

**The rational unconscious: Conscious versus unconscious thought in complex
consumer choice**

Ap Dijksterhuis, Rick. B van Baaren, Karin C.A. Bongers, Maarten W. Bos, Matthijs L.
van Leeuwen & Andries van der Leij

Radboud University Nijmegen

This chapter was supported by a VICI-grant from NWO (453-05-004) awarded to the first author. Correspondence can be directed to: Ap Dijksterhuis, Behavioral Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands; e-mail: a.dijksterhuis@psych.ru.nl

Two ways to look at rationality

One of the authors vividly remembers the day he visited a US supermarket for the first time. He was asked to buy, among a few other things, breakfast cereal for his partner. In the Netherlands (where all authors are from), supermarkets are much smaller than in the US. Moreover, they rarely have more than 5 or 6 different alternatives to choose from, whether it is for peanut butter, yoghurt, or breakfast cereal. One can imagine the bewilderment the moment he had turned the corner and faced the aisle with the cereal. In fact, it was not just “the aisle with the cereal” but simply the “cereal isle”. All six shelves, for their entire 100 or so foot length, contained different versions of this bland, sawdust-based stuff that some people eat for breakfast. Too many alternatives can lead people to not make a choice in the first place (Schwartz, 2004; Iyengar & Lepper, 2000), and indeed, the authors’ first inclination was to walk on and not buy any cereal at all. However, anticipating that not buying anything would lead to disappointment at home, he chose a different strategy. After taking a deep breath, he just grabbed the first box he saw and quickly left the aisle.

Was this a wise choice? His partner was disappointed by the choice (“no wonder you think cereal tastes like sawdust. This indeed does. But some other brands...”), but fortunately, choosing poor cereal has only minor consequences. However, other choices are important, sometimes extremely important, and making poor choices in such cases can have very serious consequences.

Because choosing can have such profound consequences, it has received a lot of attention from philosophers and scientists. In most scientific contributions, choosing and decision making is approached from a normative perspective. The emphasis was often

less on how we make decisions than on how we, ideally, *should* make decisions. Another way to conceive of it is to conclude that a lot of scientific effort was aimed at how rational (or irrational) our decisions and choices generally are.

Now, how do our choices hold up against the standard of rationality? Obviously, the answer to such a question is dependent on one's definition of rationality. Although most people will have some intuitive sense of what a rational (or an irrational) decision entails, defining the construct is not a trivial matter. There are two distinct ways to look at rationality with diverging consequences for how decision making should be investigated. Broadly stated, one can make the distinction between rationality from a normative viewpoint, and rationality from a subjective viewpoint. Evans and Over (1996; 1997; see also Chater, Oaksford, Nakisa, & Redington, 2003) defined the normative version as follows: "Thinking, speaking, reasoning, making a decision, or acting *when one has a reason for what one does sanctioned by a normative theory*". (Evans & Over, 1997, p. 2, italics added). The second definition they offer is more subjective: "Thinking, speaking, reasoning, making a decision, or acting *in a way that is generally reliable and efficient for achieving one's goals*" (Evans & Over, 1997, p. 2, italics added)¹.

For a long time, the first, normative, definition was the one favored by researchers interested in decision making. However, preferences seem to be shifting and various people opt for use of the second, subjective, definition (e.g., Evans & Over, 1997; Gigerenzer & Goldstein, 1996; Stanovich & West, 1999). A big problem with using a normative definition is that it irrevocably leads to the somewhat sobering conclusion that human decision makers are often highly irrational. The number of well-documented phenomena on human decision making that show violations of rationality is humongous

(Kahneman & Tversky, 2000; Shafir & LeBoeuf, 2002). This is insightful, but it also strongly suggests it is illuminating (though also more difficult) to pay more attention to people's own goals and standards. It does us more justice. More importantly, it makes more sense from both a psychological and from an evolutionary perspective to use a subjective definition (Cosmides & Tooby, 1996). Evolution cares about whether people achieve their goals (especially the most basic ones such as to find food, to avoid danger, or to procreate) and psychology -to some extent at least- reflects these priorities. Conversely, normative demands such as "logic" or "consistency" are concerns that are at best indirectly related to evolutionary development.

Choosing without constraints

When we compare decisions people make to standards of subjective rationality, what can we conclude? First, it is important to realize that a subjective definition of rationality does not necessarily imply that the standards we compare people to are less extreme or taxing. Some have argued that normative rational standards are simply too demanding in that they are unrealistic in their level of perfection (e.g., Gigerenzer & Todd, 1999). There is no doubt that this is true, but a subjective definition of rationality in terms of the degree to which a decision or choice fulfills people's goals can be made just as extreme or unrealistic. Consumers generally buy mundane things (i.e., a new set of towels) with the implicit goal to mildly increase happiness (or decrease unhappiness) and one could conclude that almost all such choices are irrational because they almost always fail to unleash extreme happiness. There is no point in expecting a new set of towels to change life satisfaction in a significant and enduring way.

That being said, we do make choices that do impact happiness in pronounced ways, such as when we choose between jobs or houses. The question we want to address here is how we should approach such choices, with the criterion of maximizing subjective rationality. Which decision strategy leads us to fulfill our goals? In other words, when we face a complex, important decision, how should we deal with it in order for the outcome to be highly rewarding, for it to maximize happiness and to minimize negative emotions such as regret?

Let us start with a thought experiment, in which we are allowed to choose without any of the usual psychological constraints. There is no time pressure and there are no computational constraints. Furthermore, we have all the information relevant for the choice at hand. Not only is there no time pressure, time in itself is not precious. We do not have anything else to do other than to make our choice in the most perfect way possible. That is, we can use all our powers to make the best possible choice. How should we try to achieve this? How should we choose between spending our holiday in Bora Bora, the Seychelles or the Virgin Islands?

