NEED FOR COGNITION AND RATIONALITY IN DECISION-MAKING

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Abstract: This paper addresses the relation between the need for cognition and rationality in decision-making and also reconsiders the relation between need for cognition and the framing effect using modified versions of the Asian disease task. In the first study (N = 205), a significant and positive relationship was obtained between need for cognition and the rationality of decision-makers. Also a negative and significant relationship was obtained between need for cognition and indecisiveness. These findings are consistent with the theoretical propositions hypothesized in the need for cognition theory (Cacioppo et al., 1996). The second study (N = 462) is an in-depth analysis of the relation between the need for cognition and the framing effect, revealing a positive and significant relation between need for cognition and the respondents' preference for the probabilistic framed alternatives in two risky choice framing effect tasks.

Key words: need for cognition, rationality, decision-making, framing effect, decision heuristics and biases

Rationality is one of the most important and debated assumptions underlying the research on human decision-making behavior (Simon, 1955; Shafir, LeBoeuf, 2002). The rational man is assumed to have 1) the knowledge of all the relevant aspects involved in the decision-making situation, 2) a stable and well organized system of preferences and 3) computational skills and resources which enable him to calculate the choice that will permit him to reach the highest attainable point on his preference scale (Simon, 1955, pp. 99).

Nevertheless, starting with Simon's work in the 60's and then Tversky and Kahneman's work in the 70's, a large body of empirical evidence disproved these "rationality assumptions" in human decision-making behavior. Due to the limited possibilities of knowledge representation in the human cognitive system and of its limited computational resources, the decision-makers do not analyze rationally and extensively the available information in order to make a decision (Gingerenzer, Todd, 1999; Shafir, LeBoeuf, 2002).

Since 1955 when Simon introduced the bounded rationality model (Simon, 1955), a number of decision-making heuristics, biases and paradoxes have been investigated. In the light of decision biases and heuristics literature, the decision-makers use "shortcuts" to make decisions and they do not analyze all the available information in a logic and non-contradictory way (Shafir, LeBoeuf, 2002; Ruisel, 2004). Some of the most important heuristics and

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biases which guide information processing in decision-making situations are: availability (Tversky, Kahneman, 1973), anchoring, representativeness heuristics (Kahneman, Tversky, 1972; Tversky, Kahneman, 1974, 1982; Kahneman, Slovic, Tversky, 1982), the framing effect (Tversky, Kahneman, 1974, 1981), the Ellsberg paradox (Ellsberg, 1961) and Allais paradox (Allais, Hagen, 1979). These heuristics, biases and paradoxes are identified instances in which the human decision-making behavior deviates from the norms of rationality. In this sense, rationality can be understood as a reduced sensitivity to decision-making biases, heuristics and paradoxes. This particular view will be used to conceptualize rationality in this paper. Rationality is therefore conceptualized as the quality of making logically correct choices or choices consistent with a normative ideal.

Even though rationality received a great deal of interest from the decision-making scholars (Stanovich, 1999; Shafir, LeBoeuf, 2002), little is known about the relation between rationality in decision-making and other individual differences (Hastie, 2001). In particular, there is no systematic inquiry on the relation between rationality (understood as sensitivity to decision-making heuristics and biases) and a need for cognition. Therefore, the first issue to be addressed in this paper is the relation between rationality in decision-making and cognitive motivation (need for cognition). A second issue of interest will be the exploration of the relation between need for cognition and sensibility to the framing effect. This relation received considerable attention in the literature during the last decades (Smith, Levin, 1996; LeBoeuf, Shafir, 2003; Kuvaas, Kaufman, 2004; Simon, Fagley, Halleran, 2004), but the results are not consistent across studies. In the present study, the relation between sensitivity to the risky choice framing effect (in Asian disease like tasks) and need for cognition is reconsidered on the basis of two theoretical arguments: 1) the effects of a need for cognition on information processing and 2) the effect of a need for cognition on preferences for simple vs. complex problem formulations.

