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Framing Effects: Dynamics and Task Domains

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The author examines the mechanisms and dynamics of framing effects in risky choices across three distinct task domains (i.e., life–death, public property, and personal money). The choice outcomes of the problems presented in each of the three task domains had a binary structure of a sure thing vs a gamble of equal expected value; the outcomes differed in their framing conditions and the expected values, raging from 6000, 600, 60, to 6, numerically. It was hypothesized that subjects would become more risk seeking, if the sure outcome was below their aspiration level (the minimum requirement). As predicted, more subjects preferred the gamble when facing the life–death choice problems than facing the counterpart problems presented in the other two task domains. Subjects' risk preference varied categorically along the group size dimension in the life–death domain but changed more linearly over the expected value dimension in the monetary domain. Framing effects were observed in 7 of 13 pairs of problems, showing a positive frame–risk aversion and negative frame–risk seeking relationship. In addition, two types of framing effects were theoretically defined and empirically identified. A *bidirectional framing effect* involves a reversal in risk preference, and occurs when a decision maker's risk preference is ambiguous or weak. Four bidirectional effects were observed; in each case a majority of subjects preferred the sure outcome under a positive frame but the gamble under a negative frame. In contrast, a *unidirectional framing effect* refers to a preference shift due to the framing of choice outcomes: A majority of subjects preferred one choice outcome (either the sure thing or the gamble) under both framing conditions, with positive frame augmented the preference for the sure thing and negative frame augmented the preference for the gamble. These findings revealed some dynamic regularities of framing effects and posed implications for developing predictive and testable models of human decision making.

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INTRODUCTION

Since the seminal, pioneering studies by Kahneman and Tversky (e.g., Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), framing effects have for both theoretical and practical reasons received much research attention from cognitive psychologists, decision scientists, and economists. Framing effects often refer to the changes in risk preferences as a result of how choices are described, or framed. Over the years, framing effects have been extended to a wide variety of tasks and procedures (e.g., Bazerman, Magliozzi, & Neale, 1985; Kramer, 1989; Meyerowitz & Chaiken, 1987; Neale, Huber, & Northcraft, 1987; Qualls & Puto, 1989; Travis, Phillippi, & Tonn, 1989) and have been found in different kinds of respondents, including university faculty members, students, physicians, and financial planners (e.g., McNeil, Pauker, Sox, & Tversky, 1982; Roszkowski & Snelbecker, 1990; Tversky & Kahneman, 1981). These effects appear to be a general and persistent choice phenomena.

However, converging evidence demonstrates that the occurrence of a framing effect depends on many task, content, and context variables inherent in choice problems, which themselves may involve distinct psychological mechanisms. Fischhoff (1983), for example, found it hard to predict when certain frames would be used by a decision maker. Fagley and Miller (1987) found no framing effect in their subjects' responses to a decision problem involving lives threatened by cancer. Schneider (1992) found that framing effects are unstable and vary with the probability structure of choice problems in different task scenarios.

Many researchers have noted the erratic nature of framing effects and explored different factors that may determine their occurrence. Empirical studies have shown that the psychological mechanisms of framing effects are sensitive to various social and cognitive variables. These include the amount of information avail-

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able to a decision maker (Levin, Johnson, Russo, & Deldin, 1985; Shoorman, Mayer, Douglas, & Hetrick, 1994), the justification required for a choice (Miller & Fagley, 1991), the decision maker's perspective change from his/her own money to his/her clients' money (Roszkowski & Snelbecker, 1990), the relationship between hypothetical decision recipients and a decision maker (Wang & Johnston, 1995), and the size of a social group for which a decision problem is described (Bohm & Lind, 1992; Wang & Johnston, 1995).

These findings call attention to the dynamic features of framing effects and the production rules that control their presence and absence. In some contexts, framing effects appear robust and sizable. In others, the effects appear highly variable and erratic. It is therefore important to know the antecedent conditions that determine their appearance and disappearance.

A classical example of framing effects is Tversky and Kahneman's (1981) Asian disease problem. In their study, subjects were asked to choose between a sure outcome that led to a certain survival of one third of 600 hypothetical patients (i.e., 200 people) and a risky probabilistic outcome, a one-third probability that all 600 people would survive and a two-thirds probability that no one would survive. Tversky and Kahneman found a pronounced reversal in risk preference as a result of how the choice outcomes were framed. Most of their subjects (72%) favored the sure thing when the choice outcomes were framed in terms of lives saved whereas most of the subjects (78%) in another group favored the gamble (the probabilistic outcome) when the same choice outcomes were framed in terms of lives lost.

A framing effect, such as the one found in the Asian disease problem, is often explained using Kahneman and Tversky's prospect theory (1979). Accordingly, people code the possible choice outcomes as gains and losses, and tend to be risk averse when choosing among prospects seen as gains but risk seeking when choosing among prospects seen as losses. Thus, when choice options are framed positively, a decision maker tends to perceive them as gains and becomes more risk averse. In contrast, when the same choice options are framed negatively, a decision maker tends to perceive them as losses and becomes more risk seeking.

Alternative hypotheses of framing effects have also been proposed (e.g., Frisch, 1993; Reyna & Brainerd, 1991; Schneider, 1992). These new hypotheses explore possible mechanisms of framing effects beyond those of prospect theory.

