PROBLEM REPRESENTATION, FRAME PREFERENCE, AND RISKY CHOICE *

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Previous research has demonstrated that the way in which decision problems are formulated or 'framed', can have strong and predictable effects on people's preference for alternatives with risky or certain outcomes. To predict people's behavior in decisions in less restricted situations, we studied what frame people prefer and whether this preference is related to their preference for risky or certain options. In this article we present two experiments testing the hypothesis that preference for a frame in which the alternatives are described as losses (loss frame) will lead to risk seeking and preference for gain frames will lead to risk aversion. We tested this relation including standard problems in the domain of human lives and more everyday problems. Results provided weak support for the predicted relation, but in the domain of human lives only. In the second experiment we included two types of problem presentation. We did obtain a substantial effect of the initial problem presentation on option preference, moreover, this effect was obtained irrespective of the frame subjects preferred to describe the problem. Results indicate that the initial problem presentation has an overriding effect on option preference. Implications of these findings are discussed.

'Prospect theory' (Kahneman and Tversky 1979) is a descriptive theory of choices under uncertainty, assuming that the decision maker reduces the decision problem to a series of possible outcomes, and that these possible outcomes are evaluated according to a value function and a probability weighting function. The value function concerns the subjective worth associated with a possible outcome, and the probability weighting function expresses the subjective importance attached to the probability of obtaining a particular outcome. Important features

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of the value function are that in the domain of gains the curve is concave, while the curve is convex for losses, and the function is steeper for losses than for comparable gains. Another important feature relevant to the present study, is that outcomes are represented in terms of changes from a flexible reference point, which could represent one's current status, one's anticipated status, or some other psychologically significant point.

A variety of studies has shown that people tend to be risk averse for choices involving gains, and risk seeking for choices involving losses (e.g. Kahneman and Tversky 1979; Hershey and Schoemaker 1980). This 'reflection effect' is demonstrated by presenting the same decision problem with the outcomes of two formally equivalent choice alternatives framed either as gains or as losses. For example, the sure option is preferred in a choice between a sure gain of $50 and a probability of 0.5 to gain $100 or nothing. In the domain of losses the 'fifty-fifty' option to lose either $100 or nothing is preferred to the sure loss of $50. Schneider and Lopes (1986) showed that reflection most likely occurs when one of the alternatives is riskless (as in the above example) and that the effect is weak and irregular across other problems. Others argued that the reflection effect is domain dependent; support for the effect is strong in the domain of human lives, and in problems dealing with money. In more everyday problems, subjects tend to be more risk averse, while the reflection effect is relatively weak and irregular (Van der Pligt and Van Schie 1990).

Prospect theory posits that the choice process has two distinct stages: an editing stage in which one develops a decision frame, and an evaluation stage during which decision makers assign a value to each of the edited prospects. The editing stage characterize the initial analysis of the problem, generally leading to a simplified representation of the various prospects (Kahneman and Tversky 1979). In the editing stage one makes a representation of the presented decision problem, and adopts a decision frame. The decision maker might adopt the frame which is presented in the problem presentation, or the decision frame can be derived by further editing (e.g. Kahneman and Tversky 1979: 274). In various studies focusing on the reflection effect, the editing stage is ignored, and one implicitly assumed that people adopted the frame presented in the problem presentation. In decision problems not clearly presenting the problem in a particular decision frame, the adoption of a frame is dependent on the editing stage.
In order to predict behavior in situations that do not explicitly impose a particular frame on the decision problem, one must be able to anticipate how problems will be represented and what frames people will use to interpret them. Fischhoff (1983) conducted a series of studies investigating the relation between frame preference and option preference. According to prospect theory the use of different frames should lead to different option preferences. Fischhoff tested whether preference for a specific frame was related to option preference. For instance, preference for a frame in which the options are described in terms of losses should lead to preference for a risky option. Similarly, preference for a frame in which the options are described in terms of gains should lead to preference for the sure option. In his experiments Fischhoff presented decision problems (dealing with human lives or money) along with three frames individuals might reasonably impose on, or derive from each problem. Subjects had to indicate which of the three frames they judged as most natural and which as least natural. Two frames described the options in terms of losses, one in terms of gains and losses, e.g. no pure gain frame was presented. Next, subjects had to indicate which option they preferred.

