

## The Effects of Framing and Ego-involvement on Performance on the Wason Selection Task

Katarina M. Jovanović and Iris Žeželj

*Department of Psychology, University of Belgrade, Serbia*

Man's deep-rooted tendency to maintain and reinforce a positive self-image makes man inclined to uncritically accept desirable information (the confirmation bias) as well as to criticize and reject undesirable information (the disconfirmation bias). Since disconfirmation strategy leads to a logically correct solution to the four-card Wason selection task, we predicted that ego-involvement manipulation would have a significant effect on the success rate of the task. Specifically, we hypothesized that subjects who were exposed to personally threatening information would try to reject it and thus be more successful on Wason task than those who were exposed to non-threatening information, as established in previously published study by Dawson et al. (2002a). Furthermore, we wanted to examine if manipulating valence framing of the Wason task rule would result in a higher success rate for the group exposed to the threatening and negatively framed rule (that implied their own early death) than the group exposed to the threatening but positively framed rule (that category of people other than the one they belong to live longer). One hundred ninety five high school students from Kragujevac, Serbia participated in the experiment. The results confirmed the expected effect of involvement, while the main effect of framing did not occur. However, there was a marginally significant involvement by framing interaction: unexpectedly, non involved participants were more likely to solve the task correctly when it was positively framed than when in was negatively framed, whilst in the involved group there was no difference in correct responding depending on framing. The findings suggest that the success rate in Wason task can be sensitive to the valence framing of the rule, but only when respondents are not highly personally threatened. Potential methodological interventions in ego-involvement manipulation and content of the rules are discussed.

*Key words: motivated reasoning, confirmation bias, Wason selection task, ego involvement, framing effects*

People are inclined to believe that they are unbiased when reaching certain judgments, conclusions, and decisions. At the same time, they are inclined to believe that they have above-average abilities and that their success is well earned while their failures are due to unfortunate circumstances. People often

believe the future is far brighter than the present, and that they shall live a happy and long life. It is hypothesised that a self-enhancing motive – the people’s need to see themselves in the best possible light – is what underlines these cognitive distortions. Motivation can affect reasoning through a whole set of cognitive processes: perception, attribution, memory search, belief construction and hypothesis testing (for review see Gilovich & Griffin, 2002; Kunda, 1990). The goal of our study was to examine the way in which ego-protective bias operates when evaluating hypothesis, and the operational differences it reveals when considering the hypothesis that threatens, and the hypothesis that affirms our cherished beliefs.

In experimental studies of the manner in which people evaluate scientific data, participants are usually presented with a purported results of scientific research that are either in accordance with, or contrary to, their preferences. Participants can be presented with the fact that extraversion or introversion is related to academic success (Kunda & Sanitioso, 1989); coffee drinkers can be confronted with a finding that caffeine is dangerous to women’s health (Kunda, 1987). The results from these experiments consistently confirmed people’s tendency to (a) accept and confirm preferred information without much consideration, and remain convinced in its validity, and (b) to engage more cognitive efforts in processing negative information (i.e. in its devaluation and falsification). In the example where introversion or extraversion is promoted as a desirable trait, participants distorted their self-perception in the desirable direction and retrieved more memories in support of that. In the second case, it was found that women who were heavy caffeine consumers were less persuaded by the article than those that consumed caffeine less frequently. The fact that these effects were not found in male participants indicated that a feeling of personal vulnerability, induced by given information, was sufficient to elicit the motivation to reject or disconfirm aversive information.

This type of cognitive bias – selective retrieval, construction or evaluation of data and hypothesis, with the aim of affirming previously established beliefs – became known as *confirmation bias* (Oswald & Grosjean, 2004; Trope & Bassok, 1982). Complementing tendency to this one – the need to disconfirm the information that contradicts our beliefs – was dubbed *disconfirmation bias* (Edwards & Smith, 1996).

It is presumed that these phenomena occur because desirable and undesirable information is evaluated differently. When confronted with an information that we are inclined to agree with, it is sufficient that the evidence does not force us to accept a contrasting belief and the question we ask ourselves is confined to “*Can I believe this?*”. When the information opposes our goals, the evidential standard becomes more stringent and we ask ourselves “*Must I believe this?*” (Does the data compel me to accept the unpleasant information?). While in the first case we focus on the evidence that supports our favoured conclusion, in the second we are motivated to find any irregularities in the data that can help us discredit it (Gilovich, 1991).

It is important to note that this is not a case of intentional use of deceiving strategies to distort data (as, for instance, lawyers do in court processes) but an *automatic* tendency to shape the facts so as to protect beliefs important to the person in question (see Oswald & Grosjean, 2004). Led by a desire to seek pleasure and avoid harm, people behave in adaptive ways when processing information, rather than being biased on purpose.

