PRIMENJENA PSIHOLOGIJA, 2021, Vol. *14* (1), STR. 33-52

UDK: 159.9.955.072
Research Article
doi: https://doi.org/10.19090/pp.2021.1.33-52

Draženka Levačić[1]

https://orcid.org/0000-0002-6560-4994
Catholic University of Croatia, Zagreb, Croatia

Mario Pandžić

https://orcid.org/0000-0002-8099-2964
Catholic University of Croatia, Zagreb, Croatia

Dragan Glavaš

https://orcid.org/0000-0002-5950-855X
Catholic University of Croatia, Zagreb, Croatia

1 Corresponding author
email: drazenka.le@gmail.com

Received: 08.10.2020.
Correction received: 22.03.2021.
Accepted: 29.03.2021.

ROLE OF AUTOMATIC, CONSCIOUS, AND UNCONSCIOUS THOUGHT PROCESSES IN COMPLEX DECISION MAKING

A complex decision is any decision that includes choosing among options with numerous describing attributes. Certain decisions are fast, often guided with automatic thought processes, while other decisions are made with careful examination of all the factors. The aim of this research was to investigate the effect of automatic, conscious and unconscious thought processes in the context of decision making. Participants were psychology students aged between 19 to 28 years. The first experiment investigated the role of these three different thought processes on choosing a subjectively best apartment option and take-the-best (TTB) heuristic apartment option. The second experiment investigated metacognitive aspects of decision making, precisely to determine the differences in feeling of rightness (FOR) as well as the tendency to change the decision about the chosen apartment, depending on the activated thought processes. Different thought processes determined the choice of the subjectively best option. Participants chose the subjectively best option in the conscious thought condition more often than in the automatic or unconscious thought condition. However, there was no difference between conditions in choosing the TTB heuristic option. No difference was found between the automatic and unconscious thought condition concerning the metacognitive assessment of feeling of rightness, while the same increased equally in participants of both conditions after they were subsequently included in the conscious thought condition. The tendency to change responses after engaging in a conscious thought condition also did not depend on the initial condition. The study provided support for the importance of conscious thought processes in complex decision making present in everyday functioning and regardless of the field of human expertise.

Keywords: decision making, conscious thought processes, unconscious thought processes, automatic thought processes, feeling of rightness

Introduction

Decision making often goes unnoticed because it implies a simple decision in our everyday activities. However, sometimes we engage in complex decision making, which includes choosing among options with numerous describing attributes. Two of the most interesting questions in this context are (1) how we make our mind when faced with complex problems, and (2) how much confidence do we have in our choices afterwards, depending on previous underlying decision-making processes upon which our choice was shaped. Regarding the former, our decisions are based on two types of thought processes, according to the Dual Process Theory. Type 1 processes are fast, automatic and often based on heuristic reasoning (Evans & Stanovich, 2013; Ferreira et al., 2006). A heuristic is a strategy that ignores part of the information in order to make decisions more quickly and accurately than more complex methods (Gigerenzer & Gaissmaier, 2011). On the other hand, Type 2 processes are responsible for reflective thinking and the imagination of possible hypothetical scenarios of different options (Evans & Stanovich, 2013). The second question implies the metacognitive aspect of our decision-making process. Metacognition refers to the thoughts that an individual has about his own thoughts and cognitive processes (Flavell, 1979). Some researchers claim that while faced with a dilemma, the answer that pops in our mind very fast (Type 1 processes) is usually the intuitive answer which does not have to be the correct one, but its' brief appearance makes it seem reliable and brings us confidence in our intuitive decision, much more than in equally valid (or even more valid) non-intuitive alternatives (Simmons & Nelson, 2006). However, reducing intuitive confidence can reduce intuitive biases. Thompson et al. (2011) researched various reasoning tasks and evaluated the participants' metacognitive confidence of their response, also known as Feeling of Rightness (FOR). The results showed that low FOR values correlated with more time spent thinking and the higher probability of changing the response (Thompson et al., 2011; Thompson & Wang, 2019). In other words, they also showed that higher FOR estimates might prevent us from engaging in analytical (Type 2) processes due to the fluency (ease) with which the initial decision was produced. Furthermore, Ghazal et al. (2014) have confirmed that metacognitive processes are correlated with exam performance. Their participants showed better performance when they had more time to think and evaluate their decision (Type 2 processes).

Hence, we are taught to believe that conscious and rational decision-making (engagement in Type 2 processes) is a path to making the best decision leading to the best outcomes, but some researchers have tried to refute that belief. Besides researching automatic, fast and heuristic, as well as conscious, decision making (Kahneman, 2011), some authors proposed that decision making can be done unconsciously (Dijksterhuis, 2004). Conscious thought processes are activated when a person is consciously aware of their cognitive processes needed to solve a problem or make a decision. Unconscious thought

processes imply that a person is not consciously aware of attending to a specific task or problem (Dijksterhuis, 2004). For example, if a conscious thought process is activated while deciding where to live, a person would be thinking about the apartment's price but as well about the location, trying to decide which aspect is more important. If an unconscious thought process is responsible for decision making, then a person would stop actively thinking about it and would engage in another activity and later suddenly come to a decision without knowing a specific reason behind it. Therefore, conscious and unconscious thought processes differ in the awareness of cognitive processes needed to solve a problem, yet they both engage in delayed decision making, while on the other hand, automatic decision making happens immediately upon facing a problem (Kahneman, 2011).