Results of these studies indicated that people generally prefer the risky option over the sure loss, independent of their frame preference. Moreover, they did so despite a variety of changes in parameters, context, wording instructions and order of presentation. In other words, findings did not indicate a clear relation between frame preference and option preference. Subjects who selected the neutral frame (referring to losses and gains) as the most natural one, preferred the risky option as much as subjects judging the loss frames as most natural. Fischhoff argued that according to prospect theory one would expect that subjects who choose the sure option would also prefer the neutral frame. This prediction was based on the notion that the value function is steeper for losses than for gains. Thus, those who adopt a neutral frame (i.e., one in which the risky option is described in an equal number of losses and gains, while the sure option simply refers to a status quo), would evaluate the risky option as less attractive and hence would prefer the sure option.

In Fischhoff's studies subjects always had to choose between losses, and as noted, subjects generally preferred the risky option. This lack of variation in option preference might have made it more difficult to find a relation between option choice and frame preference. In all his
experiments only a small fraction of subjects preferred the sure option. Our own findings indicate (Van der Pligt and Van Schie 1990) that people tend to be more cautious when confronted with everyday loss problems. In the present series of studies we therefore included a wider range of domains in order to get more variation in option preference. Another advantage of the use of everyday problems could be that, as indicated by Van der Pligt and Van Schie, the imposed frame has a far less pronounced impact on option preference as compared to the typical problems used in this line of research. This suggests that in these problems people are less likely to adopt the frame most similar to the initial problem presentation.

To summarize, the first experiment attempted to extend Fischhoff's (1983) study. It was expected that the inclusion of more everyday choice problems would provide a better distribution of option choices. Secondly, it was expected that the inclusion of more everyday problems might result in a stronger relation between frame preference and option preference due to the fact that these problems are less artificial and more familiar to subjects.

**Experiment 1**

In this study we first presented subjects with a problem concerning the loss of human lives and three frames which seem reasonable to impose on the decision problem. After a brief introduction two possible options are described; one option leads to a sure outcome and one options results in a risky outcome. The three frames are introduced as 'ways one might think about the problem'. The first frame is most similar to the initial description of the problem. If one prefers this frame no editing is performed beyond the necessary act of coding the consequences (as losses) in comparison to the given reference point. The second frame is obtained by cancellation of a sure loss that is common to both options. Despite the cancellation procedure, this is also a loss frame, although the losses at stake concern fewer lives than in the first frame. The third frame is derived from shifting the reference point to the sure option or cancelling the number of lives lost that equals the sure loss. This frame can best be seen as a neutral frame. The prospect of the sure option is described as the reference point, and the prospect of the risky option includes a chance to lose lives and a chance to gain lives.

The study attempts to investigate which frame is adopted by asking which of three possible frames is seen as most natural. A preference for the first frame suggests a minimal amount of editing. The two other frames are less similar to the initial problem presentation. A preference for those frames requires additional editing operations, i.e., a cancellation procedure or shifting the reference point. According to prospect theory,
it would be expected that the adoption of a loss frame leads to a preference for a risky option. Hence, it could be predicted that the risky option will be preferred if the first or the second frame is adopted. Those who adopt the third frame are expected to prefer the sure option. In this frame the risky option would be evaluated negatively because losses loom larger than gains, and the risky option describes an equal number of lives (or hours) that might be lost or gained.

Method

Subjects were 117 students recruited during an introductory psychology course at the University of Exeter, UK.

The subjects received one-page forms, each form presenting a decision problem. Each subject received two 'civil defense' problems, and half of the subjects (58) got two additional (everyday) problems, the other half (59) received one additional (everyday) problem. Between these decision problems subjects had to carry out unrelated tasks. In the two 'civil defense' problems different numbers of lives are at stake. Two different everyday problems are used, both dealing with the loss of time. One problem concerns a choice between two alternative psychology courses both (unfortunately) given by 'boring lecturers' and the other problem describes a choice between two different train routes. To illustrate the material used in this study we present one 'civil defense' problem and the 'train route' problem. Subjects first had to read the problem including the two options, followed by three possible ways one might think about the problem. Subjects were asked to indicate (a) which of the three phrasings they regarded the most natural way of thinking about the problem, (b) which seemed natural and, finally, (c) which option they would chose. In all cases the two options have equal expected value. Order of problems was fixed, and the task was carried out in small groups of 2–6 subjects in a classroom setting.

