

Can an Incidental Picture Make Us More or Less Willing to Risk?

Boicho Kokinov (bkokinov@nbu.bg)

Daniela Raeva (danielaraeva@yahoo.com)

Central and East European Center for Cognitive Science,
Department of Cognitive Science and Psychology,
New Bulgarian University, 21 Montevideo Street
Sofia 1618, Bulgaria

Abstract

This paper explores a new phenomenon – Distant Context Effects (DICE) – and in this way it broadens the spectrum of known context effects on individual decision making and further challenges both the rational choice theory and alternative theories proposed in psychology such as reason-based choice. Distant context effects are typically influences of some elements of the environment that are completely irrelevant to the task on the decisions we make and moreover, we are typically not aware of these influences.

Key words: individual decision-making, context effects, framing, risk aversion, risk seeking, psychological experimentation

Introduction

The whole economy depends on the willingness of people to risk, on their initiative and entrepreneurship. Therefore the study of human willingness to risk should be central to cognitive economics studies. Some people may be more inclined to risk than others, thus this might be considered as a personality trait. However, we sometimes are more willing to risk than usually, and sometimes – less. This paper is trying to study whether the environment does play a role in the dynamics of these changes.

This issue is important since classical theories assume some mean degree of willingness to risk thus excluding the personality issues, but they also exclude the role of the environment assuming that the willingness to risk is completely determined by the task. If we learn more we might be able to understand what kind of environments trigger risk seeking behavior and what kind – risk avoiding behavior.

Framing, Context Effects and the Rational Theory of Choice

One of the main arguments against the rational theory of choice which is at the heart of classical economics theories (von Neuman & Morgenstern, 1947) is based on the framing effects first established by Tversky and Kahneman (1981). They showed that people reverse their preference depending on whether the two options are formulated

in terms of “lives saved” or “lives lost”. Thus when the Asian disease task is formulated in terms of lives saved 72% of the participants in the study have chosen risk aversion behavior, while when the same task is formulated in terms of number of people who will die – 78% of the participants have chosen risk seeking behavior (Tversky & Kahneman, 1981). This finding contradicts the invariance principle of the rational theory of choice which requires that the preference between two options should not depend on the manner in which they are described.

This framing effect demonstrates that people are not neutral to the formulation of the task and even when the two wordings are logically equivalent they can still produce different choices. The reason, according to Tversky and Kahneman, is that people represent mentally the task in two different forms: one of them is framed in terms of gains and the other one in terms of losses, and these two representations (although logically equivalent) lead to different preferences since in the framework of gains people prefer sure gains, while in the framework of losses people prefer every chance to reduce the loss – this explanation is related to the Prospect theory (Kahneman & Tversky, 1979).

The frame effects have been extensively studied and a variety of new forms have been found. The unifying characteristic of all those studies is the same as revealed above: different wordings of crucial elements of the same problem result in perceiving (representing) the problem either positively or negatively and this on its turn leads to preference reversal.

In fact, under time constraints and cognitive load people might not be able to convert one of this representations to the other and thus establish that both are equivalent – establishing this equivalence actually requires some mental efforts (in this case some calculations). To summarise, although the changed element of the task does not change the logical task, in fact, people might believe that the change is relevant to the task and the two tasks are not easily recognised as equivalent. The question that we raise in this paper is whether we can obtain similar results with an *obviously irrelevant* change that do not require any calculations or reasoning by the participants in the experiment, i.e. they should be convinced that the two tasks are absolutely equivalent and still produce different results.

Another group of studies has demonstrated context effects of various kinds. Thus Tversky and Shafir (1992) demonstrated that a non-preferred option can become preferred when a new option is added to the offered set. This is again in contradiction with the value maximisation principle of the rational choice theory and seemingly contradicts the market principles. Simonson, Nowlis, and Simonson (1993) demonstrated that people are negatively influenced by other people’s choices when they find their arguments not appealing, in other words, one would prefer an option, but if someone else is choosing this option with an argument that we find not applicable for us, then this options seem less appealing to us and we choose the alternative.