Most people would agree we should engage in what is often called the weighted adding strategy (e.g., Bettman, Luce & Payne, 1998; Edwards, 1961; Janis & Mann, 1977). In this strategy, the chooser first weights the relative importance of various attributes, such as the water temperature, the size of the balcony of the hotelroom, or the availability of cereal for breakfast in the hotel. Subsequently, choice alternatives are assigned values for each these attributes (“Excellent, no problems on the cereal front. Cereal is banned in the Seychelles”). Finally, these values are, for each choice alternative,

multiplied by the relative importance. The resulting scores represent the utility or relative desirability of each alternative.

The problem with the weighed adding strategy is that it is very demanding. After all, we do not live in an ideal world and decision makers *do* face constraints. Our computational abilities are limited, we are often pressured for time and resources, and we often have to choose between alternatives in the absence of (part of) the relevant information. Indeed, most theorists would agree that the weighted adding strategy is nothing more than an interesting ideal, but that it does not constitute a useful tool in real life. Researchers who have investigated the extent to which actual decision makers engage in weighted adding drew sobering conclusions: We rarely do it and even if we try, we are not very good at it (e.g., Dawes, 1979; Swets, Dawes & Monahan, 2000).

This conclusion notwithstanding, in the present paper our goal is to try to advocate weighed adding as a useful decision making tool. Too much skepticism may lead us to throw away the baby with the bathwater. Research findings show indeed that people have not been good at successfully using the weighted adding strategy. However, we argue that it is not so much weighted adding itself that is out of reach for people. Instead, poor performance is often caused by the fact that people rely too much on conscious deliberation. Most people believe, explicitly or implicitly, that the more one consciously deliberates about a choice, the closer one can come to the ideal of weighted adding. Our thesis is that this belief is unjustified, and that, ironically, weighted adding becomes more attainable the more we rely on unconscious processes.

In the remainder of this chapter, we first discuss the problems we face when we apply conscious thought or conscious deliberation to complex choice tasks. In the second part we discuss the potential benefits of employing the unconscious.

Some silly errors

What do we do wrong when we make complex choices? The list of empirical demonstrations of human error in decision making is almost endless, but one of the key problems seems to be that people are not good at weighting the relative importance of attributes, or of things in general. In more sophisticated terms, people often do a poor job assessing expected utility.

Recently, one of us read a newspaper article that documented an interesting example of what we may call a “weighting error”. When buying a house, one trade-off people have to make is between the size of the house and the length of the daily commute to work. Most people (note that the example comes from a Dutch newspaper) work in city centers. As city centers are expensive, a preference for a short commute by necessity means one is forced to buy a small house or apartment. Large houses are affordable, but only for those who are willing to live in the countryside and to face a long commute. It seems that many people think about this trade-off, and many eventually choose the large house. After all, a third bathroom is very important for when grandma and grandpa come over for Christmas, whereas driving two hours each day is really not that bad. Anecdotal evidence has it that a lot of these people come to regret their choice. A long commute *does* become a big burden over time, whereas a third bathroom is a completely superfluous asset for at least 362 or 363 days each year.

Empirical demonstrations of such weighting biases abound. An already classic demonstration was published by Kahneman and colleagues (Kahneman, Frederickson, Schreiber & Redelmeier, 1993). Their experiment is as simple as it is illuminating. Participants went through two unpleasant experiences: They had to put their hand in very cold water for one minute, and they had to put their hand in the water for 90 seconds, whereby the last half minute was somewhat less cold, but still unpleasant. If asked which experience they would want to repeat, most participants chose the longer period. Participants neglected the duration and preferred the option with more overall pain, but with less pain on average. Additional research (e.g., Redelmeier & Kahneman, 1996) showed that people use a “peak-end” rule to assess pleasantness of unpleasantness of an experience. The extent to which a past experience is good or bad is based on the most intense part of the experience and on the intensity at the end of the experience.

Gilbert, Wilson and colleagues (e.g., Gilbert, Pinel, Wilson, Blumberg & Wheatley, 1998) found that people are generally bad predictors of future emotional experiences. When people are asked to estimate their emotional reactions to important events, they tend to think these reactions are more intense and more enduring than they really are. For example, young professors who were asked how they would feel after having been denied tenure predicted they would be much more devastated than they later really were. This bias in estimating future feelings is important, as anticipated feelings are often taken into account when people make decisions (e.g., Zeelenberg & Beattie, 1997).

Another problem is that decision makers seem to be often inconsistent in their weighting. They may either be inconsistent over time, or between different contexts. The

phenomenon of “preference reversal” demonstrates this. What would you prefer, bet A with a $29/36$ probability of winning 2 Euro’s, or bet B with a $7/36$ probability of winning 9 Euro’s? If you are like most people, you prefer Bet A. However, if you ask people what they would be willing to pay for either of these bets, the majority finds bet B to be more valuable (see Tversky, Sattath & Slovic, 1988; Tversky, Slovic & Kahneman, 1990, for more information on why this bias occurs). Hsee (1996) showed that such inconsistencies can also be caused by the context. When people compare two dictionaries, a torn one with 20,000 entries and a brand new one with 10,000 entries, most people prefer the torn one. However, when different people judge them separately, the new one with the lower number of entries is generally seen as more valuable.

As the examples above demonstrates, human decision making is prone to serious errors and oddities. An intuitive reaction may be to blame such errors on people’s lack of motivation to engage in serious conscious thought. Can’t we avoid such errors if we just deliberate a little more? Although it is certainly true that conscious thought can help to prevent some problems, the general rule that conscious thought makes choices and decisions better, intuitive as it may sound, is wrong. Often conscious thought does not help, and sometimes it actually makes matters worse. The bottom-line is that the relation between conscious thought and quality of decision making is complicated, with multiple moderators affecting whether deliberation helps or hinders (e.g., Dijksterhuis & Nordgren, 2006; Lerner & Tetlock, 1999; Wilson & Schooler, 1991).

In what follows, we describe some examples of conscious thought leading to inferior decisions, as these examples are relevant for explaining why conscious thought is not suitable for weighted adding. We start by discussing the relation between conscious

thought and the biasing effects of heuristics on choice. Subsequently, we give more direct examples of poor weighting as a consequence of conscious thought.