Civil defense problem

A council committee in the South West met recently to discuss contingency plans in the event of various emergencies. One emergency under discussion was the following: 'A train carrying chemical waste derails and the storage tanks begin to leak. The threat of an explosion and lethal discharge of poisonous gas is imminent'. Two possible actions were considered by the committee. The outcomes of these are described below. Read them and indicate your opinion about the relative merits of each.

Option A: Carries with it a 0.5 probability of containing the threat with a loss of 40 lives, and a 0.5 probability of losing 60 lives. It is like taking the gamble:
- 50% chance of losing 40 lives
- 50% chance of losing 60 lives

Option B: Would result in the sure loss of 50 lives:
- lose 50 lives

Here are three ways one might think about the problem:

1. This is a choice between a 50-50 gamble (lose 40 or lose 60 lives) and a sure thing (the loss of 50 lives).
2. Whatever is done at least 40 lives will be lost. This is a choice between a gamble with a 50-50 chance of either losing no additional lives or losing 20 additional lives (A), and the sure loss of 10 additional lives (B).
(3) Option B produces a sure loss of 50 lives. Taking Option A would mean a gamble over 0.5 chance to save 10 lives and a 0.5 chance to lose 10 additional lives.

**Train problem**

Suppose you intend to spend the half-term holiday at home. Usually you travel by train and the trip takes 2 hours. Unfortunately, intercity services are being disrupted by a national strike, and you have to make a choice between two alternative routes by non-intercity trains. The two alternatives are equally expensive. Please read the two options below and indicate your opinion about the relative merits of each.

**Option A:** You will have to change trains once, and have only 2 minutes to catch your connection. In other words a slight delay could result in missing the connecting train. This option carries with it a 0.5 probability of making it in time and adding 1 hour to your usual (intercity) travel time, and a 0.5 probability of missing the connection and adding 3 hours to your usual travel time. It is like taking the gamble:

- 50% chance of losing an extra hour
- 50% chance of losing an extra 3 hours

**Option B:** This alternative involves a slightly longer route. Again, you will have to change once, but the connection is less risky than the one mentioned under Option A and you will definitely catch your connecting train. This alternative will add 2 hours to your usual journey time, i.e.,

a sure loss of an extra 2 hours

Here are three ways one might think about this problem:

1. This is a choice between a 50-50 gamble (lose 1 hour or lose 3 hours) and a sure thing (the loss of 2 hours).
2. Whatever is done at least 1 hour will be lost. This is a choice between a gamble with a 50-50 chance of either losing no additional hours or losing 2 additional hours (Option A) and the sure loss of 1 additional hour (Option B).
3. Option B produces a loss of 2 hours. Taking Option A would mean gambling over a 50% chance to save 1 hour and a 50% chance to lose an additional hour.

The other civil defense problem concerned a train carrying nuclear waste. The sure option implied the loss of 320 lives, the other option consisted of 0.4 probability of losing 200 and 0.6 probability of losing 400 lives. The boring lecturer problem deals with alternative courses, one has a certain outcome (a sure waste of 32 hours), the other alternative leads to less certain consequences (0.4 probability of wasting 20 hours and 0.6 probability of wasting 40 hours).

**Results**

In the ‘civil defense’ problem only 15% of the subjects preferred the sure option. This result is compatible with prospect theory assuming that a loss frame such as frame 1 or 2 is adopted. This general preference for the risky option should be accompanied with fewer subjects preferring frame 3 as compared to frame 1 and 2.

Table 1 summarizes the findings for the civil defense problems. The top section of table 1 shows the relative popularity of the frames, as judged by the subjects. Overall, a minority of subjects judged frame 3 as most natural. One would expect decreased preference for frame 3 for subjects preferring the risky option. As can be seen in table
Table 1
Frame preference and option preference ('civil defense' problem).

