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Emotion-Based Choice

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In this article the authors develop a descriptive theory of choice using anticipated emotions. People are assumed to anticipate how they will feel about the outcomes of decisions and use their predictions to guide choice. The authors measure the pleasure associated with monetary outcomes of gambles and offer an account of judged pleasure called *decision affect theory.* Then they propose a theory of choices between gambles based on anticipated pleasure. People are assumed to choose the option with greater *subjective expected pleasure.* Similarities and differences between subjective expected pleasure theory and subjective expected utility theory are discussed.

Emotions have powerful effects on choice. Our actual feelings of happiness, sadness, and anger both color and shape our decisions. In addition, our imagined feelings of guilt, elation, or regret influence our decisions. In this article we refer to these two influences as *experienced* emotions and *anticipated* emotions. Experienced emotions affect many levels of cognitive processing. When we are in good moods, we are better problem solvers (Isen, 1984, 1987, 1993), more likely to remember happy events (Bower, 1981), more risk seeking (Kahn & Isen, 1993), and more optimistic about the chances of favorable events (Wright & Bower, 1992; Nygren, Isen, Taylor, & Dulin, 1996). When we are in bad moods, we are more likely to recall negative events (Bower, 1981) and overestimate the chances of unfavorable events (Johnson & Tversky, 1983). If we are also aroused, we make less discriminate use of information (Forgas, 1992; Forgas & Bower, 1987; Gleicher & Weary, 1991) and fail to search for options (Fiedler, 1988; Keinan, 1987). Sometimes our moods are strong enough to block out all else, as with addictions and phobias (Baron, 1992; Loewenstein, 1996).

Anticipated emotions prepare us for the future. We imagine excitement about winning a lottery, pleasure about getting a promotion, guilt about telling a lie, and frustration at not achieving a goal. Effects of anticipated regret have received much attention. Simonson (1992) found that consumers who anticipate the regret they will feel about a product malfunctioning are more likely to purchase familiar, easily justifiable products. Ritov and Baron (1990) found that people who anticipate the regret they will feel if their children become ill or die of vaccinations are less likely to vaccinate their children. Finally, Bar-Hillel and Neter (1996) found that students who were given a lottery ticket and asked if they would trade their ticket for a new one with objectively better odds tended not to trade their original ticket because they anticipated the regret they would feel if their original ticket won.

Relatively few theories of choice have incorporated effects of either experienced or anticipated emotions. Janis and Mann (1977) discussed the effects of experienced emotions on decision making, although not in any formal way. Savage (1951, 1954) proposed a minimax principle of risky choice based on anticipated regret. This principle asserts that people should select the alternative that minimizes their maximum regret. His rule was never adopted on either normative or descriptive grounds. It was normatively unappealing because it permitted violations of an axiom called *independence of irrelevant alternatives.* It was descriptively unappealing because it implied an unrealistic degree of risk aversion; people were assumed to focus on worst-case scenarios to the exclusion of all else.

Some time later, Loomes and Sugden (1982) and Bell (1982) proposed a theory of risky choice based on anticipated emotions called *regret theory.* In this account, people anticipate the regret they might experience. *Regret* is defined as the feeling that occurs when one's outcome is worse than the outcome one would have experienced had one made a different choice. Not long after, Loomes and Sugden (1986) and Bell (1985) developed another account called *disappointment theory,* according to which people are assumed to anticipate disappointment. *Disappointment* is the feeling

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that occurs when one's outcome is worse than the outcome one would have obtained with a different state of the world.

Regret and disappointment theories incorporate anticipated emotions into the choice process by means of counterfactual comparisons. Regret theory focuses on counterfactual comparisons across alternative choices, and disappointment theory focuses on counterfactual comparisons across alternative states of the world. Each theory is reasonably successful at describing different violations of expected utility theory (Loomes, Starmer, & Sugden, 1989). However, the assumptions about emotions have never been tested directly. In this article, we develop an empirically based theory of emotional responses to the outcomes of choice. Then we use that account to develop an emotion-based theory of choice.

Decision Affect Theory

Mellers, Schwartz, Ho, and Ritov (1997) examined the way people feel about monetary outcomes of gambles when people were not given choices. Participants were simply presented with gambles one at a time. Each gamble was shown as a pie chart with colored regions representing wins or losses. A spinner attached to the center of the pie chart began to rotate. Eventually it stopped, and the region containing the spinner represented the outcome. Participants saw how much they won or lost and rated their feelings about the outcome. When all else was constant, pleasure increased with the amount of the win, and displeasure increased with the amount of the loss. Furthermore, the pleasure of an outcome increased when the unobtained outcome was worse. Both wins and losses were more enjoyable if a large loss was avoided. Finally, decision makers reacted more strongly to unexpected outcomes. Surprising wins were more pleasurable than expected wins, and surprising losses were more painful than expected losses.

Mellers et al. (1997) proposed an account of judged pleasure called *decision affect theory,* in which responses are based on obtained outcomes, relevant comparisons, and beliefs about the likelihood of the obtained outcomes. To illustrate, consider a gamble with Outcomes A and B. Suppose the gamble is played, and Outcome A occurs. Decision affect theory predicts that the emotional response to A is

$$R_A = J_R[u_A + d(u_A - u_B)(1 - s_A)], \quad (1)$$

where J_R is a linear response function that links an implicit feeling to a rated response; u_A and u_B are the utilities of the obtained and unobtained outcomes, respectively; d is the disappointment function, after Loomes and Sugden (1986) and Bell (1985), that operates on the difference between the utilities; and s_A is the subjective probability or the belief that A will occur. The disappointment function could be described as a power function, with different exponents for positive and negative differences. These exponents captured asymmetries in what Loomes and Sugden (1986) and Bell (1985) called *elation* and *disappointment.* Finally, Mellers et al. (1997) assumed that the disappointment function was weighted by the surprisingness of A. When A was a surprising event, the comparison with B had greater impact.

Mellers et al. (1997) fit decision affect theory to mean pleasure ratings by finding a set of parameters that minimized the proportion of squared errors. This task required the help of a FORTRAN subroutine called STEPIT (Chandler, 1969), which conducts an iterative parameter search. After obtaining best-fitting parameters, Mellers et al. examined the residuals between data and predictions and concluded that decision affect theory provided a good account of pleasure judgments that follow from monetary outcomes of gambles.

Overview

This article begins where Mellers et al. (1997) ends. To make the presentation easier, we summarize our theoretical and empirical results. Then we present details in the experimental sections. Finally, we conclude with a general discussion and put our findings into a broader framework.

First, we test decision affect theory as a descriptive account of both anticipated and actual pleasure. Then we examine connections between pleasure and risky choice. Choices are usually followed by feedback about the outcome of the chosen option only. We do not know what would have happened if we had married someone else, followed another career path, or moved to another city. On rare occasions, we receive feedback about what would have happened under multiple choices. We refer to these situations as ones with *partial* and *complete feedback,* respectively.

Emotional experiences following choices with partial feedback are assumed to be described by the form of decision affect theory introduced earlier (Equation 1). With complete feedback, emotional experiences are described by another form of the theory. To illustrate, consider a choice between Gamble 1, with Outcomes A and B, and Gamble 2, with Outcomes C and D, as shown in Figure 1. Suppose the decision maker selects Gamble 1, receives Outcome A, and then learns that Gamble 2's outcome was C. The emotional response to A, when Gamble 2's outcome was C, is

$$R_{A(C)} = J_R[u_A + d(u_A - u_B)(1 - s_A) + r(u_A - u_C)(1 - s_A s_C)]. \quad (2)$$

This expression resembles Equation 1, but it also includes r, a regret function, after Loomes and Sudgen (1982) and Bell

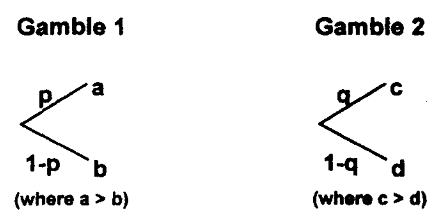

Figure 1. A stylized illustration of a gamble pair.