Recently, Schneider, Levin, and Gaeth (1995) addressed the limitations of using prospect theory as a versatile model to explain various framing effects. They pointed out the many confusions raised by comparing choice phenomena that may involve different framing mechanisms. For this reason, framing effects should have a clearer definition. According to them, there are at least three types of framing effects, each associated with its own kind of framing: (1) risky choice framing affecting a decision maker's willingness to take a risk; (2) attribute framing affecting the encoding and evaluation of object or event characteristics; and (3) action framing affecting the persuasiveness of a communication. They argued a need for different perceptual or cognitive processes to explain the distinct types of framing effect.

In this study the author examines the dynamics of different types of framing effects in risky choice and the effects of task domains on the risk preference of decision makers.

Risk Preferences in Different Task Domains

Apparently, framing effects are not limited to specific decision tasks. However, framing effects and people's risk preferences do vary as a function of task domains (e.g., Fagley & Miller, 1987; Schneider, 1992; Schneider & Lopes, 1986; Wagenaar, Keren, & Lichtenstein, 1988; Wang, 1996a; Wang & Johnston, 1995).

A question of interest in this study is how the task domains in which a problem is described influence the risk preference in human choices. Given the same probability and payoff structure, a content and context-free utility model would predict the same risk preference across different task domains. In other words, such models would predict a similar risk preference pattern independent of whether the required choice is between saving precious paintings or saving the same number of human lives with the same probability. The present study examined this issue by using choice problems that shared the same probability structure but were in three distinct task domains (i.e., life–death, public property, and personal money). The choice outcomes of the problems presented in each of the three task domains had a binary structure of a sure thing vs a gamble of equal expected value and differed in their framing conditions and the expected values.

Risk sensitivity can be considered an adaptation to different environmental problems (e.g., Real, 1991; Real & Caraco, 1986; Wang, 1996a; Wang, 1996b). Depending on the nature of a task, decision makers may have different minimum requirements in different task domains. The minimum requirement for a decision task then could be psychologically translated into a decision maker's aspiration level. When the mean expected

value of choice options is above the minimum requirement, a rational choice would be risk- and variance-averse to avoid possible failures. In contrast, when the mean expected value is below the minimum requirement, a decision maker should be more risk- and variance-seeking to maximize the probability of achieving the goal. It is therefore expected that given two choice outcomes, one sure thing and one gamble of equal expected value, a decision maker would prefer the sure thing if its expected value is above his/her aspiration level but prefer the gamble if the expected value of the sure thing is below the task-determined aspiration level.

In different task domains, however, the minimum requirement or aspiration level of a decision maker may differ. While a sure outcome of saving one-third of $6 may be preferable to a gamble of saving all $6 with a one-third probability for a person, a sure outcome of saving one-third of 6 family members may become unacceptable for the same person. As a result, the person would be more likely to choose the alternative probabilistic outcome that has a one-third probability to save all 6 family members. It is therefore expected that compared to the counterpart problems presented in the public property and monetary domains, the life–death choice problems would evoke more risk-seeking choices.

Moreover, in a task domain, manipulations along a risk-sensitive value dimension, say the total amount of money involved in a choice problem, may result in different risk preferences. If so, the risk proneness reflected by the percentage of subjects choosing either the sure thing or the gamble at each point of a selected value dimension would be different. In the present study, the numerical numbers of the expected values used in each of the three task domains were 6000, 600, 60, and 6. Along the expected value dimension in a certain task domain, a fuzzy area of ambiguous risk preference may appear at a location dependent on the selected values as well as the task, content, and context of the problem. This difference in the risk preference may affect people's susceptibility to the framing of choice outcomes.

Based on our previous findings (Wang & Johnston, 1995), it was predicted that the manipulation along the group size dimension (e.g., the total number of lives described in the life–death problems) would yield a group context-specific risk preference pattern. In a small group or a family context, subjects may hold a risk attitude that "we all live or die together," and tend to be risk seeking under both framing conditions. In contrast, in a large group situation, they may become more susceptible to the dichotic effects of positive frame and negative frame. Therefore, the occurrence and absence of framing effects would vary categorically as a function of the perceived group contexts (e.g., large group, small group, and family group) rather than a linear function of the group size. However, it is not clear how subjects would code the numerical numbers of expected value (i.e., 6000, 600, 60, and 6) in the public property and monetary domains. Although it is possible that subjects classify the problems categorically (e.g., large money versus small money) the cut point for such calcification may be more variable from individual to individual. Particularly, in the monetary domain, subjects' risk perference may be more linearly related to the stated expected values.

Bidirectional and Unidirectional Framing Effects

In a recent study, Wang and Johnston (1995) used a life–death decision paradigm similar to the Asian disease problem. In this study, they argued that saving, on average, one-third of group may have distinct adaptive consequences depending on the size of the social group, and thus the risk attitude and framing effects may vary as a function of a systematic manipulation of this variable. Framing effects appeared, disappeared, and reappeared in a markedly different form as the life–death problem was described in a large group, a small group, and a family social context, respectively. In a hypothetical large group context with either 6000 or 600 people involved, subjects' risk preference indistinguishably reversed from predominantly risk averse when the choice outcomes were framed in terms of lives saved to predominantly risk seeking when the same outcomes were framed in terms of lives lost. However, when the hypothetical patients were described in a small group or family context, no reversal in risk preference was found. The subjects were unambiguously risk seeking in order to save all the group members. In addition, when the hypothetical patients were described as subjects' own family members, the subjects, although clearly being risk seeking, became significantly more risk seeking if the choice outcomes were framed negatively in terms lives lost. The percentage of subjects choosing the gamble over the sure thing increased from 72% under positive framing to 94% under negative framing. The extreme risk seeking in this case seems to have been elicited by proposed choice outcomes that were both objectively negative and negatively worded or framed. This is a different framing effect. In this case, the predominant choice preference is unidirectionally risk seeking under both framing conditions.