The origin of confirmation bias concept is closely related to the Wason selection task (Wason & Johnson-Laird, 1972) in which participants are asked to estimate relevancy of certain evidence in order to test a given hypothesis. Participants are presented with four cards, each of them having a letter on one side and a number on the other, so that they can read the following: E, K, 4, 7. After being introduced to a conditional rule that if a card has a vowel on one side ( $p$ ), then an even number is on the opposite side ( $q$ ), participants should name those cards – and only those cards – that need to be turned over to determine unequivocally whether the given rule is *true or false*. The only way to determine the validity of the rule is to examine the possibility of it being false. This involves checking all the cases that could falsify it. In this case, this means E and 7, since if it turns out that E has an odd number on the opposite side, and that 7 has a vowel, the rule is false. More generally, in order to falsify a “if  $p$  then  $q$ ” form of a rule, the only logical solution is to turn over  $p$  and *not- $q$*  cards. Still, only 4% of the participants choose the optimal falsification strategy ( $p$  and *not- $q$* ), while the other responses were:  $p$  and  $q$  (46%), only  $p$  (33%),  $q$  and *not- $q$*  (7%) (Johnson-Laird & Wason, 1970). The fact that 46% of participants choose E and 4, Wason considered evidence of confirmation bias – a systematic tendency to *search for positive indicators* that could *confirm* and not refute the starting condition. Within newer approaches to the problem, this interpretation has been questioned, giving the notion of confirmation bias a more precise meaning.

Klayman & Ha (1987) were the first to challenge Wason’s opinion that participants do not try to test their hypothesis at all, but only tend to confirm it. Instead, they proposed a concept of *positive test strategy* (PTS) as a basic, default heuristic in hypothesis testing. Using PTS, participants search primarily for cases in which the property named in the hypothesis appears, thus narrowing the search to the cases considered relevant. While this feature makes PTS a generally useful hypothesis testing strategy in many *realistic* conditions, it is not adequate in the case of the *classic* Wason task. “People seem to require contextual or ‘extra logical’ information to help them see when this all-purpose heuristic is not appropriate to the task at hand” (Klayman & Ha, 1987, p. 221).

A manifold of studies that followed supported this observation. It has been found that embedding the rule in a more realistic and meaningful context (see Manktelow, 1999) improved the success rate to a certain degree. This effect is called the *content effect* (Cosmides, 1989). However, the effect was verified to be specific just to a particular type of content (see Chater & Oaksford, 2001; Evans

& Over, 1996) – a rule in deontic form that refers to revealing a deceit or giving permission (e.g. “If you want to enter the country, you must get a flu shot.”). Manktelow & Over (1987) made an objection to this line of research stressing that reasoning with deontic rules in fact changes the very logical structure of the task – a participant is faced with the problem of applying a certain regulation, rather than determining whether a given hypothesis is well founded.

There is another limitation of the prior studies using the original and deontic version of the Wason task – an insufficient external validity (Evans & Over, 1996). The interest of researchers has been the motivation to give a correct answer, whereas participants had no real stake in the content they reasoned about, which is indeed present in everyday life. Consequently, in the existing studies on the Wason task it is not possible to determine unambiguously whether a participant’s response is a result of the strategy of confirming an adopted belief or a result of PTS.

An experiment by Dawson, Gilovich and Regan (2002a) (see also Visser, Krosnick & Norris, 2004) addressed the above-mentioned criticism and dilemmas by investigating what Oswald & Grosjean (2004) named “a true confirmation bias”. In contrast to PTS, that can, but need not necessarily lead to falsification of a hypothesis, “a true confirmation bias” refers to adopting reasoning strategies that *systematically preclude* from refuting a hypothesis that is previously acquired or in some way motivated in the person’s mental system. Experimental manipulation employed by Dawson et al. (2002a) elicited participants’ ego-involvement by presenting them with a rule that induced *the motivation to draw a preferred conclusion* on the four-card task. Researchers anticipated that the specific motivation to reject a personally aversive rule would significantly improve performance on the Wason task. Motivational manipulation was accomplished by orthogonally manipulating feedback on results of the Emotional Lability Inventory ([ELI], Greenberg, Pyszczynski, Solomon, Pinel, Jordan, & Simon, 1993) with the contents of hypothesis being tested in the task. On the basis of their responses on ELI, the participants were categorized into two groups – high and low in emotional lability, after which one group of participants tested the rule that early death correlates with high emotional lability and the other that the same was true of low emotional lability. They hypothesized that the participants facing a statement which implies their own early death will more frequently choose the optimal falsification strategy on the selection task, compared to those presented with an acceptable or neutral statement (that the category of people different from their own dies early). This was confirmed in their study.

The aim of our study was to replicate the Dawson et al. (2002a) experiment on the impact of self-enhancing motivation on performance on the Wason task, employing one additional variable – valence framing. To our knowledge, this is the first replication of the Dawson et al’s study. Specifically, we wanted to test whether a change in valence framing of the aversive rule would affect response

patterns (as in Bizer & Petty, 2005; Kuvaas & Selart, 2004; Žeželj et al., 2007). Namely, we anticipated that the participants exposed to a *negatively* framed threatening rule (“the group I belong to will *die early*”), would be motivated to a greater extent to refute this rule and therefore more successful on the task than the participants exposed to a threatening but *positively* framed rule – “the group I do not belong to *live longer*”.