Dijksterhuis (2004) researched whether the quality of decision making depends can be enhanced by activation of unconscious thought processes. His participants were students who had to imagine choosing an apartment to live in. The stimuli consisted of various attributes describing those apartments (12 for each apartment). They had to choose between four options. The decision quality criterion was based on the TALLY rule, which considers the choice with the largest number of positive attributes (e.g., Apartment B is in the city centre) as the best one (Dijksterhuis, 2004). In all three conditions, apartment attributes were presented to participants in a one-by-one fashion for a few seconds (three minutes overall) labelled with apartment letter they belonged to in random order. In the automatic thought condition, the decision was made right after the stimuli presentation, while in the conscious thought condition, participants had three minutes to make a decision in front of the blank screen. In unconscious thought condition, the decision was made after three minutes spent solving unrelated tasks. The results indicated that the participants in the unconscious thought condition were able to make the best decision. Specifically, they had estimated Apartment B (an objectively best option with the highest number of positive attributes) as the most desirable apartment significantly more than the rest of the participants from conscious or immediate thought condition. Dijksterhuis et al. (2006) confirmed his hypotheses and claimed that unconscious thinking enhances the quality of decision-making. Some everyday examples of that are evident in a famous saying, "Sleep on it", which points out the benefits of deciding with a time delay.

These brave, controversial, and somewhat orthodox claims raised concerns and gained public attention from the pioneers in the field. His findings were faced with numerous calls on potential methodological flaws, especially regarding the duration of conscious thought condition, as well as the application of the TALLY task paradigm. Regarding the latter, he did not take into consideration the fact that people value differently the same attributes. In other words, while for someone it might be ideal to live in the city centre, for someone else it might be a nuisance. Some researchers have tried to replicate those findings with slight modifications of experimental design regarding the

conscious thought condition. Rey et al. (2008) tried to enhance the primary purpose of conscious thinking by activating the Type 2 processes but kept the TALLY paradigm. The immediate thought condition is supposed to be heuristically driven, but the conscious thought condition needs to offer enough time for the activation of Type 2 processes. That is why Rey et al. (2008) gave their participants unlimited time in the conscious thought condition, but regardless, they did not manage to find a significant difference in the quality of decision making between conscious and unconscious thought condition. However, the most important modifications were done by Newell et al. (2009). In contrast to previous experiments that considered the best apartment as the one with more positive and less negative attributes, Newell et al. (2009) proposed a WADD (weighted-additive) model as a more reliable solution compared to the TALLY rule. The WADD model enables the researcher to create options while taking into consideration the participants' importance estimates of all attributes. Using this model, Newell et al. (2009) created the best apartment option, which had the highest sum of attribute values and also gave the participant a longer time in conscious condition (4 minutes with a blank screen). Still, they did not find a significant difference regarding the thought conditions.

One could argue that the application of the WADD model in experimental designs is crucial from the perspective of construct validity. The researcher shouldn't decide which option is the best for the participants but rather let the participants estimate their best option in complex decisions. Although the WADD model used in the research done by Newell et al. (2009) is considered a great improvement, we believe that the WADD option can be modified even more carefully – by making it a subjectively best option for each participant rather than an objectively best option for everyone.

The present study

In this study, we focused on WADD based subjective decision making, additionally exploring take-the-best (TTB) heuristic and metacognitive aspects of decision making. There are no prior studies that tried to incorporate the subjective WADD paradigm, especially by simultaneously examining the effect of the TTB heuristic. Our goal was to construct another apartment option (besides the rational one used in prior studies) that should act as a heuristic for participants of all conditions, that is, to create a TTB heuristic option. This heuristic is specific because it is guided with finding at least one plausible argument of an option and ignoring the rest (Gigerenzer et al., 1999). For example, when choosing an apartment, someone might only care for the rent expense and make their decision disregarding any other attribute. Heuristics are considered part of Type 1 processes (Kahneman, 2011) that should prevail when deciding automatically in contrast with a rational option that should draw us more when conscious thought processes are triggered. All of the prior studies

only created the objectively best rational apartment option, alongside three other much obviously worse options. Our study incorporated both rational and heuristic apartment options, alongside two additional, more obviously worse options. By creating two different options – rational and heuristic, we believe that we can adequately examine the effect of different thought processes in making the best decision end enhance the external validity of the findings given that real-life complex decision making is usually much harder, and besides the best (or most rational) option incorporates one or many heuristic options to choose from. Alongside that, little is known about the metacognitive aspects of complex decision making, especially regarding unconscious thought processes. As mentioned earlier, automatic thought processes can turn us overconfident and prevent us from engaging in deeper processing. On the other hand, reducing confidence bias can also reduce intuitive response bias and activate Type 2 processes which should lead us to think over and change our decision (Simmons & Nelson, 2006; Thompson et al., 2011; Thompson & Wang, 2019). However, little is known about the metacognitive aspects of the unconscious thought process. To our best knowledge, the study of Dehghan et al. (2011) is the only one in this regard. The authors replicated Dijksterhuis and van Olden (2006) study about choice satisfaction and asked the participants to choose one poster they liked the most and to take it home with them. Ten days later, participants in the unconscious thought condition showed significantly less satisfaction than did participants in the conscious and immediate condition.