Need for cognition and rationality

A particularly interesting aspect is the role of cognitive motivation (a dispositional tendency to engage in effortful cognitive activities) on sensitivity to decision-making heuristics and biases. Need for cognition is a central concept for cognitive motivation (Cacioppo, Petty, Feinstein, Jarvis, 1996). Individuals high in need for cognition tend to seek, acquire, think about and reflect on relevant information when solving cognitive tasks, while those low in need for cognition tend to rely on cognitive heuristics, social comparison or other's expertise (Cacioppo, Petty, 1982; Cacioppo et al., 1996).

In a very comprehensive review, Cacioppo et al. (1996), analyzed the empirical relationships of need for cognition with other personality as well as cognitive variables. Their results support the need for cognition being one of the main components of cognitive motivation. People high in need for cognition possess high intrinsic motivation to engage and enjoy effortful cognitive activities, they are able to recall more relevant information about the task, to analyze accurately the quality of arguments, they generate more alternative solutions to problems, they are less uncertain when estimating the cause-and-effect relationships, they possess more knowledge, have better logical reasoning abilities and have a higher performance in cognitive

tasks when compared with individuals low in need for cognition (Cacioppo et al., 1996). In conclusion, individuals high in need for cognition seem to be closer to what we call the "rational human being" than individuals low in need for cognition. It is therefore reasonable to argue that need for cognition is negatively related to sensitivity to decision-making biases. Therefore, the first hypothesis of this study is:

Hypothesis 1: Need for cognition has a negative and significant relation with sensitivity to decision-making biases and heuristics.

The level of indecisiveness is yet another relevant aspect to be discussed in relation with the need for cognition. People high in need for cognition have been shown to have a lower uncertainty regarding cause-and-effect relations (Weary, Edwards, 1994) and also have a higher tendency to maximize information gain (Sorrentino et al., 1988) as compared with people low in need for cognition. Also Sarmány-Schuller (1999) showed that the need for cognition has a negative and significant relation with the self-esteem of the decision-maker. Because people high in need for cognition tend to seek information in order to reduce uncertainty (Cacioppo et al., 1996) and they have higher levels of self-esteem (Sarmány-Schuller, 1999), it is reasonable to argue that decision-makers with a high need for cognition will experience lower levels of uncertainty (indecisiveness) in a decision-making situation. In the light of this remark, the second hypothesis of this study is:

Hypothesis 2: Need for cognition has a negative and significant relation with the uncertainty (indecisiveness) in decision-making situations.

The effort spent in cognitive activities is yet another distinctive characteristic associated with the need for cognition. According to Cacciopo et al. (1996), individuals high in need for cognition are more likely to exert cognitive efforts in information processing tasks than individuals low in need for cognition (Cacciopo et al., 1996). Previous research paid less attention to the relation between need for cognition and the time spent to analyze the information available in decision-making tasks. Since extensive and in-depth information processing also requires time, it is expected that need for cognition will be positively correlated with the time spent to analyze the information available in a decision-making situation. The third hypothesis of this study is:

Hypothesis 3: Need for cognition has a positive and significant relation with the time spent to analyze the information available in a decision-making situation.

Framing effect and need for cognition

The influence of need for cognition on sensitivity to framing effects received substantial attention during the last decade. The framing effect is one of the most prolific areas of study in the judgment and decision-making research (Levin, Schneider, Gaeth, 1998). This phenomenon has been described in relation to the decision maker's preference to adopt a riskier or a more conservative alternative, depending on the way in which the alternatives are framed. Decision makers have the tendency to choose more conservative alternatives and to avoid risk-taking if the alternatives are perceived in positive terms (gain). Alternatives with a high degree of risk are chosen when they are formulated in negative terms (loss) (Kahneman, Tversy, 1979). Therefore, decision makers tend to be risk averse when they perceive the decision situation as choosing between

gains, but risk seeking when their representation is that they choose between losses (LeBoeuf, Shafir, 2003).