It appears that framing effects take two distinct forms. One type of framing effect involves preference reversal from predominantly risk averse to predominantly risk seeking or vise versa, due to the dichotic effect of the framing of the choice outcomes. This *bidirectional framing effect* (denoted B) is characterized by predominant risk-averse choices under positive framing and predominant risk-seeking choices under negative framing.[1] A second type of framing effect, *unidirectional framing effect,* involves no preference reversal but a shift to a more extreme risk preference. If the predominant preference is unidirectionally risk averse under both framing conditions, it is even more risk averse under positive frame than under negative frame. Similarly, if the predominant preference is unidirectionally risk seeking under both framing conditions, it is even more risk seeking under negative frame than under positive frame. Therefore, there are two possible forms of unidirectional effect, one augments the risk-averse preference (denoted Ura) and the other augments the risk-seeking preference (denoted Urs).

This view suggests that bidirectional framing effects may result from the lack of clarity in choice preferences. A decision maker with an ambiguous or ambivalent risk preference may actively search for more information besides the task, content, and context variables embedded in a decision problem. In this condition, the decision maker's risk preference may rely on not only the choice options themselves but also the way in which these choice options are worded, phrased, or framed. Both positive and negative frames thus may work effectively but bidirectionally toward the opposite riskiness direction.

On the other hand, the framing of choices may also lead to unidirectional effects. When the risk preference is clear, a decision maker would resist a framing manipulation if it is inconsistent with the existing task-determined preference's direction. However, a framing manipulation consistent with an existing risk preference may augment that preference. Positive framing therefore could intensify risk-averse preferences whereas negative framing could magnify risk-seeking preferences. Depending on the momentum of an existing preference, the augmenting effect may be negligible or significant: The bigger the momentum, the larger the effect.

[1] It needs to be noted that the reversal in risk preferences found in an experiment with a between-subject design only reflects a contrast in subjects' risk preference between two sampling groups under two different framing conditions. It does not necessarily mean that a majority of individual subjects would reverse their risk preference under the two different framing conditions.

This distinction of the two types of framing effects can be used as an experimental probe for exploring distinct cognitive mechanisms governing the risk attitude in different social situations. From this viewpoint, the bidirectional framing effects in large group context, no framing effect in small group context, and the unidirectional framing effect in family context, found in our previous study (Wang & Johnston, 1995), reflect different underlying decision mechanisms. Of equal importance, the current definition of bidirectional and unidirectional framing effects provides useful constraints for making experimental predictions. For example, based on the proposed relationship between the framing effects and task-determined risk preference, certain risk preference patterns (e.g., Ura-Urs-B; Urs-Ura-B; B-Ura-Urs; B-Urs-Ura; Ura-B-Ura; or Urs-B-Urs) would not occur along any selected value dimensions. These constraints also serve as a set of criteria for testing and falsifying the proposed hypothesis. Although the selected range on a value dimension may not cover all the effective points, the empirical results can be analyzed on the basis of these theoretical constraints. That is, if an unexpected pattern of framing effects is observed, the present hypothesis would be falsified.

In sum, the experimental predictions of the present study include: (1) there would be a task-domain effect on risk preference with a higher percentage of subjects choosing the gamble when the choice problems were presented in the life–death task domain; (2) framing effects would appear and disappear in different manners along the selected value dimension in different task domains; (3) the changes in subjects' risk proneness along the selected value dimension would appear to be more categorical in the life–death task domain and more linear in the monetary domain; (4) a positive frame would tend to increase risk-averse (the sure thing) choices and a negative frame would tend to increase the risk-seeking (the gamble) choices; and (5) the observed framing effects would be identified as either bidirectional or unidirectional, and their occurrence would follow a predicted pattern.

METHOD

Experimental Materials

The experimental paradigms of this study involved three distinct problem domains: human lives, public property (museum paintings), and dollars of personal money. Within each domain, the expected values of choice outcomes were manipulated at four numerical levels: 6000, 600, 60, and 6. These numbers represented (1) the number of people threatened by a fatal

TABLE 1

Group Differences in Risk Preference for the Positively and Negatively Framed Outcomes in the Life–Death Problems

Experimental group	Total (*N*)	Framing of the outcome	Choice of the sure thing	Framing effect	χ^2 statistics
P6000life	31	Lives saved	61.3%	Bidirectional	$\chi^2 = 3.73$
N6000life	30	Lives lost	33.7%		$p < .05$
P600life	31	Lives saved	58.1%	Bidirectional	$\chi^2 = 8.23$
N600life	34	Lives lost	23.5%		$p < .004$
P60life	33	Lives saved	42.4%	None	Not significant
N60life	30	Lives lost	33.3%		
P6life	30	Lives saved	33.3%	None	Not significant
N6life	33	Lives lost	24.4%		
$P6_r$life	33	Lives saved	33.3%	Unidirectional	$\chi^2 = 5.52$
$N6_r$life	31	Lives lost	9.7%	(Risk seeking)	$p < .02$

Note. P denotes positive framing; N denotes negative framing; 6000, 600, 60, and 6 are the number of lives at risk; r denotes that the hypothetical patients in the life–death decision problem were described as the subjects' relatives; life denotes the life–death problem. The overall risk-averse choice = 35.4%.

disease, (2) the number of museum paintings exposed to chemical pollution, or (3) the amount of money at risk due to a bankruptcy. In the life–death domain, group size six was used both in a small group context in which the hypothetical patients were six anonymous people and in a family context in which the six hypothetical patients were described as the subjects' close relatives.

