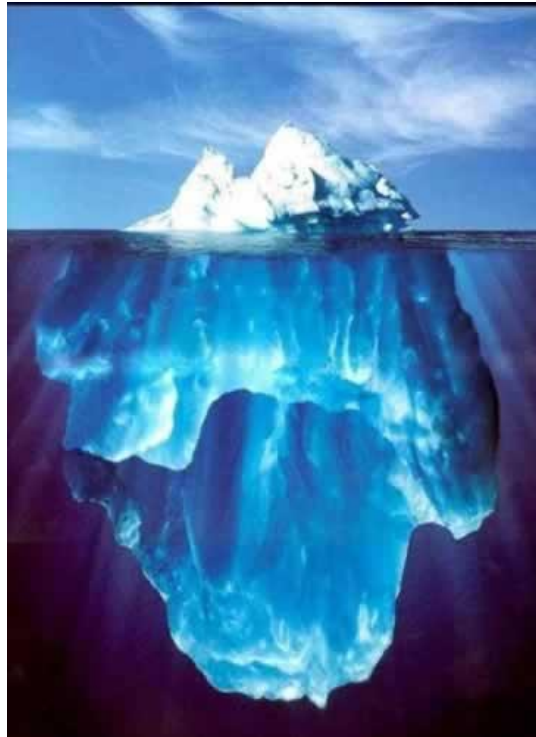


Master Thesis

**The Influence of Emotions and Unconscious Thought on
Decision Making**



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March, 2011



Preface

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Acknowledgements

For the past seven years, I have been studying Business Administration at the Erasmus University. It took me more time to finish my Master in Human Resource Management, than the time I needed to complete my Bachelor's Degree. During the summer of 2009, the main experiment of this study was conducted at the research lab of Radboud University Nijmegen. Around September 2009, I started a Bachelor study in Psychology at the University of Amsterdam. After I started my study in Amsterdam, it still took me one year and a half to complete this Master thesis, most likely due to the high workload of also participating in the honors program at the University of Amsterdam. I can imagine that receiving my Master's Degree will be a huge relief, to both me, and my parents.

There are a number of people I would like to thank for making this thesis possible. First and foremost, I would like to thank Dr. Wendy van Ginkel for her coaching, time, patience, and advice. I would also like to thank Dr. Bram van den Bergh for his time and advice. Furthermore I would like to thank two persons without whom the present experiment could not have been conducted. First, Maarten Bos, for providing me with some lab-time at the Radboud University Nijmegen. Secondly, Anna Moskova, for assisting me in programming the experiment. Special thanks go out to my parents, Henk and Lenie Lodder, who have been a great support to me. Finally, I would like to thank Japke Schreuders, for her unconditional love and support.

Amsterdam, March 2011

Paul Lodder

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Executive Summary

Over recent years, a wide array of factors that influence rational decision making have been identified. This insight in our bounded rationality eventually led some researchers to believe that conscious deliberation might in some situations not be the most optimal decision making strategy. As a result, Dijksterhuis and Nordgren (2006) developed the *deliberation-without-attention* hypothesis, which postulates a positive influence of unconscious thought processes on the quality of complex decisions. Furthermore, numerous studies have indicated the strong influence emotions have on decision making. The aim of the present study is to investigate whether positive or negative emotional states influence the way in which unconscious thought processes affect decision quality. Participants were asked to make a decision concerning the purchase of a mobile phone. They were divided over five conditions and each condition contained a different decision mode: immediate decisions; conscious thought; unconscious thought; unconscious thought and positive emotion; unconscious thought and negative emotion. It turned out that there were no differences in decision quality between conditions. These non-significant results, together with those of other recently conducted experiments within the unconscious thought paradigm, insist us to re-evaluate earlier significant results. An analysis is provided of possible explanations of the non-significant nature of the results of this study and a number of other studies. It is concluded that it is too soon to draw any valid conclusions about the nature of unconscious thought processes and their influence on the quality of decisions.

Keywords: *Decision making, unconscious thought, emotions, deliberation-without-attention*

Introduction

"Nothing is more difficult, and therefore more precious, than to be able to decide"

Napoleon Bonaparte

Every day people make decisions on behalf of organizations and their impact could be widespread. According to Henry Mintzberg (1988), decision making can be seen as one of the most important managerial activities and therefore it is extremely relevant for behavioral economists to inquire on topics as: "What drives people in making decisions?" and: "In which way can the quality of decision making be improved?"

During the last few decennia, there occurred a major change in research on human decision making processes. The focus shifted from a view in which humans are perfectly rational choosers, to a view in which humans possess limited rationality. This concept of bounded rationality was hypothesized around the beginning of the 1950's by Herbert Simon (Simon, 1955; Gigerenzer & Selten, 2002). It took scientist a while to come up with the scientific evidence supporting this theory. During the past few decennia, scholars finally became able to conduct experiments in which the importance of influences affecting rational decision making was proven. Especially due to the recent emergence of more sophisticated neural imaging techniques, they were enabled to map brain activity sites of subjects engaged in a particular emotional or psychological state.