The empirical studies that tried to replicate in different forms Kahneman and Tversky's (1979) original study have reached different results, especially about the magnitude of the effect initially outlined by Kahneman and Tversky for the now famous Asian disease decision problem (Levin et al., 1998; Zickar, Highhouse, 1998; Druckman, 2001; Levin, Gaeth, Schneider, Lauriola, 2002). Levin and his collaborators offer the most pertinent explanation, first in their 1998 study, and then in 2002 (a study which in fact gives an empirical support to the model proposed in 1998). In an analysis of the pertinent literature, the authors identify three distinct types of framing: attribute, goal and risky choice framing effects. They explain the difference in amplitudes documented in scientific literature for the framing effect by the fact that the three types of framing are independent and their manipulation can lead to different results (Levin et al., 2002). In this taxonomy, the third type (risky choice framing effect) is the one originally introduced by Kahneman and Tversky (1979). The most popular experimental task used to elicit the risky choice framing effect is the Asian disease task (Levin et al., 1998; Druckman, 2001). When analyzing different experimental tasks in the item response theory framework, Zickar and Highhouse (1998) reported that the Asian disease task is the most susceptible to the framing effect (Zickar, Highhouse, 1998). Similar results were reported by the meta-analysis conducted by Kühberger (1998).

Several recent studies (Smith, Levin, 1996; Chatterjee, Heath, Milberg, France, 2000; Simon, Fagley, Halleman, 2004) have investigated the effect of need for cognition on sensitivity to the framing effect. These studies illustrate a negative relation between these two variables, the higher the need for cognition, the lower the sensitivity to the framing effect. This relation is consistent especially for the risky choice framing effect (Simon et al., 2004).

The study by LeBoeuf and Shafir (2003) failed to identify a negative relation between sensitivity to framing effect and need for cognition. However, their results showed a tendency of those high in need for cognition to avoid inconsistency and to provide consistent responses across the framing tasks (LeBoeuf, Shafir, 2003, p. 87).

The framing tasks used in the above mentioned studies were similar to the classical framing effect tasks and did not include the normatively correct answer in the set of alternatives. Therefore, a low sensitivity to the framing effect in the classical framing tasks does not necessarily mean a higher rationality in decision-making. The classical Asian disease task is used to study risk-taking behaviors in decision-making. To a certain extent, it can be concluded that the framing task also illustrates a deviation from what we call a rational behavior, but because the participants do not have the possibility to choose a normative correct answer, we cannot estimate the degree in which their response deviates from a normative one. The relation between need for cognition and framing effect is reconsidered in this paper, starting from the modified framing effect tasks in accordance with the rationality perspective described above.

First, if the normative correct alternative is added to the initial set of two alternatives, it is expected that the preference for this alternative will have a positive and significant relation with the need for cognition. Second, based on the fact that

high levels of need for cognition are positively related with the preference for complex problem formulation (Cacciopo et al., 1996), it is expected that people preferring the alternative formulated in probabilistic terms (the risky choice, a more complex formulation) will have a higher need for cognition than those who prefer and choose the other alternative (in a simpler formulation). This may be formally stated as:

Hypothesis 4: Respondents who prefer the alternative framed in probabilistic terms (risky choice) are higher in need for cognition as compared with the respondents who prefer the other alternative.

STUDY 1

Participants

Two hundred and five undergraduates in psychology (152 women) from a Romanian university ("Babeş-Bolyai" University, Cluj-Napoca), mean age 25.79 years, volunteered to participate in this study for extra credit in a course of Social Psychology and General Psychology.

Procedure

To test the correlation between rationality in decision-making and the need for cognition, we used 10 modified decision-making tasks (normally used to elicit decision-making biases and heuristics) and a Romanian translation of the NFC scale developed by Cacioppo and Petty (1982). Before one of the courses, the respondents were asked to fill in the Need for cognition scale and after 2 weeks they were asked to perform a decision-making test. After the experiment, the participants were asked to write down what they think the study was all about, if they had any experience with similar decision-making tasks before and if they were aware of the literature on decision-making heuristics and biases. When their answers had been collected, they were debriefed about the real aim of the study. Only the data provided by respondents that had no prior knowledge about decision-making biases and heuristics literature, nor of the decision-making tasks used in this study were kept for further analysis.