(1982), that operates on the difference between u_A and u_C. The impact of regret depends on the surprisingness of the joint outcome, A and C. Because gambles are independent, the surprisingness of the joint event is $1 - s_A s_C$.[1] We find strong support for these two forms of decision affect theory as an account of judged pleasure following choices with partial and complete feedback.

It is not actual emotions, but obviously anticipated emotions, that are used in the choice process. We examined anticipated and actual feelings and found a close resemblance, despite numerous demonstrations to the contrary (see Loewenstein & Schkade, 1999, or Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). This result allows us to test choice theories using actual emotions, which were obtained in most of the experiments.

Finally, we developed a theory of risky choice called *subjective expected pleasure* theory. Consider a choice between Gamble 1 and Gamble 2, as shown in Figure 1. Each gamble is evaluated by balancing the anticipated pleasure against anticipated pain. The decisionmaker considers the average pleasure of each gamble and chooses the gamble with the greater expected pleasure. With partial feedback, the subjective expected pleasure associated with Gamble 1 is

$$s_A R_A + s_B R_B, \qquad (3)$$

where s_A and s_B are subjective probabilities estimated from decision affect theory and R_A and R_B are predicted emotions from decision affect theory. The subjective expected pleasure associated with Gamble 2 is

$$s_C R_C + s_D R_D. \qquad (4)$$

If Equation 3 is greater than Equation 4, Gamble 1 is chosen over Gamble 2.

The process is similar for choices involving complete feedback, although the expressions are more complex. With complete feedback, the subjective expected pleasure for Gamble 1 is

$$s_A s_C R_{A(C)} + s_A s_D R_{A(D)} + s_B s_C R_{B(C)} + s_B s_D R_{B(D)}, \qquad (5)$$

where parameters are estimated from decision affect theory. For Gamble 2 the expression is

$$s_C s_A R_{C(A)} + s_C s_B R_{C(B)} + s_D s_A R_{D(A)} + s_D s_B R_{D(B)}. \qquad (6)$$

If Equation 5 is greater than Equation 6, the decision maker selects Gamble 1 over Gamble 2. We find that subjective expected pleasure theory gives a good account of choices from five different experiments, even though the theory is never fit directly to choices. Rather, predictions are obtained from the fit of decision affect theory to emotional experiences and then are used to describe choices.

Subjective expected pleasure theory can be compared with other emotion-based theories of choice. Suppose a decision maker wants to maximize his maximum pleasure. If the pleasure associated with A is greater than with C, the decision maker will choose Gamble 1 over Gamble 2. Formally, if $R_A > R_C$ with partial feedback or $R_{A(D)} > R_{C(B)}$ with complete feedback, Gamble 1 is chosen over Gamble 2. Tests of this maximax theory indicate that this strategy does poorly at describing choice. Alternatively, a decision maker may want to minimize the maximum possible pain, a strategy not unlike Savage's minimax principle. If the pain of B is less than that of D, or if $R_B > R_D$ with partial feedback or $R_{B(C)} > R_{D(A)}$ with complete feedback, Gamble 1 is preferred over Gamble 2. This minimax theory also does poorly at accounting for choice.

Finally, a decision maker may prefer to minimize the probability of experiencing regret (Josephs, Larrick, Steele, & Nisbett, 1992; Ritov, 1996; Ritov & Baron, 1990; Zeelenberg, Beattie, van der Pligt, & deVries, 1996). Regret occurs when the obtained outcome is worse than the unchosen gamble's outcome. The chances of regret are calculated for each gamble and compared. The gamble with the smaller chance of regret is preferred. For example, suppose Gamble 1 has a 20% chance of \$32 and an 80% chance of −\$8. Gamble 2 has a 50% chance of \$8 or −\$8. With Gamble 1, the decision maker has a 40% chance of feeling regret (i.e., when the obtained outcome is −\$8 and Gamble 2's outcome is \$8). With Gamble 2, the decision maker has only a 10% chance of feeling regret (i.e., when the obtained outcome is −\$8 and Gamble 1's outcome is \$32). Therefore, Gamble 2 is preferred to Gamble 1. Although this strategy predicts choices better than the maximax and minimax principles, it does worse than subjective expected pleasure theory. We present details in the experiments that follow.

Experiment 1: Choices Between Gambles

In this experiment we measured both choices between gambles and emotional responses that follow from choice. We used within-subject designs with partial and complete feedback. These designs contain many trials, which were needed to obtain a good fit to decision affect theory, but these designs have been criticized by researchers who think that participants become tired or bored and adopt artificial strategies during the experiments (Rapoport & Wallsten, 1972). To address this criticism, we included between-subject designs with partial and complete feedback, with relatively few trials.

Method

Participants. The participants were undergraduates at the University of California, Berkeley, who were recruited from advertisements posted around campus. Within-subject designs had 44 and 49 participants in the partial- and complete-feedback conditions, respectively; between-subject designs had 52 and 97 participants, respectively. A few additional people who did not follow instructions were excluded from the analyses.

[1] We did not weight the regret function by $(1 - s_A)(1 - s_C)$, because this form implies that when either A or C is a sure thing, there is no surprise and hence, no effect of regret or rejoicing.

Instructions. Participants were told that the experiment involved choices between pairs of gambles with real monetary wins and losses. Each person's payment would be the sum of his or her earnings over all trials. We wanted participants to believe that the outcomes were real, so we told them that, on average, people come out ahead, but there would be a small chance that they would lose money and, if so, they would be required to work off their losses by doing menial tasks in the laboratory. Despite this risk, no one refused to participate.

In the within-subject design with partial feedback, instructions stated that average earnings were $8, but participants could win or lose as much as $15. The experiment lasted approximately 1 hr, and everyone was paid $8. In the complete-feedback design, the instructions stated that average earnings were $12 but that participants could win up to $20 or lose as much as $10. The experiment lasted approximately 2 hr, and everyone was paid $12.

In the between-subject designs, instructions stated that average earnings were $4, but participants could win or lose as much as $8. Both designs lasted 20 min, and everyone was paid $4. Finally, we administered a self-esteem scale, after Josephs et al. (1992). This measure did not correlate with either emotions or choices, so it is not discussed further.[2]

Stimuli and design. Stimuli were pairs of two-outcome gambles, presented on a computer screen, as shown in Figure 2. First, participants selected a gamble. On trials with partial feedback, a pointer appeared in the center of the chosen pie chart. It spun around several times and eventually stopped in one of the two colored regions. Participants learned their outcomes and expressed their feelings on a category rating scale that ranged from 50 (*extremely elated*) to −50 (*extremely disappointed*).[3] On trials with complete feedback, pointers spun simultaneously in both pie charts. Participants learned the outcome of the chosen and unchosen options and rated their feelings about their own outcome.

In the within-subject designs, gambles were based on a combination of *better outcomes* and *worse outcomes*. Better outcomes were $32, $8, and −$8. Worse outcomes were $8, −$8, and −$32. If the worse outcome was as good as or better than the better outcome, the outcome pair was not included. This method resulted in six outcome pairs, each of which was combined with three levels of probabilities (.2, .5, and .8). When those 18 gambles were paired with each other, 36 nondominated pairs were created. The 36 pairs were used in the experiment.

