Conscious and unconscious thought preceding complex decisions: The influence of taking notes and intelligence.

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Abstract

For many years, research has been done to find the best way to make decisions. Dijksterhuis and Nordgren (2006) formulated the Unconscious Thought Theory (UTT), stating that when making complex decisions it is better not to think consciously, but to direct your attention elsewhere, letting the unconscious make the decision. However, a wealth of research has found evidence against the predictions of UTT. Thorsteinson and Withrow (2009) found that participants, who were allowed to take notes during the information intake stage, made better decisions thinking consciously. The current study is a replication of Thorsteinson and Withrow (2009), being a four conditions design (immediate decision, unconscious thought, conscious thought or conscious thought with notes) with the addition of intelligence as a variable. The conclusion of Thorsteinson and Withrow (2009) is supported: The best complex decisions are made when participants take notes and use them while thinking consciously. Moreover, it is shown that intelligence is positively correlated with better decisions.

Introduction

When you buy a new house or car, you face a complex decision with many choice options that have different advantages and disadvantages. There are several ways to make this decision. You could try to list up all the different attributes of all the choice options, and think deeply about which option best suits your needs. Another strategy would be to make sure you are well informed about the different options, but not to decide immediately. After a good night of sleep, a gut feeling will arise, a preference for one of the options, even though you don't know where it came from. These are two completely different ways of making a complex decision, and throughout the years, there has been a lot of discussion about the intriguing question which of these strategies results in the best decisions.

For a long time, decision-making has been seen as a matter of rationality, objectivity and reflection. According to this view, a good decision can be made by breaking down the decision into small amounts of information, which have to be evaluated separately (e.g., Edwards, 1961; Dawes & Corrigan, 1974).

Later, this view has been challenged. Dijksterhuis, Bos, Nordgren, and van Baaren (2006) formulated the *deliberation-without-attention* hypothesis, stating there is a trade-off between the complexity of a decision and the usefulness of conscious thought when making the decision. To make an easy decision, it is better to think consciously, whereas unconscious thought should be used to solve more complex, broader decision problems. Unconsciousness is believed to have an equal performance, no matter the difficulty level of the choice. Consciousness, in contrast, is especially good at making easy choices, even better than unconsciousness. But as decisions get more complex, consciousness has more problems with decision making, thereby performing worse than unconsciousness (Dijksterhuis et al., 2006) The deliberation-without-attention hypothesis is drawn from the Unconscious Thought Theory (UTT; Dijksterhuis & Nordgren, 2006), which explains the different characteristics of conscious and unconscious thought.

UTT and the deliberation-without-attention effect seemed to explain findings in earlier research (e.g., Wilson & Schooler, 1991; Wilson et al., 1993; Halberstadt & Levine, 1999). Research by other authors, however, led to conclusions that cannot be explained by UTT. In Experiment 1 of Thorsteinson and Withrow (2009), participants had to recall as many attributes as possible, before or after judging the different choice options. Only when judgement preceded recall, results provided evidence for the deliberation-without-attention hypothesis. The authors argued, however, that by recalling attributes, the participants in the unconscious-thought condition engaged in a form of conscious thought. It was also argued that the weighting principle of UTT is based on a weighted-additive model (WADD), but that a TALLY-model is used in research by Dijksterhuis (2004) and Dijksterhuis et al. (2006) to measure the quality of the choice (Newell et al., 2009). A weighted-additive model calculates the quality of a choice by the weight of every attribute, for example, if a cup holder is less important in a car than a good mileage, the cup holder should not get as much weight in the calculation of the quality of the cars. A TALLY-model calculates the options by simply adding the number of positive attributes. A cup holder thus has as much influence on the car's score as a good mileage.

In order to clarify the contradicting findings in the literature, a meta-analysis was conducted by Acker (2008), which showed a large heterogeneity between different studies. It revealed a small but unconvincing advantage in favour of unconscious thought. Since different studies led to other conclusions, more research is needed to clarify under which conditions unconscious thought can be useful.