Dodgy deliberation part 1: Heuristics and biases

A common finding in the literature on decision making is that people are vulnerable to the influence of how decision problems are framed. Tversky and Kahneman (1981; see also Kahneman & Tversky, 1979) discovered that whether choice outcomes are framed in terms of gains or losses has a profound effect on choice. The well-known “Asian disease” problem provides a good example. Assume 600 people are infected with a disease. You have to choose between two intervention programs, both framed in terms of gains: With program A, you save 200 people. With program B, you have a $1/3^{\text{rd}}$ chance you save all 600 people, and a $2/3^{\text{rd}}$ chance no one will be saved. Faced with this dilemma, most people avoid risk and choose program A. However, one can also frame the choice in terms of losses: With program A, 400 people will die. With program B you have a $1/3^{\text{rd}}$ chance no one will die, and a $2/3^{\text{rd}}$ chance all will die. In this case, most people choose to be risky and select program B.

There is no rational argument for the influence of framing in such a context. In fact, the two decision problems are exactly the same. Indeed, if framing is studied with a within-participants design whereby participants see both the gain and the loss frame (like the readers of this chapter), the effects is attenuated because most people realize that the choice alternatives amount to the same thing (Stanovich & West, 1998; see also LeBoeuf & Shafir, 2003). Now can one prevent framing effects by asking people to engage in more conscious thought? Can deliberation inhibit this odd bias?

Igou and Bless (in press) tested the relation between amount of conscious thought and framing effects. Interestingly, they found the opposite of what one may have expected intuitively. In various experiments, it was shown that more conscious thought led to more pronounced framing effects. In one experiment, for instance, some participants were given the “Asian disease” problem with the cover story that it was just some statistical problem they had to solve. Others were presented with the problem under the guise of an actual medical problem. The people who treated it as a medical problem spent more time thinking about it than the people who merely thought it was a statistical problem, and they showed larger framing effects. In a second study, Igou and Bless demonstrated that the more motivated people are to deliberate about a choice, the bigger framing effects become.

In general, there is strong evidence demonstrating that more motivation to deliberate does not simply lead to better choices. Camerer and Hogarth (1999; see also Shafir & LeBoeuf, 2002) reviewed 74 studies on the relation between motivation (manipulates with incentives) and proneness to heuristics and biases. Although they found that motivation occasionally helps, it can just as well hinder choosing. The problem is that whatever the decision problem is, people always have to apply the right strategy to solve it. More motivation may occasionally help, but often it just leads to more enthusiastic application of a wrong strategy, thereby rendering choices to become inferior (e.g., Arkes, Dawes and Christensen, 1986).

A nice example of this deleterious effect of motivation was reported by Pelham and Neter (1995). Participants in their experiments were asked to solve various problems. Some problems were transparent and easy to solve, whereas others were difficult and to

solve them correctly participants had to avoid certain pitfalls (i.e., they ran the risk of using heuristics that would lead them astray). For instance, some were confronted with the “hospital problem” as used by Kahneman and Tversky (1972), which reads as follows:

“A certain town is served by two hospitals. In the larger hospital, about 45 babies are born each day, and in the smaller hospital, about 15 babies are born each day. As you know, about 50% of all babies are boys. Sometimes it is higher than 50%, sometimes lower. For a period of one year, each hospital recorded the number of days on which more than 60% of the babies born were boys. Which hospital do you think recorded more such days? A) the larger hospital, B) the smaller hospital, or C) about the same”.

As outcomes that deviate from normal (i.e., expected) probabilities are more likely to occur the smaller the sample is, answer B is the right answer. However, 56% of the original Kahneman and Tversky participants chose C. Pelham and Neter gave some of their participants this hospital problem, but gave others an easier, very transparent version. In this transparent version, the smaller hospital had “only 2” babies per day (rather than 15), and each hospital recorded the number of days on which all (100%) of the babies born were boys (rather than 60%).

Importantly, some people were simply asked to solve the problems, whereas others were strongly motivated to solve the problems accurately. As it turned out, this increased motivation helped participants to be more accurate on the easy, transparent problem, but it hindered solving the complex problems. If one is willing to make the rather safe assumption that the motivated participants engaged in more and/or more thorough conscious thinking, it means that conscious thought led to poor decisions.

As said earlier, more conscious thought may occasionally help, but often it just leads to more enthusiastic application of a wrong strategy, or, as Pelham and Neter put it (1995, p. 583): “If the only tool at a person’s disposal is a hammer, convincing the person to work harder can only lead to more vigorous hammering”.

Finally, in our own lab we once tested the role of time of conscious thought on the biasing effects of the availability heuristic (Tversky & Kahneman, 1973). In the experiment (Dijksterhuis, 2003), participants were asked to estimate how many people die each year – in the Netherlands – as a result of three different causes: AIDS, traffic accidents, and homicide. Participants were asked to come up with a number for each cause either within 12 seconds, or they were asked to think carefully and were given 45 seconds per cause. Use of the availability heuristic would lead to a relative underestimation of people dying of AIDS, and an overestimation of homicide victims, with the traffic deaths falling in between. As expected, people who thought extensively for 45 seconds per cause indeed showed this effect, whereas people who had to estimate within 12 seconds hardly showed signs of the availability heuristic. Again, conscious thought made matters worse.

Dodgy deliberation part 2: Poor weighting

Whereas the work described above shows the negative effects of conscious thought on various aspects of decision making, there is also evidence that is related more directly with the theme of this chapter: The human (in)ability to engage in weighted adding. Again, whereas we know that proper weighted adding is difficult, most people also believe that we can come closer to achieving proper weighted adding by more conscious deliberation. However, this is simply not true.