At the moment, our understanding of human decision making processes can only be rated as incomplete. The number of scientists admitting to the fact that decisions are not solely made on a rational bases is increasing due to an amazing body of new research on the unconscious or emotional influences on decision making processes (Glimcher et. al., 2009).

In our decision making, we as human beings are being influenced and biased by a large array of different factors, such as framing effects, hindsight bias, social norms, values, moods, conscious deliberation, emotions, bias toward implicit favorites, or reliance on heuristics (Greenberg and Baron, 2003). However, we might not be aware of the influence of some factors on our decision making, because they bypass our conscious thought processes. Throughout our life experiences we gather information about different situations. In some instances we have experienced a particular situation multiple times and actions during this situation start to become automated, like driving a car on an empty highway. This passive aspect of driving that seems to bypass conscious thought, might also be found in other

activities that normally involve conscious attention. For example, Dijksterhuis and his colleagues (2004) showed in their research that when deliberating complex decisions, it is beneficial to spend less time on conscious thinking - in such a way that the unconscious mind can process the information. As a result these unconscious thoughts can improve the quality of decisions, compared to a situation in which solely a conscious thought mode is applied.

Unconscious thought in this context – and throughout the remainder of this thesis - refers to all the processing of information in our minds that we are not aware of. We have to be aware, however, of not confusing unconscious thought processes with the unconscious mind. The unconscious mind can be seen as a memory pool of every stimulus we have experienced during our lives. Most of those stimuli happen completely beyond our awareness. This concept can best be illustrated by the classical example of the mind as an iceberg. The part of the iceberg above sea level can be seen as the conscious mind and the part below sea level as the unconscious mind. Thus, we are only aware of the tip of the iceberg, which forms the smallest part of our mind. Although the unconscious mind and unconscious processes can be seen as two different concepts, they are however to a certain extent interrelated. In Dijksterhuis' study (2004) one group of participants was distracted for a short period of time during decision making in order to allow the unconscious mind to process the previously presented information. Now the actual part in which the information is processed happens without the participants being aware of it and thus it can be seen as an unconscious process. However, these processes take place within the unconscious mind as a basic principle. Considering that the unconscious mind can be seen as a memory pool which stores an incredible amount of information, it is obvious that the decisions the participants take in the unconscious thought condition of Dijksterhuis' research, are based upon the information available to the unconscious mind.

Besides the above mentioned possible influence of unconscious thought on decision making, there is another factor that influences our decisions: emotions. Nearly every human being has at some point in their lives experienced a situation – for example a fight or heated discussion - in which their emotions largely interfered with their rational thinking. Antonio Damasio has conducted pioneering research (1994; 1999) on emotional states that influence human decision making, which led him to conclude that emotions can bias decision making processes. He also discovered that emotions are actually fundamental in decision making, because they give value to different choice alternatives. Without emotions, it becomes very hard to make trivial decisions, such as choosing what to eat for dinner, or deciding at which you are going to meet up with someone.

The above mentioned two scholars - Dijksterhuis and Damasio - have in some way developed two whole new fields of research. To a certain extent those can be seen as two separate fields of inquiry with the former looking at the influence of unconscious thought on decision making and the latter on the influence of emotions on decision making. It is important to conduct more research on the interface of those two particular fields of inquiry, because they are fundamentally trying to provide an answer to the same question: why is decision making not a purely rational process? As Damasio has pointed out, emotions can bias conscious thought processes and, as a result, decision making. This evidence, however, is limited to conscious decision making processes. Due to the recent insight – as provided by Dijksterhuis and his colleagues – that unconscious thought can influence decision making, it might be interesting to discover whether emotions also bias unconscious thought. Therefore, the main purpose of the present study is to discover whether emotions influence unconscious thought in decision making processes.

The outline of this thesis is as follows. In chapter one, theories of conscious and unconscious thought will be reviewed in their relationship with decision making processes. The second chapter will focus upon the influence of emotional states on decision making. After that, the third chapter will provide an overview of the present research together with its hypotheses. In the fourth chapter the methodology will be elaborated and results will be presented in the chapter five. The thesis ends with a conclusion and discussion in chapter six.

Chapter 1: Theories of conscious and unconscious thought

After the enlightenment, scientific research in particular focused on empirical studies, which caused humanity's subjective experience and value to be somewhat left out of the picture - since they were difficult to observe by people other than the individual that was experiencing. At the moment, however, there have been developed a wide array of methods that are able to describe subjective experiences, such as self-report questionnaires and interviews (Spector, 1994). Still, around the 17th century most scientists reduced subjective experiences to physical phenomenon happening in the brain (Wilber, 2000). This reductionism eventually led to a view in which humans were put forth as biological machines acting in a perfectly predictable way. As a consequence to the mechanistic view on human beings, economists started to search for the mathematics behind consumer choice and behaviour (Samuelson, 1938). Because of this mathematical approach, eventually scholars argued that human decision making could be predicted by a basic set of assumptions, called axioms. Roughly, the implications of this theory were that when humans make decisions, they perfectly obey these axioms and therefore their decisions could be seen as having a purely rational basis. Webster's English dictionary defines rationality as "the quality or state of being, agreeable to reason". Since conscious thought involves reasoning, it was equaled with rationality.

