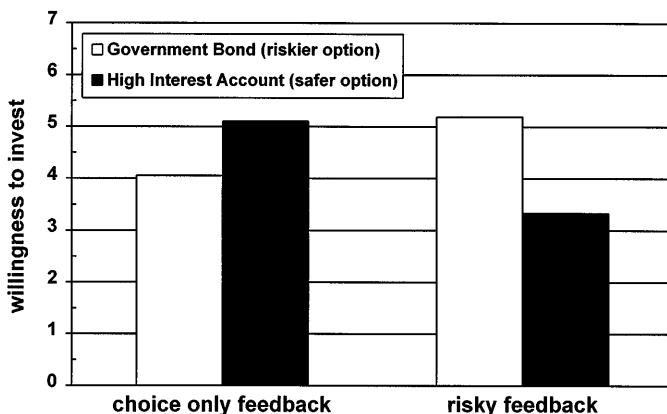


FIG. 1. Willingness to invest as a function of feedback, measured on 7-point scales with endpoints labeled *Definitely would not invest* (1) to *Definitely would invest* (7).

making. The decisions were made by individuals and the outcomes only affected the decision maker him or herself. In real life, however, our decisions often not only affect ourselves, but also others. Moreover, our own outcomes might be influenced by decisions of a number of other individuals. Hence, when making decisions we often take into account the decisions and outcomes of others.

In Experiments 2a and 2b we tested whether anticipated regret could also influence these *interpersonal* decisions. It has been argued that emotions play a large role in negotiations (Barry & Oliver, 1996; Pillutla & Murnighan, 1996). Larrick and Boles (1995) were the first to show that expected feedback can influence negotiation decisions. Participants negotiated about a signing bonus they could earn when deciding to work for a certain company ALPHA. They either expected to learn or expected not to learn the offer of a competing company BETA after they reached an agreement with ALPHA. Participants who expected to learn the offer of BETA (Feedback condition), could regret or rejoice about their decision to accept the bonus offered by ALPHA. These participants wanted to have a higher bonus and were consequently less likely to reach agreement, and were thus more risk-seeking, than those who did not expect to learn the offer of BETA (No Feedback condition).

Although our Experiments 2a and 2b are similar to Larrick and Boles' (1995) experiment, they also differ in at least two ways. First, we used a different feedback manipulation. In their research the feedback was information about what could have been the result of negotiating with a third party, whereas in our experiments the feedback was provided by one of the parties within the negotiation. Second, and more importantly, the present experiments used different negotiation task, namely the ultimatum game (Güth *et al.*, 1982).

The ultimatum game is very simple. Two players are allotted a sum of money, e.g. \$10. Player 1 (often called the Proposer) offers some portion of the money (e.g., \$4) to player 2 (the Responder). If the Responder accepts, she gets the \$4, and the Proposer gets the rest (\$6). If the Responder rejects the offer, both players get nothing. The predictions from rational economic theory are straightforward. Responders should accept the smallest amount of money, that is, one cent, since this is more than they would get by rejecting the offer. Proposers know this and should thus offer Responders only the one cent. Earlier research using this game, however, showed that people hardly ever offer the other player only one cent. Moreover, if they do so, the other players refuse the offer. Commonly the average offers are in the regions of 30–40%, with a 50–50 split often as the mode. Offers of less than 20% are frequently rejected (for an overview, see Camerer & Thaler, 1995).

How might anticipated regret influence the behavior of proposers? Proposers can regret two things, offering too little money when the offer is rejected, and offering too much when the offer is accepted. If we consider the fact that the modal offer is 50%, and that offers over 20% are almost always accepted, there is more chance of offering too much. However, there are two reasons why in a normal ultimatum game the regret about offering too much money is generally less severe than regret about offering too little money. First, when proposers regret offering too much, they still have money, whereas when proposers regret

offering too little, they do not get any money at all. Second, although proposers who's offers are accepted might infer that their offer was probably too high, they do not know to what extent, and therefore the possible regret over offering too much will not be that painful. Whereas for proposers who's offers are rejected it is crystal clear that they offered too little.