Research on the decision making process suggested that if the same problem is presented in a positive or negative light, while the essence of information remains unchanged, the decision outcomes may not be the same (Kahneman & Tversky, 1979). For instance, participants would believe that a basketball player who has a 75% free-throw accuracy rate is more successful than a basketball player who misses 25% of his free-throws (Levin, Schneider, & Gaeth, 1998; Levin, Schnittjer, & Thee, 1988). Similarly, they would rather choose a medical treatment with a 50% chance of success than the one with a 50% chance of failure (Dunning & Parpal, 1989). Following the same principle, we expected a negatively framed rule (in my group people die earlier) to be perceived as more threatening than a positively framed one (those in the other group live longer). Discovering possible sensitivity of Wason task success rate to valence framing of the rule might be especially important since the task is used in the diagnosis of several neurological diseases (Shuren & Grafman, 2002).

## Method

*Participants:* The sample consisted of 195 high school seniors from Kragujevac, Serbia (average age 18.2) of whom 110 were boys and 85 girls. Participants were randomly assigned to one of the eight experimental conditions in a  $2 \times 2 \times 2$  design presented in Table 1.

Table 1. Sample design

	Negative framing		Positive framing		N
	High emotional lability => Early death	Low emotional lability => Early death	High emotional lability => Long life	Low emotional lability => Long life	
High EL	Threatening, directly involved (25)	Non-threatening, uninvolved (23)	Non-threatening, uninvolved (24)	Threatening, indirectly involved (24)	(96)
Low EL	Non-threatening, uninvolved (24)	Threatening, directly involved (25)	Threatening, indirectly involved (26)	Non-threatening, uninvolved (24)	(99)
N	(49)	(48)	(50)	(48)	(195)

We defined *involvement* as a specific match between the information from the Wason task rule and the information about emotional lability of the individual: persons considering *aversive* and *negatively* framed rules (that connects their level of emotional lability with an early death) were categorized as *directly* involved and those considering an *aversive* but *positively* framed rule (that connects the level of emotional lability different from their own with a long life) were categorized as *indirectly* involved. The participants testing a non-

threatening rule (that connects their level of emotional lability with a long life or the one different from their own with an early death) were labelled *uninvolved*.

*Procedure:* Experiments were conducted in groups of two to six participants, with a seating arrangement that allowed them to independently solve the task. The procedure was carried out through three consecutive phases.

Given that the experiment involved deception (the employed methodology was replicated from the original study of Dawson et al. (2002a), at the very beginning of the procedure the examiner ensured that all participants were voluntarily assigned for the experiment and explained that information they provide would be anonymous and treated confidentially. Nevertheless, participants were left the opportunity to withdraw from research at any time.

In the introduction to the experiment, participants were told that the goal of the experiment was to examine how people evaluate scientific evidence and told that later they would be asked to solve a task which demonstrates this. They were then asked to complete the ELI using the excuse that the results from the inventory would serve to statistically control for individual differences among the participants in the experiment. Its actual purpose was, however, to introduce participants to the experiment with a clear consciousness about the category of emotional lability to which they belonged. The questionnaire consisted of 23 questions about the strength and volatility of participants' emotions (e.g. "How often do you have strong emotional reactions?" or "How often do you lose your temper?"). In the original version of the questionnaire (Greenberg et al., 1993) responses were given on an 11-point agreement scale, the endpoints being *always* and *never*. In the study by Dawson et al. (E. Dawson, personal communication, July 1, 2009) these endpoints were altered and two forms of the questionnaire were used, that ensured that the majority of participants were easily classified into two possible groups. In the form of the questionnaire that simulated high emotional lability, the endpoints of the response scale were labelled *virtually never* and *occasionally*. In the other form of the questionnaire that simulated low emotional lability, the endpoints were labelled *occasionally* and *virtually all the time*. A simple classification of the participants into two categories was made possible by their tendency to avoid extreme values of the scale (*never* and *always*) and more frequently choose the responses at the end labelled *occasionally*. In our study another alteration was made – instead of the 11-point scale, we used a graphic scale: a line without scale points labelled at each end, on which the participants placed their answers closer to one or the other extreme. This was done in order to facilitate providing each participant with an immediate provisional estimate of his/her level of emotional lability. When asked to estimate the adequacy of given results, four (out of an initial 199 participants) gave a negative answer, and thus were excluded from the final sample ( $N = 195$ ).

