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Exposition Effects on Decision Making: Choice and Confidence in Choice

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Many of us believe that, after writing about a subject, we understand it more deeply. Studies in education indicate that writing does indeed enhance comprehension. Three experiments examined whether similar "exposition effects" exist for decision making. In these experiments, subjects were confronted with standard framing problems. Positive exposition effects would require that the influence of alternative frames on subjects' choices be diminished by exposition demands. Control subjects made choices under customary, nonexposition instructions. Others chose after writing rationales for their selections (exposition), after explicitly planning to write such rationales, or merely in anticipation of writing the rationales. Exposition reduced framing effects in each of the experiments. The magnitudes of the effects were greatest for subjects who wrote before choosing. Also, exposition markedly increased subjects' confidence that their choices were appropriate. Theoretical and practical implications are discussed. © 1997 Academic Press

We are often called upon to describe or explain our beliefs and desires, and many of us believe that this process aids our own understanding of the situations we face. This belief is not unfounded. Education researchers have demonstrated that writing leads to improved learning. For example, in one study, Langer and Applebee (1987) compared recall performance of three different writing task groups and a nonwriting control group for various passages from social studies texts. The writing tasks consisted of answering short-answer comprehension questions, writing a summary of the passage, and an analytic writing task in which subjects were asked to use the passage to formulate an argument for a thesis, supplied by the researchers.

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Each of the writing groups in this study performed better than the group that read without writing. Furthermore, summary writing and answering review questions led to somewhat improved recall of the text as a whole, while analytic writing seemed to provide better retention for a more restricted portion of the text. Langer and Applebee (1987) proposed that the improvements from writing were a result of increased manipulation of the material in a manner consistent with the "levels of processing" explanation given by Craik and Lockhart (1972) for their finding that degree of elaboration affects comprehension.

Experimental psychology researchers have also found some evidence that writing and other explanation-based tasks improve thinking. For example, justifying one's reasoning has been shown to facilitate problem solving performance, at least under some conditions (Ahlum-Heath & Di Vesta, 1986; Gagné & Smith, 1962; McGeorge & Burton, 1989; Stinessen, 1985). As an example, Gagné and Smith (1962) found that asking subjects to provide reasons improved performance on the Tower of Hanoi problem. They studied the effects of verbalization instructions on performance during a training period on the Tower of Hanoi task, and on transfer to a more complex version of the task. The verbalization requirement improved performance on a transfer task, both as to the number of moves required and the time taken to find a solution. Gagné and Smith suggested that the instruction to verbalize reasons for the moves improved performance by motivating subjects to think carefully about each step taken.

What about decision making? That is, does writing improve decision quality? Evaluating the quality of decision making is inherently more difficult than assessing the quality of other kinds of problem solving for a number of reasons, such as outcome uncertainty and individual differences in decision makers' values for potential consequences (cf. Edwards, Kiss, Majone, & Toda, 1984; Yates, 1990, Chapter 1). One approach to assessing the impact on decision quality of decision aids such as exposition is to begin with largely

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agreed upon biases or decision errors that people reliably make and check to determine whether writing reduces those errors. Consider, for example, "framing effects" which refer to circumstances in which people choose differently when presented with different descriptions of the very same problem (Frisch, 1993). Since the problem is indeed identical given alternate frames, responding differently to those frames should be considered non-optimal. However, as with learning and more general problem solving, exposition may enhance the decision-making process so that framing effects are diminished.

At least one study has already examined the influence on framing effects of providing written reasons for one's choices. Miller and Fagley (1991) investigated several variables that might mediate framing effects associated with Tversky and Kahneman's (1981) Asian disease problem (see Table 1). The factor of interest here was the requirement that subjects state rationales for their choices. Miller and Fagley found that such requests eliminated the previously observed framing effects, whereby people tended to select program A, the risk-averse option, more often in the survival frame than in the mortality frame.

A possible explanation for Miller and Fagley's finding is that stating a rationale allowed subjects to overcome what have sometimes been called "concreteness effects" (Yates, 1990). These are instances of the general phenomenon whereby people tend to decide on the basis of aspects of their decision situations that are explicitly (concretely) displayed. Aspects that must be inferred from the displayed information are not taken into account. But if writing rationales encourages the active manipulation of the information in framing situations, then aspects of the problem that are less obvious in some frames might be brought to mind forcibly, thus reducing or eliminating framing effects.

One ambiguity with the Miller and Fagley (1991) results, however, was the ordering of the choice and rationale tasks. In the justification condition of the experiment, each problem was presented on a page, followed by a place for subjects to indicate their choices and, underneath that, space to write their justifications. Thus, although it was expected that subjects would indicate their choices first and then write, those who were so inclined could have written first and chosen afterwards. The issue is whether the presentation of a rationale needs to precede the choice response in order for framing effects to be reduced, or if simply knowing that one will be required to produce such a justification is sufficient.

Another potential difficulty with the Miller and Fagley (1991) results is that multiple decision problems with the same structure as the Asian disease problem were presented to each subject. Different problems varied the degree of apparent gains and losses, as well as the probability of success in the risky option. Since all subjects received multiple versions of the frames, it is impossible to say whether there was some interaction between providing a rationale and considering multiple problems. That is, perhaps providing a rationale facilitates recognition of the common underlying structure in these problems, and so is only effective in reducing framing effects after one has considered several problems of a similar type (cf. Vander Stoep & Seifert, 1994).

Finally, it is unclear whether writing will reduce framing effects for problems that are fundamentally different from the Asian disease problem. Three experiments were conducted to address these issues.

TABLE 1

Description of the Asian Disease Problem Situation

Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimates of the consequences of the programs are as follows:
Survival Frame:
If program A is adopted, 200 people will be saved.
If program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.
Mortality Frame:
If program A is adopted, 400 people will die.
If program B is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.

Note. Source: Tversky and Kahneman (1981), p. 453.