Thus, in a normal ultimatum game the regret minimizing option is offering too much. However, everything changes when feedback is introduced. If the responder's minimal acceptable offer is communicated to the proposers, they might learn that a much lower offer would also have been accepted. Feedback of this kind can make regret about an offer that is too high more severe because it points out exactly how much less the proposer could have offered.² Proposers who expect this feedback might anticipate the possible regret, and move away from the 50/50 split to less egalitarian offers.

In the present experiments we manipulated whether or not proposers knew in advance that they would learn the responder's minimal acceptable offer after they had made their offer. We expected that proposers who expected feedback on the minimal acceptable offer would be inclined to make lower offers than proposers who did not expect this feedback. This was because lowering their offers would lower the amount of possible regret because the offer would be closer to the minimal acceptable offers. At the same time lowering their offers would not need to result in a higher likelihood of the offer being rejected, because offers are hardly ever rejected if they remain higher than 20%.

Experiment 2a

Method. Seventy Dutch undergraduate students volunteered to participate in this experiment. They were randomly assigned to one of the two conditions (No Feedback vs Feedback). There were 35 participants in each condition.

Upon arrival in the laboratory participants were seated behind a computer screen via which the rules of the game were explained to them. Participants were told that half of them were randomly selected to be proposer, and the other half to be responder. In reality all of them were proposers. They were told that they had to divide an amount of 100 Dutch Guilders between themselves and the Responder. Participants in the Feedback condition were told that they would always learn the respondent's minimal acceptable offer, and that they would thus learn the exact amount of money that they should have offered more to get their offer accepted or could have offered less and have their offer still accepted. After all participants made their offer, the experiment ended and the participants were debriefed.

Results. Because of the skewed distributions of the offers we used a Wilcoxon-Mann-Whitney test to test for differences between the two conditions.

²The regret stemming from an offer that turns out to be too high can be characterized as a type of *winner's curse*. The winner's curse refers to a situation in which one has paid more than the opponent's reservation price. See Thaler (1992), and Bazerman and Neale (1992) for excellent descriptions of this phenomenon.

This test showed that, as predicted, offers in the Feedback condition ($M = 36.46$ Dutch Guilders) were lower than in the No Feedback condition ($M = 42.80$ Dutch Guilders), Z (corrected for ties) = 2.18, $p < .05$.

The results were thus in accordance with our predictions. However, the data do not conclusively rule out the possibility that other factors might have caused the difference between the conditions. For example, one might argue that decisions in the ultimatum game are very much based on strategic considerations, and that our manipulation induced more strategic offers. This might have happened because our manipulation focuses participants' attention on the minimal acceptable offer, whereas normally participants might not have considered this (of course it might still be the case that this strategic thinking is instigated by the anticipation of regret resulting from too high offers). We ran a second study in attempt to investigate the relation between possible considerations and the offers made.

Experiment 2b

This experiment had the same design as Experiment 2a. Dutch undergraduate students volunteered to participate in this experiment. They were randomly assigned to one of the 2 conditions (No Feedback vs. Feedback). There were 35 participants in each condition.

There were two differences between the present experiment and the former. Whereas Experiment 2a involved real playing of the ultimatum game, the present experiment was part of a one-hour series of different judgmental tasks, and therefore participants were asked to indicate what they would decide when playing the game (not an uncommon procedure in ultimatum game research, see, e.g., Pillutla & Murnighan, 1996).

The second difference is that we now asked participants some questions about their offer, after they stated it. First we asked them to indicate the extent to which they thought that the other person would accept their offer. They could do this on a 9-point scale with endpoints labeled *will definitively not accept* (1) and *will definitively accept* (9). Next we asked them to indicate on 9-point scales, with endpoints *does not apply* (1) and *does apply* (9), to what extent four different considerations played a role in their decision. These considerations were: "I wanted my offer to be as strategic as possible," "I did not want to feel regret over a too high offer," "I did not want to feel regret over a too low offer," "I was afraid that my offer would not be accepted."