Conscious Thought

Earlier research on decision making was mainly focused on the conscious mode of human thought and the majority of the decision making strategies is also based upon this mode. For example, the grid analysis works out a schedule consisting of the alternatives and all the relevant attributes. Subsequently, each alternative's attributes will be rated on a predetermined scale. In the end all the rating of an alternative will be added and the alternative with the highest score will be the best choice. Weights can be added to the attributes in order to give each a different value. It is easy to conclude that this particular analysis will require conscious attention in order to choose the best alternative. Another commonly used technique is decision analysis, which includes careful deliberations on all the possible options and their attributes (Edwards & Fasolo, 2001; von Winterfeldt & Edwards, 1986; see Newell, Lagnado & Shanks, 2007, for an overview).

Conscious thought has always been a central aspect of modern human decision making. From the moment the principle of causality was first discovered by hunter-gatherer societies, we have been thinking about our decisions in a deliberative way. This kind of thinking has enabled us to develop our present capacity of reasoning and insight that has played a central part in the evolution of our society. If we would not have been able to solve difficult mathematical calculations by conscious thought, we possibly might not live in such a technologically developed civilization.

Unconscious Thought

In the past, it was common sense that conscious thought would lead to the most beneficial choices. Most people at that time were unaware of the influences that other factors, such as unconscious thoughts could have on their choices. This could be due to the fact that we are most of the time not aware of our brain's unconscious processing capabilities. Ironically, this unconscious processing capability exceeds the conscious processing capability with hundreds of thousands of times. Thus, there is a lot more going on in our mind than we are aware of. The processing capacity of our conscious mind is limited to a certain extent and thus it only processes a small part of the available information if it has to solve a decision with a large number of attributes (Dijksterhuis, 2004).

Dijksterhuis and his team performed multiple researches that were designed to uncover the positive influence unconscious thought could have on the quality of complex decisions. In one of their studies, for example, participants were presented with information about different attributes concerning the purchase of an apartment. The participants were divided into three conditions and were asked to make a decision about their preferred apartment. In each condition there was a different process preceding the decision making. The participants either had to make their decision immediately after they were presented with the information (*immediate* condition), or they had to consciously deliberate the decision for a few minutes (*conscious* condition), or they were distracted for the same time by a simple game (*unconscious* condition). According to Dijksterhuis' theory, this distraction prevents conscious thinking and thus enables the unconscious mind to process the information. It turned out that participants that were distracted from conscious thinking significantly made better decisions than did the participants in the remaining two conditions. The above mentioned procedure is called the unconscious thought paradigm, since it is a completely new paradigm with which unconscious processes are tried to be measured. As a result of his

discovery, Dijksterhuis and his associates (2006a) gave birth to their Unconscious thought theory (UTT). This theory postulates the existence of two different modes of human thought: a conscious- and an unconscious mode. Each mode differs in its (dis)advantages and therefore the appropriateness of a mode depends on the situation. The positive effect of unconscious thoughts on the quality of decisions was dubbed the *deliberation-without-attention* hypothesis.

Another study by Dijksterhuis and his team (Dijksterhuis, Bos, Nordgren & van Baaren, 2006) indicated that unconscious thought is most effective if decision situations are complex, rather than simple. They divided participants over a conscious and unconscious condition and gave them either simple or complex decision problems. It turned out that complex decisions were better solved by unconscious thinkers as compared to conscious thinkers. This pattern was reversed for simple decisions. This implies that unconscious thought is most useful if decision situations are complex and thus bypasses the capacity of a conscious decisions mode, which is most appropriate when solving simple decision problems.

It remained unclear however, whether unconscious thoughts are always processing information, or that their activation depend on previously set goals. Bos, Dijksterhuis and van Baaren (2008) investigated whether unconscious thought is goal dependent. They used the unconscious thought paradigm, but created besides a conscious condition two unconscious conditions - instead of one. In the first *unconscious* condition participants were told that the presented information had to be used later on in the experiment. Participants in the second unconscious '*no-goal*' condition were told that later on, they would not have to answer any more question about the presented information (but of course they did have to answer question later on). It turned out that participants in the unconscious condition performed better than participants in both the conscious and no-goal conditions. The researchers concluded that unconscious thought processes are goal dependent.

The above mentioned studies support *deliberation-without-attention* hypothesis, and thus the idea that unconscious thought processes can benefit decision quality. The effect, however, is most effective if decisions are complex and people have a goal to further process the information. Recently, however, there have been conducted a large number of studies within the unconscious thought paradigm that did support the *deliberation-without-attention* hypothesis.