The following step of the experiment was aimed at inducing a certain level of ego-involvement of the participants. In this phase, the experimenter read a text aloud (and the participants followed it in print) in which a hypothesis is postulated in the context of purported scientific research. In one experimental condition, the research stated positive correlation between high emotional lability and an early death; in the second condition, early death was connected with low emotional lability, while in the third and fourth condition high and low emotional lability were connected with long life. The participants learnt that a recently conducted study on a sample of Benedictine monks and orthodox priests intended to examine the relationship between the level of emotional lability and length of life. They were told that the scientists had recorded two measures for each of the individuals from the sample: on the basis of the measured level of emotional lability, they had classified each individual as either high or low in emotional lability; likewise, having compared the age of each person

with the life expectancy of males in general population, they had classified them to either the early death or the long life category. At the end, the experimenter emphasized “the hypothesis the scientists wished to investigate was whether everyone in the study who was low (high) in emotional lability, without exception, experienced an early death (had a long life)” (as in Dawson et al., 2002a, p. 1382).

Participants were then told that they would solve a task intended to show how they would test the hypothesis of the presented study. They were shown four cards representing four randomly chosen individuals from the sample of monks and priests. It was pointed out that the one side of each card showed whether the person from that sample was designated high or low in emotional lability, while the other side showed whether the person had died early or had a long life. The participants were presented with one side of each card, ordered as in Figure 1:

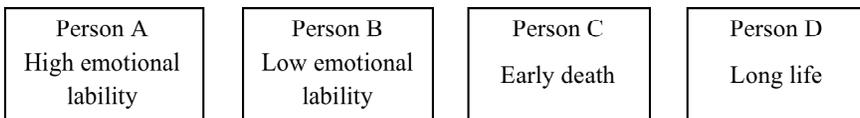


Figure 1. Stimuli in the Wason selection task used in the experiment

Next, they were instructed to choose the two cards they needed to turn over in order to test the hypothesis that the individuals from the sample of monks and priests classified as high/low in emotional lability experienced, without exception, an early death/a long life. In contrast to the instruction in the classical version of the task – to choose “those cards and only those cards” necessary to test the hypothesis, the choice was here restricted to *two cards* “to give respondents every opportunity to solve the notoriously difficult problem” (Dawson et al., 2002a, p. 1383). The time for solving the task was not limited. Participants were asked to write their decisions on a piece of paper.

At the end the examiner thoroughly debriefed the participants about true objectives of the study, stressing that there was no observed or hypothesized connection between the length of life and the level of emotional lability as registered by ELI, as well as that it was not possible to precisely measure or predict the trait of emotional lability using this instrument. The experimenter discussed with the participants their experience of the procedure, answered all their questions to complete their understanding of the research and was under the impression that nothing but the positive reactions and interest were evoked.

At this stage, participants were asked to keep the information about the experimental procedure confidential and they were explained the importance of this in order to ensure naivety of future participants. Furthermore, the fact that all student groups were examined during the lecture time, cooperation with high school professors who were asked to monitor the behaviour of prior participants once they are back in the class, and choosing the participants from another class after lecture time in one class was finished, helped keeping the sample contamination under control.

## Results

There was no significant difference in success rate between boys and girls, and no interaction between gender and the main variables in the study, thus gender was omitted from further analysis. It seems that even though the study that supported the stated correlation between emotional lability and life-

expectancy was on the male sample, the fact that during the introduction of this purported study the experimenters specified that it had been conducted exactly “in order to corroborate the relationship between level of emotional lability and length of life which has been perceived in everyday life and in general population”, led to equal involvement of both boys and girls.

The main hypothesis of our study was that the participants confronted with a personally threatening framing of the rule would be more successful on the Wason task (i.e. more frequently choose the cards equivalent to  $p$  and not- $q$ ) than the ones not personally threatened by the given rule. Results of a chi-square test confirm this hypothesis,  $\chi^2(1, N = 195) = 15.38, p < .01$  (see Figure 2). While 37% of participants in the involved group ( $n = 100$ ) correctly named the cards equivalent to  $p$  and not- $q$ , only 12.6% of the uninvolved participants ( $n = 95$ ) solved the task correctly. These results are in line with the results from the original study, in which only 10% of participants who considered a nonthreatening information correctly solved the task, in comparison to 46% of participants who considered a threatening information.

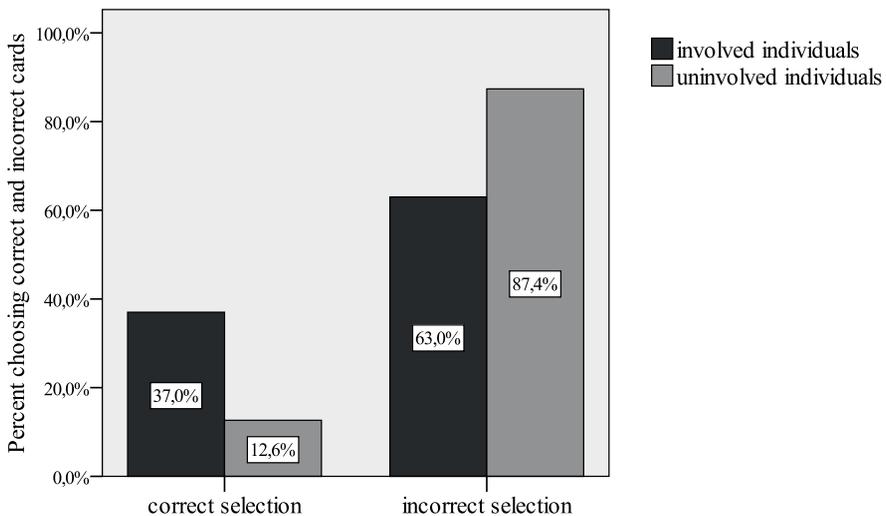


Figure 2. Percentage of correct and incorrect solutions on the four-card Wason task by involvement condition

