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Influencing Risk Preference in Decision Making: The Effects of Framing and Salience

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Prospect theory predicts that people tend to prefer the sure option when choosing between two alternative courses of action framed in terms of gains and prefer the risky option when choosing between two alternatives framed as losses. Related research investigated the impact of emphasizing the probability of the positive outcome of a risky option versus emphasizing the probability of the negative outcome on preference. Most of these studies on the effects of "outcome salience" related their findings to prospect theory's framing effect. It will be argued that most of these studies inaccurately applied prospect theory to explain the obtained effects and that these might be better understood in terms of salience. In four experiments we test the predictions that (1) choosing between two options in a gain problem will lead to decreased risk preference as compared to loss problems and (2) emphasizing the probability of positive outcomes of a risky option leads to increased preference for this option compared to emphasizing the probability of negative outcomes. Results confirm the impact of both prospect framing and outcome salience and indicate that these effects should be understood in terms of distinct, independent processes. © 1995 Academic Press, Inc.

Judgment and decision making can be affected by the way in which a decision problem is presented or

"framed." Probably the most widely cited research on framing effects is Kahneman and Tversky's (1979; Tversky & Kahneman, 1981) prospect theory. Prospect theory predicts that people tend to be risk averse when confronted with a problem framed in terms of gains and risk taking when facing a problem framed in terms of losses. Kahneman and Tversky (1979) propose that in many decision problems the outcomes of the decision can be perceived or coded as gains or as losses relative to an expectation or aspiration level. They gave the following example (p. 286): "Imagine a person who is involved in a business venture, has already lost 2,000 and is now facing a choice between a sure gain of 1,000 and an even chance to win 2,000 or nothing. If he has not yet adapted to his losses, he is likely to code the problem as a choice between $(-2,000 \times .50)$ and $(-1,000)$ rather than as a choice between $(2,000 \times .50)$ and $(1,000)$." Hence, the same problem can either be perceived as a gain problem or as a loss problem which would lead to different decisions.

Prospect theory thus states that outcomes of a decision are perceived as changes in wealth or welfare from a certain reference point. This reference point causes people to view outcomes as either gains or losses. Describing or framing the outcomes of a decision in terms of gains or losses is essentially based on shifting the reference point. A classical example of this type of framing is the "Asian disease" problem (Tversky & Kahneman, 1981) in which 600 fatalities are expected. Subjects are requested to choose between an option with certain outcomes and a risky option. In the gain frame the outcomes are positively framed, in terms of the number of people who would be saved. The loss frame describes the outcomes in terms of the number of people who would die.

Although the two problems are formally identical, the preferences tend to be quite different. In the loss

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version more subjects opted for the risky program (78%) than in the gain version (28%) (Tversky & Kahneman, 1991). The framing interpretation of this inconsistency is that the "save lives" wording of the gain problem induces a reference point giving up all 600 infected people; hence, each individual surviving the disease is perceived as a gain. In the loss version, the wording "people will die" induces a reference point in comparison to which each patient dying is perceived as a loss.

In problems such as the Asian disease problem, the perception of the outcomes as gains or losses is due to the wording or framing of the problem. In many, or even most, decisions the outcomes will be defined as gains or losses in comparison to the status quo: i.e., the amounts (of money) that are obtained or paid/lost. In other words, the outcomes are "actual" gains or losses. Preference reversal has also been demonstrated for decision problems (i.e., gambles) differing in the sign of the (actual) outcomes. This reversal in option preference is not based on framing and is generally labeled the "reflection effect" (Fagley, 1993). Prospect theory explains the reflection effect and preference reversal due to framing, i.e., the framing effect (Fagley, 1993), in the same way. The assumption is that a decision is based on a comparison of the subjective values of the options. Due to the concavity of the value function in the domain of gains prospect theory predicts preference for certainty if options are presented as gains. For example, a sure saving of 200 lives is valued more than $\frac{1}{3}$ times saving 600 lives. Similarly, the convexity of the value function in the domain of losses explains risk preference if options concern losses.

Schneider (1993) pointed out that the literature does not consistently provide strong empirical evidence for the predicted effects on risk preference of framing a problem in terms of gains or losses. In general, framing effects have been most clearly demonstrated in problems in which scenarios have been used that are similar to, or have been modeled after, Tversky and Kahneman's (1981) Asian disease problems. Scenarios in the Asian disease format require problems which can be phrased in terms of gains and in terms of losses. In other words, it should be possible to perceive more than one reference point as "natural" (or possible). As noted before, in many decisions the status quo seems to be the only natural or possible reference point, which will make framing in terms of gains or losses difficult.

Creating scenarios in accordance with the above requirements tends to be particularly difficult (or impossible) in applied research. The notion of framing, as proposed in prospect theory, inspired many researchers in applied contexts (e.g., Eraker & Sox, 1991; McNeil, Pauker, Sox, & Tversky, 1982; Levin, Johnson, & Davis, 1987; Huber, Neale, & Northcraft, 1987; Meyerowitz & Chaiken, 1987; Wilson, Kaplan, & Schneiderman, 1987; Levin, Schnitger, & Thee, 1988; Levin, Snyder, & Chapman, 1988; Marteau, 1989; Rybash & Roodin, 1989). In most of these studies the framing manipulations are, however, not based on shifting the reference point, but involve selectively emphasizing the probability of success (gain, or positive frame) versus emphasizing the probability of failure (loss, or negative frame). To distinguish this from framing as used in prospect theory we will refer to this frame manipulation as "outcome salience." The manipulation can be illustrated with a problem describing a risky surgery used by Wilson *et al.* (1987). In the "positive" condition, the problem presentation referred to a .40 probability of surviving and the "negative" condition presented a .60 probability of dying. Subjects were requested to indicate whether they opted for the treatment or not. In the positive condition more subjects opted for surgery than in the negative condition which emphasized the likelihood of losing one's life.