The results of the present experiment were strikingly similar to the former. Offers in the Feedback condition ($M = 37.34$ Dutch Guilders) were again lower than in the No Feedback condition ($M = 43.57$ Dutch Guilders), Z (corrected for ties) = 1.96, $p < .05$. Nevertheless, participants in both conditions found it equally likely that their offers would be accepted by the responder (for both conditions, $M = 7.69$). Figure 2 depicts participants' offers to the responders in both feedback conditions, collapsed over Experiments 2a and 2b.

Also interesting are the relations between participants considerations and

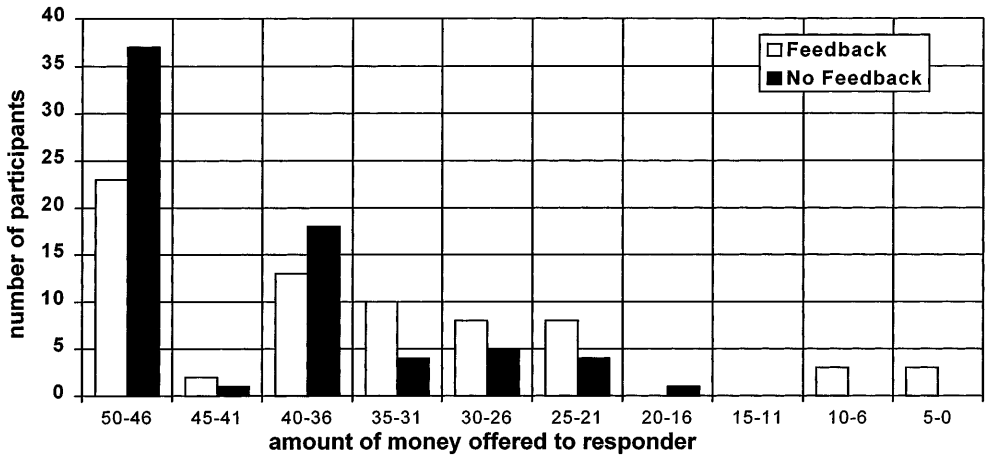


FIG. 2. Amount of money (of a fixed pie of 100 Dutch Guilders) offered by the proposers to responders as a function of feedback (combined data from Experiments 2a and 2b).

their offers.³ Overall we found that only ratings on the consideration “I did not want to feel regret over a too high offer” correlated significantly with the amount offered to the responder, $r = -.35$, $p < .005$. Thus, the more participants indicated that they anticipated the regret over an offer that could be too high, the lower their offers were. The correlations between the other considerations and the offer were all non-significant and smaller than 0.1. If we look at the correlations between the considerations and the offers in the different feedback conditions we get an even clearer picture. In the No Feedback condition there were no significant correlations between the considerations and the offer. In the Feedback condition, however, only the correlation between the consideration “I did not want to feel regret over a too high offer” and the amount offered to the responder was significant, $r = -.48$, $p < .005$.

These correlations confirm our reasoning. We hypothesized that when people anticipate regret while playing the ultimatum game, they would anticipate the regret arising from offers that would be too high. This would then promote lower offers. We also hypothesized that the anticipation of regret were likely to have its influence when people expect feedback on the minimal acceptable offer of the responder. In the present experiment we did not only find that the offers were lower in the Feedback condition, but we also found that the offers were lower as more regret was anticipated.

Discussion

The results of these experiments clearly indicate that the expectation of feedback, a possible cause of regret, influences people's choices in the ultimatum

³No between condition differences were found for the ratings of the considerations. The mean rating for each consideration was: “I wanted my offer to be as strategic as possible” ($M = 5.9$), “I did not want to feel regret over a too high offer” ($M = 3.7$), “I did not want to feel regret over a too low offer” ($M = 5.3$), “I was afraid that my offer would not be accepted” ($M = 5.2$).

game. When deciding how much to offer the responder, participants who expected feedback on the responder's minimal acceptable offer made lower offers than participants who did not expect to receive this feedback. This behavior reflects regret aversion because lower offers result in less regret if accepted. The offers were, in general, not that low that they would be rejected, which suggests that participants minimized both the regret that could arise from offering too much and the regret that could arise from offering too little.