EXPERIMENT 1

Experiment 1 was essentially a replication of Miller and Fagley's (1991) study, but it differed in a number of ways. First, only one choice problem was presented to each subject. Also, three conditions were used: an exposition condition which required subjects to write "analyses" before making their decisions; an anticipated exposition condition in which subjects were told that justifications of their decisions would be required eventually, but that they should decide first and then write; and a control condition in which subjects were not asked to write in any way. The anticipated exposition task corresponds most closely with Miller and Fagley's (1991) manipulation. In addition, each person was

asked to rate his or her confidence in having selected the better alternative. Thus, if framing effects were reduced or eliminated in the writing groups, there would be stronger support for the claim that providing reasons reduces framing effects, or improves decision quality more generally.

Method

Subjects. There were 132 subjects, of whom 67 were females and 65 were males. Nineteen subjects came from a paid subject pool and were given $5 for their participation. The rest were undergraduate students enrolled in introductory psychology classes at the University of Michigan who participated in order to fulfill part of their course requirements.

Materials. The experiment was run on Macintosh IIsi microcomputers, using the Hypercard software package. Hypercard allows for a sequential ordering of "cards," which can be thought of as representing pages in an experimental booklet. Each card in the experiment had a "next page" button, thus allowing subjects to move through the experiment at their own pace.

The first card contained general instructions, explaining that a hypothetical decision problem would be presented, that subjects should try to imagine that they were actually confronted with that problem, and that they would be asked to indicate which option they preferred. If subjects were in one of the writing conditions, the instructions additionally informed them that they would be asked to write an analysis of the decision problem either before indicating their choices (for those in the exposition group), or after choosing (for anticipated exposition group members). The instructions also stated that some follow-up questions would be asked.

The second card instructed subjects to refer to a hard (paper) copy of the decision problem, which was contained in an envelope placed next to the keyboard. The problem was presented in hard copy form so that subjects could refer to it while writing their justifications. The problem used was the Asian disease problem originally employed by Tversky and Kahneman (1981).

Another card gave more detailed instructions on the analysis the subject was to write. The guidelines suggested that subjects make the best argument or arguments they could for the option they would eventually choose (or for the options they had already chosen in the anticipated exposition group), that they feel free to edit their analyses as often and extensively as they wished within the 50 minute time limit.

In addition to these "information cards," there was also a card on which subjects chose the options they preferred, a card on which they actually typed in their expositions, one where they indicated their confidence that the choices they made were actually the best possible (on a scale from 1 to 11), and one where they reported the extent of their word processing experience (also scaled from 1 to 11).

Design. The experiment was a 3 (writing task) × 2 (frame) between-subjects design. The primary independent variable, called "writing task," contained three levels. The first was called "exposition," and required subjects to write reasons for why they would make their preferred choices, before actually making those choices. The second level, called "anticipated exposition," involved writing reasons justifying the choice after it had been made. Subjects in this condition were told at the beginning of the experiment, however, that they would be asked to write such justifications. The third level of the writing task independent variable consisted of a control group which participated in no writing activities.

Another independent variable, "frame," consisted of two levels. The first level was associated with the "survival" version of the decision problem, the other level with the "mortality" version. The dependent variables consisted of the actual choice made and the self-reported confidence that the stated choice was the best possible.

Procedure. Subjects were seated at computers as they arrived. They were told to follow the instructions on the screen, but to ask questions of the experimenter if needed. The sequence of cards varied with experimental condition.

Subjects in the exposition group went through a sequence of general instructions, instructions to read the problem, exposition (analysis) instructions, writing the analysis, indicating their choices, reporting their confidence in their choices, and their word processing experience. The specific exposition instructions requested that the subject write a "memo" to him- or herself. The guidelines for the memo included the following:

> • You are writing the memo to yourself. It is anonymous. No one else will ever associate it with you personally, not even the experimenter. So don't worry about the impression the memo will make on anyone except you.
>
> • In your memo, you should make the best argument or arguments you can for the option you eventually choose rather than its competitor. Explain to yourself: WHY is that the smart thing to do?

Subjects in the anticipated exposition group proceeded through essentially the same sequence except that the choice and confidence reports preceded the analysis instructions. The control group also followed a similar sequence, except that they received no analysis instructions or card on which to write an analysis. When

subjects were finished, they were given written feedback explaining the experiment, and were then dismissed.

Results and Discussion

Choice. Figure 1 illustrates subjects' choices between alternatives by task and frame. The percentages of subjects who chose the risk-averse option (that is, the option with the certain outcome) are provided for each cell in the design. These data were analyzed using logistic regression. As can be seen in Fig. 1, subjects exposed to the survival frame chose the less risky option significantly more often than did subjects exposed to the mortality frame, $t(126) = 2.74, p < .05$. Also, these framing effects were significantly reduced for subjects in the exposition condition, $t(126) = 1.71, p < .05$ (one-tailed), as is also apparent in Figure 1. The difference between the probabilities of choosing the less risky option given each frame can be taken as a measure of the magnitude of the framing effect. These magnitudes for each writing condition are .52, .47, and .18 for the control, anticipated exposition, and expostion groups, respectively. No other effects were significant. In particular, anticipated exposition did not significantly reduce framing effects, and there were no significant effects associated with gender or word processing experience.

Confidence. Table 2 presents a summary of subjects' confidence ratings, classified by task and frame. The ratings ranged from 1 to 11, with 1 indicating very little and 11 indicating extreme confidence. These data were analyzed using linear regression. A square transformation on the confidence ratings was used for analysis purposes to correct for heteroscedasticity. As suggested in the table, subjects in the exposition condition reported significantly greater confidence in their decisions than those in the other conditions, $t(129) = 2.91$, $p < .05$. No other effects were significant.

TABLE 2

Mean Decision Confidence Ratings (Standard Deviation), Experiment 1

	Writing task condition			
Frame	Control	Anticipated exposition	Exposition	Overall
Mortality	6.5 (1.6)	6.9 (2.2)	7.8 (2.1)	7.0 (2.0)
Survival	7.0 (2.0)	7.1 (1.7)	7.9 (1.9)	7.3 (1.9)
Overall	6.8 (1.8)	7.0 (1.9)	7.9 (2.0)	7.2 (1.9)

Note. Ratings ranged from 1 to 11, with 1 = "not confident at all" and 11 = "extremely confident."