The effects of outcome salience have been studied in a number of problem domains; e.g., medical decision making (Levin *et al.*, 1988a; Marteau, 1989), consumer decision making (Levin *et al.*, 1987), and gambling (Levin *et al.*, 1988b). The effects of outcome salience obtained in these studies were similar to the findings of Wilson *et al.* (1987), described above. Meyerowitz and Chaiken (1987) and Huber *et al.* (1987) investigated framing in the context of preventive health behavior (breast self-examination) and selecting job candidates. In both studies it was concluded that emphasizing the positive outcome (gains) leads to risk avoidance, while emphasizing the negative outcome (losses) results in risk seeking. In these studies, however, the operationalization of risk taking was disputable. In Huber *et al.*'s study interviewing more job applicants was considered risk taking, while it could easily be argued that interviewing fewer job applicants is more risky, due to the increased likelihood of missing the perfect candidate. Meyerowitz and Chaiken viewed performing breast self-examination as risky behavior. Again, it could be argued that this behavior is more cautious in comparison to not performing breast self-examination. In a study on medical decision making Rybash and Roodin (1989) also concluded that framing the information about the effectiveness of a risky medical treatment (heart surgery) in positive terms results in more rejection of this treatment compared to framing the information negatively. In the positive frame the only positive information concerned the consequences if one does *not* undergo the surgery, while the consequences of the surgery were described in negative terms. In the negative frame the outcome of not performing surgery was described negatively and the outcomes of the surgery were presented in positive terms. We would like to

argue that the positive frame in Rybash and Roodin's (1989) study is best described as the negative information condition; the outcomes of the risky option were presented in negative terms. Similarly, the negative frame is in fact a positive information condition.

The general finding of studies on outcome salience is that the majority of subjects opts for the risky alternative if the outcomes of the risky option are described in terms of probability of success, while presenting the complementary probability of failure increases the preference for the status quo and leads to risk avoidance. Based on the (incorrect) assumption that framing and outcome salience are similar variations in the problem presentation, prospect theory has been used to predict effects of outcome salience. However, prospect theory would not predict and can not explain the obtained effects. Moreover, not all studies of outcome salience involve risk. Thus, it seems incorrect to apply prospect theory to predict or understand the effects of outcome salience.

In a revision of prospect theory, called "cumulative prospect theory" (Tversky & Kahneman, 1992), the general prediction concerning framing effects has been refined. Cumulative prospect theory predicts risk preference in the "gain frame" and preference for certainty in the "loss frame" if the outcomes involve high (and moderate) probabilities, while the reverse effect (risk seeking for gains and risk aversion for losses) is predicted for low probabilities. At first sight cumulative prospect theory might explain the effects obtained in some of the studies on outcome salience mentioned above (e.g., Wilson *et al.*, 1987; Levin *et al.*, 1988a; 1988b; Marteau, 1989). However, in these studies the effects of problem presentation on risk preference was not affected by the probability level. For example, Wilson presented subjects with a decision problem emphasizing either the positive or negative outcome, varying the probabilities of the outcome. The probability level did not affect the direction of the frame effects. This suggests that cumulative prospect theory cannot explain these results.

As noted, in most of the above studies frame manipulations were not based on shifting the reference point (e.g., Huber *et al.*, 1987; Meyerowitz & Chaiken, 1987; Wilson *et al.*, 1987; Levin *et al.*, 1988a; 1988b; Marteau, 1989). Variations in the problem presentation consisted of focusing on specific aspects of the decision problem. This manipulation thus seems to rely on either emphasizing the possible positive outcome or the possible negative outcome of the risky alternative. Subjects are simply requested to indicate whether they opt for this risky alternative or not. In contrast, research in prospect theory's paradigm generally presents subjects with the *whole* problem in terms of gains or in terms of losses, and subjects are requested to choose between a

risky and a certain option. These frame manipulations can be illustrated with the following example:

Prospect framing: gain frame (loss frame)

Imagine an outbreak of a disease, which is expected to kill 600 people. Traditionally this disease has been combated by the use of vaccine A. Results of this treatment can be estimated with great certainty. Another option is to use a newly developed vaccine B. One has to choose between two vaccines:

If vaccine A is adopted, 300 people will be saved (will die). If vaccine B is adopted, there is .50 probability that 600 people will be saved (nobody will die), and .50 probability that no people will be saved (600 people will die). Which vaccine would you opt for?

Outcome salience: positive frame (negative frame)

Imagine an outbreak of an unusual disease; 600 people are being infected. Traditionally this disease has been combated by the use of vaccine A. Using this vaccine it is certain that half of the people will survive and half of the people will die. Recently a new vaccine has been developed. The result of this vaccine are still uncertain. This vaccine will either be effective for all infected people or it is not effective at all. The predictions are that there is a 50% chance that all 600 people will be saved (will die). Would you opt for the new vaccine?