Inconsistent results

The possible existence of unconscious thought processes that would benefit decision making was not embraced warmly by some parts of the scientific community. The classical view of decision making as being a purely rational and conscious process is still very popular, despite the wide range of studies that support the existence of a positive influence of unconscious thought processes on decision making (Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Dijksterhuis & Meurs, 2006; Dijksterhuis & Nordgren, 2006; Bos, Dijksterhuis, & van Baaren, 2008; Strick, Dijksterhuis, & van Baaren, 2010). Recently however, some studies appeared that seemed to the above mentioned studies (Acker, 2008; Lassiter, Lindberg, González-Vallejo, Bellezza & Phillips, 2009; Thorsteinson, & Withrow, 2009). Therefore, some scholars tried to come up with an alternative interpretation of the unconscious thought effect. What follows is a short review of studies that proposed an alternative interpretation of the *deliberation-without-attention* effect.

One of the alternative interpretations that have been proposed, suggests that the benefits of unconscious thought processes are an illusion, created by the shortcomings of conscious thought processes. Rey, Goldstein and Perruchet (2009) conducted an experiment similar to that of Dijksterhuis (2004), in which participants were provided with a complex decision task while being assigned to three different conditions - an immediate, conscious, and unconscious condition. It turned out that participants in the conscious condition were less able to identify the most attractive product alternative, than participants in both the immediate and unconscious conditions, who performed equally well. It was concluded that there was no special benefit of unconscious thought processes, because participants that were distracted - in order to stimulate unconscious thought - performed equally well as participants that had to make the decision immediately after the product information was presented. Therefore, it seemed that some extra minutes of distraction did not have any influence on the quality of the decision. Furthermore, participants that were asked to think consciously about their decision performed worst, which led the researchers to conclude that thinking consciously reduces decision quality while making complex decisions.

Payne, Samper, Bettman and Luce (2008) extended the above mentioned hypothesis by proposing that there is another important factor that influences the negative relation between conscious thought and the quality of complex decisions. They postulated that only a fixed period - and not a variable period - of conscious thought would reduce decision quality. So, the negative influence of conscious thought on decision quality would disappear if the time engaged in conscious thinking can be determined by oneself. Their research design was

almost similar to that of Dijksterhuis' (2004), however, they replaced the immediate condition with a new 'variable condition', in which participants were asked to think consciously about the decision as long as they needed. Thus, the total time spend on consciously thinking about the decision varies with each participant, contrary to the original conscious condition, in which thinking time was fixed (most frequently three minutes). It turned out that participants in the conscious condition performed worse than participants in both the variable and the unconscious conditions, who performed equally well. Payne and his colleagues concluded that unconscious thought is not especially beneficial while making decisions. A period of unconscious thought only seems beneficial, if compared with a fixed period of conscious thought. The effect could better be interpreted as being a shortcoming of conscious thought, because when participants were allowed to determine the length of their period of conscious thought, they performed equally well to the unconscious thinkers.

The above mentioned studies support the alternative hypothesis that the merit of unconscious thoughts on decision quality is an illusion, created by the shortcomings of a fixed period of conscious thought. However, there has still been conducted a number of studies in which participants in the unconscious condition performed better than participants in both the conscious- *and* immediate condition (Dijksterhuis, 2004; Bos, Dijksterhuis, & van Baaren, 2008; Strick, Dijksterhuis, & van Baaren, 2010). A preliminary meta-analysis conducted by Strick et al. (2010) comprised a total of 37 studies within the unconscious thought paradigm. More studies have to be included in this analysis, so the drawn conclusions are preliminary. In general, a significant difference in effect size of the unconscious thought conditions was measured, as compared with conscious or immediate conditions, which supports the *deliberation-without-attention* hypothesis. However, the results should be interpreted carefully, because of the preliminary nature of the meta-analysis.

Considering the inconsistent results of studies conducted within the unconscious thought paradigm, it might be possible that there are factors influencing decision quality that have not been taken into account. One of the most widely documented factors that can alter the way humans make decisions is emotion. Therefore, the following paragraph will try to point out in which way emotions can influence decisions making.

Chapter 2: Emotional influences on decision making

"Don't get too emotional, because it will impair your ability to make rational decisions", is a commonly heard statement. Emotions usually are perceived as having a negative influence on decisions. Recently, however, the Spanish neuroscientist Antonio Damasio postulated that emotions are actually fundamental to decision making.

Somatic Marker Hypothesis

In his book "Descartes' Error", Damasio (1994) points out the misconception of Descartes on the topic of the relationship between the mind and the body. Descartes envisioned the body as a machine that perfectly obeys to the laws of nature. The mind, on the other hand can be seen as completely distinct from the body and the brain and it is the mind in which thoughts arise. Thus, according to Descartes, humans act out of pure rationality and their actions are therefore not influenced by emotions. The incorrectness of this argumentation can best be illustrated by the famous case of Phineas Gage (Harlow, 1868). Gage was working at a railroad construction site and during his work his head accidentally got pierced by an iron rod. He survived the incident, although the rod went directly through the frontal lobes of his brain. It completely destroyed the ventro-medial prefrontal cortex, which resulted in an impairment of his ability to make decisions and experience emotions or feelings. Although Gage was still perfectly capable of performing complex calculations, after his recovery he started to show some very strange behavior. His ability to make decisions was impaired, in particular decisions concerning personal or social events. One person with similar brain lesions as Phineas Gage's, once was asked by his doctor if he preferred his next appointment to be at either ten or eleven o'clock. He had to think for half an hour about this question and when the doctor impatiently proposed to him ten o'clock, the patient directly agreed (Lezak, 1983).