In the design with partial feedback, we wanted to obtain decision makers' emotional responses to both outcomes of a gamble, so we presented each gamble twice and rigged the spinner to stop in a different region of the pie chart each time. In the complete-feedback design, we wanted to obtain the decision makers' emotional responses to each combination of outcomes, so we presented each gamble four times and rigged the spinners accordingly. Every pair was presented once before any pair was repeated. Both trial order and gamble position (left vs. right) were randomized.

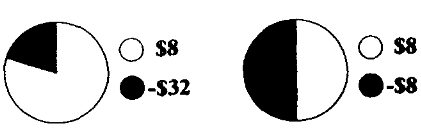

Figure 2. A gamble pair presented to participants. For each gamble, the probability of the outcome was proportional to the size of its region. Outcomes were displayed on the side.

Table 1
Gamble Pairs in the Two Feedback Conditions

Gamble pairs	Partial feedback	Complete feedback
1	$32, .5, **$8** **$32**, .8, **−$8**	**$8**, .5, **−$8** **$8**, .2, −$32
2	**$8**, .5, −$32 **$8**, .2, **−$8**	**$8**, .5, **−$8** $32, .2, **−$8**
3	$32, .5, **−$8** **$8**, .8, **−$8**	**$32**, .5, **−$32** **$32**, .2, −$8
4	**−$8**, .5, −$32 **$8**, .2, **−$32**	**$32**, .5, **−$32** $8, .2, **−$32**

Note. Numbers in boldface type indicate the outcome that occurred if the gamble was chosen.

Gamble pairs for the between-subject designs are shown in Table 1. In both designs, each pair was presented four times. Numbers in boldface type represent outcomes that were presented. If the gamble on the left was selected, either $8 or −$8 occurred, because those were the outcomes of interest. If the gamble on the right was chosen, each outcome occurred half the time. With partial feedback, only the chosen gamble's outcome was shown. With complete feedback, all combinations of boldface outcomes were presented.

In the within-subject designs, there were too many trials for people to keep track of their earnings, so our payments of $8 and $12 seemed perfectly reasonable. There were only 16 trials in the between-subject designs, so it was easier to keep track of cumulative earnings. In those designs we added two trials at the end to ensure that actual earnings were close to $4. These trials were not used in the analyses.

Results

Figure 3 shows the three most important effects: surprise, disappointment, and regret. The first and second panels show results with partial feedback, and the third panel

[2] Participants completed a 10-item self-esteem scale (Rosenberg & Simmons, 1972), which was used to test the hypothesis of Josephs et al. (1992) that people with low self-esteem would be more likely to make choices that minimized regret. In Josephs et al.'s experiments, regret-minimizing choices were also risk minimizing. They found that with complete feedback, people with low self-esteem had risk-averse preferences more often than did those with high self-esteem. We selected gamble pairs with equal expected values in Experiment 1. Then we correlated the number of risk-averse choices for each participant with his or her score on the self-esteem scale and found a correlation of −.07. In Experiment 2 we then selected gambles and sure things with approximately equal expected values and found that the correlation between number of risk-averse choices and self-esteem score was −.02. Similar results were found in Experiment 3. What accounts for the differences between our results and those of Josephs et al.? Josephs et al. administered the self-esteem test to 1,500 undergraduates and selected students in the top and bottom thirds. We did not prescreen students and use those with extreme scores. Instead, we had approximately 50 students in each experiment, and those students tended to have relatively high self-esteem. Although there may be a connection between self-esteem and risk attitudes, we found no evidence with our procedure.

[3] In another article, Schwartz, Mellers, and Metzger (1999) labeled the scale endpoints *very very happy* and *very very unhappy*. Results were identical, so we do not believe that the scale in this experiment has any special significance that might reflect a different emotion.

presents results with complete feedback. In Panel A, emotional responses are plotted against probabilities of obtained outcomes, with separate curves for different outcomes. Unobtained outcomes were equal but opposite in sign. Each point is the average of three unchosen gambles, with constant outcomes. Solid lines are data, and dashed lines are predictions of decision affect theory, which are discussed later.

Panel A shows surprise effects. People are elated with \$8 and disappointed with −\$8. Furthermore, emotions associated with outcomes interact with probabilities. The pleasure of winning and the pain of losing are more intense when outcomes are surprising; that is, responses are more extreme when outcomes are unexpected. Kahneman and Miller (1986) called this effect *emotional amplification.* The interaction between outcomes and probabilities shown in Panel A is small but systematic. Experiment 1 provides two tests with partial and complete feedback, and Experiment 4 provides four tests with actual and anticipated emotions in designs with partial and complete feedback. In five of six tests, the same pattern occurs. If convergence toward the left is just as likely as convergence to the right, the chance of obtaining five out of six convergent interactions toward the right is $.5^5$, or .03125.

Panel B of Figure 3 shows disappointment effects, also demonstrated by Boles and Messick (1995). Feelings are plotted against obtained outcomes, with separate curves for unobtained outcomes that could have occurred if the spinner had stopped in the other region. People feel better about

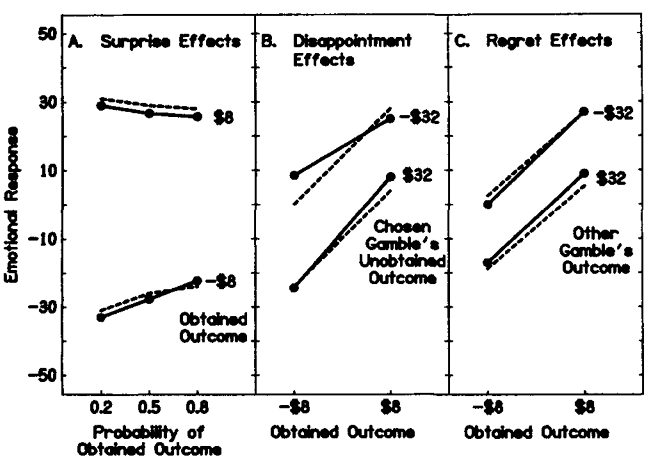

Figure 3. Panels A, B, and C show surprise effects, disappointment effects, and regret effects, respectively, in Experiment 1. In Panel A, mean emotional responses are plotted against probabilities of obtained outcomes. Each point is the average of three means that differ in probabilities of the unchosen gamble. Panel B shows obtained outcomes plotted against unobtained outcomes. Probabilities of the obtained outcome were .8. Each point is the average of two means differing in the probabilities of the unchosen gamble. Panel C shows obtained outcomes plotted against the other gamble's outcome. The probability of the obtained outcome is held constant at .8. Each point is the average of four means differing in unobtained outcomes (\$32 and −\$32) and probabilities of the other gamble's outcome.

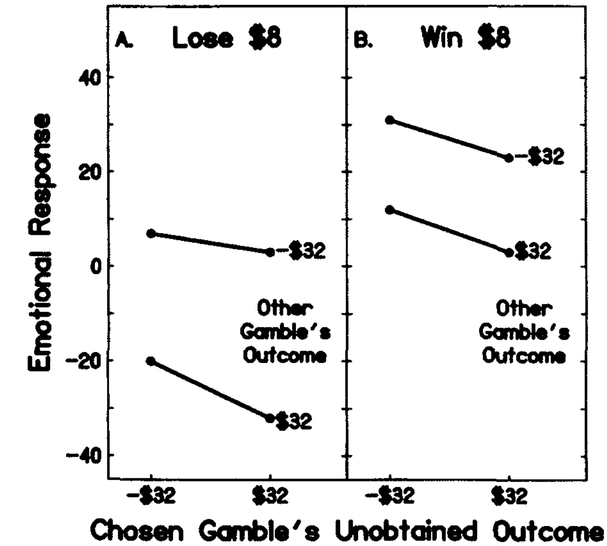

Figure 4. Panels A and B show disappointment and regret effects for losses and wins of \$8, respectively. Each point is the average of three means that differ in the probabilities of the obtained outcomes (.5 and .8).

wins and losses if they have avoided an even larger loss. The disappointment effect is strong enough to make a loss of \$8, which was likely to be an even greater loss of \$32, feel slightly pleasurable. Main effects of obtained and unobtained outcomes are statistically significant with partial feedback, $F(1, 169) = 56$, and $F(1, 169) = 53$, respectively, and complete feedback, $F(1, 341) = 143$, and $F(1, 341) = 14$, respectively.[4] Both surprise effects and disappointment effects resemble those found in situations without choice (Mellers et al., 1997).