Thus, the manipulation used in the studies on outcome salience is different from that used in studies examining framing effects as predicted in prospect theory. Moreover, the results of the studies mentioned above suggest that prospect theory might not provide an adequate explanation for the effects. An alternative explanation for the obtained results might be related to salience. It could be argued that presenting the probability of a particular outcome of the risky option makes this outcome more salient (hence the term outcome salience). It has been frequently demonstrated that salient stimuli have a disproportionate influence on people's judgments (Taylor & Fiske, 1978; Slovic, Fischhoff, Lichtenstein, 1982). Making specific aspects of an issue more salient can influence attitudes and decisions (van der Pligt & Eiser, 1984).

The impact of selective attention on particular aspects of an issue has been widely studied in attitude research (e.g., McGuire, 1985). For example, presenting the benefits of various technologies increased people's risk acceptance associated with these technologies compared to dwelling on their disadvantages (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978). On the basis of these findings we would expect that addressing positive aspects or outcomes of an issue (or a decisional option) results in a more favorable attitude toward that issue (or option) compared to focusing on the negative aspects or outcomes. Salience effects can be explained as differential attention to particular aspects of the decision. If, for example, the positive outcome of a risky option is made salient, subjects will tend to pay more attention to this positive outcome. Decisional outcomes not explicitly mentioned in the problem description, will receive relatively little attention, and might even be ignored.

Levin's (1987; Levin *et al.*, 1988a) associative model which attempts to explain the effects of outcome salience corresponds to this salience explanation. Levin (1987) asked subjects to associate with a purchase of "75% lean ground beef" versus "25% fat ground beef." His findings demonstrate that emphasizing the positive component leads to more positive associations than emphasizing the negative component. Levin (1987) proposed that this associative model could explain how judgments of single stimuli are affected by the information frame. Prospect theory tends to focus on multiple (two) option problems. Applying this associative model to decisions with, for example, a risky and a certain option both describing gains would lead to positive associations with both the risky and the certain option. Hence, the associative model does not seem to predict a clear preference for either of the two options, and it seems difficult to relate the framing effects as predicted by prospect theory to this model. As a consequence, Levin *et al.* (1988a) suggest that different theoretical accounts apply to different types of framing effects.

As argued before, prospect framing and outcome salience lead to different predictions. It has to be noted, however, that these effects are created by different manipulations. Prospect theory's explanation of framing effects is based on the nonlinearity of the value function, while effects of outcome salience might be explained as a consequence of uneven attention due to salience. The present study investigates the relative impact of prospect framing and outcome salience on risk preference. The effects of describing a problem in terms of gains versus losses will be tested under the condition of selective attention for either the positive or negative outcomes of the risky option. Based on prospect theory and the concept of outcome salience two distinct hypotheses can be put forward:

(1) *Prospect framing.* Presenting a problem in terms of gains results in preference for certainty and presenting a problem in terms of losses results in risk preference, independent of the salience of the positive or negative outcome of the risky option.

(2) *Outcome salience.* Emphasizing the probability of a positive outcome of a risky option leads to risk preference and emphasizing the probability of a negative outcome of the risky option leads to risk avoidance, independent of the presentation of the problem in terms of gains or losses.

Finally, the experiments also address the combined effects of prospect framing and outcome salience and the relative impact of the two frame manipulations.

EXPERIMENT 1

Prospect theory predicts the same effects for framing a problem in terms of gains versus losses (prospect

framing) as for "actual" gain and loss problems. The latter effect will be referred to as "reflection effect" (Fagley, 1993). In both situations gain problems would result in risk aversion and loss problems in risk acceptance. In this first experiment the effects of outcome salience will be studied in combination with the reflection effect. As the predictions are based on prospect theory but not due to framing, we will refer to this manipulation "prospect paradigm."

Method

Subjects. A total of 428 first year psychology students of the University of Amsterdam participated in the experiment. Subjects received credit points for participation.

Design. Subjects were randomly allocated to six groups. The design of this experiment was 2 (prospect paradigm: gains versus losses) $\times$ 3 (outcome salience: positive, negative and control). Subjects were presented with a gain problem or a loss problem emphasizing either the positive or negative outcomes of the risky option. Additionally, in two conditions subjects received a "classical" gain or loss problem without outcome salience (called *control* conditions hereafter).

Material. The decision problem concerned a game of chance. The three versions of the problem presentation of the gain problem are summarized below:

1. Gain-control

Suppose you are playing a game of chance. So far you have gained Dfl.200.² At this point of the game you have the opportunity to quit or to play one more time, for double or break even. You have a choice between two options with the following consequences:

Option A: you quit the game and are sure to gain Dfl.200.
Option B: you play one more time. You have a 50% chance to gain Dfl.400 and a 50% chance to gain nothing.

2. Gain-positive

Suppose you are playing a game of chance. So far you have gained Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. Playing one more time you would have a chance of 50% to gain Dfl.400.

3. Gain-negative

Suppose you are playing a game of chance. So far you have gained Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. Playing one more time you would have a chance of 50% to gain nothing.

Would you decide to play one more time?

Similarly, the loss problem is presented as follows:

4. Loss-control

Suppose you are playing a game of chance. So far you have lost Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. You have a choice between two options with the following consequences:

² 2 Dfl approximates \$1.