Previous research showed that unconscious thought does not necessarily perform better under certain circumstances. One specific condition under which unconscious thought seems to lose its advantages is when participants are not obligated to rely on their memory when making a decision. Some research already exists on this topic, but the current study will try to further elaborate some missing parts. Of special interest for the current study, is Experiment 2 of Thorsteinson and Withrow (2009). In this experiment, participants were given the opportunity to overcome their memory limitations, thereby changing the outcomes of the deliberation-without-attention effect. Laboratory studies by Dijksterhuis and colleagues (Dijksterhuis, 2004; Dijksterhuis et al., 2006) follow the same paradigm. Participants are given information about different choice options (e.g., cars, apartments or roommates). After having consciously read all the attributes of the different choice options, they have to make a decision immediately (immediate-condition), after a few minutes of conscious thought (conscious-thought condition) or after a few minutes of distraction (unconscious-thought condition). Thorsteinson and Withrow (2009) included a fourth condition in this paradigm, the conscious-thought-with-notes condition. Participants in this condition were allowed to take notes of the attributes during the presentation period, and use these notes while thinking consciously about their decision. Memory limitations would not influence the quality of the choices of these participants. Participants in the conscious-thought-with-notes condition turned out to make better decisions than participants in the other conditions. The mean unconscious score did not differ significantly from the mean score in the conscious-thought condition without notes. This study thus was unable to replicate the findings of Dijksterhuis et al. (2006), but showed that, when overcoming memory limitations, conscious thought seems to be beneficial for complex decisions. Newell et al. (2009) also included a conscious-thought condition with information in their second experiment. In this condition, participants were provided with an information sheet containing all the attributes, while thinking consciously. Participants in this condition made better choices, but the difference was only significant compared with the immediate condition, not with the unconscious-thought condition. Rey et al. (2009) found that participants in their conscious-thought condition, who also had access to the information while thinking consciously, performed worse. The effect of using a memory aid does not seem clear yet. Too little research has been done to date to draw a clear conclusion. The current study aims to provide a valuable addition on this topic.

Also important is the method Thorsteinson and Withrow (2009) used to measure the quality of the choice. Participants were asked to rate the attributes on importance for them. The description of the four choice options, in this study: non-existing cars (materials from Dijksterhuis et al., 2006), is formulated in bipolar attributes, for example, a car does or does not have a cup holder. Therefore, a score for each car can be calculated for each participant by multiplying the importance score of an attribute with either minus one (if the attribute is negative for this car) or one (if the attribute is positive for this car). As a dependent measure, Thorsteinson and Withrow (2009) calculated the difference between the score of the car with the highest score and the score of the chosen car. A participant thus had a score of zero if the chosen car was the best possible car for this participant, and higher than zero if he/she chose another car. This way, a WADD-model was used to measure the quality of a choice. The current research will include both a TALLY and two WADD calculations (a dichotomous WADD measurement and a continuous variant), in order to find the model that represents best human decision-making.

Despite the diversity of phenomena related to IQ, few have attempted to understand – or even describe – its influences on judgment and decision making (Frederick, 2005). Studies on time preference, risk preference, probability weighting, ambiguity aversion, endowment effects, anchoring, and other widely researched topics rarely make any reference to the possible effects of cognitive abilities (or cognitive *traits*).The majority of studies approach the deliberation-without-attention effect as a universal effect, being applicable to all participants. However, it could be possible that one mode of thought would be more beneficial for some participants, but not necessarily for others. Therefore, individual differences in intelligence will be studied in the current research. The short version of Raven's Advanced Progressive Matrices (Bors & Stokes, 1998) will be used to measure intelligence. To our knowing, no research on the influence of intelligence on the deliberation-without-attention effect has been done to date. However, it might influence the decision quality. A higher intelligence level could be an advantage when processing the information. Furthermore, when using conscious thought to make a decision, the quality of the analysis of the information could be influenced by intelligence.

Experiment

Method

Design and Participants

A total of 341 participants were taken over different educational levels. Participants were recruited from university students and students in secondary education. The sample thus contained participants engaging in academic education (n = 213), general secondary education (n = 37), technical secondary education (n = 41), and vocational secondary education (n = 24). University students participated in exchange for course credits, secondary educational students did so voluntarily. Ages of the participants ranged from 16 to 30, of which 99.1% was 24 or younger. Participants were randomly assigned to one of the four conditions (immediate, unconscious-thought, conscious-thought, and conscious-thought-with-notes condition).

Procedure and Material

As in most research on UTT, the paradigm of Dijksterhuis (2004) was used. All participants were presented 48 attributes from four different, nonexistent cars (12 attributes per car). These stimulus materials were taken from Dijksterhuis et al. (2006), the same as used in Thorsteinson and Withrows (2009) second experiment. Each attribute was formulated either positive or negative. All cars were described on the same 12 features. The Hatsdun had 75% positive attributes, whereas the Nabusi was characterized by only 25% positive features. Two more neutral cars were included, with the Kaiwa having 58% and the Dasuka 50% positive attributes.