Panel C presents regret effects. Emotional responses are plotted against obtained outcomes, with separate curves for outcomes of the unchosen gamble. Unobtained outcomes for the chosen gamble are held constant. Effects of outcomes for the chosen and unchosen gambles are statistically significant, $F(1, 341) = 202$, and $F(1, 341) = 138$, respectively. People felt better about their own outcome if the outcome of other gamble was worse.

Figure 4 shows the simultaneous effects of disappointment and regret. Losses of \$8 and wins of \$8 are presented in Panels A and B, respectively. The slopes of the curves show disappointment effects, and the spacing between the curves shows regret effects. A loss of \$8 is painful when the other two outcomes were \$32, but the same loss of \$8 is tolerable, even slightly pleasurable, when the other two outcomes were −\$32.

[4] All significance tests were conducted with an alpha level of .05. In each mean emotional response, we had different numbers of participants, and some participants appeared in more than one cell. To simplify the analyses, we treated the data as if they were part of a between-subject design, but we are aware that the assumptions of analysis of variance are violated.

Although disappointment theory and regret theory imply that people make one type of counterfactual comparison, Loomes and Sugden (1987, 1988) tested the possibility that people make both comparisons. More recently, Inman, Dyer, and Jia (1997) proposed a generalized disappointment theory that includes disappointment and regret. Our results are consistent with these conjectures of multiple reference points. Furthermore, the effects are predicted by decision affect theory.

Figure 4 also shows that regret is more powerful than disappointment, especially in regard to losses. Several researchers have claimed that regret has greater impact than disappointment because regret, unlike disappointment, involves the element of control (Kahneman & Miller, 1986; Markman, Gavanski, Sherman, & McMullen, 1995; but see Connolly, Ordóñez, & Coughlan, 1997, for an alternative perspective).

Do similar effects of disappointment occur in between-subject designs? In Figure 5 effects in between-subject and within-subject designs are compared in Panels A and B, respectively. The results are surprisingly similar: People felt worse about their own outcome—either a win or a loss—if the unobtained outcome was better. In Figure 6 the regret effects in between-subject and within-subject designs are compared. Once again, results are robust across the two contexts: People felt worse about their own outcome if the other gamble would have resulted in a better outcome.

We fit decision affect theory to mean responses with partial and complete feedback (Equations 1 and 2, respectively). The theory was represented as a prediction equation with a set of starting parameters. Chandler's (1969) STEPIT subroutine iteratively adjusted parameters to find those that minimized the proportion of squared errors. Not all participants made the same choices, so means were based on different numbers of observations. To reflect the stability of the estimate in the fitting procedure, we weighted each mean by the relative frequency of its occurrence. Means based on more observations had greater weight than those based on fewer observations.

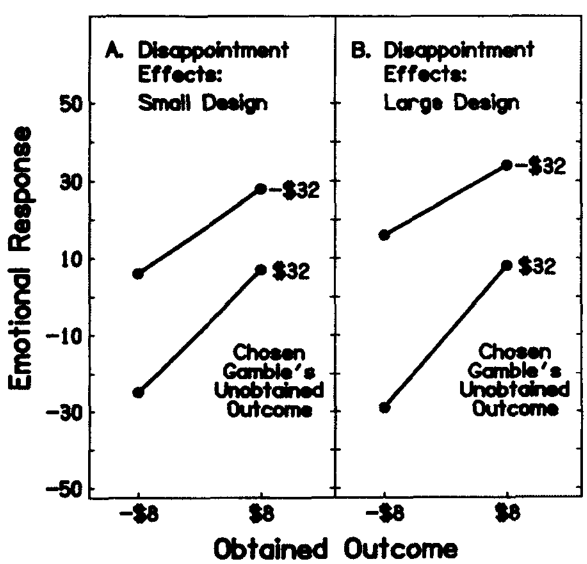

Figure 5. Results from Experiment 1. Panel A shows disappointment effects from the between-subject design, and Panel B shows identical trials from the within-subject design.

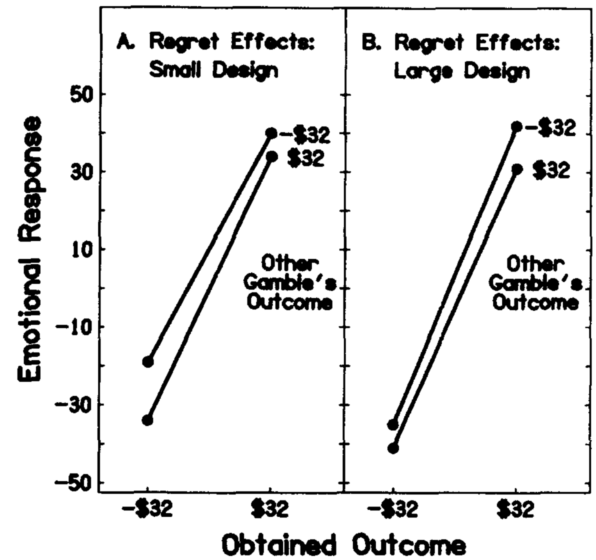

Figure 6. Results from Experiment 1. Panel A shows regret effects from the between-subject design, and Panel B shows identical trials from the within-subject design.

When specifying the theories in Equations 1 and 2, we assumed that J_R was linear. We estimated both additive and multiplicative constants. Disappointment and regret functions were approximated as step functions, and steps were allowed to differ for positive and negative comparisons.[5] We also estimated utilities for $8 and −$8 and fixed those for $32 and −$32, with no loss of generality. Finally, we estimated subjective probabilities for .2 and .8 and fixed .5 to its physical value. With these assumptions, 8 parameters were needed to describe 133 means with partial feedback, and 10 parameters were needed to describe 275 means with complete feedback.

Decision affect theory gave an excellent account of the means responses. Percentages of residual variance were 1.1% and 1.3% with partial and complete feedback, respectively. Estimated utilities were concave downward for gains (i.e., risk averse) and concave upward for losses (i.e., risk seeking). Subjective probabilities had an inverse S-shaped form, not unlike that proposed by Tversky and Kahneman (1992).[6] Figure 3 shows the predictions as dashed lines.

[5] We also tried power functions with exponents that could vary with the sign of the difference, but step functions worked better. Power functions, which allow effects of both sign and magnitude, fit better when gambles had one zero outcome and one nonzero outcome (Mellers et al., 1997). In this experiment, gambles had two nonzero outcomes. Such gambles are more complex, so participants may have simplified their comparisons.

[6] With partial feedback, utilities for −$32, −$8, $8, and $32 were −32, −17, 18, and 32, respectively. With complete feedback,

Some deviations appear, but in general decision affect theory gives a good account of surprise, disappointment, and regret effects.

We fit decision affect theory to individual participant data and found a reasonable fit for the majority of participants. Median residual variances were 6% and 9% for designs with partial and complete feedback, respectively. For about half of the people, utilities were concave for gains and convex for losses. Subjective probabilities had an S-shaped form for every participant but 1. For the majority of people, disappointment was greater than elation (61%), and regret was greater than rejoicing (76%). Finally, a comparison of regret and disappointment showed that regret was stronger than disappointment (67%).