Taking all into account, we conducted two experiments in order to examine the role of automatic, conscious and unconscious thought processes in complex decision making, specifically in choosing a place of residence, following the task stimuli of the earlier studies (Dijksterhuis, 2004; Newell et al., 2009; Payne et al., 2008; Rey et al., 2008). The purpose of Experiment 1 was to develop a method that would enable computing subjectively best decision options of each participant in contrast to previously researched objective best options, along with examining the effect of the TTB heuristic. We also tried to further alleviate critics regarding the duration of the conscious condition by extending it to 4 minutes and allowing participants to see all attributes for all four options at once. In Experiment 2, we examined the feeling of rightness (FOR) for the response given before and after engaging subjects from automatic and unconscious experimental conditions into the conscious one as well as their tendency to change the initial response after activation of conscious thought processes. In other words, we sought to get deeper insight regarding two important questions: (1) will the FOR values change and will the change rate be different or the same for the participants from the automatic and unconscious condition after giving them a chance to consciously consider the available options afterwards, and (2) will there be a change of heart regarding their final decision and would that change be dependant upon the initial condition.

Experiment 1

In Experiment 1, we examined the effect of different thought processes in choosing the subjectively best or heuristic option.

Based on previous findings (Gigerenzer et al., 1999; Kahneman, 2011), we hypothesized (a) that participants in the automatic thought condition will choose the heuristic option more often than the participants in conscious or unconscious thought condition. Further, we hypothesized (b) that participants in the conscious thought condition will choose their subjectively best option (high congruency of choice) more often than the participants in automatic or unconscious thought condition.

Method

Participants

One hundred and twenty-six (n_f = 114; n_m = 12) psychology students from the Catholic University of Croatia participated in the first experiment. They were aged from 19 to 28 years (M = 21.15; SD = 1.62). All of them received course credit for participating in the research.

Stimuli

The experimental stimuli were acquired from experiments conducted by Dijksterhuis (2004) and Newell et al. (2009). The researchers used a list of 16 attributes describing apartments which seem to be important in deciding on where to move in. We translated those attributes (from English to Croatian) and added another four that might be more relevant for Croatian students, therefore using 20 attributes in pilot research conducted on graduate psychology students of the same university (N = 36). Participants had to evaluate the importance of each given attribute on a scale from 1-10 (1 meaning *the attribute is not rather important to them*, and 10 meaning *the attribute is extremely important in deciding on where to live*). Later, we computed mean scores for each attribute and chose 5 with the highest and 5 with the lowest mean value. Those ten attributes were the final stimuli for the main experiment. Each attribute had two values – a positive and a negative one. For example, rent as an attribute could have been high or low (negative or positive), varying throughout four different options (apartment A, B, C and D).

While creating four apartment options, we followed the *WADD* model. We created one option (apartment C) that is supposed to be objectively the best, meaning it has the highest sum of its attribute values. It was also a rational decision because while reflecting on the attributes, one can notice its greater value. Another important option is apartment B which was created to be a heuristic decision, precisely TTB heuristic. Options B and C were created based

on the results of the pilot study. Apartment B was considered as a heuristic because it has low rent, nearby public transport and Internet access which were the three most important attributes according to the pilot study. Apartments A and D had inverted values of apartment B and C. They were not crucial for our hypotheses and were only there to make the task more complicated.

Procedure

Randomly assigned participants sat in a computer room in front of a PowerPoint presentation. On the first slide, there was the following instruction: *"Imagine that you are planning to rent a flat near a university because you have been living in a faraway suburb. After putting effort into finding an apartment, you are left with four apartments on your list. The new semester is starting soon, so you have to make your decision. You will see attributes describing each of 4 apartments, and eventually, you will have to choose the best apartment"*.

In each condition, participants viewed the same stimuli (10 attributes for each apartment), and at the end of the slide show, there was a link to the survey. The first question was: "*Which apartment would you choose?*". Afterwards, they answered other questions regarding the importance of attributes, evaluated other apartments, and wrote down the attributes they recall for each apartment.

Conditions differed in the time participants spent thinking about the apartments before making a decision. In all three conditions, participants read about each apartment for 25 seconds. In automatic thought condition, the decision was made right after viewing the attributes, meaning they had no time to think actively and therefore made a quick decision. In conscious thought condition, after viewing the attributes, they had 4 minutes to think about them, meanwhile looking at the screen with four apartments accompanied by a total of 40 attributes. They were given this time to compare the options and to engage in a conscious, active decision-making process. In the unconscious thought condition, after viewing the attributes, participants also had 4 minutes before making a decision. However, this time they were distracted in order not to think actively about the decision they will have to make. For 4 minutes, they were solving anagrams and concentration grids. This experiment provided more time in the conscious thought condition in comparison to the 3 minutes provided in the original experiment (Dijksterhuis, 2004) because we wanted to offer more time to engage Type 2 processes. Other than the time frame, the modification in the procedure was made in stimuli presentation as well because in this condition, they had a chance to look at all 40 attributes and examine them carefully to make a rational decision.