<table>
<thead>
<tr>
<th>Frame preference</th>
<th>Nuclear waste problem</th>
<th></th>
<th>Chemical waste problem</th>
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<tbody>
<tr>
<td></td>
<td>Risky option (N)</td>
<td>Sure option (N)</td>
<td>Total</td>
<td>Risky option (N)</td>
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<tr>
<td>Choice as most natural</td>
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<td></td>
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<td>Frame 1</td>
<td>36</td>
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<td>42</td>
<td>41</td>
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<td>Frame 2</td>
<td>46</td>
<td>6</td>
<td>52</td>
<td>39</td>
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<td>Frame 3</td>
<td>18</td>
<td>5</td>
<td>23</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>17</td>
<td>117</td>
<td>98</td>
</tr>
<tr>
<td>Choice as least natural</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame 1</td>
<td>16</td>
<td>7</td>
<td>23</td>
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</tr>
<tr>
<td>Frame 2</td>
<td>25</td>
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<td>27</td>
<td>29</td>
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<tr>
<td>Frame 3</td>
<td>59</td>
<td>8</td>
<td>67</td>
<td>49</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>17</td>
<td>117</td>
<td>98</td>
</tr>
</tbody>
</table>

(Frame 1 and 2 loss frames, frame 3 neutral frame.)

1, preference for frame 3 was marginally lower than the overall average for these subjects. Not surprisingly, the reverse relation is also found; e.g., subjects judging frame 3 as the least natural, generally preferred the risky option.

In the chemical waste problem a non-significant trend ($\chi^2 = 5.25, 2 \text{ df}, p = 0.07$) suggests a relation between option choice and frame preference, i.e., those subjects judging frame 3 as most natural more frequently chose the sure option. In the nuclear waste problem we found a significant ($\chi^2 = 6.15, 2 \text{ df}, p < 0.05$) relation between option choice and frame preference, i.e. those subjects judging frame 3 as least natural more often preferred the risky option. These results provide some support for the predicted relation between the adoption of a frame and risk seeking vs. risk aversion. Overall, our results are stronger than those obtained by Fischhoff (1983) and indicate a relation between frame and option preference. However, the overall preference for the risky option made it difficult to demonstrate a relation between frame preference and option preference. Let us now turn to the more everyday problems where we expected a more balanced distribution of option preferences.

As expected, the results in the everyday problems are somewhat different from the 'civil defense' problem. In these decision problems only 55% of the subjects prefers the risky option. According to this option preference one would expect frame 3 to be more popular than in the domain of human lives.

Table 2 summarizes the findings for the two everyday problems both dealing with loss of time. Table 2 shows that frame 3 is as unpopular as was the case with the civil defense problem, only 15% of the subjects judged this frame as most natural in the 'train' problem and 21% in the 'boring lecturers' problem. In one of the problems (train-problem) subjects preferring frame 3 show slightly more preference for the sure
Table 2
Frame preference and option preference ('every day' problems).

<table>
<thead>
<tr>
<th>Frame preference</th>
<th>British train problem</th>
<th>Boring lecturers problem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Risky option (N)</td>
<td>Sure option (N)</td>
</tr>
<tr>
<td>Frame 1</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Frame 2</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Frame 3</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>30</td>
</tr>
</tbody>
</table>

Choice as least natural

| Frame 1                 | 7                      | 7                        | 14                       | 16               | 10              | 26         |
| Frame 2                 | 11                    | 8                        | 19                       | 21               | 11              | 32         |
| Frame 3                 | 11                    | 15                       | 26                       | 31               | 28              | 59         |
| Total                   | 29                    | 30                       | 59                       | 68               | 49              | 117        |

(Frame 1 and 2 loss frames, frame 3 neutral frame.)

As compared to subjects preferring frame 1 or 2. This effect, however, is not significant ($\chi^2 = 3.16, 2\ df$). Thus, results in the everyday problem do not seem to support prospect theory. Prospect theory would predict that preference for frame 3 should lead to increased preference for the sure option, while subjects preferring frame 1 or 2 should choose the risky option.

The general preference for the loss frames contradicts our suggestion that in everyday problems people might be less guided by the original frame as compared to the domain of human lives. Although subjects showed more variation in option preference in these everyday problems, we did not obtain the expected stronger relation between option preference and frame preference. This result contradicts our suggestion that the lack of relation in Fischhoff's (1983) studies might be partly due to the overall preference for the risky option.