The choice problems presented to each subject group was framed either positively or negatively. A total of 26 choice problems were used in this study including five pairs of positively and negatively framed life–death problems, four pairs of museum paintings problems, and four pairs of personal money problems.

Examples of the choice problems presented within each task domain appear in the Appendix.

For the current between-subject design, a 50–50 risk preference point (i.e., equal percentages of subjects favoring the sure thing and the gamble in a binary decision situation) can be considered a rough estimate of the risk neutrality and therefore used as an operational reference point to classify the two proposed types of framing effect. A bidirectional framing effect would be featured by a higher than 50% of subjects choosing the sure thing under positive framing and a lower than 50% of subjects choosing the sure thing under negative framing. On the other hand, in the case of a unidirectional framing effect, the two percentage data points obtained under positive frame and negative frame would locate on the same side of the 50% reference point. If a unidirectional effect is risk-aversion augmenting, more than 50% of subjects would prefer the sure thing under both frames, but a significantly higher percentage of subjects would prefer the sure thing over the gamble under the positive frame than under the negative frame. If a unidirectional effect is risk-seeking augmenting, then more than 50% of subjects would choose the gamble over the sure thing under both frames, but a significantly higher percentage of subjects would choose the gamble under the negative frame than under the positive frame.

Subjects and Procedure

The subjects were 902 undergraduate students enrolled in introductory psychology courses who agreed to participate for extra course credit. The average age of the subjects was 20.3 years. Subjects were randomly assigned to one of 26 experimental (subject) groups. Subjects were instructed that there were no right or wrong answers and were asked to choose anonymously between two effectively identical choice options: a sure outcome versus a gamble of equal expected value.

Of the total subjects, 316 (207 females and 109 males) were randomly assigned to 10 groups, each receiving one version of the five pairs of positively and negatively framed life–death problems. Another 327 subjects (196 females and 131 males) were assigned to the eight groups that received the four pairs of the public property (museum paintings) problems. The remaining 259 subjects (166 females and 93 males) received the four pairs of choice problems presented in the monetary domain.

RESULTS AND DISCUSSION

The choice percentages, sample sizes, and χ^2 statistics for framing effects obtained from the 10 groups

TABLE 2

Group Differences in Risk Preference for the Positively and Negatively Framed Outcomes in the Museum Paintings Problems

Experimental group	Total (*N*)	Framing of the outcome	Choice of the sure thing	Framing effect	χ^2 statistics
P6000painting	38	Paintings saved	81.6%	Unidirectional	$\chi^2 = 4.17$
N6000painting	38	Paintings lost	60.5%	(Risk aversion)	$p < .04$
P600painting	39	Paintings saved	69.2%	None	Not significant
N600painting	41	Paintings lost	65.9%		
P60painting	45	Paintings saved	75.6%	Bidirectional	$\chi^2 = 8.45$
N60painting	40	Paintings lost	45.0%		$p < .004$
P6painting	45	Paintings saved	62.2%	Bidirectional	$\chi^2 = 4.67$
N6painting	41	Paintings lost	39.0%		$p < .03$

Note. P denotes positive framing; N denotes negative framing; 6000, 600, 60, and 6 are the number of paintings at risk; paintings denotes the museum paintings problem. The overall risk-averse choice = 62.4%.

receiving the life–death problems, eight groups receiving the museum paintings problems, and eight groups receiving the monetary problems are presented in Table 1, Table 2, and Table 3, respectively.

Task-Domain Effects on Risk Preference

The overall percentages of subjects choosing the sure thing across all pairs of framing groups were 35.4% for life–death problems, 62.4% for the museum paintings problems, and 64.9% for the personal money problems. The first percentage differed greatly from the latter two percentages, χ^2 (2, $N = 902$) = 65.86, $p < .00001$. There was no significant difference, however, in the overall risk preference between the data from the museum paintings problems and those from the personal money problems. As predicted, subjects were significantly more risk seeking when dealing with the choice problems in the life–death domain. This is particularly prominent when the selected group size was within a common range of human kith-and-kin groups. In a small group or a familial context, the sure outcome of saving one-third of group members appears to fall below the subjects' aspiration level (their minimum requirement). As a result, they chose the riskier probabilistic outcome. Under these conditions, revealed by another study (Wang, 1996b), even when the choice of the sure thing could save two-thirds of the hypothetical group members, a substantial proportion of subjects still preferred the probabilistic outcome that had a lower expected mean value of saving only one-third of the group members.

The significantly higher percentage of subjects choosing the sure thing when receiving the problems presented in either the public property (the museum paintings) domain or monetary domain suggests that the subjects had a lower aspiration level regarding the

TABLE 3

Group Differences in Risk Preference for the Positively and Negatively Framed Outcomes in the Personal Money Problem

Experimental group	Total (*N*)	Framing of the outcome	Choice of the sure thing	Framing effect	χ^2 statistics
P6000money	36	Money saved	91.7%	Unidirectional	$\chi^2 = 6.65$
N6000money	30	Money lost	66.7%	(Risk aversion)	$p < .01$
P600money	32	Money saved	78.1%	None	Not significant
N600money	31	Money lost	64.5%		
P60money	35	Money saved	57.1%	None	Not significant
N60money	33	Money lost	48.5%		
P6money	31	Money saved	51.6%	None	Not significant
N6money	31	Money lost	58.1%		

Note. P denotes positive framing; N denotes negative framing; 6000, 600, 60, and 6 are the number of dollars at risk; money denotes the personal money problem. The overall risk-averse choice = 64.9%.