This analysis provides empirically based disappointment and regret functions that can be compared with those assumed on theoretical grounds in disappointment and regret theories. The regret functions in Loomes and Sugden (1982) and Bell (1982) were quite general and were only assumed to be nonlinear. The disappointment function was assumed to to be nonlinear but symmetric by Loomes and Sugden (1986) and linear but asymmetric by Bell (1985). We found asymmetry in both functions, with disappointment and regret having greater impact than elation or rejoicing.

In summary, emotional reactions to monetary outcomes of gambles not only depend on obtained outcomes but also vary systematically with subjective probabilities. Surprising outcomes have greater impact than expected outcomes. Finally, emotional experiences depend on the reference points. People compare what they obtained with unobtained outcomes of the chosen gamble and outcomes of the unchosen gamble. Such counterfactual comparisons have asymmetric effects: Disappointment is greater than elation, and regret is greater than rejoicing.

Experiment 2: Choices Between Gambles and Sure Things

In this experiment we extended decision affect theory to riskless choice. In particular, we examined choices between gambles and sure things and measured postdecision emotions. Consider a choice between a sure thing, S, and a gamble with Outcomes A and B, where A > S > B. If the decisionmaker selects S and receives no feedback about the gamble, decision affect theory predicts the emotional reaction to be

$$R_S = J_R(u_S), \tag{7}$$

where R_S depends on u_S, the utility of the sure thing. If the decision maker chooses the sure thing and knows that the gamble's outcome was A, the emotional response to S is

$$R_{S(A)} = J_R[u_S + r(u_S - u_A)(1 - s_A)], \tag{8}$$

where the regret function is weighted by the surprisingness of the joint event. Because the probability of S is 1.0, the probability of A is s_A, and the two events are independent, the joint event has probability s_A. The regret function is weighted by the surprisingness of the joint event, $1 - s_A$. If the decision maker selects the gamble, and A occurs, the emotional response is

$$R_{A(S)} = J_R[u_A + d(u_A - u_B)(1 - s_A) + r(u_A - u_S)(1 - s_A)]. \tag{9}$$

The emotional reaction is influenced by the utility of A, a comparison with B, and a comparison with S. We examined these predictions in Experiment 2.

Method

Participants. Fifty University of California undergraduates were recruited as in Experiment 1.

Instructions. Participants made choices between gambles and sure things presented as pie charts. Gamble pie charts had two regions, and sure thing pie charts had one. Participants made a choice, and the preferred option was highlighted. Then pointers in both pie charts began to spin. People learned the outcome of the gamble and rated their feelings. Instructions stated that, on average, people would earn \$8, but they could win or lose as much as \$15. The experiment lasted approximately 1 hr, and everyone was paid \$8.

Stimuli and design. Gambles were based on combinations of Better Outcomes × Worse Outcomes. Better outcomes were \$32, \$16, \$8, and −\$8, and worse outcomes were \$8, \$8, −\$16, and −\$32. Three outcome pairs with "worse" outcomes that were as good as or better than "better" outcomes were not included. The remaining 13 outcome pairs were combined with three levels of probability (.2, .5, and .8) to create 39 gambles. Sure things were −\$10, −\$5, \$5, and \$10. Fifty-one nondominated pairs of gambles and sure things were selected from a larger set of 39 × 4. Each pair was presented twice.

Results

Figure 7 shows means and predictions as solid lines and dashed lines, respectively. Panel A presents feelings about sure things, plotted against levels of the sure thing, with separate curves when the gamble's outcome was better or worse. Pleasure increased with the amount of the sure thing and when the gamble's outcome was worse. Panel B shows emotions associated with the gamble. Feelings are plotted against sure things, with separate curves when a gamble's outcome was better or worse than the sure thing. The spacing between the curves shows the effect of the obtained out-

utilities were −32, −18, 20, and 32, respectively. (Values of −32 and 32 were always fixed.) With partial feedback, estimated probabilities for .2, .5, and .8 were .37, .50, and .57, respectively, and with complete feedback estimated probabilities were .36, .50, and .61. (Values of .50 were fixed.) Estimated steps in the disappointment function were −46 and 22 for disappointment and elation with partial feedback, respectively, and −29 and 3 for disappointment and elation with complete feedback, respectively. Estimated steps in the regret function were −32 and 15 for regret and rejoicing, respectively. Finally, the additive and multiplicative constants in J_R were 10.7 and 0.64 for partial feedback and 6.1 and 0.80 for complete feedback, respectively.

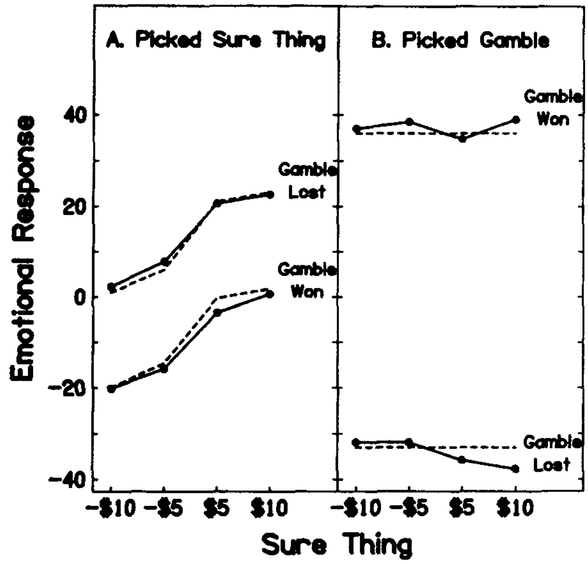

Figure 7. Results from Experiment 2. Panel A shows emotions associated with sure things plotted against values of sure things with separate curves when the gamble's outcome was better and worse than the sure thing. Panel B shows emotional responses to gamble outcomes when those outcomes were better or worse than the sure thing.

come. The slope of the curve shows the effect of the sure thing. In the upper curve, the sure thing is always worse than the outcome, and in the lower curve the sure thing is always better. Flat curves are consistent with the assumption that the regret function is sensitive to the sign of the difference between outcomes but not to the magnitude of the difference.

We fit decision affect theory to the means, as described in Experiment 1. We assumed that J_R was linear and estimated the additive and multiplicative constants. We also assumed that the disappointment and regret functions were step functions, and step sizes could differ for positive and negative differences. We estimated utilities for \$8 and −\$8 and fixed those for \$32 and −\$32. We estimated utilities for sure things of −\$10, −\$5, \$5, and \$10. Finally, we estimated subjective probabilities for .2 and .8 and fixed .5. There were 16 estimated parameters used to describe 312 mean responses.

Decision affect theory provided a good account of emotional experiences. The proportion of residual variance was only 3%. Estimated utilities for both risky and riskless outcomes were concave downward for gains and concave upward for losses. Subjective probabilities had an inverse S-shaped form. Disappointment and elation were similar in size, but regret was greater than rejoicing.[7] Predictions are shown as dashed lines in Figure 7.

We also fit the theory to individual participants. Residual variance increased, and for the majority of participants (84%) it was less than 20%. Median values of utilities were concave downward for gains and concave upward for losses for both risky and riskless outcomes. For the majority of participants, disappointment and elation were similar, and regret was greater than rejoicing. In sum, the theory appeared to be fairly reasonable at the individual-participant level, although fits were worse than those in Experiment 1.

Experiment 3: Imagined Outcomes

When people do not know the outcome of the unchosen gamble, they might imagine that a particular outcome would have occurred if they had made the other choice. Kahneman (1995) suggested that the emotional impact of options is influenced by what people imagine, in addition to what they know. Suppose that, in our paradigm, a decision maker imagined that if he or she had made the other choice, the better outcome would have occurred. Such thoughts would make him or her feel worse. The decision maker might also imagine that the worst outcome would have occurred, and this assumption would make him or her feel better. A third possibility is that the most probable outcome would have occurred. This assumption would make him or her feel better or worse, depending on the outcome.