It seemed that the valuation mechanisms of those patients were compromised. Out of the above mentioned cases, Damasio (1994) postulates that emotion plays a central role in decision making, because of the value they give to different alternatives. The information stored in the memory pools of both the conscious and the unconscious mind is given value through the experienced emotion at the moment of the acquiring the information. Damasio argues with his somatic marker hypothesis that when facing a decision, we experience a

confluence of signals that are either rational or emotional in nature. A somatic marker assists in the decision making process by giving value to decision alternatives in a way that depends on the previously experienced reward or punishment in similar decision situations (Damasio, 1999). This process can happen completely without one being aware of it and thus somatic markers are to a certain extent able to bias the available alternatives. With ‘somatic’, Damasio refers to the bodily response that is associated with a particular emotion. The word ‘marker’ in the somatic marker hypothesis implies a memory trace. This is a memory of a past decision related situation in which a positive or negative outcome is marked and categorized according to an emotional response (Damasio, 2009). The markers possibly increase decision making quality by automatically reducing the number of alternatives in such a way that the ones with an expected negative outcome will be restrained.

Emotions and Decision Making

Numerous studies have been conducted searching for the influence of emotions on decision making. It turned out that when high on positive affect, individuals make more creative decisions (Isen, 1987) and euphoric states will stimulate one to have more attention to cues that could involve a potential achievement of success (Isen, 1993). Also, happy individuals tend to rely more on their intuitions than sad people, when making decisions (Bolte et. al., 2003; Isen & Means, 1983). Furthermore, individuals high on negative affect will tend to make more deliberate decisions through detail oriented and analytic thinking (Forgas, 1992; Forgas & Bower, 1987; Schwartz, 1990; Schwartz et. Al., 1991; Clore et. al., 1994 for a review), and anxious states will lead one to become more attentive of threatening situations (Mathews, 1990; Öhman, 1993). Recent research by de Vries and her colleagues (2008) showed that individuals tend to rely more on their affective signals while making decisions, if they are experiencing a positive mood state. On the other hand, negative mood states seem to increase the tendency to be more deliberate with making decisions.. In short, it seems that a positive mood stimulates an individual to engage in more intuitive and affective way of thinking, while a negative mood encourages a more deliberate and analytic mode of thought.

Unconscious Emotions

According to Alain Berthoz (2003), emotions aid the brain in making decisions by categorizing the world we experience in order to reduce the brain’s effort in assessing all the relevant information. They function as action sets, because they motivate one to act in a

particular way (Frijda, 1986; Lang, 1984). From an evolutionary perspective, it makes sense that some emotions are processed unconsciously. When hunting for food, one most continuously is alert for any potential danger and in some situations there will not be time to consciously deliberate your actions, because if you do, you probably will become the one that is going to be killed. Therefore, it is not unlikely that certain stimuli can unconsciously trigger emotions that will prevent an organism from making a disadvantageous decision.

According to Panksepp (2000), emotions can be seen as an umbrella term, encompassing all behavioral, expressive, cognitive or psychological changes experienced by a particular person. If those changes are experienced consciously, it can be termed affect. Öhman and his associates (2000) define an unconscious emotion as an emotion that can be activated without conscious recognition of the eliciting stimulus. This definition implies, however, that only the stimulus is not experienced consciously, and thus it says nothing about whether one is aware of the actual emotions or not. A more satisfying definition - that will be used in the present research - is provided by Kihlstrom (1999), who postulates that there are two different ways of experiencing emotions. Explicit emotions are those emotions of which one is aware and - on the other hand - implicit emotions are influencing our thoughts and actions, although this occurs independent of one's conscious awareness of the particular emotional state. The somatic marker hypothesis of Antonio Damasio implies that those markers can influence people's behavior without them being aware of it - the markers act unconsciously.

Further evidence for the postulate that emotions can affect us without one being aware of it comes from Winkielman and Berridge (2004). Participants in their study were first asked whether they were thirsty and subsequently they were subliminally primed with pictures of either angry, happy, or neutral faces. After measurement of the subjective emotional experiences by a mood scale, the participants were divided over two groups. In one group they were allowed to pour some lemon-juice in a cup and drink it. Participants in the second group had to take a sip of the lemon-juice from a prepared cup and evaluate it on multiple dimensions (e.g. monetary value). It turned out that in both groups, the subjective emotional experiences of participants were not influenced by the primed pictures of faces. However, the consumption in the first group, and the ratings of the drink in the second, were found to be influenced by the subliminal stimuli, especially if the participants were thirsty. Thirsty participants in the first group drank more lemon-juice if they were primed with happy faces, than with angry faces. In the second group, the amount participants were willing to pay for the lemon-juice was twice as much if they were primed with happy faces, than with angry faces.