Wilson and colleagues (e.g., Wilson & Schooler, 1991; Wilson et al., 1993; see also Levine, Halbertstadt & Goldstone, 1996) have demonstrated that conscious contemplation disturbs what they called “natural weighting schemes”. In one well-known experiment, Wilson et al. (1993) compared post-choice satisfaction of people who chose from five different art posters. Some participants had been merely asked to choose, whereas others had been asked to deliberate. More specifically, they had been asked to carefully scrutinize the reasons for their preference. The expectations of the experimenters were confirmed a few weeks later when post-choice satisfaction was assessed. People who engaged in thorough conscious thought were less happy with their choice. Wilson and colleagues (1993, p. 332) attributed this to suboptimal weighing: “...Introspection...can change an optimal weighing scheme into a suboptimal one. When people analyze reasons, they might focus on those attributes of the attitude object that seem like plausible causes of the evaluations but were not weighted heavily before”. Conscious thought leads people to put disproportionate weight on attributes that are accessible, plausible and easy to verbalize (see also Schooler, Ohlsson & Brooks, 1993), and therefore too little weight on other attributes. Recently, we (Dijksterhuis & van Olden, 2006) replicated and extended this experiment (it will be discussed more extensively later in this chapter).

There is also research on how *consistently* people weight attributes. In experiments by Levine, Halberstadt and Goldstone (1996), participants had to evaluate a large number of faces that varied along 6 dimensions (such as the shape of the nose). Participants either merely evaluated these faces, or they had to think about the reasons for their evaluations before doing so. Of interest to the experimenters was the way people

used and weighted the six dimensions to evaluate the faces. The data clearly demonstrated that conscious thought made weighting more varied and inconsistent.

In a series of experiments by Nordgren and Dijksterhuis (2007) participants were asked to make a variety of judgments including the attractiveness of Chinese ideograms or the extraversion of people on the basis of their faces. However, participants judged the exact same stimuli twice, sometimes after a 45 minute delay, in other cases after weeks. Importantly, some participants were asked to judge quickly, whereas others were asked to engage in thorough conscious thought. People who engaged in thorough conscious thought showed more rather than less inconsistency. Quick “gut” judgments were clearly more consistent over time than judgments that were made after conscious reasoning. In addition, conscious reasoning did not lead to better judgments. In one experiment, participants repeatedly judged the quality of various pieces of art. Both what is considered good art (from MOMA, the Museum of Modern Art in New York) and bad art (from MOBA, the Museum of Bad Art in Boston) was included. Conscious thinkers were again less consistent over time but not more accurate. The conclusion was drawn that rather than making judgments more consistent, extensive conscious thought just introduces noise, rendering judgments less consistent. Overall, it seems that conscious thought often disturbs rather than helps weighting.

Bounded rationality or bounded consciousness?

As we said before, treating weighted adding as an unrealistic ideal may be like throwing the baby out with the bathwater. The fact that consciousness sometimes does such a poor job does not yet mean people cannot engage in any weighted adding at all, as we have other means than our conscious processes. Our rationality is bounded (Simon,

1955), but this is at least in part caused by the fact that consciousness is bounded. A simple analysis of what is needed for proper weighted adding combined with an analysis of what we know about consciousness makes it transparent why conscious thought is not all that suitable for weighted adding (for a more elaborate discussion, see Dijksterhuis & Nordgren, 2006).

First, in order to engage in weighted adding for a complex choice (e.g., comparing three holiday destinations on a large number of dimensions) one needs quite a bit of processing capacity. One could help capacity by writing attributes on a list, but most people will still spend at least some time thinking about a complex choice in the absence of such a list. This is potentially problematic, because one cannot fit much information in consciousness at the same time. One can think about a single attribute (“The hotel on the Seychelles provides a better breakfast than the hotel on Bora Bora”), but a simultaneous consideration of a lot of information is impossible for consciousness. This incapability of integrating large amounts of information with conscious processing can come at the cost of the quality of decisions because it hinders a full appreciation of complex alternatives (Dijksterhuis, Bos, Nordgren & Van Baaren, 2006). To quote filmmaker David Lynch, with a “golf-ball-consciousness” one cannot get more than a golf-ball-size appreciation of what was dealt with consciously.

Even more important than capacity is the ability to weight the importance of attributes itself. In a sense, one could argue that for proper weighting, two things are needed. The first is obvious, it is the capacity to establish proper weights based on diagnostic information. The second is that once such weights are established (or perhaps while establishing these weights), one should refrain from allowing noise to interfere

with this process. Like Wilson and colleagues (Wilson & Schooler, 1991), we believe that consciousness does interfere: In popular terms, it often screws things up (Dijksterhuis & Nordgren, 2006).

In the previous sections, we have given some examples of noise introduced by conscious thought. First, Wilson and colleagues showed that we rely more on attributes that are verbalizable, accessible, and plausible and less on attributes that do not qualify as such. Language is consciousness' favorite tool, so it is no wonder that conscious thought leads to a restriction to information that is verbalizable. There are circumstances under which this is not necessarily bad, such as when a decision should be based largely or solely on verbalizable information. For most people, a laptop is a good example, as it really amounts to comparing verbalizable, usually numerical specifications. However, it can also have consequences that are highly problematic, as especially our most important choices (partner, job, house) do and *should* at least in part rely on attributes that are not easy to verbalize. One could ask a friend why she/he loves her/his partner, and of course, cooperative and intelligent as friends go, one will probably get an answer that sounds both sweet and plausible. But does such a verbal description really gets anywhere near the psychological "essence" of what love is? Of course it doesn't. Consciousness doesn't know anything about such matters.

Second, as we have seen, more conscious thought sometimes leads us to rely even more on (contextual) information that we should really ignore, such as gain/loss frames. In addition, conscious thought can lead us to rely on weird little theories. A nice example is the diversification bias (Simonson, 1990). In an interesting experiment, Simonson asked students to choose one of six snacks they could consume in three future classes. If

students choose before each class, they generally choose their same favorite snack over and over again. However, if students have to choose three snacks for three future classes at once, they more often opt for variety. Students base this choice on the generally erroneous theory that it is nicer to have variety rather than to stick to the same snack. Plausible as this may sound, it really makes more sense to choose the same favorite snack. It is your favorite after all, and it is highly likely it will be your favorite tomorrow and next week. Indeed, Simonson showed that students who opted for variety later experienced regret.

To recapitulate, conscious thought is not a good instrument for weighted adding. The capacity of consciousness is low making it difficult to deal with complex problems. Moreover, conscious thought introduces a number of biases that can lead to very poor assessments of the relative important of attributes.