In order to establish whether the observed difference actually reflects a feeling of personal vulnerability induced by the rule, we examined the *individual* impact of the level of emotional lability as measured by ELI and the particular framing of the rule on performance on the task. Neither of the variables taken individually had a significant effect on correct choice of cards,  $\chi^2(1, N = 195)$

$=0.384, p > .05 (.535); \chi^2(1, N = 195) = 0.206, p > .05 (.650)$ . Therefore, the choice of optimal strategy in this experiment was a result of a subjective *interpretation* of the given rule, which elicited a specific motivation to disconfirm the rule aimed against personal well being or a tendency to confirm the rule signaling positive outcomes for the person. This was also supported by the fact that individuals confronted with a negative, but personally irrelevant hypothesis (“A category of people different from the one I belong to dies earlier”) demonstrated success rates comparable to the ones on the “abstract version” of the Wason task ( $n = 47, 6.4\%$ ).

The second hypothesis predicted that the participants designated as directly involved, exposed to the threatening and negatively framed rule (“People with high/low emotional lability *die earlier*”) would be more successful on the four-card task compared to the group of indirectly involved, exposed to the threatening, but positively framed statement (“People with high/low emotional lability *live longer*”). This hypothesis was not confirmed,  $\chi^2(1, 100) = 0.386, p > .05 (.534)$ . Despite the fact that the directly involved participants chose p and not-q cards this difference was not large enough (40% and 34% respectively) and was not statistically significant (Figure 3).

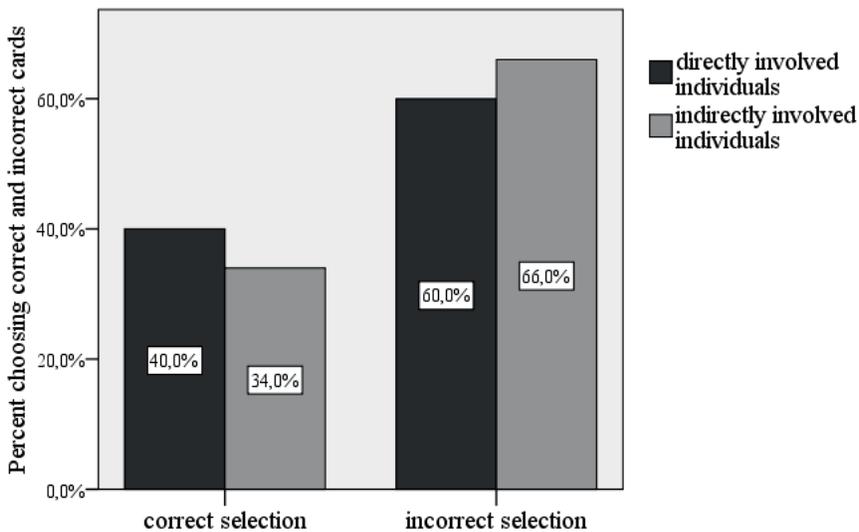


Figure 3. Percentage of correct and incorrect solutions on the four-card Wason task by direction of ego-involvement

In order to assess the joint main effects of factors, as well as the potential interaction, we also performed a hierarchical logistic regression analysis (Table 2).

Table 2. Hierarchical Logistic Regression Analysis With involvement and rule framing as Predictors of success rate (N=195)

	B	SE B	sig.	e <sup>B</sup>
Step 1				
Involvement <sup>a</sup>	1.4	.37	.000	4.07
Rule framing <sup>b</sup>	.17	.35	.621	1.19
Step 2				
Rule framing X Involvement	1.00	.56	.074	1.92

<sup>a</sup> Coded 0 = non involved, 1 = involved <sup>b</sup> Coded 0 = negatively, 1 = positively;  
Nagelkerke R Square = .15

The overall model was significant ( $\chi^2(194)=15.96, p<.001$ ). There was a significant main effect for involvement: highly involved participants were more likely to solve the task correctly in comparison to the participants who were not involved (*odds ratio*=4.07; *Wald*=14.2,  $p<.001$ ), and no significant main effect of framing (*odds ratio*=1.19; *Wald*=.24, *Ns*).