Summary. In this first experiment, we replicated Miller and Fagley's (1991) basic result that providing reasons reduces framing effects. We explain this finding by suggesting that writing encourages people to actively manipulate the information presented to them in the problem description. The increased manipulation of presented information promotes the possible consideration of the reference point that is more salient in the alternate frame, which leads to the reduction in framing effects, according to the account proposed by Kahneman

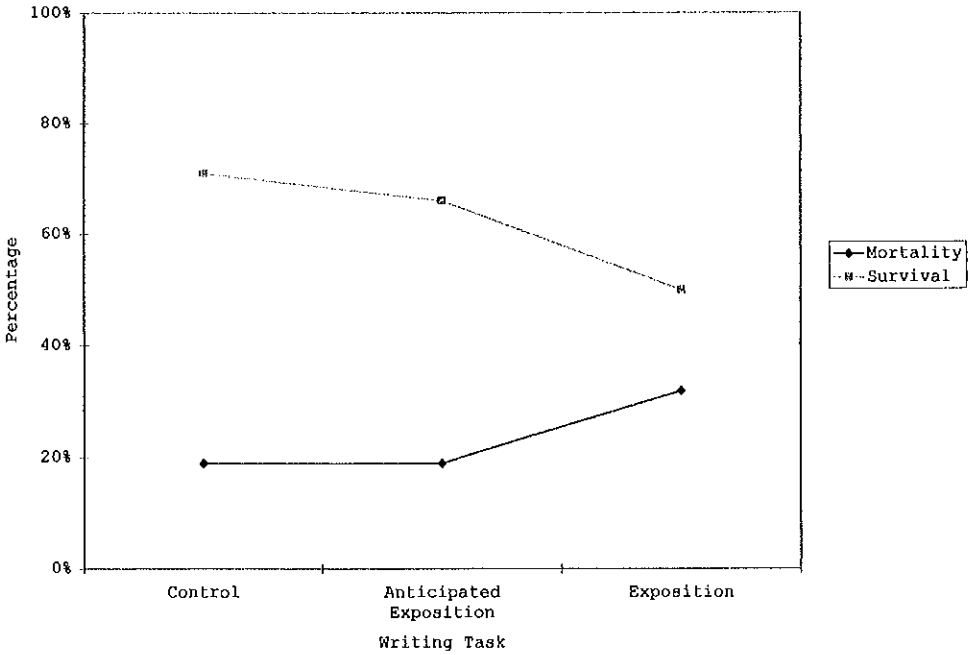

FIG. 1. Percentages of subjects choosing the less risky option in the Asian disease problem by writing task and frame, Experiment 1.

and Tversky's (1979) prospect theory. Although we replicated Miller and Fagley's pattern of effects, our results were not as strong as the previous findings. In particular, our anticipated exposition condition led to little if any reduction in framing, although it seemed most similar to Miller and Fagley's manipulation.

Writing analyses also influenced the degree to which subjects were confident in their choices. Specifically, subjects who wrote analyses before making choices were more confident that they had made the best choices than those writing after choosing and those who did not write at all.

EXPERIMENT 2

Experiment 1 replicated past findings of reduced framing effects for those who provide reasons for their choices (Miller & Fagley, 1991). But note that previous research employed problems that are structurally the same as the Asian disease problem. It is as yet unclear whether framing effects would be reduced in other framing situations, as argued presently.

As Frisch (1993) notes, there are "strict" and "loose" senses of alternate problem frames. Under the strict definition of a framing problem, two frames should consist of redescriptions of the identical situation. However, in the loose sense, alternative frames need only be equivalent in terms of economic or expected utility analysis. The Asian disease problem is a good example of a problem satisfying the strict framing definition. On the other hand, the scholarship problem presented in Table 3 is a framing problem in the loose sense only. Here the equivalence of the two frames depends on reducing the options in the two-stage frame to single-stage options by multiplying the probabilities of winning each scholarship, assuming that one has made it to the interview, by the probability of actually getting an interview.

Loose framing problems like the scholarship problem might require the application of formal rules (e.g., the multiplication rule for probabilities of conjunctions of events) to recognize the equivalence of alternate frames. If people do not possess those rules, then writing may have no influence on framing effects. Hence, it could be that providing reasons for a choice will lead to reductions in framing effects only for problems that are equivalent in the strict sense. On the other hand, writing may influence people to take into account more of the available information in a beneficial way, even without formal rule use. In the present case, writing may lead to some informal combination of the probabilities in the two-stage frame (e.g., via averaging), which might lead to people in the two-stage frame choosing similarly to people in the one-stage frame.

TABLE 3

Descriptions of the Scholarship Problem Situation

Two-Stage Frame:

You are about to submit an application for one of two scholarships offered by the university. Both scholarships present awards for the following term. There are two stages in the selection process. The first is based on the application, and the second on a personal interview. There is a 75% chance that you will not be asked in for an interview at all, and a 25% chance to make it to this second stage. If you make it to the interview, you have a choice between:

A. sure win of a $3,000 'Washington Scholarship'
B. 80% chance to win a $4,500 'Jefferson Scholarship'

Your choice must be made before submitting the application (i.e. before you know whether or not you will get the interview). However, your choice will not affect the initial chances of getting an interview.

One-Stage Frame:

You are about to submit an application for one of two scholarships offered by the university. Both scholarships provide awards for the following term. Which of the following options do you prefer:

A. 25% chance to win a $3,000 'Washington Scholarship'
B. 20% chance to win a $4,500 'Jefferson Scholarship'

Note. Adapted from Tversky and Kahneman (1981), p. 455.

In Experiment 2, we sought to determine whether or not the effects of writing on framing would generalize beyond strict framing problems. Although the variables and design were very similar to those in Experiment 1, the scholarship problem was employed to determine whether the framing effects would be reduced for alternative forms of a problem that are equivalent only in the loose sense.

Method

Subjects. There were 116 subjects, including 79 females and 37 males. Subjects were undergraduate students enrolled in introductory psychology classes at the University of Michigan. Their participation fulfilled a course requirement.