Instruments

The 10 decision-making tasks used to evaluate the decision-maker's rationality are distilled from the most frequently used experimental tasks in the decision-making heuristics and biases literature. The test items were related to the following decision-making biases and heuristics: the framing effect, representativeness bias, and Ellsberg's paradox. The decision-making tasks were formulated as multiple-choice questions. The tasks are presented in Appendix 1. For each task, the normative correct answer receives 1 point and other answers receive zero points. The total score for the rationality in decision-making is computed by adding the partial items scores. Low scores describe people who are very sensitive towards decision-making biases and heuristics, while high scores describe people who are less sensitive to these biases and heuristics. Also due to the item format, it is possible to compute indecisiveness (uncertainty) score as the total number of items to which the respondents answered with "I cannot decide". We also timed the participants while they were completing the decision-making tasks.

The need for cognition (NFC) scale (Cacioppo, Petty, 1982) was translated and adapted for the Romanian population (Curşeu, 2004). In our study we used the

initial version with 34 items. The respondents answer 34 self-statements (e.g.,"I would prefer a task that is intellectual, difficult and important to one that is somewhat important but does not require much thought") on a 5-points Likert scale. The translated version for Romanian population has a good internal consistency (the Spearman-Brown coefficient is .82, $p < .0001$, $N = 968$). The results of the factor analysis reveal a factorial structure similar to the one reported by Cacioppo and Petty (1982). The scale has a good test-retest reliability, for a 4 week interval $r = .812$ ($p < .0001$, $N = 82$) (Curşeu, 2004).

RESULTS AND DISCUSSION

The correlation coefficients between the need for cognition and the other variables are presented in Table 1.

As hypothesized, there is a positive and significant correlation between the respondents' need-for-cognition and their rationality in decision-making tasks. That means that respondents who enjoy being involved in effortful cognitive activities are less sensitive to the decision-making heuristics and biases documented in the literature. The use of cognitive heuristics often leads to a sub-optimal choice in a decision-making situation, meaning a deviation from the normative correct judgment (Stanovich, 1999; Ruisel, 2004). Cognitive motivation and particularly the need for cognition seem to play an important role in the rationality of decision-making behavior.

Indecisiveness (uncertainty) is another important variable investigated in our study. This variable reflects the tendency to remain undecided in a typical decision-making situation. Indecisiveness has a negative and significant correlation with the need for cognition, therefore we can conclude that Hypothesis 2 is supported. The lower the need for cognition, the higher the probability that the respondent will answer "I can't decide" in a decision-making task.

Also, as stated in Hypothesis 3, a need for cognition has a positive and significant correlation with the time needed to complete the decision-making tasks. This result is consistent with the results reported in literature on need for cognition, showing that people high in need for cognition tend to spend more time and effort in analyzing a cognitive task (Cacioppo et al., 1996). However, a longer time devoted to the task

Table 1. Descriptive statistics and correlations

	Mean	SD	1	2	3	4	5
1. Gender	1.24	.43					
2. Age	25.79	5.42	.10				
3. Rationality in decision-making	3.81	1.73	.12	-.05			
4. Need for cognition	122.23	13.45	-.01	-.05	.24**		
5. Indecisiveness	.28	.62	.09	.04	-.24**	-.27**	
6. Decision time (in seconds)	504.96	185.13	-.02	.03	.05	.16*	-.04

Legend: Gender is coded as 1= woman and 2 = man, time is measured in seconds, ** $p < 0.01$ and * $p < 0.05$

Table 2. The responses of participants in the two framing tasks based on their level of need for cognition (NFC) - median score for NFC 123

		First framing task		Second framing task	
		Low NFC	High NFC	Low NFC	High NFC
Alternative	A	61	27	38	18
	B	27	35	53	51
	C	15	32	11	25
	D	7	0	5	0
	Total	110	94	107	94

Legend: NFC - need for cognition; first framing task = problem 2 in Appendix 1; second framing task = problem 9 in Appendix 1

does not necessary mean a better quality of the decision-making process. When controlled for the time spent to analyze the decision-making tasks, the correlation between need for cognition and rationality only drops to .23 ($p < .0001$). That means that it is not the time spent analyzing the task that explains the relation between the need for cognition and decision-maker's rationality.