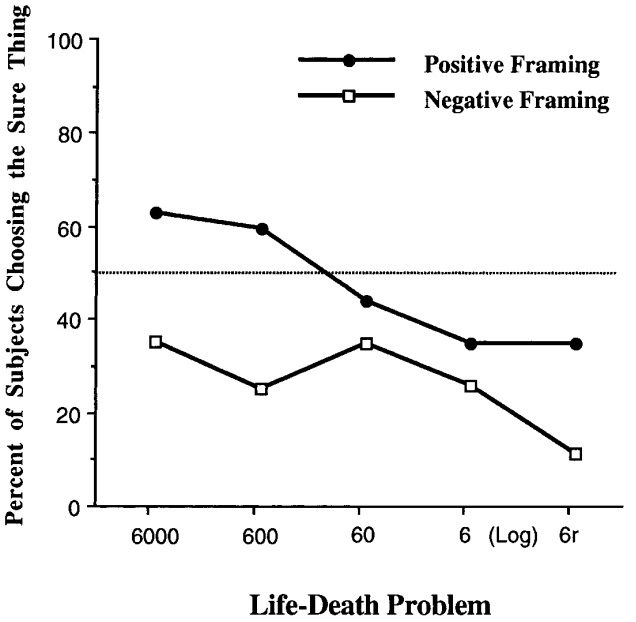

FIG. 1. Percentages of the risk averse choice as a function of the number of hypothetical lives at risk plotted logarithmically; r denotes the problem in which the patients were described as the subjects' relatives.

minimum proportion of the total value that had to be rescued.

Bidirectional and Unidirectional Framing Effects in Each of the Three Task Domains

The patterns of framing effects emerging from the three task domains were different.

Life–death problem. There was a significant difference in subjects' choices over the 10 experimental groups, χ^2 (9, N = 327) = 31.17, $p < .0003$. The overall framing effect was also significant, χ^2 (1, N = 316) = 14.31, $p < .0002$.

A graphic representation of the dynamic pattern of the observed framing effects is shown in Fig. 1. Both bidirectional and unidirectional framing effects appeared. The 50–50 choice distribution point, represented by the dotted line in the figure, was used as the reference for risk neutrality to classify the two types of framing effect. Also as summarized in Table 1, as the social group context changed from large group with either 6000 or 600 people to smaller group with either 60 or 6 people, and to the family group with 6 hypothetical relatives, bidirectional framing effects (B) were found in the two large group contexts, followed by no framing effect (no) in the two smaller group contexts, and a risk-seeking augmenting unidirectional effect (Urs) in the family group context: a B-B-no-no-Urs pattern (for the theoretical and operational definitions of B, Ura, and Urs framing effects, see the relevant discussions in the Introduction and Method parts of the paper).

The framing effect found in the family group context was different from the two bidirectional framing effects found in the two large group contexts. For the two bidirectional effects, the choice percentage of the sure thing under the positive frame was above the 50% reference point but below 50% under the negative frame. However, the unidirectional framing effect found in the family context was featured by a significant preference shift from risk seeking under the positive frame to more risk seeking under the negative frame. That is, the negative framing accentuated the task-determined existing risk-seeking preference to a more extreme degree.

Museum paintings problem. χ^2 analysis showed that the risk preferences between the eight subject groups given the museum paintings problems were significantly different, χ^2 (7, N = 327) = 25.35, $p < .0007$. A significant overall framing effect was found, χ^2 (1, N = 327) = 13.14, $p < .0003$.

As Table 2 shows, framing effects appeared and disappeared along the manipulated expected value dimension (i.e., the total number of paintings at risk) (see also Fig. 2). Both bidirectional as well as unidirectional

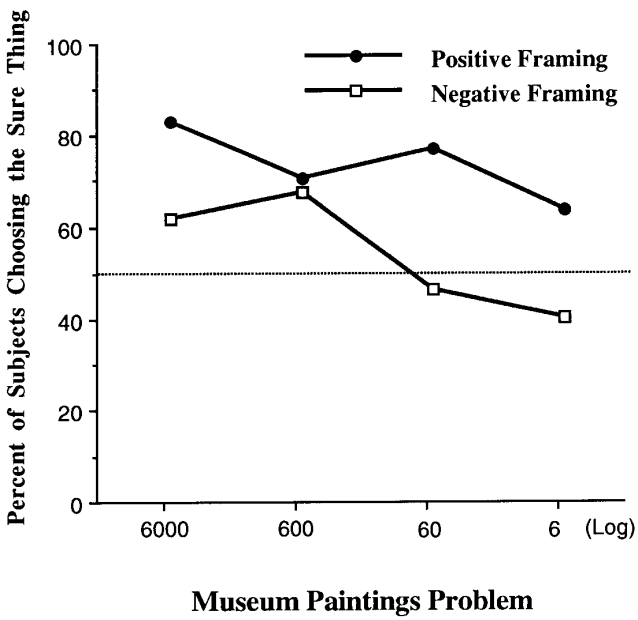

FIG. 2. Percentages of the risk averse choice as a function of the number of hypothetical museum paintings at risk plotted logarithmically.