Design

In Experiment 1, we employed an independent groups design, with participants randomly assigned to one of the three conditions: automatic, conscious and unconscious thought condition (42 participants assigned to each).

Results

The statistical analysis for Experiment 1 was conducted on 124 participants (two were excluded due to missing data on certain variables). The frequency of choosing one of the four apartments is presented in Figure 1. The most commonly chosen option was apartment C (n = 60 (48.4%)), and the following was apartment B (n = 50 (40.3%)).

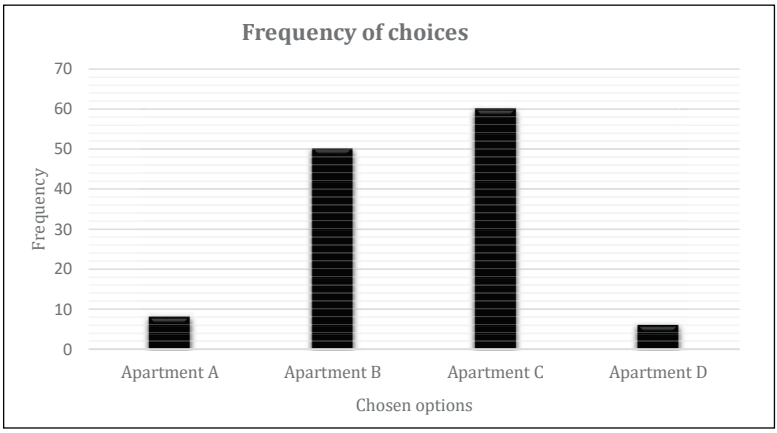

Figure 1. Frequency of choosing different options overall.

To examine the effect of experimental condition on apartment decision, we did a chi-square analysis. Table 1 shows the correlation between experimental condition and apartment decision. Results showed the dependence of participants' decision on the experimental condition ($\chi 2(6) = 18.33$, $p < .01$, Cramer's $V = 0.26$). Further post-hoc analysis with Bonferroni correction of adjusted residuals showed the more frequent choice of Apartment A in the unconscious in comparison to two other conditions, and more often the choice of apartment D in the automatic in comparison to two other conditions. Considering these findings, we rejected the first hypothesis, in which we expected that the participants of automatic thought condition would be more inclined to choose a heuristic option (apartment B). Results showed that approximately the same number of participants chose apartment B in all three conditions.

Table 1
Distribution of chosen options depending on the experimental condition

		Experimental condition			
		Automatic	Conscious	Uncon-scious	Total
Aparment A	Frequency	2	0	6	8
	Adjusted residuals	-0.50	-2.10	2.70	
Aparment B	Frequency	16	21	13	50
	Adjusted residuals	-0.40	1.60	-1.20	
Aparment C	Frequency	19	21	20	60
	Adjusted residuals	-0.50	0.30	0.20	
Aparment D	Frequency	5	0	1	6
	Adjusted residuals	2.60	-1.80	-0.80	
	Total	42	42	40	124

To test the second hypothesis (b), we created a new variable called the WADD value. First, we considered estimates that each participant made about every attribute on a scale of 1-10. Then we combined this variable with the question about the preferred alternative of each attribute. For example, one might estimate his importance of the size of the apartment with a high number such as 8. There are two alternatives to this – a small apartment or a big apartment. If someone is highly motivated to get a big apartment, then every option showing that feature (Apartment A and C) could be desirable. At the same time, every option of offering a small apartment would be extremely unattractive. To estimate the best option for every participant (subjectively best decision) according to the WADD model, we had to calculate those values of each attribute and change their sign depending on the preferable alternative of each attribute. For example, if someone valued the size of an apartment as an 8, and also preferred a big apartment, then in the total sum of WADD values, 8 would be positive (+8) for apartment A and C, but negative (-8) for apartment B and D. Using this formula we calculated *WADD* values for each apartment and participant. The highest WADD value of one apartment represented the subjective best option for that person, and we could examine in which condition they were more likely to choose this option. Another new variable was choice congruency which implied that a person chose their subjectively best apartment. On the other hand, if one had chosen apartment B even though his/her highest WADD value is for apartment C, then the choice was incongruent.

We conducted a chi-square analysis to investigate choice congruency dependence on the experimental condition. We expected higher congruency in the conscious thought condition. The results (Table 2) showed a significant difference in making incongruent choices between three experimental conditions ($\chi 2(2) = 7.09$, $p < .05$, Cramer's $V = 0.24$). The difference is found in the conscious thought condition in which participants were more prone to make a choice congruent with their WADD model (Post-hoc analysis of adjusted residuals with Bonferroni correction).

Table 2
Distribution of (in)congruent choices across three experimental conditions

		Experimental condition			
		Automatic	Conscious	Unconscious	Total (% congruency)
Incongruent options	Frequency	19.00	8.00	16.00	43.00
	% experimental condition	45.20	19.00	40.00	34.70
	Adjusted residuals	1.80	-2.60	0.90	
Congruent options	Frequency	23.00	34.00	24.00	81.00
	% experimental condition	54.80	81.00	60.00	65.30
	Adjusted residuals	-1.80	2.60	-0.90	
	Total	42.00	42.00	40.00	124.00

To make choice congruency differences even more clear, the conscious thought condition was analyzed separately (Table 3).