This finding thus extends our previous findings, because it shows that the motive of minimizing regret can also influence decision making in interpersonal contexts. It thereby replicates the findings of Larrick and Boles (1995) in a very different negotiation context. As in Experiment 1, the results also show that regret effects can be obtained in richer situations, in which different motives may influence the final decision.

EXPERIMENT 3: EXPERIENCED REGRET IN THE ULTIMATUM GAME

This experiment addressed the effects of *experienced* regret on future behavior. Until now regret research has predominantly focused on the effects of the anticipation of this emotional state on decision making. This is, however, only half of the story. As emotion researchers know, the emotion a person brings into the situation has a considerable impact on how that person behaves (e.g., Zeelenberg, van der Pligt, & Manstead, in press-a; Zeelenberg, van Dijk, Manstead, & van der Pligt, in press-b). Hence, decision makers who have just experienced regret will probably behave differently than decision makers who did not experience regret. Since regret is a common emotion, that is experienced quite regularly (Landman, 1993; Shimanoff, 1984), it seems not only worthwhile, but also a necessary next step, to investigate how this experience shapes our future behavior (cf. Zeelenberg, 1996). We suspect that the behavior of people who experience regret can be characterized as a sort of emotion management. They will behave in such a way that their regret will disappear. They will probably choose options that shield them from further regret, and so restore their original, more or less neutral, emotional state.

In the present experiment the focus was again of decision making in the ultimatum game. In Experiments 2a and 2b we saw that participants who expect feedback on the responders minimal acceptable offer anticipate the regret from offering too much and decide in such a way to prevent this regret from happening. What happens if they do not succeed in this? How will this regret influence their decisions when playing a second ultimatum game? These are the questions addressed by Experiment 3.

In this experiment participants played the ultimatum game and expected to receive feedback on the responders minimal acceptable offer. They learned that the minimal acceptable offer is either 2 Guilders less than they offered (2 Guilders Too Much condition) or 10 Guilders less than they offered (10 Guilders Too Much condition). The prediction was that participants in the latter condition would experience most regret. Next participants played a second ultimatum game against another responder, and we predicted that participants

in the 10 Guilders Too Much condition would lower their offers more than participants in the 2 Guilders Too Much condition. Moreover, we predicted that they would do so because of the regret they experienced over the first offer.

Method

Forty-six Dutch undergraduate students volunteered to participate in this experiment. They were randomly assigned to one of the 2 Feedback conditions (2 Guilders Too Much vs 10 Guilders Too Much). There were 23 participants in each condition.

The procedure of this experiment was for the first part similar to that for the participants in the feedback condition of Experiment 2a. However, after participants made their offer the experiment did not end. Participants were then informed about the decision of the responder. Depending on the condition they were in participants either learned that their offer was accepted and they could have offered 2 Guilders less, or that offer was accepted and they could have offered 10 Guilders less. Following this feedback, the regret over their offer was assessed. This was done by presenting the participants on the computer screen with the feedback and asking them to indicate, on 7-point scales, how much regret they experienced and how good they thought their offer was in retrospect.⁴ Both ratings, after reverse coding for the second question, were combined in a regret measure (Cronbach's $\alpha = .76$).

Next, participants were informed that they were going to play a second round. We wanted the difference in regret to be the main difference between the two conditions. Therefore we told all participants that they would now play with a different responder. They were also told that the average minimal acceptable offer in the first round was 22 Guilders. After all participants had made their second offer, the experiment ended and the participants were debriefed.