Because participants were also recruited under the national legal age for a driving licence, it could possibly be hard for them to imagine buying a car. To make sure that these younger participants would perceive the materials the way intended by the researchers, a pre-test was conducted with a small sample of secondary education students, none of whom participated in the real experiment (n = 13). The materials used by Thorsteinson and Withrow (2009) in their first experiment, which contained attributes from apartments, were tested at the same time, to find out which materials suited best the needs of participants their age. Half the sample were given the attributes in a positive formulation (e.g., “The car has good mileage.”), and were asked to rate the importance of the attributes. The other half received the same attributes, but negatively formulated (e.g., “The car has poor mileage.”) and were asked to rate how bad they felt about the car not having the feature. A mean score for each choice option was calculated, by multiplying the mean score of each attribute by either minus one (if the choice option did not have the feature) or one (if the choice option did have the feature), and summing these. The results showed that, for both sets of materials, features that were intended to be positive, were perceived as positive, and those intended to be negative, were perceived as negative. The choice options were ranked in the same order as intended. Since both sets were suitable, the car-materials were used to make comparison with Thorsteinson and Withrows (2009) second experiment easier.

In the real experiment, participants in the conscious-thought-with-notes condition were instructed that they were allowed to write down whatever they wanted during the presentation of the information, whereas participants in the other conditions were just instructed to pay attention to the attributes presented. They all knew they would have to make a decision on which car they preferred, resulting in impression forming (Lassiter et al., 2009). The 48 attributes were presented in a random order, for eight seconds each, using E-prime software (Psychological Software Tools, Pittsburght, PA).

After the presentation of the information, participants in the conscious-thought conditions had four minutes to think carefully about the different cars. After four minutes, they had to choose the car they preferred. Then they were asked to rate the 12 different attributes on importance, on a scale from one, meaning “no importance at all”, to seven, meaning “very important”. This made it possible to calculate the subjective preferences of each participant. In the unconscious-thought condition, participants were distracted for four minutes by solving anagrams, before they had to make their decision and rate the attributes. In the immediate condition, participants had to choose their preferred car immediately after the presentation of the information, followed by the rating of the attributes, and were then instructed to solve the anagrams as a filler task in order to obtain the same the experiment duration in all conditions.

After these tasks, all participants were asked to fill in the short version of Raven’s Advanced Progressive Matrices (Bors & Stokes, 1998). During the last decade, this has been one of the most widely used instruments by researchers interested in participants’ inductive or analytic reasoning capacities or fluid intelligence (Cattell, 1963). Raven’s Advanced Progressive Matrices (Raven, Court, & Raven, 1988) or APM is a version of these matrices intended for use with people above average aptitude and designed to reliably differentiate among those in the top 25% of the population (Bors, & Stokes, 1998). In the present study a short version of the APM (Bors, & Stokes, 1998) has been used. It is a selection of 14 items with increasing difficulty drawn from Set 2 of the original APM (item 3, 10, 12, 15, 16, 18, 21, 22, 28, 30, 31 and 34). For all 14 items, participants had to indicate which was the missing segment required to complete a 3x3 matrix, which takes about 20 minutes. All parts of the experiment were presented in Dutch.

Results

First, the proportions of participants choosing the best car according to a TALLY-model, were compared between the different conditions, following Dijksterhuis (e.g., Experiment 2 in Dijksterhuis, 2004). As shown in Figure 1, participants in the conscious-thought-with-notes condition performed best, with a proportion of 0.578 choosing the Hatsdun, which had the most positive features. Participants in the conscious-thought condition, who did not take notes, performed only slightly worse (.54). Participants in the unconscious-thought condition made the worse choices, with a proportion of only.32 choosing the Hatsdun. Those who couldn’t engage in any form of thought, in the immediate condition, scored in between the conscious and unconscious-thought conditions, with a proportion of .48 choosing the objectively best car. An ANOVA showed that the main effect was statistically significant: $F_{(3, 337)} = 4.64$, $p < .01$, $MSE = .24$. Tukey contrasts showed that the differences between both conscious-thought conditions and the unconscious-thought condition were significant, with $p < .01$ for the conscious-thought-with-notes condition and $p < .01$ for the conscious-thought condition.