All these context effects have been explained by Shafir, Simonson, and Tversky (1993) in terms of the Reason-Based Choice Theory. They claim that all these changes in the task result in providing new arguments in favour of one of the alternatives and thus produce a preference reversal. This explanation assumes that people are consciously perceiving the task elements and constructing arguments involving these elements. We would like to challenge this theory by demonstrating context effects that would be unconscious, i.e. people would not be aware of the influence of the environmental cues and thus they cannot construct explicit arguments using them.

Dynamic Theory of Context and the DUAL Cognitive Architecture

According to the dynamic theory of context (Kokinov, 1995, 1997, 1999) context does not have clear-cut boundaries and thus not only target problem elements may have an influence, but also incidental environmental cues. This claim has been experimentally tested in a problem solving context and the results confirmed that an incidental picture on the same sheet of paper may change the way we solve a problem (Kokinov & Yoveva, 1996; Kokinov, Hadjiilieva, Yoveva, 1997). Moreover, it was demonstrated that people are not aware of the fact that this environmental cue has played any role in the problem solving process. We would like to explore whether a similar phenomenon can be established in a decision-making context. If such a phenomenon exists this will expand the range of known context effects on choice. It will also challenge the reason-based choice theory explanation, since in this case the influence is more subtle and unconscious and people do not construct explicit arguments using this environmental cue. This would also contribute to the unification of the fields of decision making and problem solving providing examples of unified phenomena.

The dynamic theory of context has been implemented in the DUAL cognitive architecture (Kokinov, 1994a, 1994b, Petrov & Kokinov, 1999, Kokinov & Petrov, 2001). Using a general architecture in modeling allows for integrating various cognitive processes thus decision-making may be related to memory processes, perception, and reasoning. One important feature of DUAL is that it explains unconscious influences from the environmental cues by perceiving the cues and activating pieces of knowledge related to the perceived elements thus involving this knowledge into the reasoning process at an unconscious level. This is possible because of the parallel processing which is characteristic for DUAL. Thus the perception and memory activation runs in parallel to the reasoning or decision-making process and influences it without the source of influence to be revealed to the consciousness. The experiment described in the next section is based on the predicted mechanisms of the DUAL architecture and looks for Distant Context Effects (DICE), it explores the possible influence of an environmental cue that seems incidental and irrelevant to the task. Contrary to the experiments described in the first section where the experimenter misleads subjects by providing seemingly relevant features of the task that are in fact irrelevant, in the experiment to be described in the next section the experimenter provides seemingly irrelevant features of the environment that turn out to be relevant.

Experiment

In this experiment people play gambles and we measure their willingness to risk with the percentage of cases in which they chose to stake on the less probable event which is, however, related to higher profit if it happens.

A computer game has been specially developed for this experiment and an irrelevant feature of the game (the backs of the cards used in the game) has been the manipulated variable. We assume that the participants would not be aware of our manipulation and all possible effects (if any) will be due to unconscious mechanisms at work.

Method

Design

The experiment has a single factor between group design. Three conditions have been used: control condition (the cards have a neutral back), “risk-seeking” condition (the cards have a picture of James Bond as their back), and “risk-aversion” condition (the cards have a sleeping baby as their back). The dependent variable was the percentage of risk responses during the game.

Procedure

Participants were invited to play a game on a PC in a soundproof boot. On the computer screen they were presented with a stack of cards that has an Ace in it. The card stack consists of 10 cards, which are randomly distributed over two rows (Figure 1). The particular position of the Ace is randomly chosen on each trial. The participants have to guess where (in which row) the Ace is. If they guess correctly they win a certain amount of points, which are accumulated in a general score. The amount of points was selected in such a way as to make the expected value of the two rows equal. Thus in the example provided in Figure 1 we have expected value of 24 points for each of the rows ($4/10 \times 60$ for the first row and $6/10 \times 40$ for the second row). According to the rational theory we should obtain a random 50:50 choice of either options. On each trial participants faced a different configurations which varied from 1 card in the first row and 9 cards in the second row to 9 cards in the first row and 1 card in the second row (excluding 5 cards on each row). Every trail displays a different not-repeating configuration.