TABLE 1
Risk Preference as a Function of Prospect Paradigm and Outcome Salience, Experiment 1

	Prospect paradigm					
	Gain		Loss		Total	
	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)
Outcome salience						
Positive	30 (22)	70 (52)	52 (37)	48 (34)	41 (59)	59 (86)
Negative	48 (35)	52 (38)	66 (44)	34 (23)	56 (79)	43 (61)
Control	40 (29)	60 (43)	49 (35)	51 (36)		
Total prospect paradigm	39 (86)	61 (133)	53 (116)	47 (103)		

Option A: you quit the game and are sure to lose Dfl.200.

Option B: you play one more time. You have a 50% chance to lose Dfl.400 and a 50% chance to lose nothing.

5. *Loss-positive*

Suppose you are playing a game of chance. So far you have lost Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. Playing one more time you would have a 50% chance to lose nothing.

6. *Loss-negative*

Suppose you are playing a game of chance. So far you have lost Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. Playing one more time you would have a 50% chance to lose Dfl.400.

Would you decide to play one more time?

Subjects were asked to indicate their preference.

Results and Discussion

Table 1 presents an overview of the percentage (and number) of subjects accepting and rejecting the risky option. Table 2 presents the results of a log linear analysis (P referring to the factor prospect paradigm, S to the factor outcome salience, and R to the dependent variable risk preference).

Results of the log linear analysis show a significant main effect for outcome salience ($S * R$) and a significant main effect for prospect paradigm ($P * R$). The interaction effect ($P * S * R$) is not significant. As can be inferred from Table 1 the effect of outcome salience is in accordance with the prediction. In both the gain problem and the loss problem, focusing on the probability of success increased risk preference compared to addressing the complementary probability of failure.

The main effect for prospect paradigm is not in accordance with the predictions based on prospect theory. This effect indicates that aggregated over the conditions, more respondents accepted risk in the gain problem compared to the loss problem. The χ^2 for the control condition (the problem being presented in accordance with prospect theory's paradigm) was not significant ($\chi^2 < 1$, n.s.). In other words, the predicted reflection effect was absent. Previous research on the re-

lection effect using money problems also showed mixed results (Hershey & Schoemaker, 1980; Schneider & Lopes, 1986).

As no effects were found in the control conditions, the overall effect of prospect framing is the result of differences in risk preference in the conditions with outcome salience. Not surprisingly, eliminating the control conditions from the analysis results in (even stronger) effects for the factor prospect paradigm. Results in Table 1 also indicate that the obtained effect could be attributed to outcome salience. The salient outcome receives more attention and disproportionately influences the attractiveness of the risky option. In other words, salience of the positive outcome results in a more positive evaluation of the risky option than salience of the negative outcome. This effect is especially found in the gain-positive condition and in the loss-negative condition. The gain-negative and loss-positive conditions did not reveal a clear preference for the gamble or the certain option. This result suggests that salience of the positive or negative outcome does affect subjects' willingness to take risk, but that the effect is more pronounced if the presentation directs subjects' attention to clearly positive or negative outcomes. Salience of the outcome "nothing to gain" or "nothing to lose" (conditions 3 and 5) does not seem to influence the preference for the risky or cautious option.

TABLE 2
Effects of Outcome Salience and Prospect Paradigm on Risk Preference, Experiment 1

Model	χ^2	df	p
(1) $P * S * R, P * S, P * R, S * R, P, S, R$	0.00	0	
(2) $P * S, P * R, S * R, P, S, R$	1.46	2	
$\Delta 1-2: P * S * R$	1.46	2	n.s.
(3) $P * S, P * R, P, S, R$	9.52	4	
$\Delta 2-3: S * R$	8.08	2	<.05
(4) $P * S, S * R, P, S, R$	13.26	3	
$\Delta 2-4: P * R$	11.80	1	<.01

Note. P, prospect paradigm; S, outcome salience; R, risk preference).

The obtained results are in accordance with our prediction based on the role of outcome salience. Those outcomes which are salient in the presentation are expected to be available and to receive more weight in the evaluation. However, an alternative explanation could be related to 'missing information' and a misunderstanding of the problem. Previous research clearly demonstrated an impact of missing information upon risk preference (e.g., Levin *et al.*, 1986). One could argue that subjects only presented with the chance to gain (or to lose) Dfl.400 did not understand the complementary chance to gain (or lose) nothing. Misunderstanding of the complementary chances could even be stronger when subjects are presented with the chance to gain (or lose) nothing. This could explain the lack of effects of outcome salience in the gain-negative, and loss-positive conditions.

As far as missing information is the explanation for our findings, this would also explain the effects of outcome salience as demonstrated in previous research (e.g., Levin *et al.*, 1988a; Marteau, 1989; Wilson *et al.*, 1987). Our manipulation of outcome salience in Experiment I was similar to the manipulations used in these studies. In a second experiment outcome salience will be manipulated in a slightly different way. To control for missing information as an explanation for the effects, subjects will be presented with full information about the expected outcomes of a decision problem. In accordance with Baron and Herschey's (1988) study on the effects of salience of outcome information subjects receive an example of a previous decision, in which another person preferred the risky option. Outcome salience will be manipulated by describing the outcome of the risky decision as either positive or negative. In their study the reference to either the positive or the negative outcome of a risky choice affected the evaluation of the risky decision. Baron and Herschey's explanation for the obtained effects was related to salience. They argued that describing a positive (negative) outcome would make this outcome more salient, resulting in a disproportionate weight in the evaluation of the risky decision.