Decision affect theory asserts that people compare their outcomes to relevant reference points, but it does not predict that people imagine an outcome of the unchosen gamble. To test this assumption, we used the same participants in choice tasks with both partial and complete feedback. If R_L, the feeling associated with a loss with partial feedback, resembles $R_{L(W)}$, the feeling associated with that loss with complete feedback when the unchosen gamble's outcome was a win, we infer that the decision maker was imagining that the better outcome would have occurred. If R_L resembles $R_{L(L)}$, we would assume the decision maker was imagining the worse outcome would have occurred. We examined these predictions in Experiment 3.

Method

Participants. Twenty-six University of California undergraduates participated in the experiment. A few additional people who did not finish the task were excluded from the analyses.

Instructions. Emotional responses were obtained with partial and complete feedback for the same participants. The tasks were performed 2 days apart, and the order of tasks was counterbalanced. Instructions stated that participants earned \$14 on average, and they could win up to \$25 or lose as much as \$5. Everyone was paid \$14 for approximately 2 hr of work.

Stimuli and design. Gambles were constructed from a Win × Loss × Probability factorial design. Levels of wins were \$8 and \$32; levels of losses were −\$8 and −\$32. Probabilities were .2, .5, and .8. There were 12 gambles. All 24 nondominated gamble pairs

[7] Utilities for −\$32, −\$16, −\$8, \$8, \$16, and \$32 were −32, −22, −10, 18, 23, and 32, respectively. Utilities of sure things for −\$10, −\$5, \$5, and \$10 were −10, −3, 17, and 20. Subjective probabilities of .2, .5, and .8 were .38, .50, and .56, respectively. Steps for disappointment and elation were −10 and 10, respectively, and steps for regret and rejoicing were −32 and 23, respectively. The additive and multiplicative constants in J_R were 3.1 and 0.74, respectively.

were selected from the set of 12 × 12. Each pair was presented twice with partial feedback and four times with complete feedback.

Results

For each gamble pair we compared feelings about an outcome with partial feedback with feelings about the same outcome with complete feedback. We used only triplets for which we had all three responses from the same person and the actual outcome fell between the outcomes of the unchosen gamble. Results showed no evidence that people were imagining outcomes for either losses or wins. R_L was equidistant to $R_{L(L)}$ and $R_{L(W)}$ in 45% of the triplets, closer to $R_{L(L)}$ in 32% of triplets, and closer to $R_{L(W)}$ in the remaining 23% ($n = 99$). Similarly, R_W was equidistant to $R_{W(L)}$ and $R_{W(W)}$ in 40% of the triplets, closer to $R_{W(W)}$ in 24% of triplets, and closer to $R_{W(L)}$ in 36% of the triplets ($n = 92$).

To test whether participants were imagining that the most probable outcome occurred, we selected triplets for which probabilities in the unchosen gamble were .2 and .8, but this time we did not require the actual outcome to fall between the outcomes of the unchosen gamble. Once again, there was no systematic evidence for imagined outcomes. R_L was closer to the more probable outcome 50% of the time ($n = 110$), and R_W was closer to the more probable outcome 53% of the time ($n = 77$).

If emotions were consistent with decision affect theory, R_L should be more pleasurable than $R_{L(W)}$ but less pleasurable than $R_{L(L)}$ (assuming the loss of the unchosen gamble is worse than the loss of the chosen gamble). Indeed, in 72% of triplets, R_L was at least as pleasurable as $R_{L(W)}$, and in 72% of triplets R_L was at least as painful as $R_{L(L)}$ ($n = 162$). Similarly, R_W was at least as pleasurable as $R_{W(W)}$ 74% of the time and at least as painful as $R_{W(L)}$ 85% of the time ($n = 92$).

We fit decision affect theory to emotional responses with partial and complete feedback simultaneously. We estimated an additive and multiplicative constant for J_R, two steps in the disappointment function, two steps in the regret function, two utilities for \$8 and −\$8, and two subjective probabilities for .2 and .8. With these assumptions, there were 10 estimated parameters to describe 144 mean responses.

We obtained a good account of judged pleasure. The proportion of residual variance in the means was 1.3%. Estimated utilities were concave downward in the gain domain and concave upward in the loss domain. Subjective probabilities had an inverse S-shaped form. Disappointment had greater impact than elation, and regret and rejoicing were similar.[8] Finally, individual participant fits resembled those in the means.

Experiment 4: Anticipated Versus Actual Emotions

In this experiment we examined the resemblance between anticipated and actual emotions. Can people anticipate the surprise, disappointment, and regret they later experience? We investigated these questions in two sessions. In the first session, people made choices and imagined how they would feel about hypothetical outcomes. One week later they performed the same task, but this time the outcomes were real.

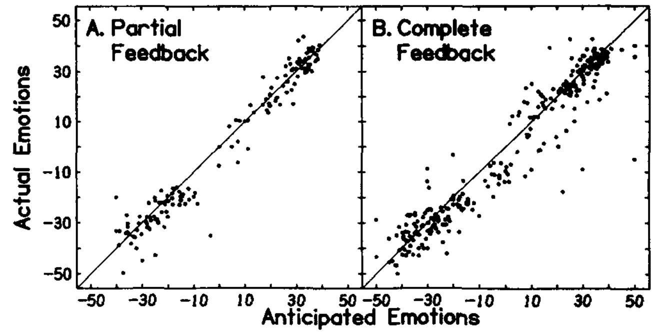

Figure 8. Results from Experiment 4: average actual emotions plotted against average anticipated emotions in both partial and complete resolution tasks.

Method

Participants. There were 40 and 34 people in the partial- and complete-feedback conditions, respectively.

Instructions. There were two sessions with partial feedback, each of which lasted approximately 1 hr, and two sessions with complete feedback, each of which lasted approximately 2 hr. With partial feedback, all participants were paid \$4 in the first session. Outcomes were hypothetical. In the second session, participants were told that, on average, their earnings would be \$4, but they could win or lose as much as \$10. They were all paid \$4. With complete feedback, everyone was paid \$6 in the first session, and in the second session they were told that, on average, they could earn \$6, but they could win or lose as much as \$15. Everyone was paid \$6.

Stimuli and design. Gamble pairs were identical to those in the within-subject designs of Experiment 1.

Results

Figure 8 presents actual emotions plotted against anticipated emotions for partial and complete feedback in Panels A and B, respectively, using the response scale of 50 to −50. Each point is the actual emotion and the anticipated emotion associated with an outcome. In both panels, points fall close to the identity lines, which implies that people can accurately predict their emotions. Points lying farthest away are instances in which people anticipated pleasure but did not experience it. Despite these points, correlations between anticipated and actual emotions were .98 and .96 with partial and complete feedback, respectively.

Figure 9 shows anticipated and actual responses as open and solid points, respectively. Panels A and B are based on partial feedback, and Panel C is based on complete feedback. In Panel A the interaction between probability and

[8] Utilities for −\$32, −\$8, \$8, and \$32 were −32, −22, 20, and 32, respectively. Subjective probabilities for .2, .5, and .8 were .38, .50, and .60. Steps for disappointment and elation were −35 and 28, respectively, and steps for regret and rejoicing were −5 and 8, respectively. Finally, the additive and multiplicative constants in J_R were 3.5 and 0.69, respectively.