Unconscious thought

In recent years, we have conducted research on what we called “unconscious thought”. The idea for unconscious thought was partly derived from old work on incubation. The process of incubation is especially relevant for creativity and problem solving. After an initial period during which people gather information, it is at times not fruitful to continue to concentrate on a problem consciously. Instead, a period during which the unconscious can think while conscious attention is directed elsewhere – in other words, a period of incubation – is often helpful².

The key distinction between conscious thought (what we associate with normal thought) and unconscious thought is based on attention. We defined conscious and unconscious thought as such: “Conscious thought refers to the cognitive and/or affective

task-relevant processes one is consciously aware of while attending to a task. For instance, one may compare two holiday destinations and consciously think “The Spanish coast is cheap but I do not want to go there because it is way too crowded.” Unconscious thought, on the other hand, refers to cognitive and/or affective task-relevant processes that take place outside of conscious awareness. One may compare two holiday destinations and not know which one to choose. Subsequently, one does not consciously attend to the problem for a few days, and suddenly the thought “It’s going to be Tuscany!” pops into mind. This thought itself is conscious, but the transition from indecision to a preference a few days later is the result of unconscious thought” (Dijksterhuis, 2004, p. 586-587)³.

Recently, we formulated a theory called Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006) about the strength and weaknesses of both unconscious and conscious thought. The theory is in part based on recent research from our own laboratory. We started our research by comparing conscious and unconscious thought in the context of decision making. In the first series of experiments, we did the following. First, participants read information pertaining to a choice problem. For instance, they would be presented with information about four different apartments, whereby each apartment was described by 12 different aspects. We rigged the information in such a way that one apartment had much more positive attributes (and therefore less negative) than the others. After participants had read all the information, some were asked to choose between the apartments immediately. Others were given some time to consciously think before they chose, whereas a third group was distracted for a while after which they were asked to choose. Participants in this latter group were hypothesized to engage in

unconscious thought. What we generally found with this paradigm is that unconscious thinkers make better decisions than either conscious thinkers or immediate choosers (for more details, see Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren & van Baaren, 2006; Dijksterhuis & Nordgren, 2006). Moreover, we have also obtained the effects for participants who chose an actual object (such as poster) rather than a hypothetical one and whereby quality of choice was operationalized as post-choice satisfaction (Dijksterhuis et al., 2006; Dijksterhuis & van Olden, 2006). We dubbed the effect that unconscious thought improves decisions the “deliberation-without-attention effect” (Dijksterhuis et al., 2006)⁴.

In addition, unconscious thought is an active process. Some have argued that the increase in quality of a decision after unconscious thought is merely caused by distraction. That is, an alternative explanation for our effects in the unconscious thought conditions is the process of set-shifting (see e.g., Schooler & Melcher, 1995). According to this alternative explanation, the beneficial effects of a period of distraction from a decision problem does not necessarily result from an active unconscious thought process, but from the disruption of counterproductive conscious thought. For instance, people often approach a problem with wrong cues, wrong heuristics and/or wrong information. Following a period of distraction, such wrong approaches become less accessible or are forgotten altogether. The effects of distraction on a change of mental set can be both very pronounced (such as when one tries to solve a chess problem and initially gets truly “fixed” in thinking along a wrong path) or more subtle (such as when distraction attenuates the biasing influence of primacy or recency effects). Such processes are often

categorized under the umbrella of the “fresh look” explanation: Putting a problem aside for a while allows for a fresh, unbiased new look.

In a recent set of experiments, we refuted this possibility by demonstrating that unconscious thought is a goal-dependent process (Bos, Dijksterhuis & van Baaren, 2007). In our experiments, we again gave participants information about a decision problem. We then compared two groups of participants who were both distracted before they made a decision. One group was given the same instructions as in the unconscious thought conditions of our previous work. They were told that we would later ask them some questions about the decision problem before they were distracted. The other group did not receive these instructions: They were told that they would not be asked anything later on. In other words, one group had the goal to further process the information, whereas the other group had no such goal. Results showed that the former group made better decisions than the latter. This means that unconscious thought is a goal-dependent process, and merely distracting people does not help them.

Unconscious weighted adding 1: Capacity

The fact itself that unconscious thought can facilitate decision making does not yet imply it will bring us closer to the “ideal” of proper weighted adding. However, we think there are reasons to believe that indeed it does.

As we have argued before, weighted adding in the context of relatively complex decisions involving many dimensions requires large processing capacity. In fact, we concluded that this was one of the reasons conscious thought is not really suitable for weighted adding. Unconscious thought, however, has a much larger capacity than

conscious thought which renders it a more suitable candidate for weighted adding. At least capacity constraints will not be in the way.

In another recent set of studies, we (Dijksterhuis, Bos, Nordgren & van Baaren, 2006) compared choices between simple products and complex products. There are of course many ways in which simple or complex can be operationalized, and we looked at one relevant dimension: The number of relevant attribute dimensions. Examples of simple products with few relevant attributes are CD's (where most people really only care about the music) or a dishwashing brush (where most people do not really care about anything at all). Examples of complex products are cars or houses (where most people want to take into account many different attribute dimensions). As predicted, unconscious thinkers made better decisions about complex products than conscious thinkers. However, this effect disappeared or was even reversed for simple decisions. In sum, when capacity becomes an issue – that is, for complex products – unconscious thought led to comparatively better choices.

Unconscious weighted adding 2: weighting itself

One of the principles of the Unconscious Thought Theory is the following (and note that it is based on the work by Wilson and colleagues discussed earlier): *The unconscious naturally weights the relative importance of various attributes. Conscious thought often leads to suboptimal weighting because it disturbs this natural process* (Dijksterhuis & Nordgren, 2006, p. 99-100). The second part of the principle received a lot of attention earlier in this chapter when we discussed the fallacies on conscious thought. It now time turn to the first part. Do we engage in weighted adding when we think unconsciously? And if so, how?