EXPERIMENT 2

This experiment is basically a replication of Experiment 1. The main difference concerns the manipulation of outcome salience. Subjects were presented with full information about the problem, describing *all* expected outcomes. Outcome salience was manipulated describing a previous risky decision which resulted either in a positive outcome or a negative outcome. As in Experiment 1, effects of outcome salience were studied in combination with the prospect paradigm.

Method

Subjects. A total of 207 fifth grade high school students (age approximately 17–18 years) participated in this experiment. The task was carried out in a classroom setting.

Design. As in Experiment 1 subjects were randomly allocated to six groups.

Material. The decision problem again concerned a game of chance. The different problem presentations are summarized below.

1. Gain-control

Suppose you are playing a game of chance, involving substantial amounts of money. So far you have gained Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even. You have a choice between two options with the following consequences:

Option A: Quit the game, with a sure gain of Dfl.200.

Option B: Play one more time, with a 50% chance to gain Dfl.400 and a 50% chance to gain nothing.

Would you decide to play one more time?

2/3. Gain-positive (negative)

Suppose student X is playing a game of chance, involving substantial amounts of money. So far X has gained Dfl.200. At this point of the game X has the opportunity to quit or to play one more time, for double or break even.

Student X has a choice between two options with the following consequences:

Option A: quit the game, with a sure gain of Dfl.200.

Option B: play one more time, with a 50% chance to gain Dfl.400 and a 50% chance to gain nothing. X decides to play one more time: option B. X is lucky (has bad luck) and gains Dfl.400 (gains nothing).

Suppose you are student X. Would you decide to play one more time?

4. Loss-control

Suppose you are playing a game of chance, involving substantial amounts of money. So far you have lost Dfl.200. At this point of the game you have the opportunity to quit or to play one more time, for double or break even.

You have a choice between two options with the following consequences:

Option A: quit the game, with a sure loss of Dfl.200.

Option B: play one more time, with a 50% chance to lose Dfl.400 and a 50% chance to lose nothing.

Would you decide to play one more time?

5/6. Loss-positive (negative)

Suppose student X is playing a game of chance, involving substantial amounts of money. So far X has lost Dfl.200. At this point of the game X has the opportunity to quit or to play one more time, for double or break even.

Student X has a choice between two options with the following consequences:

Option A: quit the game, with a sure loss of Dfl.200.

Option B: play one more time, with a 50% chance to lose Dfl.400 and a 50% chance to lose nothing. X decides to play one more time: option B. X is lucky (has bad luck) and loses nothing (loses Dfl.400).

TABLE 3
Risk Preference as a Function of Prospect Paradigm and Outcome Salience, Experiment 2

	Prospect paradigm					
	Gain		Loss		Total	
	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)
Outcome salience						
Positive	56 (19)	44 (15)	64 (21)	36 (12)	60 (40)	40 (27)
Negative	82 (31)	18 (7)	73 (24)	27 (9)	77 (55)	23 (16)
Control	68 (25)	32 (12)	41 (13)	59 (19)		
Total prospect paradigm	69 (75)	31 (34)	59 (58)	41 (40)		

Suppose you are student X. Would you decide to play one more time?

Results and Discussion

The percentages (and numbers) of subjects accepting or rejecting the risky option are presented in Table 3. Table 4 presents the results of a log linear analysis. Table 4 shows a significant interaction effect of prospect paradigm $\times$ outcome salience ($P * S * R$) and a significant main effect for prospect paradigm ($P * R$). The main effect for outcome salience ($S * R$) is not significant.

The main effect of prospect paradigm shows that more subjects reject the risky option in the gain problem than in the loss problem. This effect is in accordance with prospect theory's reflection effect. The interaction effect implies that the effect of prospect paradigm is dependent on outcome salience. Results in Table 3 indicate the existence of the reflection effect in the control condition ($\chi^2 < 5.03, p < .05$). In other words, when the problem presentation is in accordance with the standard paradigm used in research on prospect theory's reflection effect, the predicted effect is found.

In Experiment 1, the control condition did not show the reflection effect. As noted, in previous studies the reflection effect received mixed support when using money problems. The absence of the reflection effect is most often found in problems with small amounts of money at stake (Hershey & Schoemaker, 1986). The reflection effect we obtained in the second experiment could partly be due to the fact that the amounts of money at stake were more valuable to the younger (and less "wealthy") subjects in this experiment compared to the older subjects in the first experiment. Subjects were high school students dependent on pocket money, while in the first experiment we used university students receiving grants. Van der Pligt and van Schie (1990) also argued that the reflection effect tends to be more pronounced when dealing with relatively important stakes. It should also be noted that both our sec-

ond study and the third study in Hershey and Schoemaker (1986) show an increased preference for certainty in the gain problem. In both cases the particular experiment relied on relatively young subjects compared to the subjects in the remaining experiments.

To investigate whether the reflection effect is also present in the conditions *with* outcome salience, we tested for the effect of prospect paradigm aggregated over the positive and negative outcome salience conditions. In these conditions the difference in risk preference between the gain problem and the loss problem is not significant ($\chi^2 < 1, n.s.$); in the gain problem 31% and in the loss problem 32% of the subjects accepted the risky option.