Results

Table 1 depicts the results of this experiment. These support our predictions. The first offer was very much similar to the offers in the feedback conditions

TABLE 1
Mean First Offer, Regret, and Second Offer for Both Feedback Conditions

	Feedback condition		<i>F</i> (1,44)	<i>p</i> <
	2 Guilders too much	10 Guilders too much		
First offer	35.69	30.43	2.79	<i>ns.</i>
Regret	1.30	2.09	11.02	.003
Second offer	34.69	26.34	8.41	.006

⁴According to Bell (1982, p. 961) regret stems from realizing after the fact that one has made the wrong decision.

of Experiments 2a and 2b, and there was no significant difference between the two conditions on this offer. Next we analyzed the regret ratings. Note that the overall regret was very low because all participants got their offers accepted. There was, however, a significant difference in the regret experienced after receiving the feedback. Participants in the 10 Guilders Too Much condition reported more regret than participants in the 2 Guilders Too Much condition.

We hypothesized that the experienced regret would influence the subsequent offer made. As can be seen from Table 1, the second offer was lower in the 10 Guilders Too Much condition than in the 2 Guilders Too Much condition. In an analysis of covariance the effect of Feedback remained significant after controlling for differences in the first offer, $F(1,43) = 7.41$, $p < .01$, even though the first offer appeared to be a highly significant covariate, $F(1,43) = 139.45$, $p < .001$. More importantly, when we also included the experienced regret as a covariate ($F(1,42) = 9.31$, $p < .005$), the effect of Feedback was no longer significant, $F(1,42) = 2.73$, *ns*. This supports our prediction that the effects of feedback on the second offer are mediated by the regret experienced over the first offer.

Discussion

This experiment shows that the experience of retrospective regret influences subsequent decision making. Participants played an ultimatum game and received feedback on how much less they could have offered and still had their offer accepted. Participants who could have offered 10 Guilders less experienced more regret than participants who could have offered only 2 Guilders less. When participants were asked to play a second round of the ultimatum game their offers were influenced by the amount of regret experienced. It thus seems that participants engaged in a sort of emotion, or regret, management; they behaved in such a way that their regret will disappear, or future regret will be minimized. This finding extends our previous findings from Experiments 1 and 2, and from Zeelenberg *et al.* (1996), because it shows that not only anticipated future regret, but also experienced retrospective regret influences behavioral decision making. To our knowledge the present data are the first demonstration of such an influence.

Pillutla and Murnighan (1996) recently also studied on the role of emotions in decision making in the ultimatum game. They focused on how experienced anger might influence the decisions of responders whether or not to accept the offer made by the proposer. We believe that their experiment, our experiments, and Larrick and Boles' (1995) experiment, provide initial support for Barry and Oliver's (1996) recent approach to the role of emotion in negotiation, in which emotion plays a large role at several stages in the negotiation process.

GENERAL DISCUSSION

Taken together, the results of these experiments show that both the anticipation of regret caused by the manipulation of expected feedback, and the

experience of regret caused by actual feedback, have a profound influence on decisions in several contexts. Evidence for effects of anticipated regret was found in financial investment decisions (Experiment 1) and in decisions in the ultimatum game (Experiments 2a and 2b). Experiment 3 showed that experienced regret in an ultimatum bargaining situation influences subsequent decisions. The research presented thus extends our earlier research presented in Zeelenberg *et al.* (1996) by showing regret effects in decisions representing more real life decision making, and by showing effects of experienced regret on subsequent decisions.

In addition, Experiment 1 showed that regret effects can be strong. Zeelenberg *et al.* (1996) showed regret effects for choices between two equally preferred options. Experiment 1 showed that even when there is a clear preference for a certain course of action, anticipated regret might push people toward another course of action.

Experiments 2a, 2b, and 3 extend our earlier work by showing regret effects in interpersonal decision making. This suggests that also other interpersonal decisions might be influenced by regret. For example people's decision whether or not to contribute to a public good might be influenced by the regret they may anticipate if they did contribute and the public good was not realized, or if they did not contribute and the public good was not realized, because of their decision. In contrast, decision makers might also anticipate the regret arising from contributing when the public good would also have been realized without their contribution. A careful study of feedback structures in such social dilemma situations is needed to predict which behavior is regret minimizing. If it is shown that in these situations people will be motivated to minimize regret, then external provisions of feedback might influence choice behavior, and help to solve social dilemmas.