We concede that the evidence for superior unconscious weighting is still limited, but we have some hints that we also described in Dijksterhuis and Nordgren (2006, p. 100). One experiment will be discussed again here. Recently, we (Dijksterhuis & van Olden, 2006) replicated and extended the “poster-experiment” by Wilson and colleagues discussed before. Participants chose a poster (out of 5) to take home under one of three different conditions. They either chose after looking at the posters briefly, after briefly looking at them and then thinking about them for nine minutes, or after nine minutes of unconscious thought following a brief look. Participants took their chosen poster home and were called a few weeks later to find out how they felt about their choice. As expected, participants who thought unconsciously were happier with their poster than participants in the other two conditions. In addition, when asked for what amount of money they would be willing to sell their poster, they indicated a sum twice as high as conscious thinkers.

It is possible that conscious thinkers chose poorly because they were indecisive. However, it is also possible that they had a clear preference for the wrong alternative, or, in other words, that they weighted poorly. Right after we asked participants to choose, they were also asked to give their attitude towards each individual poster. By subtracting the average attitude of the four non-chosen posters from the attitude towards the chosen one, we calculated the extremity of their preference. As it turned out, conscious thinkers actually had the clearest preference, whereas unconscious thinkers were relatively indecisive. However, correlations between the attitude towards the chosen poster and later satisfaction revealed that for immediate choosers and for unconscious thinkers, attitudes predicted later satisfaction. This was not the case among conscious thinkers. In

other words, unconscious thinkers (and immediate choosers) weighted much better than conscious thinkers.

In a recent set of studies, we (Dijksterhuis, Bos, van Baaren & van der Leij, 2007a) looked at weighting more closely in experiments in which we compared immediate deciders and unconscious thinkers. We used a paradigm based on work by Alba and Marmorstein (1987). Participants received information about a choice problem. Some objects (in our case, cars) had few positive attributes and many negative ones. However, the positive aspects were highly important (e.g., good gas mileage, excellent safety) whereas the many negative attributes were unimportant (e.g., no cupholders, no sunroof, no logo on the grill, etc.). In contrast to these what we may call “Quality-cars”, other cars were the exact opposite: They had many positive attributes that were unimportant (cupholders, sunroof, nice logo on the grill, etc.) and few negative but important attributes (poor safety and gas mileage). These we called the “Frequency-cars”. In our experiments so far, we showed that participants generally chose quality-cars over frequency-cars, which shows they engaged in appropriate weighting. However, the effects differed under different conditions. Whereas immediate choosers indeed weighted to some extent (about 75% chose the quality car), unconscious thinkers showed much stronger weighting effects, up to the point that almost all unconscious thinkers (> 90%) chose the quality car.

Towards explaining how

As we have seen, when we think unconsciously, we generally have enough capacity to engage in weighted adding, even for relatively complex problems. Moreover, recent evidence shows that we do indeed engage in weighting to at least some extent. The

intriguing question is how such an unconscious weighting process ensues. We concede that our current knowledge is both incomplete and speculative, but there are a few avenues that are useful to explore. We briefly discuss two such ideas. The first is based on commonalities between unconscious thought theory and fuzzy trace theory. The second is based on the idea of implicit learning.

To explain what both conscious and unconscious thinkers may do in the paradigm we often use, we can borrow insights from fuzzy trace theory (e.g., Brainerd & Reyna, 1990). Fuzzy-trace theory assumes that people encode information in two ways. They distill both the gist of the information, as well as a verbatim representation. It is tempting to believe that a verbatim storage of information is somehow better because it is more precise, but a host of research shows that it is not (e.g., Reyna, Lloyd & Brainerd, 2003). Verbatim representations are relatively instable and unreliable. Indeed, when people have to judge or decide, they rely more on gist representations and less on verbatim representations the more experienced they are with the decision domain. Reyna, Brainerd and colleagues have collected an impressive amount of evidence showing that reliance on gist rather than verbatim representations improves performance.

It is likely that unconscious thought works on gist representations whereas conscious thought relies more on verbatim representations. This could explain why conscious thought makes weighting less consistent, as was shown by Levine et al., (1996) and Nordgren and Dijksterhuis (2007). After all, verbatim representations themselves are less stable. Of course, for gist based decisions to be sound, one needs to be able to infer the correct gists for encoded information in the first place. However, this becomes easier with more practice and it is no wonder that experience leads people to use more gist-

based strategies (Reyna, 2004). This is consistent with recent work in our laboratory in which we show that the quality of decisions correlates with experience with the domain for unconscious thinkers. In recent studies (Dijksterhuis, Bos, van Baaren & van der Leij, 2007b) we have asked participants to predict results of sports events. As expected, unconscious thought is more effective for people with more experience. One would expect the same for conscious thought, but we actually find a surprisingly low correlation between experience and quality of decisions for conscious thinkers. This is fully in line with fuzzy-trace theory: Experience helps with gist-based decisions, much less so with verbatim-based decisions.

The fact that unconscious, gist-based processing can be very effective is likely also helped by the fact that we can apply implicit knowledge during unconscious thought that we do not apply during conscious thought. That is, knowledge that is inaccessible to consciousness will probably not be used during conscious thought, but it may be well be applied during gist-based, unconscious processing. Recently, Lieberman (2003) made a strong claim for an intimate relation between implicit learning and intuition. Intuitive processes may seem to appear out of nowhere, but they are often based on an impressive amount of implicit knowledge. An anecdote that comes to mind is one used by Malcolm Gladwell in his book *Blink* (2005). A few years ago, a Los Angeles based museum bought a Kouros, an old Greek statue. Before they acquired it however, they did some tests to check whether it was a forgery or not. Everything seemed fine, until one or two very experienced and knowledgeable art connoisseurs “felt” something was wrong. I emphasize “felt” because these specialists merely sensed something was dodgy without

being able to verbalize what was wrong. Their suspicion turned out to be correct though when very advanced tests later showed the Kouros was indeed a fake.