Since UTT is based on a WADD-model, and the proportion of participants choosing the Hatsdun is a TALLY measurement, the best weighted subjective choice options were calculated. For each participant, a unique rating for each car was calculated according to a WADD-model, by summing the importance ratings of each attribute, with the ratings of attributes that the particular car did not have, being counted negative.

It turned out that the Hatsdun was, subjectively, not the best car for each participant. For 23.2% of the participants, another car than the Hatsdun had a higher or equal subjective score, so not choosing the Hatsdun was not necessarily a bad decision for them. Therefore, the proportions of participants choosing their subjectively highest rated car were compared between the four conditions, making it a dichotomous WADD measure (see Figure 2).

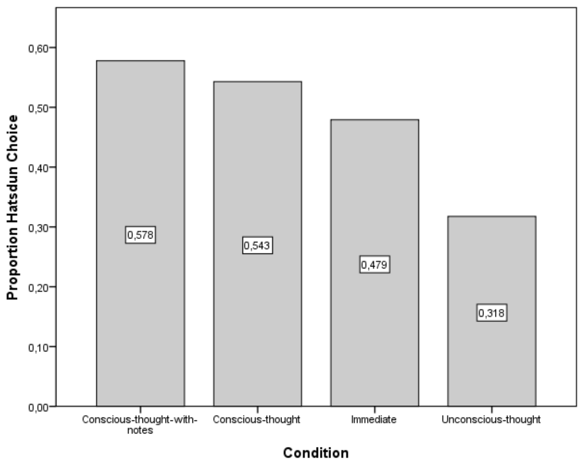

Figure 1. Proportion of participants choosing the best car according to a TALLY-model (the Hatsdun) under different conditions.

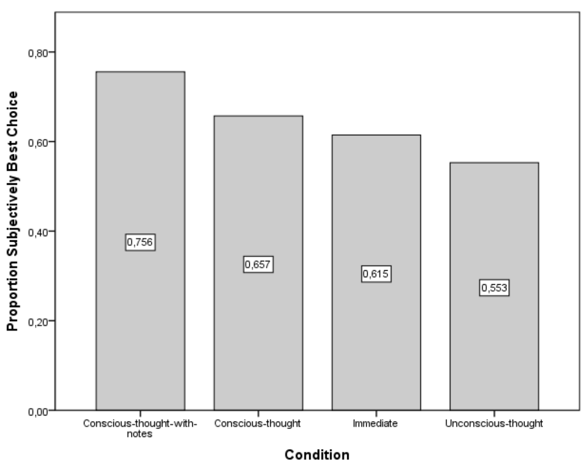

Figure 2. Proportion of participants choosing their best option according to a dichotomous WADD-model under different conditions.

In all conditions, the proportions of participants choosing their subjectively best car were higher than the proportions of those choosing the Hatsdun, indicating that participants in all conditions followed a weighted decision model. The pattern of differences between the conditions changed, but the ranking remained the same. Unconscious thinkers scored relatively better with this weighted measurement, with a proportion of 0.553 choosing their subjectively best car. However they still performed worse than participants in all other conditions. Participants in the immediate condition chose their subjectively best choice option with a proportion of .62, in the conscious-thought condition with a proportion of .66 and in the conscious-thought-with-notes condition with a proportion of .76. An ANOVA revealed that this effect was significant, $F_{(3,\ 337)} = 2.83$, $p < .01$, $MSE = .23$. Post-hoc Tukey contrast showed that participants in the conscious-thought-with-notes condition made significantly better decisions than those in the unconscious-thought condition, $p < .01$.