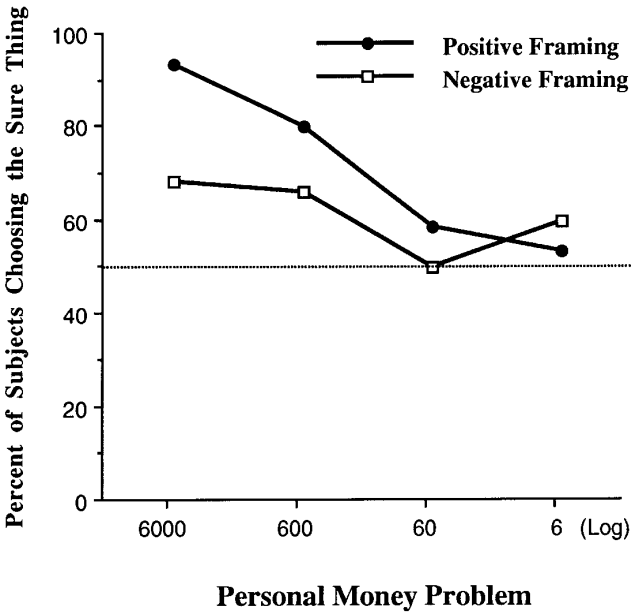

FIG. 3. Percentages of the risk averse choice as a function of the amount of hypothetical money at risk plotted logarithmically.

framing effects were identified. Unlike the categorical pattern of B-B-no-no found in the life–death domain, the framing effects showed a Ura-no-B-B pattern. See Table 2 for the χ^2 statistics and p values.

Personal money problem. An overall analysis showed that subjects' choice preferences in the eight subject groups differed markedly, χ^2 (7, N = 259) = 25.33, $p < .0007$. An overall framing effect, although much smaller than those found with the life–death problems and the museum paintings problems, was statistically significant, χ^2 (1, N = 259) = 4.44, $p < .04$.

As summarized in Table 3 and illustrated in Fig. 3, of the four selected levels along a monetary dimension (i.e., the total amount of money at risk), only a unidirectional framing effect was found (see Table 3 for χ^2 statistic and p value). The pattern was Ura-no-no-no, suggesting that the subjects' risk preference was quite clear and stable when dealing with personal money type of problems with the total amount of money ranging from $6000 to $6.

Changes in Risk Preferences along the Expected Value Dimension

To examine whether there is a linear increase in risk preference for the sure thing as the numerical number of the expected value in each task domain increased from 6 to 6000, a series of six linearity tests were conducted for each of the three tasks under either positive framing or negative framing condition separately. The only significant linear effect found was in the monetary domain and under the positive framing condition, χ^2 (3, N = 134) = 17.30, $p < .0006$. As the expected values increased from 6 to 6000, the number of subjects choosing the sure thing under the positive framing linearly increased from 52 to 92%.

Effects of Frames on Risk Preference

Although the patterns of framing effects were task specific, there evidently was a dynamic regularity with regard to the occurrence of framing effects across all three task domains. All the seven framing effects found in the 13 pairs of choice problems showed a positive frame–risk aversion and/or negative frame–risk seeking pattern.

GENERAL DISCUSSION

The seemingly erratic pattern of framing effects may have its dynamic regularities. The basic notion of the current hypothesis is that the primary determinants of a decision maker's risk preference are the task, content, and contexts variables inherent in a decision problem. These factors determine the aspiration level of a decision maker and his/her risk attitude. A decision maker will tend to be risk seeking when facing a loss than a gain. In the case of a gain, the mean expected value of choice outcomes is more likely to be above the aspiration level (the minimum requirement) of a decision maker whereas, in the case of a loss, the mean expected value is more likely to be below the reference level. Positive frame of choice outcomes emphasizes the "gain" aspect of a prospect whereas negative frame emphasizes the "loss" aspect of the prospect. In other words, positive frame tends to increase the perceived surplus and decrease the perceived deficit between the aspiration level and the expected mean value of choice outcomes. On the other hand, negative frame tends to increase the perceived deficit and decrease perceived surplus between the aspiration level of a decision maker and the expected mean value of choice outcomes. However, whether or not the framing will have an effect on the risk preference of a decision maker depends on the direction and intensity of the risk preference elicited by task, content, and context variables in a decision problem.

The framing of choice outcomes may induce two different types of effects in risky choices. When a decision maker's risk preference is ambiguous or weak, s/he may become susceptible to both positive and negative frames of choices. The positive frame tends to pull a

choice in the risk-averse direction and the negative frame in the risk-seeking direction (i.e., a bidirectional effect). However, when the risk preference is unambiguous, a decision maker will be more immune from the framing manipulations. Therefore, the framing of choices will have either no effect or a unidirectional effect that augments the decision maker's existing preference.

To examine the dynamic functions of risk preference and framing effects in different social task domains, choice problems sharing the same formal probability structure and expected values were presented in different task domains under either positive or negative framing condition.

1. The risk preference data revealed a task-specific pattern. Subjects were significantly more risk seeking when facing life–death choice problems than facing their counterpart problems presented in a public property or personal money domain. This finding is in agreement with the hypothesis that the subjects' aspiration level (the minimum requirement) for the life–death problems was higher than that for the public property and personal money problems.

2. Framing effects appeared and disappeared as a result of experimental manipulations along the selected expected value dimension.

3. The patterns of risk preference obtained from the three task domains were different. In the life–death domain, a group-context specific pattern emerged. Bidirectional framing effect appeared in the large group context (i.e., 6000life and 600life groups) and disappeared in the small group context (i.e., 60life and 6life groups), and a risk-seeking augmenting unidirectional framing effect occurred in the family context (i.e., 6rlife groups). In addition, the risk preference patterns were indistinguishable within the large group context or within the small group context.

Although in none of the three task domains, the risk preference data revealed a complete linear trend over the manipulated value dimension under both framing conditions, the monetary problems elicited more linearly correlated changes in risk preference under positive framing as the expected values increased from 6, 60, 600, to 6000.