Winkielman and Berridge concluded that they were able to elicit emotions that were powerful enough to alter participants' behavior, while participants were not aware of them.

The above mentioned study indicates that awareness of an emotional state is not required if such states are influencing behavior. These results, together with the conclusions drawn from the studies performed by Dijksterhuis and his colleagues, point out that decision making can be influenced by processes that bypass human awareness.

Despite the great number of studies conducted on the influence of emotions on decision making, there have not yet been any studies on the combined influence of emotions and unconscious thought on decision making. This might be caused by the fact that the paradigm used to measure unconscious thought processes - Dijksterhuis' UTT paradigm - is relatively new. Now, since the literature concerning emotions, unconscious thought and decision making is covered, the hypotheses of the present study will be elaborated in the following chapter.

Chapter 3: The present study

As Dijksterhuis mentions in his theory of unconscious thought (2006), the degree to which our unconscious thoughts provide us with a right solution depends on a number of moderators. The present study postulates that emotions can have such a moderating influence. Damasio showed in his research (1997) that gut feelings can be developed before a person is able to explain the existence of the feelings. He concluded that emotional pathways in the brain precede the conscious thought. Furthermore, Winkielman and Berridge (2004) pointed out that emotions can influence our behavior, without one being aware of it.

Emotions are already known to influence *conscious* decision making. Like unconscious thought, emotions can influence our behavior without one being aware of it. Therefore the present study aims to discover whether emotions influence the unconscious thought that precedes decision making. Specifically, whether positive and negative emotional states influence the positive effect that unconscious thought has on the quality of decisions.

As mentioned earlier, participants in Dijksterhuis' (2004) unconscious thought condition performed better while making complex decisions due to a more intuitive thought mode. Furthermore, according to research by Bolte and his associates (2003) and Isen & Means (1983), happy individuals tend to rely more on their intuition while making decisions than sad people do. Therefore, it could be possible that such positive emotional states will lead to an even more intuitive thought mode - and thus an even better decision quality - than while utilizing the normal intuitive unconscious thought mode.

Hypothesis 1a

A positive emotional state will lead to higher decision quality while utilizing an unconscious decision mode, than a negative or no emotional state.

The next hypothesis will focus on the opposing, negative emotional state. Dijksterhuis' (2006) theory states that intuitive thought modes outperform deliberative thought modes while making complex decisions. Furthermore, individuals experiencing a negative emotional state are more likely to make their decisions through detailed, deliberative, analytic thinking (Forgas, 1992; Forgas & Bower, 1987; Schwartz, 1990; Schwartz et. Al., 1991; Clore et. al., 1994 for a review). It might be possible that a negative emotional state will reduce the degree to which a thought mode is intuitive, and consequently lead to a lower decision quality while

making complex decisions. Therefore, the third hypothesis postulates that the negative emotional state will lead to a lower decision quality, as compared to the neutral or positive emotional states.

Hypothesis 1b

A negative emotional state will lead to lower decision quality while utilizing an unconscious decision mode, than a positive or no emotional state.

Dijksterhuis (2004) already showed that unconscious thought will improve the decision quality with complex decisions. In part, the present research aims to validate Dijksterhuis' research by replicating the study according to his UTT paradigm, as used in earlier studies (Bos, Dijksterhuis, & van Baaren, 2006; Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006). Therefore, the last hypothesis will be similarly formulated as in the Dijksterhuis studies:

Hypothesis 2

When making complex decisions, a brief period of unconscious thought will lead to higher decision quality relative to conditions under which unconscious thought is prevented.

In the present study, participants are presented with information about the purchase of a mobile phone and asked to indicate which phone they prefer. Decision mode will be manipulated by assigning participants to one of five conditions. In the immediate choice condition, participants will have to make a purchase decision immediately and in the conscious thought condition they are asked to deliberate for a total of three minutes on their decision. In the remaining three unconscious conditions, all participants are prevented from engaging in conscious thought by asking them to – before making a decision - think for three minutes about experiences in their lives. The experiences are asked to be neutral in the unconscious thought condition, positive in the positive unconscious thought condition, and negative in the negative unconscious thought condition. Decision quality was measured by the degree to which participants were able to identify the best mobile phone from the other phones. Based on *hypothesis 2*, It is expected that participants in the unconscious thought condition are better able to identify the best mobile phone from the other phones, than participants in the conscious thought or immediate choice conditions. Furthermore, *hypotheses 1a* and *1b* lead to the expectation that participants in the positive unconscious

thought condition will be better able to identify the best mobile phone from the other phones, than participants in the unconscious thought condition, who on their behalf will be better than participants in the negative unconscious thought conditions. So, to sum up, it is expected that participants in all three unconscious thought conditions will outperform participants in the conscious and immediate thought conditions. Subsequently, within the unconscious thought conditions, it is expected that participants in the positive unconscious thought condition perform better than participants in the unconscious thought condition, who on their turn are expected to perform better than participants in the negative unconscious thought condition.