Materials. The same approach was used as in Experiment 1; only the problem differed. The decision problem that was used was an adaptation of one originally developed by Tversky and Kahneman (1981). The context was changed from that of a choice between gambles to that of a choice between scholarships. There were two frames to the problem, which are described in Table 3. Although the two versions are not so obviously redescriptions of the same problem as were the two versions of the Asian disease problem, described earlier, they are equivalent from the standpoint of the probability calculus. That is, both versions reduce to a choice

between a 25% chance to win a $3000 "Washington Scholarship" and a 20% chance to win a $4500 "Jefferson Scholarship."

In addition, there were two cards added on which subjects answered hypothetical questions about their personal likelihoods of winning each of the scholarships, if they had picked the pertinent options. These were included to determine if subjects exposed to the two-stage frame perceived their chances of winning to be greater than those in the one-stage frame, and whether or not exposition would attenuate such effects (cf. Bar-Hillel, 1973; Ronen, 1973).

Design. The design in Experiment 2 was identical to that in Experiment 1. However, there were some minor differences pertaining to the variables. In Experiment 2, the frame variable refers to the number of stages rather than presentation of mortality vs survival statistics as in Experiment 1. The design for Experiment 2 also included personal likelihood ratings as a second dependent variable, unlike Experiment 1.

Procedure. The procedure for Experiment 2 was almost the same as that in Experiment 1. The only exception was that self-reported "personal" chances of winning each of the scholarships were requested.

Results

Choice. Figure 2 illustrates subjects' choices between alternatives by task and frame. The percentages of subjects who chose the risk-averse option (that is, the option with the higher probability of success) are provided for each cell in the design. These data were analyzed using logistic regression. As can be seen in Figure 2, subjects exposed to the two-stage frame chose the less risky option (the "Washington Scholarship") significantly more often than did subjects exposed to the one-stage frame, $t(110) = 2.53, p < .05$. These framing effects appeared to be slightly reduced for subjects in the exposition condition, with writers in the one-stage frame more often choosing the risk-averse option than non-writers. However, the result was statistically nonsignificant. The difference between the probabilities of choosing the less risky option given each frame are again used as a measure of the magnitude of the framing effect. These magnitudes for each writing condition are .38, .37, and .22 for the control, anticipated exposition, and expostion groups, respectively. No other effects were significant.

Confidence. Table 4 presents a summary of subjects'

TABLE 4

Mean Decision Confidence Ratings (Standard Deviation), Experiment 2

	Writing task condition			
Frame	Control	Anticipated exposition	Exposition	Overall
One-stage	6.1 (1.9)	6.6 (2.0)	7.5 (1.7)	6.7 (1.9)
Two-stage	6.2 (2.0)	6.0 (2.0)	7.7 (1.9)	6.6 (2.1)
Overall	6.2 (1.9)	6.3 (2.0)	7.6 (1.8)	6.7 (2.0)

Note. Ratings ranged from 1 to 11, where 1 = "not confident at all" and 11 = "extremely confident."

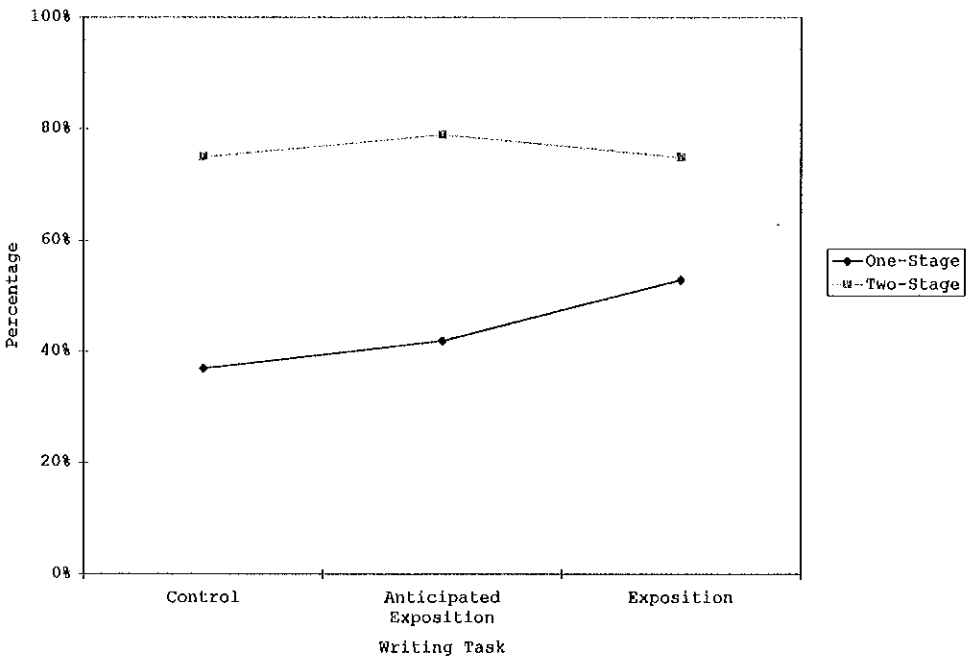

FIG. 2. Percentages of subjects choosing the less risky option in the scholarship problem by writing task and frame, Experiment 2.

confidence ratings, classified by task and frame. The rating scale and analyses were the same as in Experiment 1. As can be seen in the table, subjects in the exposition condition reported significantly greater confidence in their decisions than those in the other conditions, $t(112) = 3.51, p < .05$. No other effects were significant.

Personal likelihood ratings. Table 5 presents a summary of subjects' ratings of their personal likelihoods of winning each of the scholarships if they were chosen, classified by task and frame. The ratings ranged from 1 to 11, where 1 meant that the subject felt he or she would not have been likely to win the indicated scholarship at all, and 11 implied that the subject felt that he or she would have been extremely likely to win, assuming he or she had selected that alternative. The mean differences between the personal likelihoods of winning the less risky and riskier options are also presented. We examined these differences to determine whether writing would reduce the perceived advantage in personal likelihood of winning the less risky option in the two-stage frame. The data were analyzed using linear regression.