Results in Table 3 indicate that in the conditions with outcome salience more subjects prefer the risky option in the positive condition as compared to the negative condition. Aggregated over the gain and loss problems this effect is significant ($\chi^2 < 5.07, p < .05$). In comparison with Experiment 1, relatively few subjects accept the risky option. This choice pattern might be related to the subjects being less experienced with or willing to take risks with substantial amounts of money. More important, the effects of outcome salience are similar to the effects obtained in Experiment 1.

The results of this experiment demonstrate that the

TABLE 4
Effects of Outcome Salience and Prospect Paradigm on Risk Preference, Experiment 2

Model	χ^2	df	p
(1) $P * S * R, P * S, P * R, S * R, P, S, R$	0.00	0	
(2) $P * S, P * R, S * R, P, S, R$	9.47	2	
$\Delta 1-2: P * S * R$	9.47	2	<.01
(3) $P * S, P * R, P, S, R$	10.25	4	
$\Delta 2-3: S * R$	.78	2	n.s.
(4) $P * S, S * R, P, S, R$	14.48	3	
$\Delta 2-4: P * R$	5.01	1	<.05

Note. P, prospect paradigm; S, outcome salience; R, risk preference).

effects of outcome salience can diminish the reflection effect: the reflection was found in the control condition, but absent under the condition of selectively addressing one side of the risky outcomes. In the next experiment the impact of outcome salience will be studied in combination with framing effects. Unlike the first two experiments in which we studied the impact of outcome salience in problems which actually differed in sign, in the next experiment gain and loss versions of the problem will be based on wording or framing the same problem. In connection to this, another difference concerns the problem domain. In the former two experiments money problems were used, in the next experiment the decision problem deals with human lives.

EXPERIMENT 3

Method

Subjects. A total of 288 first year psychology students of the University of Amsterdam participated in this experiment. Subjects received credit points for participation.

Design. As in Experiments 1 and 2 subjects were randomly allocated to six groups.

Material. The decision problem used describes human lives at stake. This problem was derived from the Asian disease problem. The different versions of the problem presentation are summarized below:

1. *Gain-control*

Suppose there is an outbreak of a deadly disease at an island with 600 inhabitants. All inhabitants have been infected. The vaccine which has been used up to now to combat this disease leads to a rather certain prediction. There is also a new vaccine available of which the results are less certain. A medical consultant Y has to decide which of the two vaccines to use. Y has a choice between two options with the following consequences:

Vaccine A: certainty that 300 people will be saved.

Vaccine B: a 50% chance that 600 people will be saved and a 50% chance that none of the people will be saved.

2/3. *Gain-positive (negative)*

Suppose there is an outbreak of a deadly disease at an island with 600 inhabitants. All inhabitants have been infected. The vaccine which has been used up to now to combat this disease leads to a rather certain prediction. There is also a new vaccine available of which the results are less certain. A medical consultant Y has to decide which of the two vaccines to use. Y has a choice between two options with the following consequences:

Vaccine A: certainty that 300 people will be saved.

Vaccine B: a 50% chance that 600 people will be saved and a 50% chance that none of the people will be saved. Y decides to use vaccine B. This turns out positive (negative), all (none) of the people are saved.

4. *Gain-control*

Suppose there is an outbreak of a deadly disease at an island with 600 inhabitants. All inhabitants have been in-

fectured. The vaccine which has been used up to now to combat this disease leads to a rather certain prediction. There is also a new vaccine available of which the results are less certain. A medical consultant Y has to decide which of the two vaccines to use. Y has a choice between two options with the following consequences:

Vaccine A: the certainty that 300 people will die.

Vaccine B: a 50% chance that 600 people will die and a 50% chance that none of the people will die.

5/6. *Loss-positive (negative)*

Suppose there is an outbreak of a deadly disease at an island with 600 inhabitants. All inhabitants have been infected. The vaccine which has been used up to now to combat this disease leads to a rather certain prediction. There is also a new vaccine available of which the results are less certain. A medical consultant Y has to decide which of the two vaccines to use. Y has a choice between two options with the following consequences:

Vaccine A: the certainty that 300 people will die.

Vaccine B: a 50% chance that 600 people will die and a 50% chance that none of the people will die.

Y decides to use vaccine B. This turns out positive (negative), none (all) of the people die.

Suppose you were Y. What would you have decided?

Results and Discussion

The percentages (and numbers) of subjects accepting or rejecting the risky option in the disease problem are presented in Table 5. The results of a log linear analysis are presented in Table 6.

The log linear analysis shows a significant main effect for prospect framing ($P * R$) and a significant main effect for outcome salience ($S * R$). The interaction effect prospect framing $\times$ outcome salience ($P * S * R$) is not significant.

Results in Table 5 indicate that the main effect for outcome salience is in accordance with our prediction. In the positive conditions more subjects opted for the risky option compared to the negative conditions. Aggregated over the gain and loss problem a comparison between the positive and negative conditions (excluding the control conditions) resulted in a significant difference in risk preference ($\chi^2 < 5.54, p < .05$).