The overall preference for loss frames in both problems suggests that subjects preferred the frame most similar to the initial problem presentation. Based on this result, it could be argued that people adopt the frame that requires minimal editing. Similarly, one could argue that this preference could be due to linguistic similarity between the initial problem presentation and the frames. In other words, it may well be the case that an introduction that frequently refers to losses automatically leads to a preference for frames that also refer to losses. Moreover, during debriefing, subjects pointed out that the task of indicating which of the three frames was seen as most/least natural was rather difficult. These and other issues will be investigated in experiment 2.
Experiment 2

The mixed results of the first experiment might partly be attributed to the instruments used. The fact that the problem introduction clearly presented the prospects as losses, in a manner that seems most compatible with frame 1, seems to increase subjects' preference for a loss frame. In other words, it could be argued that the initial problem presentation imposes a particular frame on the problem which cannot be neglected. A presentation of the problem in neutral terms, referring to gains and losses might leave more room for further editing in either loss or gain prospects. The second experiment aims to investigate whether the initial presentation of options influences frame preference and option preference. Another possible shortcoming of the first experiment is that subjects could only choose between two loss frames and one neutral frame. A choice between a loss frame, a neutral frame and a pure gain frame is likely to provide a more balanced set of alternative frames. A complete set of frames (gain, neutral and loss) can simply be derived from a neutral problem introduction. Experiment 2 thus again tests our hypothesized relation between option preference and frame preference but with (a) a neutral initial problem presentation and (b) a better balanced set of alternative frames.

Another reason for the mixed results of the first study might be that the task of judging which frame is most/least natural is simply too difficult. In the first experiment, subjects indicated this difficulty during debriefing. In judging which frame is seen as most natural, subjects might simply choose the frame which is closest linguistically to the initial problem presentation. It was expected that it is easier to judge which reference point is most/least natural, compared with judging the naturalness of frames. The three frames presented in the first experiment are essentially changes of reference points. For example in the civil defense problem, the first frame uses the implicit reference point 'no lives lost' (the situation before the accident), the second frame has '40 lives lost' as reference point (the number of lives that will definitely be lost), and in the third frame the reference point equals the consequences of the sure option: 50 lives lost. In presenting reference points which are comparable to the presented frames one would avoid a naturalness judgement based on simple similarities. Reference points do not have the drawback of obvious linguistic similarity with the initial problem presentation.

Thus, experiment 2 tests the relation between frame preference and option preference, and between reference point preference and option preference. It was investigated whether these tasks would result in similar preference patterns. Furthermore, it is hypothesized that a neutral problem presentation including neutral initial options, and the presentation of a better balanced set of frames/reference points (loss, neutral and gain) will (a) decrease the popularity for loss frames/reference points, as compared to an initial presentation in terms of losses: and (b) strengthen the relation between frame preference/reference point and option preference.

Method

Subjects were 191 first- and second-grade psychology students at the University of Amsterdam. They participated in the experiment for credit towards their course grade.
Three decision problems were presented: one in the domain of human lives, one concerning money, and a third problem concerning jobs. Each subject received a series of three problems. Between the three problems subjects filled out unrelated questionnaires. Order of problems was fixed, and the task was carried out in groups of 15–20 subjects in a classroom setting.

Each problem was presented in four conditions: (1) the initial problem presentation is described in terms of losses only, and subjects had to judge the naturalness of frames before indicating their option preference, (2) the initial problem presentation is described in terms of losses only, and subjects had to judge the naturalness of reference points, (3) the initial problem presentation refers to both gains and losses, and subjects had to judge the naturalness of frames, and (4) the initial problem presentation refers to both gains and losses, and subjects had to judge the naturalness of reference points. We did not present a pure gain problem presentation. This would have been possible for the first problem in the domain of human lives, but a pure gain presentation would result in extremely artificial problem presentations in the two other problems.

In accordance with the first experiment, condition 1 included two loss frames (frame 1 and 2) and one neutral frame (frame 3). Frame 1 describes the problem in terms of a relatively high number of losses, frame 2 describes it in a relatively low number of losses. Frame 3 refers to both losses and gains. The three frames could be derived from the initial problem presentation by simple editing operations. It would be impossible to derive a pure gain frame from this presentation. Condition 3 describes the initial prospects in terms of gains and losses, and the three presented frames consist of one loss frame (frame 1), one neutral frame (frame 2) and one gain frame (frame 3). These three frames could all be obtained using only simple editing operations leaving from the (neutral) problem presentation. In this condition frame 1 describes the problem in terms of a relatively high number of losses, frame 3 in a relatively high number of gains. In both conditions (1 and 3) the neutral frame (resp. frame 3 and frame 2) is presented in terms of gains and losses. In conditions 2 and 4 subjects had to judge the naturalness of reference points which are comparable with the frames in conditions 1 and 3, respectively. To illustrate the material used in this study, the problem in the domain of human lives is presented for all 4 conditions.