4. All the observed framing effects showed a positive frame–risk aversion and negative frame–risk seeking relationship.

5. Two types of framing effects were theoretically defined and empirically identified. In the case of a bidirectional framing effect, a majority of the subjects preferred the sure outcome under a positive frame but the gamble under a negative frame. In contrast, a unidirectional framing effect involved a preference shift, either risk averse or risk seeking, due to the framing of choice outcomes. In the case of risk-aversion augmenting effect, more than 50% of subjects preferred the sure thing under both positive and negative framing conditions but even more of them preferred the sure thing under positive frame. When the augmenting effect was in the direction of risk seeking, on the other hand, a majority of subjects chose the gamble over the sure thing of equal expected value under both framing conditions, but the choice of the gamble became even more dominant among subjects under negative frame.

It appears that the framing of choices as a weak editing factor in choice making processes shows its effects when (1) the risk preference of a decision maker is weak, or (2) it can accentuate an existing risk preference. The framing of choices does not determine risk preference; it only regulates an existing risk attitude that is determined primarily by the task, content, and context variables inherent in choice problems.

Although the author did not directly test it, Frisch (1993) expressed a similar idea, that if subjects do not really care whether they choose a sure outcome or a gamble, then minor variations in wording or phrasing would greatly influence their choices. On this view, one would expect that the proportions of subjects showing the framing effect would increase as the strength of preference within each frame decreases.

Several investigators have argued that the classical framing effects (bidirectional effects in the present definition) occur only when ambiguity about a choice problem is high. For example, the framing effects occur when people are ambiguous in their experiences of consequences of a decision (e.g., Frisch, 1993; Hoch & Ha, 1986), when consumers are unfamiliar with the products they have to choose among (e.g., Bettman & Sujan, 1987), or when the information about the consequences of choice is incomplete or limited (e.g., Schoorman, Mayer, Douglas, & Hetrick, 1994).

In a recent study, Reyna and Brainerd (1991) presented a modified version of the Asian disease problem (Tversky & Kahneman, 1981) to their subjects with either positively framed or negatively framed choice outcomes. They manipulated the explicitness of the problem by replacing the numerical information of expected payoff values and/or probabilities of choice outcomes with qualitative information such as "some," "many," "few," or "higher." What is interesting here is that the classical (bidirectional) framing effects were not only observed in the subjects' choices but also appeared to be sensitive to the amount of numerical information replaced by the qualitative information. The

amplitude of the framing effect peaked when all of the numerical information was replaced, presumably when the problem was least explicit and most ambiguous to the subjects.

It is also worth mentioning that the choice pattern from the five pairs of framing groups receiving the life–death problems replicated our previous findings discussed earlier in this paper (Wang & Johnston, 1995). This validity check lends additional support to the notion that social group size and perceived social contexts are powerful contextual variables affecting human choices.

The observed choice preferences in the present study showed a clear task domain-specific pattern. Both normative theories such as expected utility theory and descriptive theories such as prospect theory are silent about the specific roles of the task, content, and context of a decision problem in regulating the risk preference in human choices. Research has repeatedly demonstrated that given the identical formal probability structure of choice prospects, changes in a cover story about the context in which a decision problem occurs often resulted in significant reversal or shift in respondents' risk proneness (e.g., Schneider, 1992; Wagenaar, Keren, & Lichtenstein, 1988; Wang, 1996a; Wang & Johnston, 1995).

Recently some researchers have proposed that future research should consider content and context of decision or reasoning problems not as intervening or decorative variables but as primary and defining factors of human reasoning and judgement. From this perspective, the content and contextual variables can be used either for evaluating human judgment or as a research probe to uncover the underlying psychological mechanisms (e.g., Cosmides & Tooby, 1992; Gigerenzer, 1996; Gigerenzer & Hug, 1992, Lopes & Oden, 1991).

Several Conceptual Distinctions Regarding Framing Effects

The notion of framing effects involves quite different connotations. The word framing was used to refer to a variety of situations including any changes in a decision context, in complex mental accounting of prospects, or in simple wording of choice options or outcomes. In this article, the term is restricted to the positive and negative ways of presenting choice outcomes. In other words, the framing of decisions is defined in terms of how a problem is described to a decision maker but not in terms of how that person mentally represents the problem.

To facilitate discussions of framing effects, several points need to be clarified. First, one needs to be aware of the distinction between framing effect and what is called reflection effect (Fagley, 1993). Reflection and framing effects are two distinct phenomena. In the latter, changes in risk preferences are caused by phrasing the same choice outcomes as though they are gains versus phrasing them as though they are losses. The reflection effect is a decision bias, but not a cognitive illusion. It refers to having opposite preferences for the positive versus negative prospects (i.e., whether the outcomes are net gains or net losses). Reflection effects do not involve the same choice outcomes described as though they are gains or losses; reflection effects involve real gains and loses. From this perspective, the framing effect (the bidirectional effect by the present definition) is an irrational choice phenomenon but the reflection effect is not.

Second, the task-specific choice pattern observed in the current results suggests that framing effects should be examined separately from the contextual effects that have often resulted from presenting the same choice options in different scenarios or cover stories. Contextual description in a cover story is not a decoration for an abstract problem but a real condition that triggers different risk attitudes. Although the expected values of two choice problems may be the same, the opposite risk preferences could be produced by changing the social context in which the problem is described. This contextual effect is not a result of a cognitive illusion, and therefore it should be clearly distinguished from a bidirectional framing effect. Unlike presenting a glass as "half full" versus "half empty," contextual differences specified in different task domains are meaningful antecedent factors that determine choice preferences.

Third, the current findings call attention to the necessity to classify framing effects by their forms: the bidirectional effects involving a reversal in risk preferences versus the unidirectional framing effects involving a preference shift.