As the results of the log linear analysis indicate, the main effect of prospect framing is highly significant. Results in Table 5 show that this effect is in accordance with the predictions based on prospect theory: more subjects rejected the risky option in the gain problem compared to the loss problem. The frame effect was also found in the control condition separately ($\chi^2 < 10.20, p < .001$). This finding is in accordance with previous studies demonstrating that the predicted effect of prospect framing is most likely to occur in problems which are similar (or identical) to the Asian disease problem (Tversky & Kahneman, 1981; van der Pligt & van Schie, 1990; Schneider, 1992).

In this problem subject's risk preference tends to be strongly affected by prospect framing. Aggregated over

TABLE 5
Risk Preference as a Function of Prospect Framing and Outcome Salience, Experiment 3

	Prospect framing					
	Gain		Loss		Total	
	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)
Outcome salience						
Positive	45 (20)	55 (24)	33 (16)	67 (33)	39 (36)	61 (57)
Negative	71 (29)	29 (12)	44 (22)	56 (28)	56 (51)	44 (40)
Control	73 (37)	27 (14)	42 (22)	58 (31)		
Total prospect framing	63 (86)	37 (50)	39 (60)	61 (92)		

the positive and negative conditions more subjects opted for the risky alternative in the loss problem and more subjects preferred the certain option in the gain problem. Outcome salience also resulted in a significant main effect but the effect did not eliminate the effect of prospect framing.

In order to test the generalizability of these findings, the next experiment again addresses the combined effects of prospect framing and outcome salience using a decision problem dealing with another issue than human lives.

EXPERIMENT 4

Method

Subjects. A total of 115 students of the University of Amsterdam from a number of faculties (mostly studying economics or chemistry) participated in this experiment. This experiment took place in the second term. By then most first year psychology students are familiar with prospect theory, hence they were excluded from participation. The experiment was part of a larger set of unrelated questionnaires. Subjects received Dfl.20 for participation.

Design. As in the former experiments subjects were randomly allocated to six groups.

Material. The decision problem used describes for-

est fires with hundreds of acres of forest at stake. The different versions of the problem presentation are summarized below:

1/4. (Gain) loss-control

Suppose there is an outbreak of forest fires in the South of France (4500 ha³ of forest are under threat). The French authorities are forced to choose between two options to combat these large scale fires. Option A is the traditionally used method, leading to a rather certain prediction of the results. Option B involves a new fire fighting method. The results of this method seem more dependent on all kinds of circumstances. Therefore, the predicted outcome is less certain. The predicted consequences for both methods are: Option A: the certainty that 3000 ha (1500 ha) of forest will be lost (will be saved).

Option B: a 60% chance that 2000 ha (2500 ha) will be lost (will be saved) and a 40% chance that 4500 ha (no forest under threat) will be lost (will be saved).

2/3. Gain-positive (negative)

Identical descriptions of the problem as in condition 1. Fighting a former forest fire the authorities decided for the risky option B. At that time the result were favorable (unfavorable), relatively much (little) of the forest was saved.

5/6. Loss-positive (negative)

Identical description of the problem as in condition 4. Fighting a former forest fire the authorities decided for the risky option B. At that time the results were favorable (unfavorable), relatively little (much) of the forest was lost.

Which option would you choose?

Results and Discussion

The percentages (and numbers) of subjects accepting or rejecting the risky option in the "forest fire problem" are presented in Table 7. The results of the log linear analysis are presented in Table 8.

The log linear analysis shows a significant main effect for prospect framing ($P * R$), a significant main effect for outcome salience ($S * R$), and a significant interaction effect prospect framing $\times$ outcome salience ($P * S * R$).

Results in Table 7 indicate that the main effect for outcome salience is in accordance with our prediction.

³1 ha (hectare) approximates 2.4 acres.

TABLE 6
Effects of Outcome Salience and Prospect Framing on Risk Preference, Experiment 3

Model	χ^2	df	p
(1) $P * S * R, P * S, P * R, S * R, P, S, R$	0.00	0	
(2) $P * S, P * R, S * R, P, S, R$	1.77	2	
$\Delta 1-2: P * S * R$	1.77	2	n.s.
(3) $P * S, P * R, P, S, R$	10.23	4	
$\Delta 2-3: S * R$	8.46	2	<.05
(4) $P * S, S * R, P, S, R$	18.66	3	
$\Delta 2-4: P * R$	16.89	1	<.001

Note. P, prospect framing; S, outcome salience; R, risk preference.

TABLE 7
Risk Preference as a Function of Prospect Framing and Outcome Salience, Experiment 4

	Prospect framing					
	Gain		Loss		Total	
	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)	Reject risk % (N)	Accept risk % (N)
Outcome salience						
Positive	70 (14)	30 (6)	20 (4)	80 (16)	45 (18)	55 (22)
Negative	85 (17)	15 (3)	95 (18)	5 (1)	90 (35)	10 (4)
Control	88 (15)	12 (2)	53 (10)	47 (9)		
Total prospect framing	81 (46)	19 (11)	55 (32)	45 (26)		

In the positive conditions more subjects opted for the risky option compared to the negative conditions. Aggregated over the gain and loss problem only 10% of the subjects accepted the risky option in the negative conditions and in the positive conditions 55% accepted the risky option.