**Problem introduction and initial options: loss problem (conditions 1 and 2)**

Imagine that The Netherlands is preparing for the outbreak of a deadly disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. One concerns the use of a known vaccine, the other the use of a recently developed, not yet fully tested vaccine. The consequences of each vaccine are as follows:

- **Option A**: vaccine A carries with it a 0.5 probability that 200 people die and a 0.5 probability that 400 people die. It is like taking the gamble:
  - 0.5 losing 200 lives
  - 0.5 losing 400 lives

- **Option B**: vaccine B would result in a total loss of 300 lives:
  - a sure loss of 300 lives

**Condition 1**

Here are three ways one might think about the problem:

1. This is a choice between a 50-50 gamble (lose 200 or lose 400 lives) and a sure thing (the loss of 300 lives).
(2) Whatever is done at least 200 lives will be lost. This is a choice between a gamble with 50-50 chance of either losing no additional lives or losing 200 additional lives (A) and the sure loss of 100 additional lives (B).

(3) Option B produces a loss of 300 lives. Taking option A would mean gambling over a 0.5 chance to save 100 lives and a 0.5 chance to lose 100 additional lives.

**Condition 2**

When you choose between two options you can compare the outcomes with various situations.

1. a situation in which no lives are lost,
2. a situation in which 200 lives are lost,
3. a situation in which 300 lives are lost.

The introduction used in conditions 3 and 4 is identical to the one presented above, while the initial options are different.

**Initial options: neutral problem** (conditions 3 and 4).

**Option A:** vaccine A carries with it a 0.5 probability that 200 people die and 400 are saved, and a 0.5 probability that 400 people die and 200 are saved. It is like taking the gamble:

- 0.5 200 lives lost, 400 saved
- 0.5 400 lives lost, 200 saved

**Option B:** vaccine B will lead to a total of 300 death and 300 saved, i.e:

certainty 300 lives lost, 300 saved

**Condition 3**

Here are three ways one might think about the problem:

1. This is a choice between a 50-50 gamble (lose 200 or lose 400 lives) and a sure thing (the loss of 300 lives).
2. Option B produces a loss of 300 lives, 300 saved. Taking option A would mean gambling over a 0.5 chance to save 100 additional lives and a 0.5 chance to lose 100 additional lives.
3. This is a choice between a 50-50 gamble (save 400 lives or save 200 lives) and a sure thing (save 300 lives).

**Condition 4**

When you choose between two options you can compare the outcomes with various situations.

1. a situation in which no lives are lost,
2. a situation in which 300 lives are lost and 300 saved,
3. a situation in which no lives are saved.

Subjects were asked to indicate which of the three phrasings they regarded the most natural way of thinking about the problem, which they found the least natural, and finally which option they preferred (A or B).

The decision problem in the domain of money described a situation concerning income tax. Subjects had to choose between two strategies on how to inform the tax office about their income situation; one strategy leading to a sure result (loss or loss and gain) and one strategy being a gamble.

The third decision problem is in the domain of jobs, and described a company with 400 employees on the brink of bankruptcy. Subjects have to choose between two plans...
to rescue the company and save as many jobs as possible. One option leads to a sure result (e.g. 200 jobs lost or/and 200 jobs saved), the other leads to an uncertain result (e.g. 50% chance of losing/saving 100 jobs, 50% chance of losing/saving 300 jobs).

Results

The first question to be answered is whether option preference (sure vs. risky), is influenced by the initial presentation of the options. In conditions 1 and 2 the initial problem presentation, including the initial options, is presented in terms of losses and the third and fourth conditions present the initial problem presentation in terms of both gains and losses. The results for each condition separately are presented in table 3 (human lives), table 4 (money), and table 5 (jobs).