As can be seen in Table 5, subjects reported significantly greater likelihoods of winning the less risky Washington Scholarship (had it been chosen) than of winning the riskier Jefferson Scholarship (if it had been chosen), $t(112) = 9.38, p < .05$. Also, these differences were marginally significantly larger in the two-stage frame than in the one-stage frame, $t(112) = 1.47, p < .10$ (one-tailed). This effect was not significantly reduced for subjects in the exposition condition, $t(112) = 1.07, p > .10$ (one-tailed). However, the apparent effect was in the expected direction, i.e., larger differences in the control and anticipated exposition conditions than in the exposition condition.

TABLE 5

Mean Personal Likelihood Ratings of Winning Each Scholarship (Standard Deviation), Experiment 2

Frame/ Option	Writing task condition: Control	Anticipated exposition	Exposition	Overall
One-stage				
Less risky	5.7 (2.1)	6.4 (2.2)	6.0 (2.5)	6.0 (2.2)
Riskier	4.8 (1.9)	5.0 (2.1)	4.1 (2.6)	4.1 (2.2)
Difference	.95 (1.3)	1.4 (1.1)	1.2 (1.2)	1.2 (1.2)
Two-Stage				
Less risky	8.1 (2.2)	8.3 (1.9)	7.0 (2.0)	7.8 (2.1)
Riskier	6.2 (2.2)	6.4 (2.1)	5.1 (2.6)	6.9 (2.3)
Difference	1.8 (1.8)	2.3 (2.5)	1.1 (1.7)	1.7 (2.1)
Overall				
Less risky	6.9 (2.4)	7.4 (2.3)	6.5 (2.3)	6.9 (2.3)
Riskier	5.10 (2.1)	5.5 (2.1)	5.6 (2.6)	5.10 (2.3)
Difference	1.4 (1.6)	1.9 (2.0)	1.1 (1.4)	1.4 (1.7)

Note. Ratings ranged from 1 to 11 where 1 = not likely at all and 11 = extremely likely.

Summary. We replicated the finding from the first experiment that writing analyses influenced the degree to which subjects were confident in their choices. Subjects who wrote analyses before making choices were more confident that they had made the best choices than those writing after choosing and those who did not write at all.

The analyses on subject's choices suggested that writing may decrease framing effects, as compared with not writing or anticipating writing. However, this effect was non-significant. Also, if a reduction in framing does exist for this problem, it occurs in the opposite frame from what might be expected. That is, the apparent reduction seems to be due to people in the one-stage frame more frequently choosing the risk-averse option rather than people in the two-stage frame more often choosing the risk-seeking option after writing.

EXPERIMENT 3

Experiment 3 attempted to replicate and extend the findings of Experiment 2. One of the main purposes of Experiment 3 was to determine whether the pattern of apparent effects found in Experiment 2 was reliable. Also in Experiment 3, we asked subjects to report on their subjective values for obtaining each of the scholarships to determine whether writing influenced the assessment of these values. This could occur if people tend to base their value assessments on the difference between the two monetary amounts naturally, and writing leads them to consider more carefully the significance of the smaller scholarship for achieving their educational goals. An increase in the assessed personal value of the lesser scholarship could account for the apparent effects observed in the second experiment whereby people in the one-stage frame became more likely to choose the risk-averse option after writing.

In addition, the anticipated exposition condition was replaced with a planning condition wherein participants were specifically asked to think through their analyses of the problem before choosing. We expected this to be a stronger manipulation than merely anticipating writing, and for it to coincide more closely with Miller and Fagley's (1991) request for a rationale. Finally, in the previous experiments we looked for framing reductions by comparing different groups of subjects' responses. In Experiment 3, we complemented this approach by examining the same subjects' responses before and after they wrote, a potentially more sensitive procedure.

Method

Subjects. Subjects were 106 undergraduate students enrolled in introductory psychology classes at the University of Michigan. Their participation fulfilled a course requirement.

Materials. The "scholarship problem" was used in Experiment 3, as in Experiment 2. The only difference in materials was the addition of two cards on which subjects answered hypothetical questions about their personal values associated with winning each of the scholarships. These were included to determine whether writing changed the subjects' subjective values associated with the different monetary amounts.

Design. The design in Experiment 3 was highly similar to that in Experiment 2. One difference, however, was that personal value rating questions were added. Another was the replacement of the anticipated exposition condition with a planning condition. Subjects in the planning condition were explicitly asked to plan what they would write in as much detail as possible prior to choosing. However, they did not write their expositions until after they had made their choices and responded to the confidence, personal likelihood, and personal value questions.

Procedure. The procedure for Experiment 3 was similar to that in Experiment 2. A minor difference was that we surprised control subjects by asking them to write after they had made their choices and responded to the follow-up questions. We also asked control and planning subjects to choose and respond to the follow-up questions a second time, after they had written.

Results

Choice. Figure 3 illustrates subjects' choices between alternatives by task and frame. As in Experiment 2, the percentages of subjects who chose the risk-averse option (that is, the option with the higher probability of success) are provided for each cell in the design. These data were analyzed using logistic regression. As shown in Fig. 3, subjects exposed to the two-stage frame chose the less risky option (the "Washington Scholarship") significantly more often than did subjects exposed to the one-stage frame, $t(102) = 3.01$, $p < .05$. However, these framing effects were significantly reduced for subjects in the exposition condition, $t(102) = 1.90$, $p < .05$ (one-tailed). Also, a marginally significant reduction occurred for subjects in the planning condition, $t(102) = 1.38$, $p < .10$ (one-tailed). These reductions in framing again seem to be largely the result of writers in the one-stage frame being more likely to choose the risk-averse option than non-writers in that frame, although people in the two-stage frame seem to be more affected by writing in this experiment than in Experiment 2. The framing effect magnitudes for each writing condition are .56, .26, and .15 for the control, planning, and expostion groups, respectively.