It could be argued that not choosing the car that suits one's subjective needs best, does not mean the choice was necessarily a bad one, since for some participants the subjective scores of some choice options didn't differ much. For example, one participant had chosen the Kaiwa, with a subjective score of 22, but the best option for this person would have been the Hatsdun, with a score of 24. This choice was not as bad as the choice of another participant who had also chosen the Kaiwa, with a subjective score of -6 as opposed to his best option, the Hatsdun, with a subjective score of 18. Therefore, to measure the real quality of a participant's choice, the continuous WADD calculation of Thorsteinson and Withrow (2009) was used. For each participant, the subjective score of the chosen car was subtracted from score of the car with the highest subjective score. Participants that chose the car that suited them best thus had a difference score of zero. The higher the difference score, the worse the choice made by the participant. This continuous WADD measurement seemed to fit participants' decision patterns best, because 14.2% of those who did not choose their best option according to the dichotomous WADD-model, had a difference score of only two. With difference scores ranging up to 68 in the total population, these choices were not necessarily bad ones. When using the difference score as the dependent variable, the pattern remained the same but the relative difference between the unconscious-thought and the conscious-thought-with-notes condition increased. Participants engaging in unconscious thought had a mean difference score of 6.87, thereby performing only slightly worse than participants in the immediate (6.60) and conscious-thought condition (5.10), but remarkably worse than those in the conscious-thought-with-notes condition, with a mean difference score of only 2.467 (see Figure 3). An ANOVA showed that this effect was significant, $F_{(3,\ 327)} = 2.99$, $p < .01$, $MSE = 122.29$. Post-hoc Tukey contrasts indicated that the difference between the conscious-thought-with-notes condition and the unconscious-thought condition was significant, $p < .01$. The mean difference score of the conscious-thought-with-notes condition was also marginally significantly lower than the mean score of the immediate condition, $p < .05$.

Finally, intelligence seems to influence decision quality. In the total population[1], a positive correlation[2] was found between the scores on the short version of Raven's Advanced Progressive Matrices and the proportion of participants making the best decision according to a dichotomous WADD model (.17). A negative correlation with the difference scores (-.10) also provided evidence that a higher intelligence level leads to better decisions. Within the different conditions, no correlations with the difference scores were found, but the dichotomous WADD scores correlated positively with the intelligence measure in the immediate (.21) and unconscious-thought conditions (.27). In the immediate condition, a correlation with the TALLY measurement (.20) was found.

[1] To make sure the different levels of intelligence were equally spread over the different conditions, t-tests were conducted. No significant differences were found.

[2] All reported correlations are significant at the .05 level except for the correlation with the dichotomous WADD model in the total population, which is significant at the .01 level.

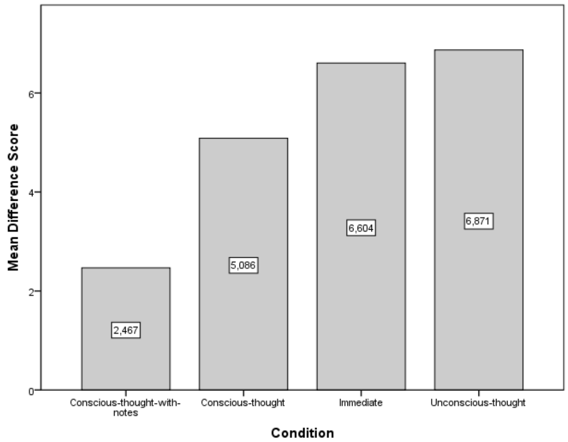

Figure 3. Means of difference scores (continuous WADD-model) under different conditions.

Discussion

The results of this experiment did not support the predictions of UTT. Using three different methods to measure decision quality, including the measurement used by Dijksterhuis (2004), no evidence for a beneficial effect of unconscious thought was found. In contrary, participants in the unconscious-thought condition performed worst of all participants, significantly worse than participants in the conscious-thought-with-notes condition. It thus seems that overcoming memory limitations is enough to make conscious thought a better decision strategy. But even without notes, participants engaging in conscious thought outperformed those engaging in unconscious thought. Even though this difference was only significant when a TALLY-model was used to measure the decision quality, the results of the other measurement methods still show the opposite pattern as predicted by UTT. The results of Thorsteinson and Withrow (2009) were confirmed.

Another important finding is that participants seemed to follow a WADD-model to make their decisions. In all conditions participants chose the car that was best for them, as calculated with a weighted additive model, more often than the car that was best according to a TALLY-model. A continuous WADD-model measured decision quality even better. This finding adds up to the findings of other research in support of using a WADD-model to measure decision quality (Newell et al., 2009; Thorsteinson & Withrow, 2009). Also from a theoretical point of view, a WADD-model should be used, since it reflects the weighting principle of UTT better. However, even when using this weighted measure, conscious thought seems to outperform unconscious thought when notes can be taken. These participants had an advantage since they were able to structure the information and select what to write down, writing only down what they consider important for their decision. These advantages made weighting easier. Under these circumstances, it thus seems that conscious thought is beneficial.

Individual differences also seemed to influence decision quality, but not under all circumstances. For the overall population, intelligence seemed beneficial for the decision quality, but in the conscious thought conditions, no correlation could be found. This might be due to the overall better decisions made in these conditions.

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