The analysis revealed a marginally significant interaction between involvement and framing (*odds ratio*=1.92 *Wald*=3.27;  $p=.074$ ). Non involved participants were more likely to solve the task correctly when it was positively framed than when it was negatively framed. In the group of involved participants there was no difference in correct responses depending on framing, although negatively framed rule led to more correct responses than positively framed rule (Figure 4).

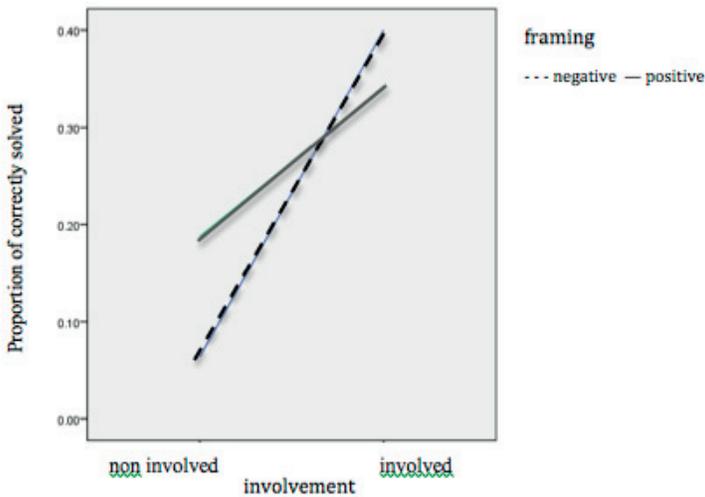


Figure 4. Proportion of correctly solved tasks by involvement and framing

## DISCUSSION

The results of the experiment are consistent with the predictions of the “Can I / Must I?” model: positive information elicits a search for information that can confirm, whereas unfavourable information elicits a search for data that can disconfirm (Gilovich, 1991). In the case of uninvolved participants, favourable information remains consistent with self-enhancing tendencies, and the individuals tend to confirm it. In the case where the information is opposite to the favoured conclusion, the same self-enhancing tendency incites defensive motivation resulting in the rejection of the given rule. The results demonstrate that, as in most life situations that include evaluation of information of a great importance for the person in question, determining accuracy does not have to be the primary or sole aim of the person. It is the aim of defending the self that has primacy. Therefore, significantly more frequent selection of p and not-q cards in the involved group should not be understood as a falsification strategy in a logical sense, but rather in a psychological sense – as a strategy for falsifying undesirable information. However, even if in this case the aim of refuting the hypothesis is evidently biased, it leads to the adoption of heuristics that match a logically correct strategy. This observation is important for discussing evaluation standards for quality of thinking, since other studies conducted in different areas of reasoning have registered a favourable effect of a sceptical mindset. Such mindset may lead to a better detection of illusory correlations (Schaller, 1991, 1992), an accurate reliance of proportions instead of raw scores when estimating contingencies between variables (Dawson, Gilovich, & Regan, 2002b), and to an attenuated tendency to generalize conclusions based on small or highly variable samples (Doosje, Spears, & Koomen, 1995).

As for the stated involvement by framing interaction, there was an unexpected effect of framing in the uninvolved group: they were more successful in the task when the rule implied longer life for their group than when the rule implied early death for the other group. The only explanation we can offer for now is that different motives guided behavior of involved and uninvolved group: the involved group was faced with threatening rule, implying shorter life/early death for the group they belong to. Motivation to disconfirm that rule was really strong, so it attenuated the effects of framing. In the uninvolved group, which was faced with non-threatening rule, the overall success rate was significantly lower, but the inverted framing effect was observed, which can be attributed to the lack of motivation to solve the task at all, to invest in the task at the first place, when “other group” was the subject of the rule. So, it might be that threatening rule activates the disconfirming motivation, but in the absence of threat, it is mentioning one’s own group that elicits more cognitive effort in solving the task than mentioning the opposite group. Previous studies on interaction between message framing and involvement level have produced mixed results: there are studies (Donovan & Jalleh, 1999; Maheswaran & Meyers-Levy, 1990)

suggesting that under high involvement conditions, negative framing should be superior, with positive framing superior under low involvement conditions. However there are studies suggesting that under high involvement framing effect should be attenuated or eliminated (Takemura, 1994). It might be worth investigating the effects of threat-level on framing. Would the same results be obtained in the involved group, if the threat was less deadly for the participants (e.g. that the rule implied that in the given case they would be more inclined to having heartburn or headache)? One could expect that in this case there would be a stronger effect of negative frame in the involved group.