What is important here is that these specialists had their suspicion because they could call on an enormous amount of relevant knowledge. That this knowledge was (at least in part) implicit is also obvious, otherwise they would be able to say why the Kouros was a forgery. However, they could not, it just “felt” wrong. A line of research that supports this reasoning is the work on “bootstrapping”. The bootstrapping technique (see e.g., Dawes, 1979) neatly shows that we have more knowledge than we often apply. A linear combination of attributes based on a decision makers’ past weights does better in decision making than the decision maker on whom the weights are based. This clearly shows that we possess highly useful information that we often fail to apply.

Let’s again use a concrete decision example. Let’s say you buy a house for the eighth time of your life. The explicit knowledge about what you like and don’t like, about what is an asset in a house and what is not, about how different attributes will make you feel, is likely only a fraction of your “total” knowledge. Most of this knowledge is implicit, and we hypothesize that such knowledge is applied during unconscious, gist-based thought and not (or at least much less so) during conscious, verbatim-based thought.

Conclusions

Is giving up weighted adding as an ideal unnecessary? We argue that it is. At least for complex choices, unconscious thought does quite well in approaching weighted adding. One can ask the question whether unconscious thought *does* weighted adding or whether it merely *behaves as if* it does weighted adding. Chater et al., (2003) recently

published an insightful paper where the distinction is made between rational calculation and rational description. The requirement of rational calculation for weighted adding would presuppose that people would “calculate” weighted adding with the exact knowledge of how such things must be calculated. This seems unrealistic, but it is also an unnecessary requirement. Chater et al., (2003, p. 67) use a nice analogy: “The wings of a bird may approximate the results of a calculation of optimal aerodynamic design...but there is, of course, no presumption that the bird conducts any calculations in designing its wing”. This analogy may apply to unconscious thought and weighted adding. Perhaps unconscious thought doesn’t quite do it, but it behaves as if it is doing it.

In their paper, Chater et al. also show that computer simulations (that are obviously not consciously aware of their own algorithms) can perform rationally on complex decision tasks that require integration of a lot of information.

In contrast to current prevailing wisdom, we believe that people can actually do that too.

If they are willing to engage in unconscious thought.

Notes

1. Interestingly, the definition of the Compact Oxford English Dictionary is broad enough so that it can encompass both the normative and the subjective definition. It says that “rational” means “based on or in accordance with reason or logic”. This leans towards a normative definition, but a further search shows that “reason” (at least the noun) can be defined as “good or obvious cause to do something”, which creates room for a more subjective take on rationality.
2. Although it needs to be said that whereas the anecdotal evidence for incubation is overwhelming (e.g., Ghiselin, 1952), solid and replicable scientific evidence is fairly scarce (see also Dijksterhuis & Nordgren, 2006).
3. A continuous reliance on sunny holiday destinations as examples of a decision problem is explained by the fact that it always rains in the Netherlands.
4. One may remark that in the paradigm we used conscious thinkers are not given a fair chance. After all, they do not have access to the information (other than through recall from memory) during conscious thought. There are different views on this, one is that one can object that conscious thought while participants can still read information is also problematic, as one gives conscious thinkers more time to encode information than participants in the other two conditions. However, for now it suffices to appreciate that unconscious thought itself is helpful for making decisions, as is demonstrated by the fact the unconscious thinkers always outperform immediate decision makers (the effects have now been independently replicated, see Ham & van den Bos, 2007; Lerouge, Pieters & Stapel, 2007).

References

- Alba, J. W., & Marmorstein, H. (1987). The effects of frequency knowledge in consumer decision making. *Journal of Consumer Research*, *14*, 14-25.
- Arkes, H.R., Dawes, R.M., & Christensen, C. (1986). Factors influencing the use of a decision rule in a probabilistic task. *Organizational Behavior and Human Decision Processing*, *37*, 93-110.
- Bettman, J.R., Luce, M.F., & Payne, J.W. (1998). Constructive consumer choice processes. *Journal of Consumer Research*, *25*, 187-217.
- Bos, M.W., Dijksterhuis, A., & van Baaren, R.B. (2007). On the goal-directedness of unconscious thought. *Manuscript submitted for publication*.
- Brainerd, C.J., & Reyna, V.F. (1990). Gist is the grist: Fuzzy-trace theory and the new intuitionism. *Developmental Review*, *10*, 3-47.
- Camemer, C.F., & Hogarth, R.M. (1999). The effects of financial incentives in experiments: A review and capital-labor-production framework. *Journal of Risk Uncertainty*, *19*, 407-441.
- Chater, N., Oaksford, M., Nakisa, R., & Redington, M. (2003). Fast, frugal, and rational: How rational norms explain behaviour. *Organizational Behavior and Human Decision Processes*, *90*, 63-86.
- Cosmides, L., & Tooby, J. (1996). Are humans good intuitive statisticians after all? Rethinking some conclusions from the literature on judgments under uncertainty. *Cognition*, *58*, 1-73.

- Dawes, R.M. (1979). The robust beauty of improper linear models in decision making. *American Psychologist*, *34*, 571-582.
- Dijksterhuis, A. (2003). *Conscious thought and the availability heuristic*. Unpublished data set, Radboud University Nijmegen.
- Dijksterhuis, A. (2004). Think different: The merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology*, *87*, 586-598.
- Dijksterhuis, A., Bos, M.W., Nordgren, L.F., & van Baaren, R.B. (2006). Complex choices better made unconsciously? *Science*, *313*, 760-761.
- Dijksterhuis, A., Bos, M.W., van Baaren, R.B., & van der Leij, A.R. (2007a). Unconscious thought and the weighting problem in decision making. *Manuscript in preparation*.
- Dijksterhuis, A., Bos, M.W., van Baaren, R.B., & van der Leij, A.R. (2007b). Expertise, conscious thought and unconscious thought. *Manuscript in preparation*.
- Dijksterhuis, A., & Nordgren, L.F. (2006). A Theory of Unconscious Thought. *Perspectives on Psychological Science*, *1*, 95-109.
- 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.
- Edwards, W. (1961). Behavioral Decision Theory. *Annual Review of Psychology*, *12*, 473-498.