By using the modified versions of the risky choice framing tasks we could also investigate the pattern of results in a framing task when the normative correct answer is presented in a set of alternatives. In our study, 22.9% of the subjects made the correct choice for the first framing task (problem 2 in Appendix 1) and 17.6% for the second framing task (problem 9 in Appendix 1). This result shows a significant percentage of the respondents choosing the normative correct answer, an aspect ignored until now in the literature. The distribution of preferences for the first two alternatives, however, reveals a similar pattern with the results obtained using classical framing tasks. The pattern reported here for the framing tasks is similar to the one reported by Zickar and Highhouse (1998), showing a lower discrimination in the positively framed version of the Asian disease task, as compared with the negatively framed version.

Following a procedure similar to the one used in previous studies (Smith, Levin, 1996; LeBoeuf, Shafir, 2003; Simon et al., 2004) that addressed the relation between the framing effect and the need for cognition, we used the median split technique to divide the sample in two, based on the need for cognition score. The summary of the choices made by the two samples in the framing tasks are presented in Table 2.

Our results show that for the positively framed task (Asian disease problem) the framing effect is indeed lower in the high need for cognition group. On the contrary, in the negative framed problem, the framing effect is higher in the high need for cognition group (see Table 2). This result is consistent with our hypothesis that in Asian disease-like decision tasks, the high need for cognition is associated with a preference for the alternative formulated in probabilistic terms. The results shows that people choosing alternative b (formulated in probabilistic terms) seem to have a higher need for cognition than those choosing the first alternative (see Figures 1 and 2).

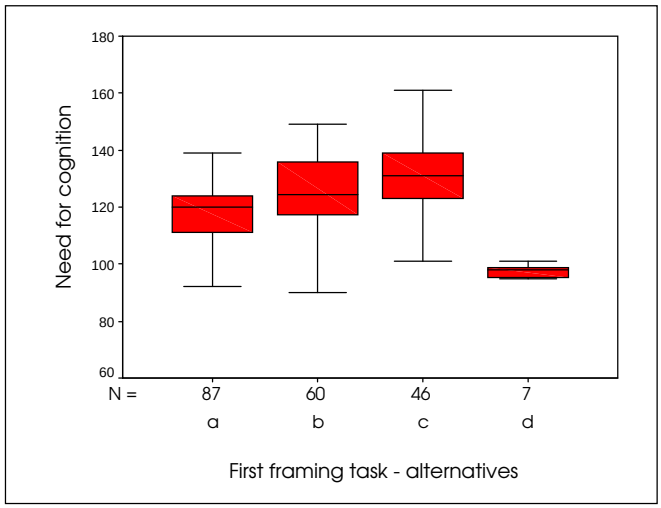

Figure 1. Need for cognition - means, standard deviations and sample sizes according to the preferences for the four alternatives in the first framing problem (Asian disease task, problem 2 in Appendix 1)

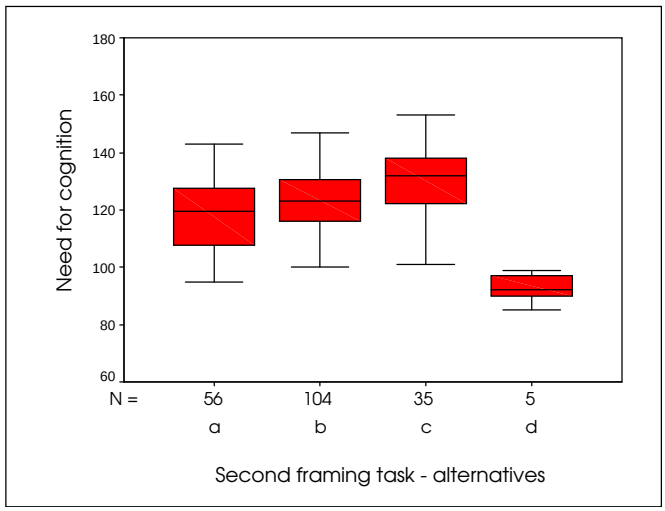

Figure 2. Need for cognition - means, standard deviations and sample sizes according to the preferences for the four alternatives in the second framing problem, problem 9 in Appendix 1

Table 3. Need for cognition - means, standard deviations and tests of significance for the difference in responses between the first two alternatives of the framing tasks

Framing task	Choice	Mean NFC	SD	N	"t" test value
First framing task	A (positive - survival framing)	118.06	9.64	87	3.99 ($p < .0001$)
	B (probabilistic)	125.51	13.20	60	
Second framing task	A (negative - mortality framing)	118.01	12.92	56	2.74 ($p < .007$)
	B (probabilistic)	123.34	11.03	104	

Legend: NFC - need for cognition; first framing task = problem 2 in Appendix 1; second framing task = problem 9 in Appendix 1

The comparison between means supports the results of this observation. The results are presented in Table 3.