In the context of development of conditional reasoning, our findings suggest that adolescents perform quite well on this reasoning task which is consistent with the results of some previous longitudinal studies on deontic versions of the Wason selection task (Müller, Overton, & Reene, 2001). However, in accordance with the observation of the author of the original study (Dawson et al., 2002a), a question of interest is whether, outside of the given context, in absence of a strong defensive motivation, a sceptical mindset would facilitate sound reasoning (in this particular case avoiding confirmation bias). Future research might also benefit from examining the impact of another type of involvement, for example, the impression-relevant involvement (Johnson & Eagly, 1989) on performance on the task. Would confirmation bias on the Wason task be less pronounced if we provided participants with alternative sources of positive self-reflections (as in Sherman & Cohen, 2000)? Would the explicit affirmative labelling of their cognitive style as “objectively oriented” result in less biased processing on this task (as the effect of attributional labeling, Henderlong & Lepper, 2002; see also Branković & Žeželj, 2010)? Having in mind that people tend to see greater bias in others’ judgement than in their own (see Ehrlinger, Gilovich, & Ross, 2005), can the very information about other people’s inclinations to see positive events as more likely to happen than the negative ones result in a correctional self-reflection on this reasoning task? Finally, can information about the favourable effects of a sceptical mindset, in itself, correct to a certain extent the cognitive strategies for this task, since there is evidence of a similar effect in everyday conditions (Gilovich, 1991)?

Disentangling the effects of motivation on reasoning may be a challenging task that requires (a) identifying which motives operate in different situations, and (b) identifying if cognitive processes are in fact distorted or facilitated by those motives. The “Must I Believe” situation, as it is created in this and similar experiments, seems to be particularly informative for this investigation. The “Must I Believe” situation confronts our wish to adopt or refute different information with the presented evidence, and therefore can lead to a desire to examine available data and its possible implications more thoroughly. By analyzing the results of these cognitive efforts, we might get to a better understanding of the processes themselves.

## REFERENCES

- Bizer, G. Y., & Petty, R. E. (2005). How we conceptualize our attitudes matters: The effects of valence framing on the resistance of political attitudes. *Political Psychology, 26*, 553–568. doi:10.1111/j.1467-9221.2005.00431.x
- Branković, M., & Žeželj, I. (2010). The effects of matching a persuasive message with a recipient's self-concept on attitude change. *Psihologija, 43*, 233–251. doi:10.2298/PSI1003233B
- Chater, N., & Oaksford, M. (2001). Human rationality and psychology of reasoning: Where do we go from here? *British Journal of Psychology, 92*, 193–216. doi:10.1348/000712601162031
- Cosmides, L. (1989). The logic of social exchange: Has natural selection shaped how humans reason? Studies with the Wason selection task. *Cognition, 31*, 187–276. doi:10.1016/0010-0277(89)90023-1
- Dawson, E., Gilovich, T., & Regan, D. T. (2002a). Motivated reasoning and performance on the Wason selection task. *Personality and Social Psychology Bulletin, 28*, 1379–1389. doi:10.1177/014616702236869
- Dawson, E., Gilovich, T., & Regan, D.T. (2002b). *Motivated reasoning and susceptibility to the "Cell A" bias*. Manuscript submitted for publication. Retrieved from [http://mba.yale.edu/faculty/PDF/dawson\\_cella.pdf](http://mba.yale.edu/faculty/PDF/dawson_cella.pdf)
- Donovan, R. J., & Jalleh, G. (1999). Positively versus negatively framed product attributes: The influence of involvement. *Psychology & Marketing, 16*, 613–630.
- Doosje, B., Spears, R., & Koomen, W. (1995). When bad isn't all bad: Strategic use of sample information in generalization and stereotyping. *Journal of Personality and Social Psychology, 69*, 642–655. doi:10.1037/0022-3514.69.4.642
- Dunning, D., & Parpal, M. (1989). Mental addition versus subtraction in counterfactual reasoning: On assessing the impact of personal actions and life events. *Journal of Personality and Social Psychology, 57*, 5–15. doi:10.1037/0022-3514.57.1.5
- Edwards, K., & Smith, E. (1996). A disconfirmation bias in the evaluation of arguments. *Journal of Personality and Social Psychology, 71*, 5–24. doi:10.1037/0022-3514.71.1.5
- Ehrlinger, J., Gilovich, T., & Ross, L. (2005). Peering into the bias blind spot: People's assessments of bias in themselves and others. *Personality and Social Psychology Bulletin, 31*, 1–13. doi:10.1177/0146167204271570
- Evans, J. B., & Over, D. E. (1996). *Rationality and reasoning*. London: Taylor & Francis Routledge.
- Gilovich, T. (1991). *How we know what isn't so: The fallibility of human reason in everyday life*. New York: Free Press.
- Gilovich, T., & Griffin, D. (2002). HHeuristics and biases: Then and now. In T. Gilovich, D. Griffin, & D. Kahneman (Eds.), *Heuristics and biases: The psychology of intuitive judgment* (pp. 1–4). Cambridge: Cambridge University Press.
- Greenberg, J., Pyszczynski, T., Solomon, S., Pinel, E., Jordan, K., & Simon, L. (1993). The effects of self-esteem on vulnerability-denying defensive distortions: Further evidence that self-esteem serves an anxiety-buffering function. *Journal of Experimental Social Psychology, 29*, 229–251. doi:10.1006/jesp.1993.1010
- Henderlong, J., & Lepper, M. R. (2002). The effects of praise on children's intrinsic motivation: A review and synthesis. *Psychological Bulletin, 128*, 774–795. doi:10.1037/0033-2909.128.5.774
- Johnson-Laird, P. N., & Wason, P. C. (1970). A theoretical analysis of insight into a reasoning task. *Cognitive Psychology, 1*, 134–148. doi:10.1016/0010-0285(70)90009-5