TABLE 6

Mean Decision Confidence Ratings (Standard Deviation), Experiment 3

Frame	Writing task condition: Control	Planning	Exposition	Overall
One-stage	7.0 (2.2)	7.3 (1.4)	8.7 (1.7)	7.7 (1.9)
Two-stage	7.6 (2.2)	8.2 (1.8)	9.1 (1.4)	8.3 (1.9)
Overall	7.3 (2.2)	7.7 (1.6)	8.9 (1.6)	8.0 (1.9)

Note. Ratings ranged from 1 to 11, where 1 = "not confident at all" and 11 = "extremely confident."

Confidence. Table 6 presents a summary of subjects' confidence ratings, classified by task and frame. The rating scale and analyses were the same as in the previous experiments. As shown in the table, subjects in the exposition condition reported significantly greater confidence in their decisions than those in the other conditions, $t(102) = 3.70$, $p < .05$. No other effects were significant.

Personal likelihood ratings. Table 7 presents a summary of subjects' ratings of their personal likelihoods of winning each of the scholarships if they were chosen, classified by task and frame. The rating scale and analyses were the same as in Experiment 2. As can be seen in the table, subjects reported significantly greater likelihoods of winning the less risky Washington Scholarship (had it been chosen) than of winning the riskier

TABLE 7

Mean Personal Likelihood Ratings of Winning Each Scholarship (Standard Deviation), Experiment 3

Frame/ Option	Writing task condition: Control	Planning	Exposition	Overall
One-stage				
Less risky	5.9 (2.3)	5.9 (1.7)	5.7 (2.0)	5.8 (2.0)
Riskier	4.9 (2.3)	4.9 (1.6)	5.2 (2.5)	5.0 (2.1)
Difference	1.0 (1.0)	1.0 (1.5)	0.5 (1.8)	0.8 (1.5)
Two-stage				
Less risky	8.1 (2.3)	7.3 (1.8)	7.3 (2.1)	7.6 (2.1)
Riskier	5.9 (1.9)	5.8 (1.7)	6.1 (1.9)	5.9 (1.8)
Difference	2.2 (2.5)	1.6 (1.6)	1.2 (1.6)	1.6 (1.9)
Overall				
Less risky	7.0 (2.5)	6.6 (1.9)	6.5 (2.2)	6.7 (2.2)
Riskier	5.4 (2.1)	5.3 (1.7)	5.6 (2.3)	5.5 (2.0)
Difference	1.6 (1.9)	1.3 (1.6)	0.9 (1.7)	1.2 (1.8)

Note. Ratings ranged from 1 to 11 where 1 = "not likely at all" and 11 = "extremely likely."

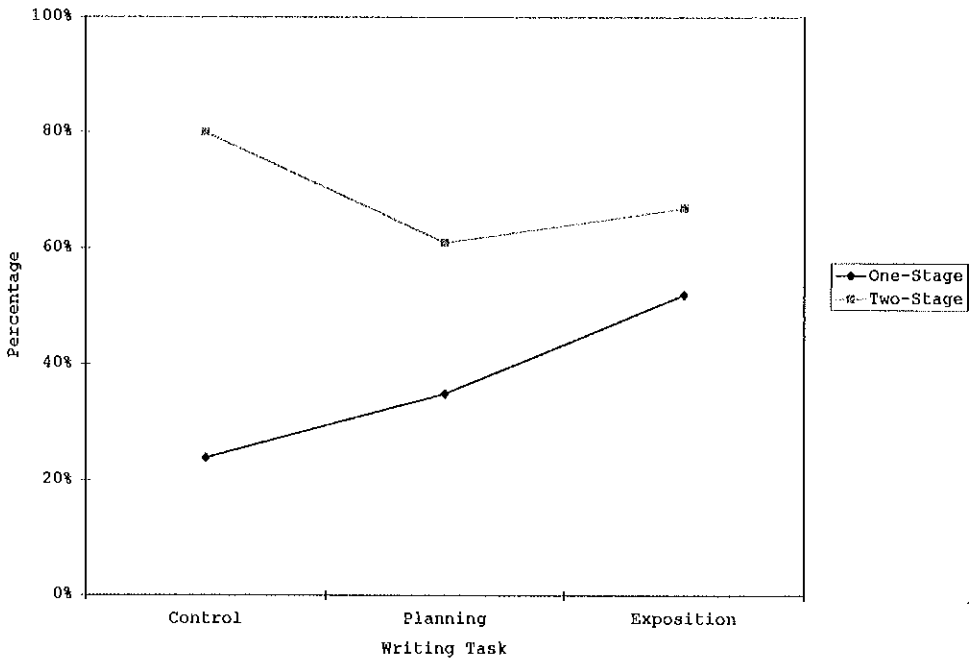

FIG. 3. Percentages of subjects choosing the less risky option in the scholarship problem by writing task and frame, Experiment 3.

Jefferson Scholarship (if it had been chosen), $t(102) = 5.26, p < .05$. Also, these differences were significantly larger in the two-stage frame than in the one-stage frame, $t(102) = 2.42, p < .05$, and this effect was not reduced for subjects in the exposition condition. However, as shown in Table 7, exposition subjects did exhibit significantly smaller differences in their personal likelihoods of winning each of the options regardless of frame, $t(102) = 1.75, p < .05$ (one-tailed).

Personal value ratings. We examined subjects' ratings of their personal values for winning each of the scholarships to determine whether writing would reduce the perceived difference in personal value of winning the Washington versus the Jefferson scholarship. Not surprisingly, subjects reported significantly greater personal value for winning the $4500 Jefferson (riskier; $M = 10.7$) than for the $3000 Washington (less risky; $M = 9.6$) scholarship, $t(102) = 4.39, p < .05$. However, no other effects were significant. In particular, the difference between personal values of winning each of the scholarships did not appear to be reduced for exposition group relative to either of the other groups. This may be due to the fact that subjects were asked to rate the value of winning the less valued Washington scholarship first, and most gave that scholarship the highest rating of eleven. Hence, any existing effects were likely washed out due to the experimental ordering of value judgments. Nonetheless, it is notable that when asked to rate it directly, most subjects judged the Washington scholarship to be extremely valuable.