Chapter 4: Methodology

Design and Participants

208 undergraduate students (161 women and 47 men) with an average age of 22.10 years ($SD = 4.388$), recruited at the Radboud University Nijmegen, were randomly divided over five experimental conditions: a direct choice condition ($N=54$), a conscious thought condition ($N=46$), an unconscious thought condition ($N=29$), a positive unconscious thought condition ($N=42$), and a negative unconscious thought condition ($N=37$). The experimenters were not aware of the condition each participant was assigned to. After the experiment, participants were rewarded with either course credits or money (€ 7,50) for their participation.

Manipulations

The first part of the experiment was based upon the same methodology as used in Dijksterhuis' (2004) research. All participants were asked to pay close attention to the presented information. After the presentation of this information, the experiment was split up into five different conditions. In the immediate condition, participants had to decide immediately which of the four different mobile phones received their preference. The participants in the conscious thought condition, on the other hand, were asked to deliberate which product they preferred by consciously thinking about the decision for a total of three minutes. After those three minutes, they were allowed to indicate their preference. Participants in the unconscious thought, positive unconscious thought, and negative unconscious thought conditions were distracted from conscious thinking about the mobile phones by performing a distraction task. During this distraction task either a positive emotion, negative emotion, or no emotion, was elicited - depending on the experimental condition the participants were assigned to.

There exist multiple techniques in which researches are able to induce these emotional states. Westermann and his associates (1996) performed a meta-analysis on the effectiveness of mood induction techniques used in 250 different studies. Furthermore, Martin (1989) performed a review on different ways in which moods can be induced. It is very important to investigate for each technique if it will be effective in eliciting the desired changes. There are two important criteria that have to be accounted for when choosing an appropriate manipulation technique. First it is important that the technique used in the present research

can be applied to induce negative, as well as neutral and positive emotional states. It is for example very difficult to elicit a neutral emotional state by showing participants a movie during the experiment. Some participants might enjoy the movie during a ‘boring’ experiment, even if the movie is beforehand rated as emotionally neutral. The second criterion is that in order for the present research to obtain a higher validity, it is of high importance that the emotional states are going to be elicited during the distraction tasks instead of before. In this way the encoding of the acquired information before the distraction task is not affected by a positive or negative emotional state. Therefore it is essential to find a distraction tasks in which the emotional manipulation is integrated.

Using a review by Martin (1989) and applying the above mentioned criteria, there remain a few possible manipulation techniques. Those are: hypnosis, music, imagery and autobiographic recall. The first technique is very difficult to use, because each individual tends to react different towards hypnosis. Hilgard and his colleagues (1958) showed that there exist individual differences in susceptibility to hypnosis. The remaining three techniques are all valid in applying them to the present research. However, the fourth technique is most advantageous for the present research. If emotions are elicited through music or imagery, bias can occur because of differences in individual taste. With the autobiographical recollection technique, participants are asked to think about positive, negative, or neutral events out of their life. In this way, the preferred emotions are induced by the individuals themselves and depend not on differences in individual aesthetics. Autobiographical recollection has already successfully been used in studies by Brewer, Doughtie, and Lubin (1980) and Barlett, Burleson, and Sanrock (1982).

The emotional state was induced by means of autobiographical recollection. Participants were asked to close their eyes and imagine in their minds eye three different situations with a similar emotional denominator. For example, participants in the positive unconscious condition were asked to think about events which they remembered to be blissful, joyous, or very happy. They were asked to visualize everything that happened during the particular event. Participants in the negative unconscious thought condition, on the other hand, were asked to think about events that they remembered to be sad, lonely, or rejected. Finally, participants in the unconscious thought condition were asked to think about neutral events, in order to prevent any emotional changes and at the same time. Afterwards, the participants were questioned about their awareness of a shift in their emotional state. This was necessary in order to determine whether the manipulation was effective. After the distraction tasks, participants were asked to point out their preferred mobile phone.

The emotional states were induced during the distraction task, because during this distraction the unconscious mind is processing the earlier presented information and if the emotional state is induced at that precise time, its effects will be optimal. Eliciting emotional states before the distraction task might lead to a diminished emotional state at the time of the unconscious thought. Furthermore, the states are not induced before the presentation of the information, because according to scholars as Forgas (1992) and Schwartz (1990), negative moods might result in a more deliberate look upon the presented information..

Measures

The participants were presented with information about four different alternatives concerning the purchase of a mobile phone. The phone names were made up by taking two parts of existing phone names and combining them in order to form new non-existing names: *Samkia*; *Motosung*; *Noberry*; and *Siemerola*. This would prevent any choice on behalf of a priori values relating to the contemporary mobile phone brands. Of each mobile phone 12 different attributes were presented, which makes a total of 48 pieces of information that were presented randomly (*Appendix 1*). These attributes were presented for a total of 4 seconds, which was just enough time in order to read them carefully. Each attribute either had a positive, negative, or neutral value (e.g. large memory storage; low memory storage; medium memory storage). Out of the four different product alternatives, one could be seen as ‘best choice’, one as ‘worst choice’ and the remaining two as ‘average choices’. The best choice had a total score of 4 (*Samkia*, with eight positive- and four negative attributes). The worst choice, on the other hand, had a score of -4 (*Siemerola*, with four positive- and eight negative attributes). The two average choices both had a score of 0 (*Noberry*, with six positive- and six negative attributes; *Motosung*, with four negative-, four positive- and four neutral attributes).