Table 3
Distribution of (in)congruent choices in conscious thought condition

		Chosen option		
		Apartment B	Apartment C	
WADD B	Frequency	14	1	15
	Adjusted residual	4.20	-4.20	
WADD C	Frequency	7	20	27
	Adjusted residual	-4.20	4.20	
	Total	21	21	42

Experiment 2

In Experiment 2, we examined the effect of automatic and unconscious thought processes and activation of conscious thought processes on the feeling of rightness (FOR) for the response given and the tendency to change the initial response.

Based on previous findings (Thompson et al., 2011), we expected (c) that responses in automatic thought condition would generate higher FORs compared to responses in unconscious thought condition and (d) equal increase of FOR after the activation of the conscious thought processes for the automatic and unconscious condition (Simmons & Nelson, 2006).

In addition, based on the findings of Dehghan et al. (2011), we expected (e) that the participants in unconscious thought condition compared to the participants of automatic thought condition will be significantly more inclined to change their final response after the conscious thought activation.

Method

Participants

Forty-nine psychology students (n_f = 40; n_m = 9) aged between 19 and 24 (M = 20.94; SD = 1.39) participated in the second experiment. All participants received course credit for participating in the research.

Stimuli

The experimental stimuli were identical to the first experiment.

Procedure

The procedure was similar to Experiment 1 - participants had to make the same decision (choose the best of 4 apartments). In Experiment 2, there were

only two conditions - automatic and unconscious. After participants made their decisions in the first condition, they all viewed the slide show once again, but this time in a conscious thought condition. This means that they had to look at the same experimental stimuli for another 4 minutes and then answer the question about apartments. This repeated measurement gave them the opportunity to change the initial response. Participants also estimated theirs FOR. This metacognitive judgment was examined twice for everyone – the first time after the initial choice has been made and the second time after participating in a conscious thought condition and making another decision. More precisely, participants were asked to estimate how sure they were of their decision on a scale of 1 to 7 (1 - *I am completely unconfident with my decision*, 7 - *I am completely confident with my decision*). All participants entered their personal code in a survey, which enabled us to pair their answers from two separate measurements.

Design

In Experiment 2, we employed a complex mixed design (2x2) with one between- and one within-subject factor. Participants were randomly assigned into two experimental conditions (25 in automatic and 24 in unconscious condition), and afterwards, all participated in the conscious thought condition.

Power Analysis

Given the scarcity of empirical insights on the effect of conscious thought processes in comparison to the effects of automatic and unconscious processes and the modification of the WADD model in our study, we hypothesized a medium-sized effect of conscious thought process activation on FOR and small to medium-sized effect interaction between experimental conditions and activation of conscious processes. Thus, power analysis indicated that 46 participants would be adequate to detect the medium-sized effect of conscious thought processes and the medium-sized effect of interaction between experimental conditions and conscious thought process activation (Cohen's $f^2 = .25$, $1 - \beta > .90$).

Results

To answer the first (c) and second hypothesis (d) of Experiment 2, we conducted mixed-design ANOVA (2x2). Box's M test has shown the equality of multiple variance-covariance matrices (Box's $M = 4.26$, $p > .10$). Levene's test found homogenous variances of two observed groups ($F(1,47) = 0.21$, $p > .10$). The difference in FOR between automatic and conscious processes groups before the intervention, hypothesized with the first hypothesis, in this statistical model implies the simple effect. Thus, we performed a simple effect analysis

to compare automatic and unconscious groups after the initial decision. Result showed non-significant difference between two experimental conditions ($F(1,47) = 1.35$, $p > .10$). Therefore, the hypothesis was rejected. Participants did not differ significantly in their feeling of rightness before the intervention (activation of conscious thought process), depending on the thought condition they were engaged in (Figure 2, dotted line).

The effect of activation of the conscious thought process on FOR in the utilized ANOVA model implies the main effect of the repeated-measure factor. The effect of the activation of conscious thought processes on the FOR, was statistically significant with a large size effect ($F(1,47) = 43.31$, $p < .001$; $\eta p^2 = 0.48$). FOR was significantly higher in the second measurement after the conscious thought condition ($M = 5.93$, $SD = 0.14$), than before, in the automatic or unconscious condition ($M = 4.95$, $SD = 0.18$). Therefore, we confirmed the second hypothesis (d). Interaction of experimental condition and activation of conscious processes was not statistically significant ($F(1,47) = 0.02$, $p > .10$), implicating that the change in FOR after conscious thought condition (FOR2) was equal among participants previously engaged in automatic and unconscious thought condition.