Within-subject responses before and after writing. Subjects in the control and planning conditions chose both before and after they wrote. Figures 4 and 5 illustrate these "before" and "after" choices for each frame. Split-plot analysis of variance was used to determine whether framing effects were reduced for the second, as compared to the first, choices for each of these groups. Framing effects were significantly reduced after writing for the control group, $t(30) = 1.73, p < .05$ (one-tailed). As can be seen in Fig. 4, subjects in the one-stage frame were more likely to opt for the less-risky Washington scholarship after they wrote about their decisions. The framing effect magnitudes were .56 before writing and .39 after writing.

Framing was not further reduced for the planning group due to this writing (magnitudes were .26 before and .25 after writing). But, as shown in Fig. 5, there was some indication that subjects in both frames were more likely to choose the less risky option after writing, $t(33) = 1.41, p < .10$ (one-tailed).

Confidence in decision quality also significantly increased for each group. The mean confidence score for the planning group was 7.7 before they wrote and 8.5 after writing, $t(34) = 3.11, p < .05$. The mean confidence score for the control group was 7.3 before they wrote and 8.3 after writing, $t(31) = 3.94, p < .05$.

Summary. We replicated the apparent effect in the second experiment that writing reduced framing effects for the scholarship problem, and the reduction achieved statistical significance in this experiment. There was

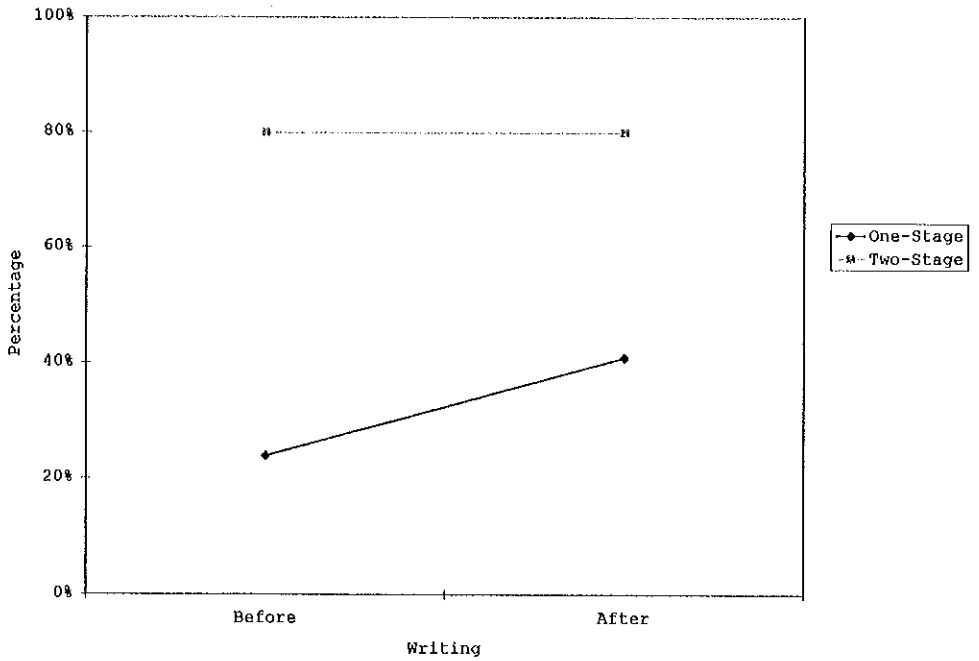

FIG. 4. Percentages of subjects choosing the less risky option in the scholarship problem before and after writing in the control condition, Experiment 3.

also some indication that planning an exposition also led to reductions in framing. And, writing reduced framing effects when examined within- as well as between-subjects.

The difference in subjective likelihoods of winning each of the scholarships was smaller in the two-stage frame for subjects who wrote than for controls. This suggests that writing might induce subjects to better integrate the probability information from the first stage, hence revising downward their subjective likelihoods of winning in that frame. Also, most of the personal value ratings associated with the smaller valued

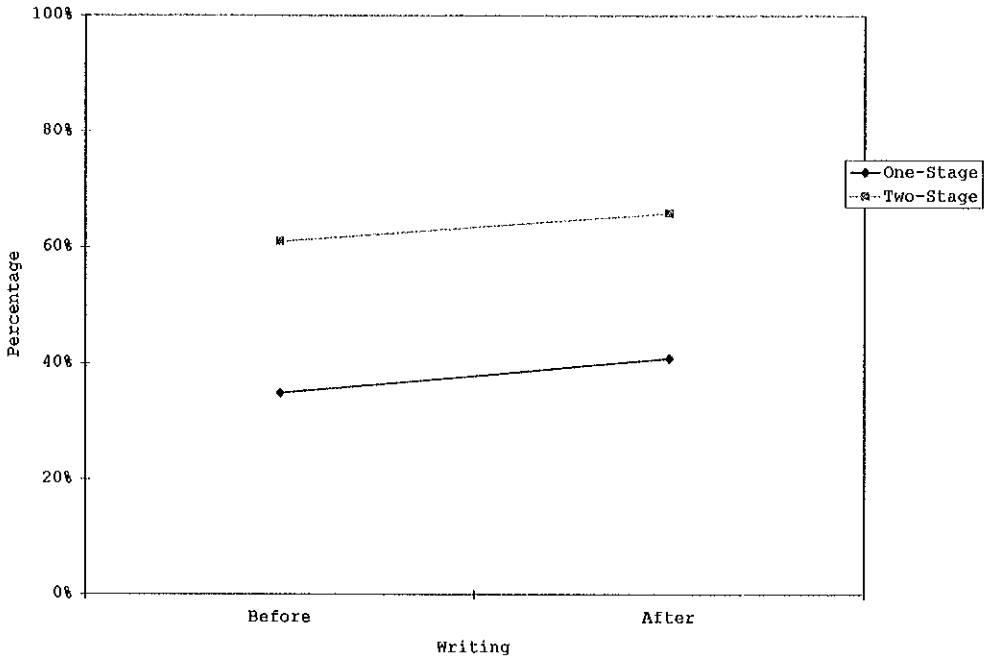

FIG. 5. Percentages of subjects choosing the less risky option in the scholarship problem before and after writing in the planning condition, Experiment 3.

scholarship were at the top of the scale. The personal value of that scholarship may have become obvious to exposition subjects during their writing, which would explain why writers in the one-stage frame were more likely to choose the risk-averse option than were nonwriters in that frame. Finally, writing analyses again increased the degree to which subjects were confident in their choices.