The present demonstrations thus show that people's tendency to minimize regret can be powerful motivators while making decisions. Analogies of these results found in real life decision making indicate that regret effects are not just laboratory findings. How regret may influence real life decisions is illustrated by the success of the Dutch postal code lottery. In this lottery the winning number is a randomly selected postal code. If your postal code is selected and you bought a lottery ticket you can win as much as 15,700,000 Dutch Guilders (grand prize in May, 1997; approximately \$8,000,000). The lottery ticket only costs 10 Guilders. The decision whether or not to buy a ticket might be based on regret aversion.

Consider the following situation: your postal code has been selected, but you did not buy a ticket. Your neighbor, however, did buy a ticket and won the grand prize. How would you feel? Probably, feelings of regret will be present, and extremely painful. If you consider this possibility of regret before deciding to buy a ticket or not, it might prompt you to buy a ticket and be protected from severe regret. This does not apply to "normal" lotteries, because in these you will never learn whether you would have won if you do not play.

The organizers of the postal code lottery also recognize the power of regret. In their advertisements they state the following: "Don't you have any tickets?"

Then your neighbors will win everything. So make sure that you buy some now." Moreover, since the lottery is connected to a nation wide broadcast TV game show, the feedback is hard to avoid. This, and the intensity of the possible regret, might explain why so many people play this lottery.

Our present and earlier research showed effects of regret in decision making. It is important to note that the effects of regret are not easily extended to other emotions, such as disappointment. Regret and disappointment have in common the fact that they are experienced when the outcome of a decision is unfavorable. They both arise from thoughts about "what would have been," had things been different. There is virtually no empirical research focusing on effects of anticipated disappointment on decision making. However, recent research on the experience of disappointment (van Dijk & van der Pligt, 1997) suggests that the findings for regret cannot easily be generalized to disappointment. Other recent research focused on differences between regret and disappointment and showed that two emotions are different in many respects. They have different antecedents, that is regret arises from comparing an obtained outcome with a better outcome that might have occurred had a different choice been made, whereas disappointment arises from comparing an obtained outcome with a better outcome that might have resulted from the same choice being made (Zeelenberg *et al.*, 1997). Regret and disappointment feel quite different (cf., Zeelenberg *et al.*, in press-b), and they have different effects on post decisional evaluations (Inman, Dyer, & Jia, 1997). We thus argue, following van der Pligt, Zeelenberg, van Dijk, de Vries, & Richard (1997), that it is important to be specific about the emotion under investigation because each emotion has its own effects on choice behavior. Therefore we think that research on the effects of anticipated disappointment is needed, in order to come to a better understanding of the different effects of the anticipation of different emotions in the decision making process.

Conclusion

People are motivated to avoid or minimize post-decisional regret. This motivation exerts impact on their decisions, because the possibility of future regret is anticipated and taken into account when making decisions, and because experienced retrospective regret promotes decisions that make this regret disappear (the so-called regret management). As a result people can become risk averse or risk seeking, depending on which of the possible choice options is the regret minimizing option. In principle this can be considered rational, because it protects the decision maker from some of the aversive consequences of decision making. There might be cases, however, in which one can argue that regret results in bad decisions or in reduced learning from experience (because feedback is avoided), and might be considered irrational. Now that we have established that regret does influence decision making and that feedback is one of its prime determinants, future theorizing could focus on the normative status of these effects. Future research should focus more on effects

of experienced regret on choice behavior. These enterprises are required to come to an complete understanding of the role of regret in decision making.