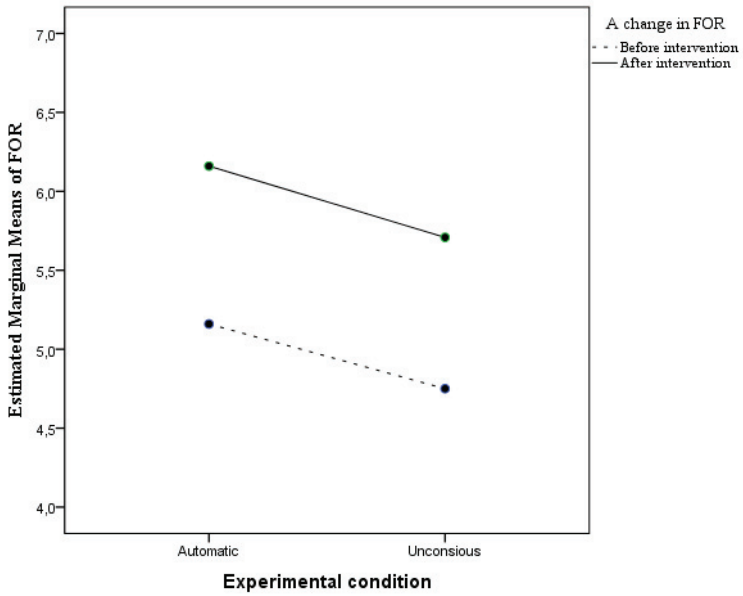

Figure 2. Change in FOR after the activation of conscious thought processes depending on the initial experimental condition.

To test the third hypothesis (e), we created a new variable that shows the tendency to change the initial decision about apartments (values of this vari-

able were: 0 – there was no change; and 1 – the first decision was changed) and performed a chi-square test. The results showed the same tendency to change the initial response after activating conscious thought processes. As shown in Table 4, the majority of participants (81.63%) did not change their response after engaging in conscious thought condition, while the minority of them (18.36%) did.

Table 4
Analysis of the tendency to change initial response in conscious condition depending on the initial experimental condition

		Change of response		
		No change	Another response	Total
Automatic thought condition	Frequency	21	4	25
	% of total participants	42.85	8.15	51
Unconscious thought condition	Frequency	19	5	24
	% of total participants	38.80	10.20	49.00
Total	Frequency	40	9	49

General discussion

The purpose of this research was to examine the effect of automatic, conscious and unconscious thought processes in choosing the subjectively best or the heuristic apartment option, as well as the effect these processes have on the feeling of rightness (FOR) about a decision and the tendency to change it.

Our first experiment managed to clarify its specifics, focusing on the modified WADD model-based decision making. Researchers in this area (Dijksterhuis, 2004; Newell et al., 2009) have not found the benefit of conscious thought in making the best decision, but their experiments did not account for the subjective nature of the decision-making process. However, Payne et al. (2008) have found the superiority of a modified conscious thought condition owing to an unlimited amount of time assigned for the process of decision making. Jekel et al. (2012) claim that WADD model-based decision making leads to better outcomes than heuristic decision making in tasks of probability estimations. Apartment choosing, on the other hand, is a far more subjective decision that requires our attention, time, and deep processing. We expected that participants in conscious thought condition would more often make a decision congruent with their preferences since they would have enough time to become aware of them. With this confirmed, the conscious thought condition

showed a significant degree of congruency between the choice made and the option preferred according to the WADD model, while the same was not true for automatic or unconscious thought condition.

Various research has confirmed the importance of the TTB heuristic in everyday decision making (Bergert & Nosofsky, 2007; Garcia-Retamero & Dhami, 2009; Gigerenzer et al., 1999). It was shown that TTB heuristic decisions had brought the best possible outcome (Gigerenzer et al., 1999) as well as that their benefit depends on the smaller number of attributes and options. By examining the choice congruency (Experiment 1), we can notice that almost one half of our sample has estimated apartment B as their subjectively best option. We can therefore conclude that apartment B was not a proper representation of the TTB heuristic and that we were wrong to consider this option uniquely heuristic for every participant. Since people have different preferences of different magnitudes, a heuristic attribute could be something else for each person. Feasibly, our heuristic features were not of such importance for some participants. Most previous research of the TTB heuristic focused on problems with one specific answer (Bergert & Nosofsky, 2007; Garcia-Retamero & Dhami, 2009), and there is a scarcity of research regarding heuristics affecting subjective, complex decision making. Therefore this construct should be further developed in that direction.

The second experiment examined the role of activated thought processes in the metacognitive estimation of the FOR for the given response. Contrary to our expectations, we did not find the difference between automatic and unconscious thought condition in FOR. Earlier research (Thompson et al., 2011) found that participants often choose a fast, intuitive response and later show high levels of intuitive confidence. Our results can be explained according to Dual-process theory which identifies Type 1 and Type 2 processes (Alter & Oppenhaimer, 2007; Evans & Stanovich, 2013). Perhaps automatic and unconscious thought processes should both be characterized as Type 1 processes since they did not provide sufficient time to facilitate deeper processing. Furthermore, we have found higher estimates of FOR after the conscious thought condition (FOR2) which enabled participants more time to reflect, all in line with previous research (Simmons & Nelson, 2006).