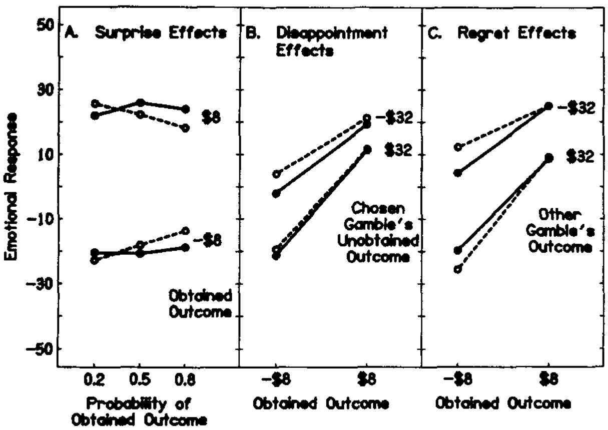

Figure 9. Anticipated and actual emotions, shown as open and solid points, respectively. People can anticipate the surprise, disappointment, and regret that occur in their actual emotions.

outcome converges to the right for actual emotions, but not anticipated emotions. In Panel B, main effects of obtained and unobtained outcomes were significant, $F(1, 137) = 59$, and $F(1, 137) = 18$, respectively. In Panel C main effects of obtained outcome and unchosen gamble's outcome were significant, $F(1, 243) = 52$, and $F(1, 243) = 68$.

The similarity of the open and solid points shows that participants were good at predicting their feelings. Their predictions were not perfect; they did not seem to anticipate surprise, but they did anticipate the disappointment and regret they later experienced. Accuracy in predictions may be limited to simple situations, as found in our paradigm. Nonetheless, the results allow us to use actual emotions as a proxy for anticipated emotions when testing theories of choice.

Predicting Choices From Emotions

Experiment 1 contains 36 and 26 choice proportions with partial and complete feedback, respectively. Experiment 2 has 51 choice proportions between gambles and sure things, and Experiment 3 has 24 choice proportions with both partial and complete feedback. We used these five sets of data to examine emotion-based theories of choice.

Suppose people prefer the gamble with the greater subjective expected pleasure. Anticipated pleasure associated with each outcome is weighted by the chance the outcome will occur, then averaged over pleasure. The selected gamble has the greater average pleasure. To test this theory, we calculated the subjective expected pleasure for each gamble in a pair. Consider Gamble 1, with Outcomes A and B, and Gamble 2, with Outcomes C and D. Decision affect theory provides predicted pleasure for A, B, C, and D, as well as subjective probabilities. When choices were based on partial feedback, we calculated the expressions in Equations 3 and 4 and assumed that people preferred the gamble with the greater expected pleasure. When choices were based on complete feedback, we calculated Equations 5 and 6 and made the same assumptions. Binary predictions of

Table 2
Correlations Between Choice Proportions and Emotion-Based Theories

Experiment and condition	Theory: Maximize SEP	Theory: Maximize SEP(SEU)	Theory: Minimize prob reg
Exp. 1: Partial feedback	.74	.64	
Exp. 1: Complete feedback	.86	.44	.58
Exp. 2: Complete feedback	.72	.03	.45
Exp. 3: Partial feedback	.71	.30	
Exp. 3: Complete feedback	.66	.25	.61

Note. Predictions of all theories are binary. SEP = subjective expected pleasure; maximize SEP(SEU) = maximizing SEP with subjective expected utilities (SEU) partialed out of SEP. Minimize prob reg = minimizing the probability of regret; Exp. = experiment.

subjective expected pleasure theory were then correlated with choice proportions.

Correlations ranged from .66 to .86 across the five sets of choice proportions, as shown in Table 2. These correlations are remarkably high given that predictions of the theory are based on the fit of another theory to judgments of pleasure; that is, choice proportions were never directly fit to subjective expected pleasure theory. The data in Table 2 show that choices between gambles, as well as those between gambles and sure things, can be reasonably well described by assuming that people prefer the gamble that, on average, gives them the greatest emotional satisfaction.

Maximizing subjective expected pleasure is not the same as maximizing subjective expected utilities. Emotions, as predicted from decision affect theory, differ from utilities derived from choice theories in two important ways. Utilities are typically assumed to be independent of beliefs. However, emotions depend on beliefs. Furthermore, most utilities are typically assumed to be monotonically related to monetary outcomes. However, emotional pleasure need not increase with the size of the outcome. Smaller wins can feel better than larger wins, depending on beliefs and counterfactual comparisons.

Despite these differences between emotions and utilities, subjective expected utility theory is a special case of subjective expected pleasure theory under certain conditions. When choices are based on partial feedback, maximizing subjective expected pleasure is equivalent to maximizing subjective expected utility if the judgment function is linear, the subjective probabilities sum to 1.0, and the disappointment function is symmetric about zero.[9] In our experiments, J_R was linear, and subjective probabilities were approximately equal to 1.0, but the disappointment func-

[9] The subjective expected pleasure associated with Gamble 1 is $s_A\{a + b[u_A + d(u_A - u_B)(1 - s_A)]\} + s_B\{a + b[u_B + d(u_B - u_A)(1 - s_B)]\}$, which can be written as $a + b[s_A u_A + s_B u_B + d(u_A - u_B)s_B s_A + d(u_B - u_A)s_B s_A]$. If d, the disappointment function, is symmetric about zero [i.e., $d(u_A - u_B) = -d(u_B - u_A)$], the subjective expected pleasure of Gamble 1 reduces to $a + b(s_A u_A + s_B u_B)$, an expression that is linearly related to the subjective expected utility of Gamble 1. With complete feedback, the connection between the theories is more complex.

tions were asymmetric. This asymmetry implies that the theories differ; that is, subjective expected pleasure theory contains subjective expected utility theory, as well as effects of disappointment and elation. Therefore, we can ask whether the additional variance adds to the predictability of choices over and beyond subjective expected utility theory.

To answer this question, we calculated another set of correlations between choice proportions and subjective expected pleasure theory, with subjective expected utility theory partialed out of subjective expected pleasure theory. We used our previous sets of binary predictions for subjective expected pleasure theory, then we calculated binary predictions for subjective expected utility theory based on utilities and subjective probabilities estimated from decision affect theory (see Equations 1 and 2). Finally, we computed the partial correlations. These correlations, also shown in Table 2, ranged from .64 to .03.[10] In all five cases, correlations were greater than zero, and those in Experiment 1 were significantly different from zero. We conclude that emotions can add to the predictability of choices, over and beyond utilities.

We can also compare subjective expected pleasure theory to other emotion-based theories of choice. To test the maximax strategy, we assumed that the decision maker prefers the gamble with the maximum possible pleasure. We then computed correlations between binary predictions and choice proportions. Correlations were .36, .47, .03, .33, and .35 for the five sets of data in Table 2. The theory was not a good account of choice proportions.

To test the minimax theory, we calculated binary predictions in the same fashion. We assumed the decision maker prefers the gamble that minimizes the maximum possible displeasure and correlated predictions with choice proportions. Correlations were .32, .36, −.47, .08, and .07 for the five sets of data in Table 2. Thus, minimax was even worse.

Ritov (1996), Zeelenberg et al. (1996), and Josephs et al. (1992) have argued that people select options to minimize the chances of regret. To test this theory, we computed the probability of regret for each gamble within a pair for data sets with complete feedback. Then we generated choice predictions by assuming that people prefer the gamble that minimizes their probability of regret. Results are shown in Table 2; correlations ranged from .45 to .61. Although these values are higher than those based on maximax and minimax theories, they are still worse than those provided by subjective expected pleasure theory.

General Discussion

Decision affect theory describes the emotions that follow from choices between gambles with monetary outcomes. In Experiment 1 we investigated the pleasure associated with the outcomes of choices with partial and complete feedback. In Experiment 2 we examined emotions following choices between sure things and gambles. In both experiments postdecision feelings were consistent with decision affect theory. In Experiment 3 we examined the possibility that people imagine the outcome of the unchosen gamble. Decision affect theory predicts that, with partial feedback, outcomes of unchosen gambles do not influence feelings. Results showed no evidence that people imagine any specific outcome. In Experiment 4 we investigated the relationship between anticipated and actual emotions and found a close connection between the measures. Results imply that decision affect can describe anticipated emotions as well as actual emotions. The generality of this finding is an important topic for future research (see Loewenstein & Schkade, 1999).