- Johnson, B. T., & Eagly, A. H. (1989). Effects of involvement on persuasion: A meta-analysis. *Psychological Bulletin*, *106*, 290–314. doi:10.1037/0033-2909.106.2.290
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*, 263–292. doi:10.2307/1914185
- Klayman, J., & Ha, Y-W. (1987). Confirmation, disconfirmation and information in hypothesis testing. *Psychological Review*, *94*, 211–228. doi:10.1037/0033-295X.94.2.211
- Kunda, Z. (1987). Motivation and inference: Self-serving generation and evaluation of evidence. *Journal of Personality and Social Psychology*, *53*, 636–647. doi:10.1037/0022-3514.53.4.636
- Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*, 480–498. doi:10.1037/0033-2909.108.3.480
- Kunda, Z., & Sanitioso, R. (1989). Motivated changes in the self-concept. *Journal of Experimental Social Psychology*, *25*, 272–285. doi:10.1016/0022-1031(89)90023-1
- Kuvaas, B., & Selart, M. (2004). Effects of attribute framing on cognitive processing and evaluation. *Organizational Behavior and Human Decision Processes*, *95*, 198–207. doi:10.1016/j.obhdp.2004.08.001
- Levin, I. P., Schneider, S. L., & Gaeth, G. J. (1998). All frames are not created equal: A typology and critical analysis of framing effects. *Organizational behavior and human decision processes*, *76*, 149–188. doi:10.1006/obhd.1998.2804
- Levin, I. P., Schnittjer, S. K., & Thee, S. L. (1988). Information framing effects in social and personal decisions. *Journal of Experimental Social Psychology*, *24*, 520–529. doi:10.1016/0022-1031(88)90050-9
- Maheswaran, D., & Meyers-Levy, J. (1990). The influence of message framing and issue involvement. *Journal of Marketing Research*, *27*, 361–367.
- Manktelow, K. (1999). *Reasoning and thinking*. London: Psychology Press.
- Manktelow, K. I., & Over, D. E. (1987). Reasoning and rationality. *Mind and Language*, *2*, 199–219. doi:10.1111/j.1468-0017.1987.tb00117.x
- Müller, U., Overton, W. F., & Reene, K. (2001). Development of conditional reasoning: A longitudinal study. *Journal of Cognition and Development*, *2*, 27–49. doi:10.1207/S15327647JCD0201\_2
- Oswald, M. E., & Grosjean, S. (2004). Confirmation bias. In R. Pohl (Ed.), *Cognitive illusions: A handbook on fallacies and biases in thinking, judgment and memory* (pp. 79–98). Hove, UK: Psychology Press. doi:10.1002/ejsp.2420210103
- Shuren, J. E., & Grafman, J. (2002). The neurology of reasoning. *Archives of Neurology*, *59*, 916–919. doi:10.1001/archneur.59.6.916
- Schaller, M. (1991). Social categorisation and the formation of group stereotypes: Further evidence for biased information processing in the perception of group-behaviour correlations. *European Journal of Social Psychology*, *21*, 25–35. doi:10.1002/ejsp.2420210103
- Schaller, M. (1992). In group favoritism and statistical reasoning in social inference: Implications for formation and maintenance for group stereotypes. *Journal of Personal and Social Psychology*, *63*, 61–74. doi:10.1037/0022-3514.63.1.61
- Sherman, D. K., & Cohen, G. L. (2000). Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science*, American Psychological Society, *11*, 119–123. doi: 10.1111/1467-8721.00182
- Takemura, K. (1994). Influence of elaboration on the framing of decision. *Journal of Psychology*, *128*, 33–39. doi:10.1080/00223980.1994.9712709
- Trope, Y., & Bassok, M. (1982). Confirmatory and diagnosing strategies in social information gathering. *Journal of Personality and Social Psychology*, *43*, 22–34. doi:10.1037/0022-3514.43.1.22

- Visser, P. S., Krosnick, J. A., & Norris, C. M. (2004). *Challenging the common factor model of strength related attitude attributes: Contrasting the antecedents and consequences of attitude importance and attitude relevant knowledge*. Unpublished manuscript, University of Chicago, Chicago, IL.
- Wason, P. C., & Johnson-Laird, P. N. (1972). *Psychology of reasoning: Structure and content*. Cambridge, MA: Harvard University Press.
- Žeželj, I., Škorić, M., Bogdanović, S., Hristić, D., & Stokić, D. (2007). Valence framing of political preferences and resistance to persuasion. *Psihologija, 40*, 365–383. doi:10.2298/PSI0703365Z