Conditions 1 and 2 revealed a fairly strong overall preference for the risky option. In these conditions the problem is initially presented as a loss problem. This pattern is similar to the results obtained in the first experiment. In contrast, the neutral initial problem presentation describing both gains and losses results in a preference for the sure option. In the neutral option gains as well as losses are mentioned. A preference for the risky option in conditions 1 and 2, and for the sure option in conditions 3 and 4 is found in all three domains. All three problems resulted in a significant chi-square (human lives; \( \chi^2 = 27.35, 3 \text{ df}, p < 0.001 \); money: \( \chi^2 = 9.17, 3 \text{ df}, p < 0.05 \); jobs: \( \chi^2 = 11.31, 3 \text{ df}, p < 0.01 \)). The relation between initial problem presentation and option preference is strongest in the domain of human lives. Given these outcomes prospect theory would predict that in the first two conditions subjects would adopt a loss frame and in the last two conditions subjects would adopt a neutral or a gain frame.

Table 3
Frame/reference point preference and option preference (experiment 2, human lives).

<table>
<thead>
<tr>
<th>Frame conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
<th>Reference points conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
</tr>
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<tbody>
<tr>
<td>Loss introduction</td>
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<td>High loss</td>
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<td>Low loss</td>
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<td>Gain/loss</td>
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<td>Neutral introduction</td>
<td></td>
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</tr>
<tr>
<td>High loss</td>
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<td>8</td>
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<td>11</td>
<td>12</td>
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<tr>
<td>Gain/loss</td>
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<td>9</td>
<td>15</td>
<td>5</td>
<td>16</td>
<td>21</td>
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<tr>
<td>High gain</td>
<td>8</td>
<td>17</td>
<td>25</td>
<td>6</td>
<td>8</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>31</td>
<td>48</td>
<td>12</td>
<td>35</td>
<td>47</td>
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Table 4
Frame/reference point preference and option preference (experiment 2, money).

<table>
<thead>
<tr>
<th>Frame conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
<th>Reference points conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
<tr>
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<td>18</td>
<td>5</td>
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<td>9</td>
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</tr>
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<td></td>
</tr>
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<td>16</td>
<td>49</td>
<td>31</td>
<td>16</td>
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<td>12</td>
<td>3</td>
<td>1</td>
<td>4</td>
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<tr>
<td>Gain/loss</td>
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<td>20</td>
<td>5</td>
<td>13</td>
<td>18</td>
<td></td>
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<td>15</td>
<td>15</td>
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<td>26</td>
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<td><strong>Total</strong></td>
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<td>27</td>
<td>47</td>
<td>23</td>
<td>25</td>
<td>48</td>
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</table>

Surprisingly, results in tables 3, 4 and 5 reveal no clear overall preference for one of the reference points or frames. Condition 1 revealed no clear preference for any of the frames, except in the domain of human lives in which more subjects (45%) judged the 'high loss' frame as more natural than any of the other frames, and only a relatively

Table 5
Frame/reference point preference and option preference (experiment 2, jobs).

<table>
<thead>
<tr>
<th>Frame conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
<th>Reference points conditions</th>
<th>Risky option (N)</th>
<th>Sure option (N)</th>
<th>Total (N)</th>
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<tbody>
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<td></td>
<td></td>
</tr>
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<td>5</td>
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<td>7</td>
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<td>10</td>
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<td>14</td>
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<tr>
<td>Gain/loss</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>15</td>
<td>11</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25</td>
<td>23</td>
<td>48</td>
<td>30</td>
<td>17</td>
<td>47</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>6</td>
<td>2</td>
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<td>12</td>
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<td>46</td>
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<td>33</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>
small group (23%) of subjects preferred the neutral frame. In condition 3 a relatively small number of subjects (17%) preferred the loss frame. These results indicate that in condition 1 subjects show some preference for the 'high loss' frame and in condition 3 the neutral frame and gain frame are more often preferred. These preferences were not found in conditions 2 and 4. In condition 2 more subjects preferred the neutral reference point in comparison to the other reference points. This finding is obtained in all three domains.

The presented frames in conditions 1 and 3 are in principle equivalent to the reference points in conditions 2 and 4 respectively. In conditions 1 and 3 the prospects are described in terms of gains and losses, while the shifted reference points are not mentioned explicitly. The reverse is true for conditions 2 and 4 in which the prospects are not explicitly presented, but instead a value to compare the results with. Results show a lack of correspondence between the preference patterns for frames and reference points, i.e., between conditions 1 and 2, and between conditions 3 and 4. These differences in preference might be due to the lack of overt correspondence between frames and theoretically equivalent reference points.