The effects of prospect framing are in accordance with prospect theory. The overall pattern is that in the loss problem more subjects opted for the risky option compared to the gain problem. It needs to be noted, that in all conditions subjects showed a greater preference for certainty in the first three experiments. Even in the loss problem only a minority preferred the risky option. The absence of a clear risk preference in the loss problem has also been shown in previous research on framing effects (e.g., Schneider's, 1992). Schneider concluded that risk preference in loss problems as predicted by prospect theory is relatively unstable and seems easily dominated by other variations in the problem presentation. The overall tendency to prefer certainty in this problem might be related to the stakes, i.e., the problem domain (in this case forest). Previous research also suggests that risk preference is dependent on the problem domain (Fagley & Miller, 1990; van Schie, 1991). So far, little is known about the mechanisms causing differences in risk preference between problem domains.

The obtained interaction effect implies that outcome salience affects risk preference in the loss problem, but not in the gain problem. This might be related to the overall preference for certainty. In the gain control condition a clear majority of subjects opted for the certain option, emphasizing the negative outcome of the risky option did not increase the preference for certainty. The absence of an effect of outcome salience in the gain problem might be due to a ceiling effect.

GENERAL DISCUSSION

The present study was instigated by the relatively confusing predictions and findings in previous research

on the effects of problem presentation on risk preference (e.g., Huber *et al.*, 1987; Levin *et al.*, 1988a; Marteau, 1989; Meyerowitz & Chaiken, 1987; Wilson *et al.*, 1987; Rybash & Roodin, 1989). Most of these studies referred to prospect theory's framing effect (Kahneman & Tversky, 1979). This framing effect is essentially based on manipulating the reference point and presenting subjects with a description of the *whole* problem in terms of gains or losses. It seems, however, that the studies mentioned above did not test the effects of prospect framing. In these studies the reference point was identical in the positive and negative conditions, and the manipulation was based on selectively emphasizing one possible outcome of a risky decision. In the present study we distinguished between effects of difference in the *actual* sign of the outcomes (Experiments 1 and 2) and effects of prospect framing (Experiments 3 and 4). We tested for these effects in combination with the effects of outcome salience to investigate their relative impact on risk preference.

Results of the present study clearly show that selectively emphasizing one side of the outcomes of a risky decision affects risk preference. Results in all four experiments show that selective attention for the positive outcome leads to more risk acceptance as compared to selective attention for the negative outcome. In other words, a positive presentation results in risk seeking and a negative presentation in risk avoidance. The ef-

TABLE 8
Effects of Outcome Salience and Prospect Framing on Risk Preference, Experiment 4

Model	χ^2	df	p
(1) P * S * R, P * S, P * R, S * R, P, S, R	0.00	0	
(2) P * S, P * R, S * R, P, S, R	7.07	2	
Δ 1-2: P * S * R	7.07	2	<.05
(3) P * S, P * R, P, S, R	27.91	4	
Δ 2-3: S * R	20.84	2	<.01
(4) P * S, S * R, P, S, R	17.36	3	
Δ 2-4: P * R	10.29	1	<.01

Note. P, prospect framing; S, outcome salience; R, risk preference.

fects of outcome salience are found in both gain and in loss problems. These findings support our hypothesis based on the notion of salience. Selective attention for one side of a risky decision enhances the salience or availability of this specific outcome and disproportionately influences the evaluation of the option. This reasoning fits with findings in previous studies on the effects of salience (e.g., Taylor & Riske, 1978; van der Pligt & Eiser, 1984) and availability (Tversky & Kahneman, 1973).

Results of the present study also confirm previous findings on the effects of prospect framing. Results show more preference for certainty if the problem is framed in terms of gains compared to option preference if the problem is framed in terms of losses (Experiments 3 and 4). Similar differences in option preference are obtained in a problem differing in the sign of the actual outcome (Experiment 2). In other words, the present study demonstrates both significant framing effects and the reflection effect.

The present findings suggest that the impact of prospect framing and outcome salience should be understood in terms of distinct and independent processes. Prospect theory proposes that a problem can be framed (or perceived) as a gain problem or a loss problem. Prospect theory's S-shape value function describes that certain gains are perceived as relatively more attractive compared to uncertain gains, and uncertain losses are perceived as relatively less unattractive compared to certain losses. On top of evaluating the outcomes on the basis of the value function decision makers could pay more attention to a particular outcome. As a consequence this (salient) outcome might disproportionately affect the evaluation of the option. The present findings indicate that in addition to the subjective evaluation of prospects as described in prospect theory, salient positive or negative outcomes might receive more attention and also affect the final decision. Increased salience seems to have a profound impact on decisional preference.

Kahneman and Tversky (1979) proposed that (in principle) one could describe or perceive decision problems in terms of gains or losses. The perception of a decision problem as a gain or as a loss problem is dependent on the (perceived) reference point, and according to Kahneman and Tversky this reference point is variable. In reality it is often difficult, however, to choose a reference point which is different from the status quo. As a consequence, framing *the same problem* in terms of gains or in terms of losses can be difficult or even impossible or might lead to rather forced problem descriptions. On the other hand, selective attention to one side of a risky decision implies a simple variation in the problem presentation. Many decisions represent a choice between the status quo and a risky

option involving a chance to gain and a chance to lose. Selective attention to the positive side of the risky decision stresses the possible gain while selective attention to the negative side stresses the possible loss. It could be argued that in applied settings these variations in the problem presentation are relatively natural and taken for granted. As shown in this study, these variations can affect the decision, but the effects can not be explained on the basis of prospect theory's value function.

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