A conclusion can be drawn from these results. Respondents who prefer the alternatives framed in probabilistic terms (alternative b in both problems) have definitively a higher need for cognition than those preferring the other alternatives. Is this a general tendency regarding the framing effect? In order to answer this question and to fully test hypothesis 4, we designed another study in which we used the above-mentioned framing problems as they were used in classical framing studies.

STUDY 2

Sample and procedure

We asked 462 respondents (undergraduate students from "Babeş-Bolyai" University, Cluj-Napoca, Romania, 320 women), mean age 26.95 years, to complete two framing problems (in their original formulation) together with the Romanian version of the NFC scale presented in the first study. The two framing problems were given together with other five decision-making tasks in order to reduce the similarity effect. For the first framing problem the respondents' choices were as follows:

* If Program A is adopted, 200 people will be saved (N = 294, 62.3%).

* If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved (N = 178, 37.7%).

While for the second problem the respondents' choices were:

* If the army retreats on the route X, 7500 soldiers will die (N = 129, 27.3%).

* If the army retreats on the route Y, there is a 1/4 probability that nobody will die and 3/4 probability that all soldiers will die (N = 343, 72.7%).

RESULTS AND DISCUSSIONS

The cross-tabs reveal a picture, which fully supports Hypothesis 4. People who prefer the alternative framed in probabilistic terms have higher levels of need-for-cognition than those who prefer the other alternative. The people who choose in both framing problems the alternative framed in probabilistic terms have the highest scores on the NFC scale (see Table 4).

Table 4. Need for cognition - means, standard deviations and sample sizes based on the distribution of preferences for the two alternatives in the risky choice framing tasks

Framing task		Second framing task	
First framing task	Choice	A (negative - mortality framing)	B (probabilistic)
	A (positive - survival framing)	NFC = 114.47 (SD = 12.64) N = 111	NFC = 119.69 (SD = 11.73) N = 183
	B (probabilistic)	NFC = 118.05 (SD = 15.98) N = 18	NFC = 123.65 (SD = 14) N = 160

Legend: NFC - need for cognition; first framing task = Asian disease task; second framing task = army retreat task

When we use the median split technique to divide the sample based on the need for cognition, we obtain results similar to those of the first study. Participants high in need of cognition show a decrease in the framing effect for the positively framed problem and an increase in the framing effect in the negatively framed problem (see Table 5).

These results are consistent with the hypothesis that the need for cognition has a positive relation with the preferences for the alternatives framed in probabilistic terms (complex formulations). Therefore, the relation between need for cognition and sensitivity to the framing effect in Asian disease-like tasks can be (at least partially) explained by the preferences of those high in need for cognition for the more complex formulations (alternative b).

GENERAL DISCUSSION

Decision-making literature tends to show increasing interest in the influence of individual differences on sensitivity to cognitive heuristics and biases (Simon et al., 2004; Sarmány-Schuller, 1998). In this respect, a need for cognition received special interest in the last decade. This stable

Table 5. The responses of participants in study 2 on the two framing tasks based on their level of need for cognition (NFC)

		First framing task		Second framing task	
		Low NFC	High NFC	Low NFC	High NFC
Alternative	A	158	134	82	46
	B	74	104	150	192
	Total	232	238	232	238