GENERAL DISCUSSION

In all three experiments, we observed two basic consequences of exposition, a choice effect and a confidence effect. In the choice effect, exposition reduced the influence of alternative frames. The confidence effect was such that exposition bolstered subjects' beliefs that their choices were indeed the best. We consider interpretations and implications of these effects in turn.

First the choice effect. How and why did it occur in the present experiments? It seems plausible that exposition reduced framing effects in the Asian disease problem by inducing subjects to recognize two different reference points, each of which ordinarily is apparent only to subjects exposed to one particular frame, either survival or mortality. The most reasonable account for the reduction of framing effects with the scholarship problem is that exposition encouraged the subjects to integrate together the probabilities in both stages of the two-stage frame, something they would be relatively disinclined to do normally, according to Kahneman and Tversky's (1979) proposal that the initial probabilities are dismissed in an editing phase prior to valuating the options. These experiments are best viewed as initial demonstrations of an effect rather than attempts to provided detailed explanations. Thus, we must await further, more carefully structured experimentation to establish definitive accounts.

Should we expect the present choice effect to generalize? That is, should we predict exposition demands to improve decision quality for all manner of decision problems? The findings reported here are encouraging. But there are at least three reasons for urging only cautious optimism. First, although the choice effect seems "real," it is small. Second, as noted above, we do not yet know exactly why it occurred here and thus to what extent the conditions that contributed to it might be peculiar to particular aspects of the present procedures. Finally, there is a growing body of research illustrating that explanation and verbalization can actually be detrimental to performance on cognitive tasks, at least under certain conditions (Schooler, Ohlsson, & Brooks, 1993; Sieck, Quinn, & Schooler, 1996; Wilson, Dunn, Kraft, & Lisle, 1989; Wilson & LaFleur, 1995; Wilson & Schooler, 1991). For example, Schooler et al. (1993) found that verbalization can interfer with the solving of insight problems, and Wilson and Schooler (1991) have shown that providing reasons can impair the quality of affective decisions. The primary claim emerging from such studies is that explanation is detrimental to performance when the relevant aspects of a situation are inaccessible or not readily verbalized. Hence, there are some situations in which exposition would be decidedly unhelpful.

These observations point toward priorities in subsequent work on the choice effect. The primary theoretical task is to develop and test a good account for how an exposition requirement alters the fundamental processes by which the decision maker arrives at a choice. Explanations for conceptually similar accountability effects (e.g., Tetlock, 1985) provide one point of departure, e.g., that exposition induces more comprehensive and complex processing of various considerations. An essential practical task is to devise refined exposition instructions that do two things. First, they should induce the decision maker to write in such a way that the beneficial choice effects seen here are sharpened, and that negative effects seen elsewhere are minimized. Second, those instructions should make writing as effortless as possible. After all, a clear liability of any writing task is that it is laborious.

What about the confidence effect? A good case can be made that it is actually an *over*confidence effect reminiscent of the one observed by Oskamp (1965). Oskamp required his subjects to take a test repeatedly concerning a clinical case history, after reading more and more about the case. He found that, although subjects' actual performance on the test remained essentially the same as they learned more, their confidence in their performance soared on successive repetitions of the test. Here, although exposition about the given decision problem yielded modest improvement in decision quality, in the sense of resistance to framing influences, subjects' increased confidence that they had chosen well seemed to outstrip that improvement.

How can the confidence effect be explained? As in the case of the choice effect, a definitive answer to this question must await more pointed research. However, three broad classes of (not necessarily exclusive) contributors seem plausible and should receive attention in subsequent efforts. The first entails an "effort-performance belief" account. In this view, a person anticipates his or her performance level as, in part, a monotonically increasing function of how much effort is devoted to the given task. In the present case, since exposition instructions required more pre-choice effort than the other instructions, the confidence effect follows. There

is indeed evidence that people strongly hold the requisite effort-performance beliefs, even when they are objectively unwarranted (e.g., Yates & Kulick, 1977).

The second possible basis for the confidence effect is related to the first, and can be termed a "generalization contributor." Consistent with the composition research discussed at the outset of this article (e.g., Langer & Applebee, 1987), there is good reason to expect that the exposition requirement did indeed induce greater learning of some kind. For instance, it would not be surprising if, had our subjects been given a free-recall test, the exposition subjects would have recalled more details about the decision problems than the other subjects. And those subjects may well have sensed that writing improved their knowledge of such details. When asked about the quality of their choices, they would have simply generalized, assuming that such greater understanding would translate into better decisions. The problem, of course, is that this final inference may or may not be warranted, given the nature of the decision problem.

The third potential contributor to the confidence effect focuses on how exposition per se might affect the formation of the subject's performance judgment. There is a body of research, reviewed by Koehler (1991), indicating that constructing an explanation for a potential occurrence (e.g, here, writing an exposition claiming that one alternative is superior to its competitor) increases the apparent likelihood of that occurrence. There is at least some evidence that this happens partly because, in the process of assembling a coherent explanation for one position rather than another, the subject selectively focuses on supporting evidence and neglects or dismisses contrary evidence (cf. Ditto & Lopez, 1992).

Is the confidence effect good or bad for decision makers? The answer to this question depends on the circumstances, and it mirrors a similar question that is sometimes asked about the value of overconfidence generally. Overconfidence is often thought to be dysfunctional because it is expected to discourage the decision maker from improving the quality of his or her knowledge when improvement is actually needed (e.g., Russo & Schoemaker, 1992). Depending on the actual basis for the overconfidence, that expectation may be justified. But it also seems reasonable to anticipate certain clear-cut benefits of the confidence effect. For example, if exposition does, in fact, more firmly convince the decision maker in the wisdom of the chosen option, then the decision maker can be expected to be more committed to actually carrying out any actions that choice demands.

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