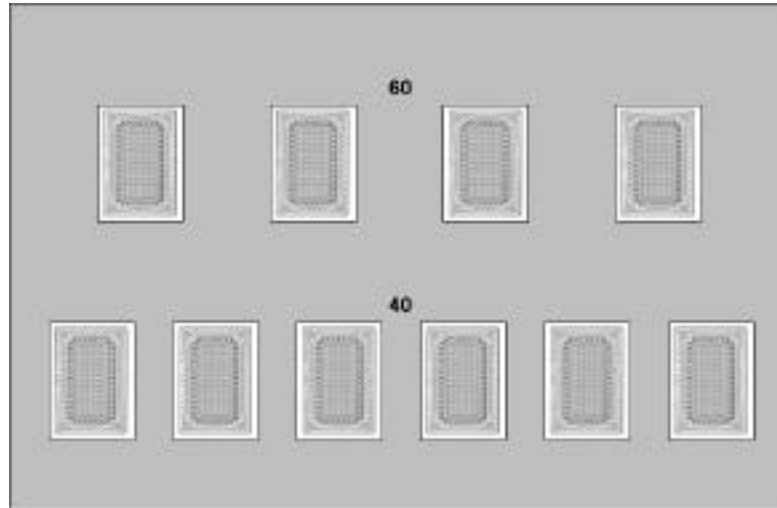


Figure 1. An example display of a trail from the decision-making game.

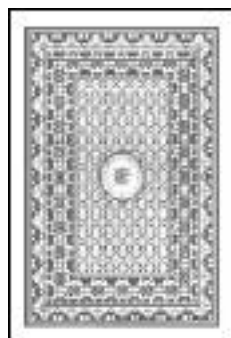
The game starts with 3 practice trails and continues with 8 test trials. Participants were instructed to guess in which row is the Ace situated on each trial. After they have made their choice they were able to see the face the Ace card and thus to know whether they have correctly guessed or not. After every trail the score of the accumulated points was displayed in the middle of the screen. For indicating their choice subjects pushed a button on the computer keyboard (button assignment was balanced over subjects). Subjects were informed by the experimenter that the reaction time for their responses is measured. Reaction time (RT) was measured from the offset of each stimulus. The trials were presented in randomized order to the subjects.

Material

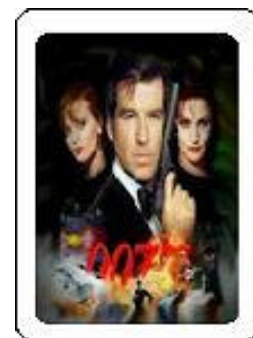
People have seen many card stacks and they know that the back of the cards may vary, but the particular picture on the back do not play any role in any card game. Thus participants were supposed to ignore (at the conscious level) the picture at the back of the card (and thus this to be an example of a good distant context). At the same time the picture was supposed to be perceived and possibly have an impact on the choice at an unconscious level. Three different pictures have been used in the three groups of the experiment (Figure 2).



risk-aversion condition



control condition



risk-seeking condition

Figure 2. Pictures used as back of the cards (i.e. as contextual stimuli) in the different context conditions.

Picture selection

The pictures were selected among a set of 15 pictures on the basis of “expert” judgment. 10 “experts” were asked to rate each of a series of 15 card-backs on two 7-point scales: to what degree this picture provokes risk-seeking behavior, and to what degree this picture provokes risk-avoidance behavior. The selected pictures received the best possible ratings: The very left picture obtained a mean score of 1,7 on the scale for risk-seeking and 5,2 on the scale of risk-avoidance; the very right picture received a mean score of 5,6 on the scale of risk-seeking, and 2,7 on the scale of risk-avoidance.