REFERENCES

- Barry, B., & Oliver, L. (1996). Affect in dyadic negotiation: A model and propositions. *Organizational Behavior and Human Decision Processes*, **67**, 127–143.
- Bazerman, M. H., & Neale, M. A. (1992). *Negotiating rationally*. New York: The Free Press.
- Bell, D. E. (1982). Regret in decision making under uncertainty. *Operations Research*, **30**, 961–981.
- Boles, T. L., & Messick, D. M. (1995). A reverse outcome bias: The influence of multiple reference points on the evaluation of outcomes and decisions. *Organizational Behavior and Human Decision Processes*, **61**, 262–275.
- Camerer, C., & Thaler, R. H. (1995). Ultimatums, dictators and manners. *Journal of Economic Perspectives*, **2**, 209–219.
- Güth, W., Schmittberger, R., & Schwarze, B. (1982). An experimental analysis of ultimatum bargaining. *Journal of Economic Behavior and Organization*, **3**, 367–388.
- Inman, J. J., Dyer, J. S., & Jia, J. (1997). A Generalized Utility Model of Disappointment and Regret Effects on Post-Choice Valuation. *Marketing Science*, **16**, 97–111.
- Josephs, R. A., Larrick, R. P., Steele, C. M., & Nisbett, R. E. (1992). Protecting the self from the negative consequences of risky decisions. *Journal of Personality and Social Psychology*, **62**, 26–37.
- Kahneman, D., & Tversky, A. (1997). Prospect theory: An analysis of decision under risk. *Econometrica*, **47**, 263–291.
- Landman, J. (1993). *Regret: The persistence of the possible*. New York: Oxford University Press.
- Larrick, R. P., & Boles, T. L. (1995). Avoiding regret in decisions with feedback: a negotiation example. *Organizational Behavior and Human Decision Processes*, **63**, 87–97.
- Loomes, G. & Sugden, R. (1982). Regret Theory: An alternative theory of rational choice under uncertainty. *Economic Journal*, **92**, 805–824.
- Pillutla, M. M., & Murnighan, J. K. (1996). Unfairness, anger, and spite: Emotional rejections of ultimatum offers. *Organizational Behavior and Human Decision Processes*, **68**, 208–224.
- Ritov, I. (1996). Probability of regret: Anticipation of uncertainty resolution in choice. *Organizational Behavior and Human Decision Processes*, **66**, 228–236.
- Ritov, I., & Baron, J. (1995). Outcome knowledge, regret, and omission bias. *Organizational Behavior and Human Decision Processes*, **64**, 119–127.
- Savage, L. J. (1951). The theory of statistical decision. *Journal of the American Statistical Association*, **46**, 55–67.
- Shimanoff, S. B. (1984). Commonly named emotions in everyday conversations. *Perceptual and Motor Skills*, **58**, 514.
- Thaler, R. H. (1992). *The winner's curse: Paradoxes and anomalies of economic life*. New York: The Free Press.
- van der Pligt, J., Zeelenberg, M., van Dijk, W. W., de Vries, N. K., & Richard, R. (1997). Affect, attitudes, and decisions: Let's be more specific. *European Review of Social Psychology*, **8**, in press.
- van Dijk, W. W., & van der Pligt, J. (1997). The impact of probability and magnitude of outcome on disappointment and elation. *Organizational Behavior and Human Decision Processes*, **69**, 277–284.
- Zeelenberg, M. (1996). *On the importance of what might have been: Psychological perspectives on regret and decision making*. Ph.D. dissertation, University of Amsterdam.
- Zeelenberg, M., Beattie, J., van der Pligt, J., & de Vries, N. K. (1996). Consequences of regret aversion: effects of expected feedback on risky decision making. *Organizational Behavior and Human Decision Processes*, **65**, 148–158.

- Zeelenberg, M., van der Pligt, J., & Manstead, A. S. R. (in press-a). Undoing Regret on Dutch Television: Apologizing for interpersonal regrets involving actions and inactions. *Personality and Social Psychology Bulletin*.
- Zeelenberg, M., van Dijk, W. W., Manstead, A. S. R., & van der Pligt, J. (in press-b). The experience of regret and disappointment. *Cognition and Emotion*, **12**.
- Zeelenberg, M., van Dijk, W. W., van der Pligt, J., Manstead, A. S. R., van Empelen, P., & Reinderman, D. (1997). *Emotional reactions to the outcomes of decisions: Counterfactual thought and the experience of regret and disappointment*. Manuscript under review.

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