Legend: NFC - need for cognition; first framing task = Asian disease task; second framing task = army retreat task

individual difference related to the information processing efficiency as well as to cognitive abilities and other personality variables, seems to moderate sensitivity to the framing effect (Smith, Levin, 1996; Chatterjee et al., 2000; Simon et al., 2004; Kuvaas, Kaufman, 2004) and ratio-basis phenomenon (Alonso, Fernandez-Berrocal, 2003). However, less attention was shown to the relation between the need for cognition and the rationality in decision-making. This study defines rationality in decision-making as reduced sensitivity to the cognitive heuristics and biases documented in the literature. Starting from this theoretical position we modified 10 decision-making tasks (used to elicit framing effect, Ellsberg paradox, and representativity bias) in order to evaluate the degree in which decision makers deviate from the rationality norm. This deviation is lower for those scoring high on the need for cognition scale (Cacioppo, Petty, 1982), therefore, the higher the need for cognition, the higher the rationality in decision-making. However, the intimate details of this relation are not clear yet. Possibly, consideration given to the way in which the decision tasks are represented in the cognitive system can shed some light on this relation.

For the particular case of the framing effect, this study proves that in the case of Asian disease-like tasks, decision makers high in need of cognition prefer the alternatives formulated in probabilistic terms. This relation explains the association between sensitivity to framing effects (using this particular type of task) and a need of cognition. In the first study when we modified the framing task in line with the rationality assumptions, we clearly observed a significant difference in the preferences expressed for the normatively correct alternative among those with a high, versus those with a low need of cognition. Besides this result, another association was observed in the first study, namely, preference of those high in need of cognition for the alternative formulated in probabilistic terms. This result was further explored in the second study, in which the data show that the association between sensitivity to the framing effect and a need for cognition is explained by the preference for the alternatives framed in probabilistic terms. These results however cannot be generalized. First, because we only used decision tasks similar to the Asian disease task. The framing effect was documented in a large variety of tasks and contexts (Levin et al., 1998), and even though most framing items are a variant of the Asian disease task (Zickar, Highhouse, 1998), we cannot extend the findings of this study to the entirety of the framing effect. When compared with other framing tasks, the strongest framing effect, however, was documented for the Asian disease-like tasks (Zickar, Highhouse, 1998; Kühberger, 1998). The most plausible explanation is that people distinguish between lives and other possible outcomes (Zickar, Highhuse, 1998) and because the human cognitive system seems more sensitive in processing information signaling life threatening dangers (Miclea, Curşeu, 2003). This explanation is also supported by the fact that the positively framed version is less discriminative as compared with the negatively framed version in which the danger of loss of life is better underlined (Zickar, Highhuse, 1998; Kühberger, 1998). The Asian disease items used in our study were similar with respect to the content of the framing problem. Both items involved loss of lives. This made them similar with respect to the interpretation given by Zickar and Highhouse (1998). Therefore, because the two tasks used in our study are not strictly related to risk taking (Zickar, High-

house, 1998), risk-taking theories are not considered in the interpretation of our results but instead, cognitive motivation concepts are used to explain them.

Individuals high in need of cognition enjoy effortful cognitive endeavors and, being involved in problem-solving activities, they prefer complex to simple problem descriptions (Cacioppo et al., 1996). In simple terms, the two alternatives in the Asian disease task differ in terms of complexity, the second alternative (framed in probabilistic terms) being a more complex formulation than the first. This is one of the reasons why people high in need for cognition prefer the second alternative. The very content of one of the items in NFC scale (Cacioppo, Petty, 1982) ("I would prefer complex to simple problems") supports this explanation. This interpretation, however, is not generalizable across different types of framing tasks.

LIMITATIONS

The use of students' sample may also limit the generalizability of the results even if some studies argued that the student populations do not significantly differ from the general population with respect to the sensitivity to framing effects (Kühberger, 1998), but there are sensitive differences with respect to the need for cognition which is significantly higher in student populations as compared with the general population (Curşeu, 2004).

The framing tasks, which initially were designed to assess risk-taking behaviors in decision-making, are modified in this study to assess rationality. Another modification was that two framing items were used and the first one presented only the gain frame and the second one only the loss frame. These modifications make the first study difficult to compare with previous research on the relation between need for cognition and framing effect. However, the aim of this study was not to investigate risk taking, but rationality in decision-making and its relation to the need for cognition. The use of classical Asian disease task, with both loss and gain versions in within subjects designs will probably shed some more light on the relation between framing effect and need for cognition.