Based on previous research (Dehghan et al., 2011; Dijksterhuis & van Olden, 2006), we expected participants of unconscious thought condition to change their response significantly more often after engaging in conscious thought condition. The difference compared to the initial experimental condition was not found. Since this is the only similar study in the field, the difference in our results could be explained by the fact that participants of Dijksterhuis & van Olden's (2006) research made a decision based on visually presented posters, in contrast with our verbally described apartments. Moreover, their participants were asked for feedback about their choice ten days after, whereas our participants were asked only after a few minutes. Thus, we can argue that choosing an apartment is not that similar to choosing a poster, nor do the following emotional reactions

bear much resemblance. Furthermore, considering that our third hypothesis was rejected and that automatic and unconscious thought processes do not significantly differ in FOR estimates, insinuating that maybe both processes should be considered as Type 1 we can conclude that our participants in both initial conditions were overconfident. Our findings in Experiment 1 clearly showed that subjectively best decisions are more often made in conscious condition compared with automatic and unconscious, so we should still expect to see the change in the decision as well as the change in FOR after engaging in the conscious thought condition in Experiment 2 (Simmons & Nelson, 2006). Since our last hypothesis of the second experiment was not confirmed, we can conclude that overconfidence is not that easy to change when making subjective decisions because one can probably adjust their preferences later in the process to be aligned with the initial decision they were confident about.

Our results show the contribution of the conscious, rational approach to making complex decisions congruent with personal preferences. Other than bringing a contribution to the field of marketing or real estate business, the study's possible implication goes even beyond. Although the two experiments examine decision making in the context of choosing the place of residence, the implications can be easily seen across different areas of human expertise where the rational, attribute weighing approach could be of great value for choosing the best option given. For example, complex decisions are made while buying apartments, cars or pets, while choosing between two jobs or universities as well as when hiring new team members at the company we work for. In each of these situations and many more, we often hear the advice: „Sleep on it and do what feels right.". However, this research clearly supports evidence of rational, engaged decision making being the best approach in choosing an option that is congruent with our preferences and therefore is our subjectively best option. This is especially important if we take into account the results of our second experiment that indicated that we would probably overconfidently stick to our first choices, even if later on we take our time to consciously think it through, which only boosts our prior confidence even more. Hence, we should be cautious and refrain from making rushed or 'slept over' initial decisions because although our first choice may not be the best fitting one, it could easily be hard to overcome, potentially leading us to poor decision making.

Even though this study brought new and interesting insights, future research should try to elaborate on the role of thought processes and metacognition in complex decision-making. New experimental tasks should deploy programming syntax in order to create a TTB heuristic that would be adequate for each participant based on their subjective preferences that should be collected prior to final stimuli exposure and taken into account while creating a heuristic option.

Conflict of interest

We have no conflicts of interest to disclose.

References

Alter, A. L. & Oppenheimer, D. M. (2007). Overcoming intuition: metacognitive difficulty activates analytic reasoning. *Journal of Experimental Psychology: General, 136*(4), 569–576. https://doi.org/10.1037/0096-3445.136.4.569

Bergert F. B. & Nosofsky, R. M. (2007). A response-time approach to comparing generalized rational and take-the-best models of decision making. *Journal of Experimental Psychology: Learning, Memory and Cognition, 331*, 107–129. https://doi.org/10.1037/0278-7393.33.1.107

Dehghan, B., Enjedani, E., Meybodi, F. A. & Sadeghi, S. (2011). The study of immediate, unconscious and conscious thought condition in the post choice satisfaction: a replicated study. *Procedia – Social and Behavioral Sciences, 30*, 1201–1204. https://doi.org/10.1016/j.sbspro.2011.10.233

Dijksterhuis, A. & van Olden, Z. (2006). On the benefits of thinking unconsciously: unconscious thought increases post-choice satisfaction. *Journal of Experimental Social Psychology, 42*, 627–631. https://doi.org/10.1016/j.jesp.2005.10.008

Dijksterhuis, A. (2004). Think different: the merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology, 87*(5), 586–598. https://doi.org/10.1037/0022-3514.87.5.586

Dijksterhuis, A., Bos, M. W., Nordgren, L. F. & van Baaren, R. B. (2006). On making the right choice: the deliberation-without-attention effect. *Science, 311*, 1005–1007. https://doi.org/10.1126/science.1121629

Evans, J. St. B. T. & Stanovich, K. E. (2013). Dual-process theories of higher cognition: advancing the debate. *Perspectives on Psychological Science, 8*(3), 223–241. https://doi.org/10.1177/1745691612460685

Ferreira, M. B., Garcia-Marques, L., Sherman, S. J., & Sherman, J. W. (2006). Automatic and controlled components of judgment and decision making. *Journal of Personality and Social Psychology, 91*(5), 797–813. https://doi.org/10.1037/0022-3514.91.5.797

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*(10), 906–911. https://doi.org/10.1037/0003-066x.34.10.906

Garcia–Retamero, R. & Dhami, M. K. (2009). Take-the-best in expert-novice decision strategies for residential burglary. *Psychonomic Bulletin and Review, 16*, 163–169. https://doi.org/10.3758/PBR.16.1.163

Ghazal, S., Cokely, E. T. & Garcia-Retamero, R. (2014). Predicting biases in very highly educated samples: numeracy and metacognition. *Judgment and Decision Making, 9*(1), 15–34.

Gigerenzer, G. & Gaissmaier, W. (2011). Heuristic decision making. *The Annual Review of Psychology, 62*, 451–482. https://doi.org/10.1146/annurev-psych-120709-145346

Gigerenzer, G., Todd, P.M. & ABC Research Group (1999). *Simple heuristics that make us smart*. New York: Oxford University Press.