- Evans, J.St.B.T., & Over, D.E. (1996). *Rationality and reasoning*. Hove Sussex, Psychology Press.
- Evans, J.St.B.T., & Over, D.E. (1997). Rationality in Reasoning: The problem of deductive competence. *Cahiers de Psychologie Cognitive*, 16, 1-35.
- Gigerenzer, G., & Goldstein, D. (1996). Reasoning the fast and frugal way: Models of bounded rationality. *Psychological Review*, 103, 650-669.
- Gigerenzer, G., Todd, P., & ABC Group (1999). *Simple heuristics that make us smart*. Oxford: Oxford University Press.
- Gilbert, D.T., Pinel, E.C., Wilson, T.D., Blumberg, S.J., & Wheatley, T.P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology*, 75, 617-638.
- Gladwell, M. (2004). *Blink: The power of thinking without thinking*. New York: Little, Brown and Company.
- Ham, J., & van den Bos, K. (2007). *Unconscious justice judgments: Evidence for better justice judgments without conscious thought*. Poster presented at the Annual Society for Personality and Social Psychology meeting. Memphis, January 25-27, 2007.
- Hsee, C.K. (1996). The evaluability hypothesis: An explanation of preference reversals between joint and separate evaluations of alternatives. *Organizational Behavior and Human Decision Processes*, 67, 247-257.
- Igou, E.R. & Bless, H. (in press). On undesirable consequences of thinking: Framing effects as a function of substantive processing. *Journal of Behavioral Decision Making*.

- Iyengar, S., & Lepper, M. (2000). When choice is demotivating: Can one desire too much of a good thing? *Journal of Personality and Social Psychology*, *79*, 995-1006.
- Janis, I.L., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.
- Kahneman, D., Fredrickson, B., Schreiber, C.M., & Redelmeier, D. (1993). When more pain is preferred to less: Adding a better end. *Psychological Science*, *4*, 401-405.
- Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology*, *3*, 430-454.
- Kahneman, D., & Tversky, A. (2000). *Choices, values, and frames*. New York: Cambridge University Press.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: An analysis of decisions under risk. *Econometrica*, *47*, 263-291.
- LeBoeuf, R.A., & Shafir, E. (2003). Deep thoughts and shallow frames: On the susceptibility to framing effects. *Journal of Behavioral Decision Making*, *16*, 77-92.
- Lerouge, D., Pieters, R., & Stapel, D.A. (2006). *On moderators of unconscious thought*. Paper presented at the Twente Conference on Consumer Psychology, Enschede, November 13 and 14, 2006.
- Lerner, J.S., & Tetlock, P.E. (1999). Accounting for the effects of accountability. *Psychological Bulletin*, *125*, 255-275.
- Levine, G.M., Halberstadt, J.B., & Goldstone, R.L. (1996). Reasoning and the weighing of attributes in attitude judgments. *Journal of Personality and Social Psychology*, *70*, 230-240.
- Lieberman, M.D. (2000). *Intuition: A social cognitive neuroscience approach*.

Psychological Bulletin, 126, 109-137.

Nordgren, L.F., & Dijksterhuis, A. (2007). The devil is in the deliberation: Thinking too much reduces judgmental consistency. *Manuscript submitted for publication*.

Pelham, B.W., & Neter, E. (1995). The effect of motivation on judgment depends on the difficulty of the judgment. *Journal of Personality and Social Psychology*, 68, 581-594.

Redelmeier, D., & Kahneman, D. (1996). Patients' memories of painful medical treatments: Real-time and retrospective evaluations of two minimally invasive procedures. *Pain*, 116, 29-39.

Reyna, V.F., Lloyd, F.J., & Brainerd, C.J. (2003). Memory, development, and rationality: An integrative theory of judgment and decision making. In S. Schneider & J. Shanteau (Eds.), *Emerging Perspectives on Judgment and Decision Research*. New York: Cambridge University Press.

Schooler, J.W. & Melcher, J. (1995). The ineffability of insight. In S.M. Smith, T.B. Ward & R.A. Finke (Eds.), *The creative cognition approach*, pp. 97-134. Cambridge, MA: MIT Press.

Schooler, J.W., Ohlsson, S. & Brooks, K. (1993). Thoughts beyond words: When language overshadows insight. *Journal of Experimental Psychology: General*, 122, 166-183.

Schwartz, B. (2004). *The paradox of choice*. New York: Harper Perennial.

Shafir, E., & LeBoeuf, R. (2002). Rationality. *Annual Review of Psychology*, 53, 491-517.

- Simon, H.A. (1955). A behavioural model of rational choice. *Quarterly Journal of Economics*, 69, 99-118.
- Stanovich, K.E., & West, R.F. (1999). Discrepancies between normative and descriptive models of decision making and the understanding of the acceptance principle. *Cognitive Psychology*, 38, 349-385.
- Swets, J.A., Dawes, R.M., Monahan, J. (2000). Psychological science can improve diagnostic decisions. *Psychological Science in the Public Interest*, 1, 1-26.
- Tversky, A., & Kahneman, D. (1981, January 30). The framing of decisions and the psychology of choice. *Science*, 211, 453-458.
- Tversky, A., Sattath, S., Slovic, P. (1988). Contingent weighting in judgment and choice. *Psychological Review*, 95, 371-384.
- Tversky, A., Slovic, P., & Kahneman, D. (1990). The causes of preference reversal. *American Economic Review*, 80, 204-217.
- Wilson, T.D., Lisle, D., Schooler, J.W., Hodges, S.D., Klaaren, K.J., & LaFleur, S.J. (1993). Introspecting about reasons can reduce post-choice satisfaction. *Personality and Social Psychology Bulletin*, 19, 331-339.
- Wilson, T.D. & Schooler, J.W. (1991). Thinking too much: Introspection can reduce the quality of preferences and decisions. *Journal of Personality and Social Psychology*, 60, 181-192.
- Zeelenberg, M. & Beattie, J. (1997). Consequences of regret aversion 2: Additional evidence for effects of feedback on decision making. *Organizational Behavior and Human Decision Processes*, 72, 63-78.