Next we turn to the relation between frame (or reference point) preference and option choice. According to prospect theory subjects adopting a loss frame are expected to be risk seeking and subjects adopting a neutral or gain frame should be risk averse. Results in table 3 show that this prediction is only supported in the first condition ($\chi^2 = 8.11; df = 2; p < 0.05$). This result is in correspondence with our findings in the first experiment. No significant results were obtained in any of the other conditions in the domain of human lives. These results do not support the prediction that it would be more easy to obtain a clear pattern of preferences when subjects could choose between more diverse frames. Results do not show a clearer relation between frame preference and option preference in condition 3 as compared to condition 1.

Both the money problem and the job problem did not show a relation between frame or reference point preference and option preference. These discouraging findings underline the difficulty to demonstrate the suggested process of frame adoption leading to a particular option preference.

Discussion

According to prospect theory decisional preference is related to the frame adopted, i.e., the manner in which a decision problem is perceived. In order to examine this, Fischhoff (1983) conducted a series of studies to investigate the relation between frame preference and option preference. Results of these studies were generally discouraging.

Contrary to Fischhoff's results, the first experiment and the condition in experiment 2 most similar to the first experiment, revealed a (weak) relation between frame preference and option preference. In both experiments this relation was obtained only in the domain of
human lives. Subjects preferring a neutral frame more frequently chose the sure option as compared to those subjects adopting a loss frame. This pattern of preference is compatible with prospect theory, assuming that people interpret the naturalness question as an inquiry into the frame that they themselves have used.

Studies concerning the reflection effect in different domains demonstrated that in problems concerning human lives the decisions are most strongly influenced by the way a problem is framed. In everyday problems the imposed frame has a far less pronounced impact on option preference (Van der Pligt and Van Schie 1990). This could suggest that in these problems people might find it easier to select a frame that differs from the initial problem presentation. We did not, however, obtain any relation between frame preference and option preference in these everyday problems. Nevertheless, the absence of a relation between frame preference and option choice does not contradict prospect theory, assuming that people adopted another frame than one of the three presented frames (and the one judged as most natural). To further investigate this, it might be useful to continue this line of research by using process tracing techniques. These methods could provide further insight into what frames people adopt when choosing between decision alternatives. Maule (1989) conducted such a study on the ‘Asian disease’ problem. The results of his study provided some support for the relation between adopted frames and option choice.

Our results concerning the impact of the initial problem presentation showed that the gain frame was more often preferred in the condition with the neutral initial problem presentation and the loss frame was selected more often if the initial presentation was in terms of losses. This result might indicate a preference for minimal editing. However, these results were not found when subjects had to judge the naturalness of the corresponding reference points. In these conditions, the lack of linguistic resemblance between the initial problem presentation and the presented reference points made it impossible for subjects to base their naturalness judgments on linguistic similarity. This suggests that judging the naturalness of frames is primarily a function of similarity between initial problem presentation and the frame.

The most clear-cut finding of the present studies is that the initial presentation of a decision problem has a strong effect on option preference. A problem presentation in terms of losses generally leads to
risk seeking, while a neutral presentation leads to risk-aversion. Fischhoff (1983) failed to find a relation between the framing of the initial problem presentation and option preference. In his experiments frames were presented in terms of losses or as a combination of gains and losses. It needs to be added, however, that even in the latter condition the wording emphasized losses; the sure option was presented as a loss, and the risky option as a loss or a gain in comparison with the sure loss. In our second experiment the initial problem presentation emphasized both losses and gains. The results in the present experiments are not in accordance with Fischhoff’s suggestion that in problems such as the ‘civil defense’ problem, people do prefer the risky option to the sure option, despite changes in the problem presentation. People show a preference for the risky option or the sure option as a function of the initial presentation. Once a problem is presented in a particular frame, people seem to adopt this frame and seem to be insensitive to other frames. Tversky and Kahneman (1981) suggested that ‘individuals who face a decision problem... are normally unaware of alternative frames’. Our results indicate that even if alternative frames are presented people are not likely to change the frame first adopted.

The relation between the manner in which a problem is framed and risky choice is extensively demonstrated, while the assumed intermediate stage: the adoption of a frame, is hardly empirically documented. More insight in frame adoption might explain why subjects do not always prefer the option predicted by prospect theory. It could be argued that the more artificial a decision problem and the more explicitly a problem is framed, the less likely it is that people will adopt another frame than the one presented. Research into more familiar decision problems with a more neutral frame should provide more insight in editing and frame adoption processes.

References