Participants

90 students and employee at New Bulgarian University (36 males and 54 females) participated in the Experiment, with an average age of 22,58 years (ranged from 19 to 48). Participants received course credit or were paid for the participation. They were randomly assigned to one of the three conditions. The 10 “experts” were graduate students in cognitive science.

Results and Discussion

The trials with too long response times have been excluded from the analysis, since it is very probable that in this cases subject have used complex conscious strategies or have simply not attended to the task. Thus, upon examination of the RT distribution all responses with RT longer than 6000 ms were excluded from the analysis (8,4% of all responses). This results in having different number of trials for each participant (the maximum will be 8 if he or she responded quickly in all trials).

The measured variable is the percentage of risk responses (the participant has chosen the row with smaller number of cards in it, i.e. where the probability of having an Ace is smaller) in the whole set of responses. We used percentage rather than frequency since each participant had a different number of trials with duration below 6000 ms.

The mean results for each group is given in Table 1 and Figure 3. ANOVA has been performed and it has demonstrated a main effect of the picture ($F(2,87)=3,155$, $p=0,048$). The only significant pair-wise comparison is between the risk-aversion and the risk-seeking group (difference=0,1340, $p=0,014$).

GROUP	Mean
risk-aversion	41 %
control	48 %
risk-seeking	55 %

Table 1. Mean % of risk responses of the subjects in each group.

% of risk choices normalized

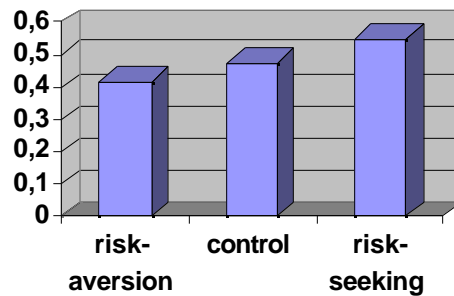


Figure 3. Percentage of risk choices in each group.

These results show that the picture on the back of the cards (which is obviously completely irrelevant to the task) does play a role in the decision-making process. The explanation that DUAL is offering is that the picture on the back is perceived automatically and its representation is built. In that way all the perceived elements of the picture start to emit activation to their neighbours in long term memory. For example, if the picture of James Bond is perceived the nodes corresponding to “James Bond”, “winning hero”, “adventure”, and “risk” are getting activation. These active nodes give greater weight to playing risky and unconsciously the participants start to relate risk with winning. This would be a possible explanation of why participants in this group were taking more risk.

The performed experiment has provided some evidence in support of the predictions of the DUAL-based model of context influence. Distant and supposedly irrelevant elements of the environment (pictures in our case) have played a role in the decision process and have led to reversed preference.

Conclusions

The performed experiment expanded the known territory of context influences: not only elements of the task, but also distant and irrelevant elements of the environment can produce a contextual effect. These studies have also potential relevance to the practice. They show that even a incidental picture on the wall of a store may change the choices of the customers.

This new phenomenon raises also important theoretical challenges to the economic theories which are based on the classical rational theory of choice by showing that even though the choice task is the same in all conditions, people react in a different ways depending on factors that are supposed not to have any relation to the optimal choice. They also challenge the reason-based choice theory since these effects may appear without subjects' awareness and without producing explicit arguments

(arguments like “since we have James Bond on the back of the card we should risk more” seem odd to the participants). On the other hand, the reason-based choice theory may be combined with the DUAL architecture in the following way. The activation process initiated by the James Bond’s picture may activate the memory for a specific event where we have acted like James Bond, i.e. the memory for an episode when we have risked and won. This specific memory may be used as an argument based on analogy that we should risk again (Kokinov, 2003). In that way we would be aware of the argument and of the specific previous experience we have been reminded of, however, we might not be aware of the fact that we were reminded of that episode by the picture. In that way the picture has an implicit influence on our behavior.

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