We then developed an emotion-based theory of risky choice. We assumed that people prefer gambles that maximized their subjective expected pleasure. We fit the theory to five sets of choice proportions and showed that risky choices are well described by assuming that people prefer the gamble that maximizes their average pleasure.

Emotional reactions to outcomes differ from the utilities associated with outcomes. Kahneman and Varey (1991) offered a distinction between *experienced utility* and *decision utility*. Experienced utility is the pleasure or pain of an outcome, as proposed by Bentham (1823/1968), and decision utility is the satisfaction of an outcome as inferred from choice, in the spirit of Neumann and Morgenstern (1947). We found that decision utilities are a component of the emotional experience, but not all of it. Emotional experiences also depend systematically on beliefs and counterfactual comparisons.

In our paradigm there was no ambiguity about what counterfactual comparison people would use; there was only a question of whether they would use it and, if so, how. When counterfactual comparisons are less obvious, people may use a variety of other reference points that need not be counterfactual comparisons (Mellers & McGraw, 1999). Counterfactual comparisons depend on the timing of events; people are more likely to "undo" the initial event or the final event in a causal sequence (Kahneman & Miller, 1986; Roese & Olson, 1995). Furthermore, actions seem to provoke more counterfactual thinking than inactions do (Gleicher et al., 1990; Landman, 1987). Finally, people are more likely to imagine how a bad outcome could have been better than how a good outcome could have been worse (Gavanski & Wells, 1989; Gleicher et al., 1990; Kahneman & Miller, 1986; Landman, 1987).

In our paradigm, the surprisingness of an event was represented as the probability the event would not occur, but surprisingness could be defined as a range of expected outcomes. A surprising outcome would be one that fell outside the expected range. The surprisingness of an outcome could depend on other factors as well. For example,

[10] We could not fit subjective expected pleasure theory directly to choices (i.e., independent of emotions), because the disappointment and regret functions were unstable; that is, estimated parameters varied greatly depending on starting values, and there appeared to be a large number of estimates that would provide the same lack-of-fit index. This problem did not occur when disappointment and regret functions were estimated from the fit of decision affect theory to emotions. We could fit subjective expected utility theory directly to choices, but this method of fitting would have given subjective expected utility theory an unfair advantage over subjective expected pleasure theory.

Miller, Turnbill, and McFarland (1989) varied the ease with which one could imagine an outcome by manipulating the number of ways it could happen, holding objective probability constant. The harder it was to imagine the event, the more surprising the outcome and the greater the impact of the counterfactual comparison.

Are people aware of the average pleasure associated with a gamble? Schwartz (1997) investigated this question by asking people to judge the average pleasure they would experience each time they played a gamble if they played it many times. He found that people were quite good at judging expected feelings, and they judged expectations to be similar to the subjective expected pleasure of a gamble, as calculated from the parameters of decision affect theory.

Another way to investigate awareness of pleasure in choice is to investigate preferences for feedback. Mellers, Schwartz, and Ritov (1998) asked people to make choices between risky options. People learned their outcomes, but before they rated their feelings, they were given the opportunity to get additional feedback about the outcome of the unchosen gamble. If people preferred to maximize their subjective expected pleasure, they would request feedback if the subjective expected pleasure of the best gamble with complete feedback was greater than the subjective expected pleasure of the best gamble with partial feedback. We found support for this hypothesis with losses, but not with wins.

Can people maximize their maximum pleasure or minimize their maximum pain when instructed to do? Schwartz, Mellers, and Metzger (1999) investigated this question in a two-part study. First, people made choices with no instructions and rated their feelings about outcomes. Then they made choices again with instructions to either maximize pleasure or minimize displeasure or pain. We could construct individual participant predictions for each strategy by using each individual's emotions from the first set of choices. Choices were not perfectly predicted by assuming that people followed instructions, but they were in the right direction. Choices based on instructions to maximize pleasure or minimize pain were best predicted by an average of anticipated feelings, but pleasurable or painful feelings were weighted more when instructions said to maximize pleasure or minimize pain, respectively. In sum, people appear to be aware of their emotional experiences associated with outcomes and even their average emotional experience (Schwartz, 1997).

Finally, we raise the normative question: Should people use emotions to guide their choices when trying to make the best possible decision? Answers tend to fall along a continuum. At one end of the continuum is the view that feelings such as regret and disappointment are irrational and merely distract us from our long-range plans. Howard (1992) wrote "My preferences must be based on prospects—the futures I face. Regret is a bad thought that arises when I think about futures I might have received instead of the future I did receive" (p. 38). At the other end of the continuum is the view that emotions are important components of rationality (Damasio, 1994; Lane, 1991). Loomes and Sugden (1982) wrote "We do not claim that maximizing expected modified utility is the only objective that is consistent with a person being rational. However . . . we believe this is not irrational" (p. 809). Baron (1994) pointed out that emotions are real consequences: If the same monetary reward is associated with two different emotions, those emotions imply different consequences.

The results of the present experiments suggest that, at least in some cases, the debate need not be dichotomous. There is theoretical and empirical overlap between subjective expected pleasure theory and subjective utility theory. Despite this overlap, we still need a better understanding of emotions. Simply dismissing them as irrational will surely leave us vulnerable to their effects.

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The 1999 Research Awards in Experimental Psychology

The Awards Committee of the Division of Experimental Psychology (Division 3) of the American Psychological Association recognizes work by new investigators in all areas of experimental psychology. There is a separate award for each of the five *Journals of Experimental Psychology*, and each year an outstanding new investigator is selected for the best article in each journal. This year's committee included David A. Balota (Chair), Henry L. Roediger III, and Peter J. Urcuioli.

The APA Science Directorate, proud sponsor of the Research Awards in Experimental Psychology, is pleased to join with Division 3 in congratulating the following individuals for their outstanding research, which was published in 1998 issues of the *JEP*s.

Journal of Experimental Psychology: General
Alan W. Kersten, "A Division of Labor Between Nouns and Verbs in the Representation of Motion" (Vol. 127, pp. 34–54)

Journal of Experimental Psychology: Applied
Susan Joslyn (with Earl Hunt), "Evaluating Individual Differences in Response to Time-Pressure Situations" (Vol. 4, pp. 16–43)

Journal of Experimental Psychology: Animal Behavior Processes
Lewis A. Bizo (with Sergei V. Bogdanov & Peter R. Killeen), "Satiation Causes Within-Session Decreases in Instrumental Responding" (Vol. 24, pp. 439–452)

Journal of Experimental Psychology: Human Perception and Performance
Cathleen M. Moore (with Howard Egeth), "How Does Feature-Based Attention Affect Visual Processing?" (Vol. 24, pp. 1296–1310)

Journal of Experimental Psychology: Learning, Memory, and Cognition
Robin D. Thomas, "Learning Correlations in Categorization Tasks Using Large, Ill-Defined Categories" (Vol. 24, pp. 119–143)

Honorable Mentions

Journal of Experimental Psychology: General: Arthur B. Markman (with Valerie S. Makin)

Journal of Experimental Psychology: Applied: Julien Gross (with Harlene Hayne)

Journal of Experimental Psychology: Animal Behavior Processes: Andrew B. Slifkin (with Jasper Brener)

Journal of Experimental Psychology: Human Perception and Performance: Satoru Suzuki (with Patrick Cavanagh)

Journal of Experimental Psychology: Learning, Memory, and Cognition: Neil W. Mulligan