Framing effects are commonly considered as one of the most severe violations of normative utility axioms, and therefore a strong indication of irrationality. Framing effects violate the description invariance axiom of utility theory of rational choices, which states that different descriptions of the same choices should yield the same preference order. In a framing condition, whether the change in phrasing the same decision prospect results in a significant reversal in risk preference appears to be a key aspect for determining the rationality of the choices. The classical, bidirectional framing effects often led to an irrational reversal in risk preferences under different framing conditions. However, in the

case of the unidirectional framing effect, there is no risk preference reversal. The unidirectional effect was manifested only with strong risk preference and may be considered a kind of confirmation bias.

From this viewpoint, bidirectional framing effects reflect the susceptibility to an irrational preference reversal elicited by positive framing in one direction and by negative framing of the same outcomes in the opposite direction. However, the unidirectional framing effects reflect an immunity from the irrational reversal in risk preferences. While being resistant to a framing manipulation that is inconsistent with an existing risk preference, a decision maker is sensitive to framing that confirms an existing risk preference. The finding of no framing effect in small group context but a significant unidirectional effect of risk-seeking augmentation in family context suggests that subjects' risk proneness was stronger in the family context and became more likely to be intensified by the negative framing of the choice outcomes. It appears that unidirectional augmenting effects tend to occur when an existing risk preference is strong.

Of 13 pairs of framing problems used in this study, seven showed framing effects. However, only four were identified as bidirectional effects according to the standards proposed in the present study. The finding suggests that without a pronounced reversal in risk preferences, a framing effect may not be an irrational violation of description invariance principle, but a confirmation bias produced by framing the choices in a way that is consistent with the existing risk preference.

As Payne, Bettman, and Johnson (1992) pointed out, a complete theory of framing has proven to be difficult to formalize, although progress has been made in identifying important elements of framing. Further research is needed to develop a better theoretical foundation for the conditions under which the framing of decisions will have either greater or less impact on decision making. In addition, further research on framing effects should not only focus on demonstrating the effects of decision framing but also attempt to clarify the antecedent conditions that elicit framing effects, to search for underlying mechanisms, and to construct falsifiable models that can predict the riskiness direction of a framing effect and explain the absence as well as the presence of a framing effect.

APPENDIX

Choice Problems Used in the Study

I. Versions of the life–death problem.

1. Positively framed problems:

Imagine that 6000 (600, 60, 6, 6_r) people are infected by a fatal disease. Two alternative medical plans to treat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the plans are as follows:

If plan A is adopted, 2000 (200, 20, 2, 2_r) people will be saved.

If plan B is adopted, there is a one-third probability that all the people will be saved, and two-thirds probability that none of them will be saved.

Which of the two plans would you favor?

2. Negatively framed problems:

Imagine that 6000 (600, 60, 6, 6_r) people are infected by a fatal disease. Two alternative medical plans to treat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the plans are as follows:

If plan A is adopted, 4000 (400, 40, 4, 4_r) people will die.

If plan B is adopted, there is a one-third probability that none of them will die, and two-thirds probability that all the people will die.

Which of the two plans would you favor?

Note. Each item in a parenthesis represents the number of hypothetical patients used for a different subject group. The subscript r means that the hypothetical patients in the corresponding questionnaire were described as close relatives of the subject.

II. Versions of the museum paintings problem.

1. Positively framed problems:

Imagine that 6000 (600, 60, 6) pieces of precious paintings in a world-famous museum are accidentally exposed to a disastrous chemical pollution. Two alternative plans to rescue these art treasures have been proposed. Assume that the exact estimates of the consequences of the plans made by scientists are as follows:

If plan A is adopted, 2000 (200, 20, 2) pieces will be saved from the chemical pollution.

If plan B is adopted, there is a one-third probability that all the paintings will be saved, and two-thirds probability that none of these paintings will be saved.

Which of the two plans would you favor?

2. Negatively framed problems:

Imagine that 6000 (600, 60, 6) pieces of precious paintings in a world-famous museum are accidentally exposed to a disastrous chemical pollution. Two alternative plans to rescue these art treasures have been proposed. Assume that the exact estimates of the consequences of the plans made by scientists are as follows:

If plan A is adopted, 4000 (400, 40, 4) pieces will be destroyed by the chemical pollution.

If plan B is adopted, there is a one-third probability

that none of these paintings will be destroyed, and two-thirds probability that all of these paintings will be destroyed.

Which of the two plans would you favor?

Note. Each item in a parenthesis represents the number of the paintings used for a different subject group.

III. Versions of the personal money problem.

1. Positively framed problems:

Imagine that you brought $6000 (600, 60, 6) worth of stock from a company that has just filed a claim for bankruptcy recently. The company now provides you with two alternatives to recover some of your money.

If you choose alternative A, you will save $2000 (200, 20, 2) of your money.

If you choose alternative B, you will take part in a random drawing procedure with exactly a one-third probability of saving all of your money, and two-thirds probability of saving none of your money.

Which of the two alternatives would you favor?

2. Negatively framed problems:

Imagine that you brought $6000 (600, 60, 6) worth of stock from a company that has just filed a claim for bankruptcy recently. The company now provides you with two alternatives to recover some of your money.

If you choose alternative A, you will lose $4000 (400, 40, 4) of your money.

If you choose alternative B, you will take part in a random drawing procedure with exactly a two-thirds probability of losing all of your money, and one-third probability of not losing any of your money.

Which of the two alternatives would you favor?

Note. Each item in a parenthesis represents the amount of money used for a different subject group.

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