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APPENDIX 1
Decision-making test

1. Suppose you flip a coin several times and the coin falls 9 times on head. On which of the sides do you think will the coin most probably fall the 10th time?
   a. Head.
   b. Tails.
   c. Both sides are equally probable.
   d. I cannot decide.

2. Imagine that your country 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: Program A and Program B. Assuming that the exact scientific estimates of the consequences of the programs are known, which one will you choose?
   a. If Program A is adopted, 200 people will be saved.
   b. If Program B is adopted, there is a 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.
   c. Both programs are equally effective.
   d. I cannot decide.

3. A family has 10 kids and 9 of them are boys. The wife is pregnant again. Which do you think will most probably be the sex of the newborn child?
   a. Boy.
   b. Girl.
   c. Both are equally probable.
   d. I cannot decide.

4. Suppose you have an urn with 90 balls, 30 yellow and 60 red or blue. You can draw one ball from the urn and you have to bet on the color of the ball. If you guess correctly the color of the ball, you can earn 100$. Which color do you think has the highest probability of being drawn?
   a. Yellow.
   b. Red.
   c. Both have the same probability of being drawn.
   d. I cannot decide.

5. You have the chance of buying a lottery ticket. Suppose that on the first ticket the numbers are 7, 12, 18, 24, 33 and 45 and on the second ticket, the numbers listed are 1, 2, 3, 4, 5 and 6. Which one do you think has the highest chance of being winner?
   a. The first ticket.
   b. The second ticket.
   c. Both tickets have equal chances of being a winner.
   d. I cannot decide.

Appendix 1 continues

Appendix 1 (continued)

6. Maria is a very bright 31-year-old woman, she is single, politically active and outspoken. Which statement do you think has the highest chance of being correct?
a. Maria is a bankteller.
b. Maria is a feminist bankteller.
c. I cannot decide.

7. John lives in a village with many farmers and one librarian. John has a few books with him and wears glasses. Which statement do you think has the highest chance of being correct?
a. John is a farmer.
b. John is the librarian.
c. I cannot decide.

8. You take part in a contest in which you have to draw without seeing a ball from an urn. If you draw a red ball you will earn 100$. You can choose 2 urns. In which urn do you think you have a higher probability of drawing a red ball?
a. In the first urn are 50 red and 50 black balls.
b. In the second urn are 100 mixed red and black balls in an unknown proportion.
c. In both urns I have equal probability of choosing a red ball.
d. I cannot decide

9. A leading commander and his army are in an ambush, which is expected to kill all 10.000 soldiers. The commander and his strategy advisors identified 2 possible ways out of the ambush: route X and route Y. Assuming that the exact scientific estimates of the consequences of the escape routes are known, which route will you advise him to follow?
a. If the army retreats on the route X, 7500 soldiers will die.
b. If the army retreats on the route Y, there is a 1/4 probability that nobody will die and 3/4 probability that all soldiers will die
c. Both routes are equally dangerous.
d. I cannot decide.

10. Which event do you think is most probable?
a. A man had a heart attack.
b. A man over 50 had a heart attack.
c. I cannot decide.

POTREBA KOGNÍCIE A RACIONALITY PRI ROZHODOVANÍ

P. L. C u r ş e u

Súhrn: Tento článok sa zaoberá vzťahom medzi potrebou kognície a racionalitou pri rozhodovaní. Prehodnocuje aj vzťah medzi potrebou kognície a efektom zarámcovania pomocou modifikovaných verzií Problémov ázijskej choroby. V prvom výskume (N = 205) sa zistil pozitívny signifikantný vzťah medzi potrebou kognície a racionálnym rozhodovaním. Zistil sa aj negatívny signifikantný vzťah medzi potrebou kognície a nerozhodnosťou. Tieto výsledky sú v súlade s teoretickými predpokladmi, vychádzajúcimi z teórie potreby kognície (Cacioppo et al., 1996). V druhom výskume sa do hĺbky analyzoval vzťah medzi potrebou kognície a efektom zarámcovania. Zistil sa pozitívny signifikantný vzťah medzi potrebou kognície a preferovaním pravdepodobnostne zarámcovaných alternatív v dvoch úlohách rizikového rozhodovania.