Jekel, M., Glöckner, A., Fiedler, S. & Bröder, A. (2012). The rationality of different kinds of intuitive decision processes. *Synthese, 189*, 147–160. https://doi.org/10.1007/s11229-012-0126-7

Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.

Newell, B. R., Wong, K. Y., Cheung, J. C. H. & Rakow, T. (2009). Think, blink, or sleep on it? The impact of modes of thought on complex decision making. *The Quarterly Journal of Experimental Psychology, 62*(4), 707–732. https://doi.org/10.1080/17470210802215202

Payne, J. W., Samper, A., Bettman, J. R. & Luce, M. F. (2008). Boundary conditions on unconscious thought in complex decision making. *Psychological Science, 19*(11), 1118–1123. https://doi.org/10.1111/j.1467-9280.2008.02212.x

Rey, A., Goldstein, R. M. & Perruchet, P. (2008). Does unconscious thought improve complex decision making? *Psychological Research, 73*(3), 372–379. https://doi.org/10.1007/s00426-008-0156-4

Simmons, J. P. & Nelson, L. D. (2006). Intuitive confidence: Choosing between intuitive and non-intuitive alternatives. *Journal of Experimental Psychology: General, 135*(3), 409–428. https://doi.org/10.1037/0096-3445.135.3.409

Thompson, V. A., Prowse Turner, J. A. & Pennycook, G. (2011). Intuition, reason and metacognition. *Cognitive Psychology, 63*, 107–140. https://doi.org/10.1016/j.cogpsych.2011.06.001

Thompson, V. A.. & Wang, S. (2019). Fluency and Feeling of Rightness: The Effect of Anchoring and Models. *Psychological Topics, 28*(1), 37–72. https://doi.org/10.31820/pt.28.1.3

Appendices

Appendix A: Experimental stimuli used in both Experiments

Apartment A	Apartment B	Apartment C	Apartment D
with a view	without a view	without a view	with a view
high rent	low rent	high rent	low rent
without a built-in wardrobe	with a built-in wardrobe	without a built-in wardrobe	with a built-in wardrobe
high-quality building structure	low-quality building structure	high-quality building structure	low-quality building structure
large apartment	small apartment	large apartment	small apartment
no leisure facilities nearby	leisure facilities nearby	leisure facilities nearby	no leisure facilities nearby
new kitchen	old kitchen	new kitchen	old kitchen
far from public transport	near public transport	near public transport	far from public transport
no noise in surrounding environment	noise in surrounding environment	no noise in surrounding environment	noise in surrounding environment
no fixed wireless internet	fixed wireless internet	no fixed wireless Internet	fixed wireless internet

Draženka Levačić

Hrvatsko Katoličko Sveučilište, Zagreb, Republika Hrvatska

Mario Pandžić

Hrvatsko Katoličko Sveučilište, Zagreb, Republika Hrvatska

Dragan Glavaš

Hrvatsko Katoličko Sveučilište, Zagreb, Republika Hrvatska

ULOGA AUTOMATSKIH, SVJESNIH I NESVJESNIH PROCESA MIŠLJENJA U DONOŠENJU KOMPLEKSNIH ODLUKA

Kompleksne odluke su one koje podrazumijevaju odabir između opcija s više obilježja. Određene odluke donosimo brzo, vođeni automatskim procesima mišljenja, dok druge donosimo pažljivo razmatrajući sve faktore. Cilj ovog istraživanja bio je istražiti ulogu automatskih, svjesnih i nesvjesnih procesa mišljenja u kontekstu donošenja odluka. Sudionici su bili studenti psihologije u dobi između 19 i 28 godina. Prvi eksperiment ispitivao je ulogu ova tri različita procesa mišljenja na odabir subjektivno najbolje opcije i heurističke opcije. Drugi eksperiment ispitivao je metakognitivne aspekte donošenja odluka, konkretno, s ciljem utvrđivanja razlike u metakognitivnoj procjeni sigurnosti u odgovor (eng. feeling of rightness, FOR) kao i tendenciji promjene odluke, ovisno o aktiviranim procesima mišljenja. Različiti procesi mišljenja utjecali su na odabir subjektivno najbolje opcije. Sudionici u uvjetu svjesnog procesa mišljenja češće su odabirali subjektivno najbolju opciju u odnose na sudionike ostala dva uvjeta. Međutim, razlika između uvjeta nije pronađena pri odabiru TTB (eng. take-the-best) heurističke opcije. Nije pronađena razlika između automatskog i nesvjesnog uvjeta s obzirom na metakognitivnu procjenu sigurnosti u odgovor, dok je ista podjednako porasla kod sudionika obaju uvjeta nakon što su naknadno uključeni u uvjet svjesnog mišljenja. Tendencija promjene odgovora nakon uključivanja u svjesni uvjet također nije ovisila o početnom uvjetu. Ovo istraživanje potvrdilo je važnost svjesnih procesa mišljenja u donošenju kompleksnih odluka koje su prisutne u svakodnevnom životu, neovisno o području ljudskog djelovanja.

Ključne riječi: donošenje odluke, svjesni procesi mišljenja, nesvjesni procesi mišljenja, automatski procesi mišljenja, metakognitivna procjena sigurnosti u odgovor