The preferred mobile phone of each participant was measured in two different ways. At first they indicated their preference in a multiple choice question and subsequently they had to value each alternative on a one to five scale. After the gathering of the data, two different indexes were created in order to evaluate the extent to which participants were able to identify the best mobile phone.

The first differentiation index was created by subtracting the participants' attitudes towards the worst mobile phone (*Siemerola*) from the attitudes towards the best mobile phone (*Samkia*). Larger values of this subtraction indicated a higher ability in differentiating the best from the worst mobile phone (as in Dijksterhuis, 2004). A second differentiation index was

calculated by subtracting the mean of the participants' attitudes towards the worst and the two average mobile phones (Siemerola, Noberry, Motosung) from the attitude towards the best mobile phone (Samkia). Larger values of this subtraction assessed whether the participants were able to differentiate the best mobile phone from the others. The second differentiation index - as opposed to the first - also takes into account the valuation of the two average mobile phones and can therefore in some situations more accurately calculate the extent to which participants are able to identify the best mobile phone. For example, if all participants rated the worst phone extremely low - but the average phones as relatively high, compared to the best phone - then only the second differentiation index will be able to reveal that.

In order to assess whether the emotional states in the negative- and positive unconscious conditions were effectively induced, participants were asked to describe how positive or negative they felt, on a 7 point likert scale from 1 (absolutely not negative/positive) to 7 (extremely negative/positive).

Procedure

The experiment was part of a longer series with many unrelated experiments. Participants were assigned to private cubicles with a computer and were told that the experiment was an inquiry into consumer behavior. Subsequently they were instructed about the tasks they were asked to perform. After the real experiment started, participants were shown the 48 pieces of information. After that, depending on the condition they were assigned to, participants were asked to either immediately indicate their favorite mobile phone; or think about the purchase for three minutes and after indicate their preferred mobile phone; or think about either negative, neutral or positive life events, before indicating their preferred mobile phone. At the end of the experiment, the participants were asked to answer some evaluative questions to discover if they were aware of the purpose of the study. After that the participants were debriefed, thanked and paid by the experimenter.

Chapter 5: Results

An ANOVA - in which condition was compared with mood rating - was performed in order to determine whether the emotional manipulation was effective. For positive [$F(1,203) = 4,525, p < 0.01$] as well as negative emotions [$F(1,203) = 4,817, p < 0.01$] the manipulation was found to be effective. Participants that were asked to think about positive life events rated their moods as more positive than participants that were asked to think about negative life events [$p < 0.01$, 95% confidence interval: 0,28;1,68]. Participants that were asked to think about negative life events, on the other hand, rated their moods as more negative than the participants that were asked to think about positive life events [$p < 0.01$, 95% confidence interval: 0,36;1,99].

Overall, the participants judged the best mobile phone (Samkia) as more positive than the remaining three mobile phones. They valued the Samkia as better [$M = 3,52$] than the average mobile phones, Noberry [$M = 2,99$] and Motosung [$M = 2,75$]; and the worst mobile phone, Siemerola [$M = 2,63$]. Furthermore, when the participants had to point out their favorite mobile phone, they more often chose Samkia [52,9%] than Noberry [28,4%], Motosung [11,5%] and Siemerola [7,2%].

Table 1 shows for each condition the average scores and standard deviations of participants on the two differentiation indices. The first differentiation index (attitude best phone - attitude worst phone) significantly differed from zero in all conditions [$p < 0.01$], which implies that the participants were able to differentiate the best mobile phone from the worst mobile phone. A one-way ANOVA was performed in order to discover whether there were differences in scores on the differentiation index between conditions. First, since Levene's test was not significant ($p = 0.748$), the assumption of equal variances was met. It was found that the comparison of the differentiation index between conditions failed to reach significance [$F(1,203) = 0.911, p = 0.459$]. Further contrast analyses also failed to find any significant differences between conditions.

The second differentiation index (attitude best phone - average attitude other phones) significantly differed from zero in all conditions [$p < 0.01$], which indicates that the participants could differentiate the best mobile phone from the other phones. A one-way ANOVA was performed in order to discover whether there were any differences in scores between conditions on this second differentiation index. The assumption of equal variances was met, since Levene's test did not show a significant result ($p = 0.364$). It turned out that the

comparison of this second differentiation index between conditions was not significant [$F(1,203) = 0.453, p = 0.770$]*. A contrast analysis failed to find significant differences between conditions.

The present research does not support to the hypothesis that unconscious thought - compared to other modes of decision making - is beneficial when making complex decisions. Furthermore, the results fail to provide any support for the hypotheses that, when utilizing unconscious thought, positive emotional states lead to a higher decisions quality, than neutral or negative emotional states. Finally the present study did not confirm the hypothesis that when engaging in unconscious thought, negative emotional states lead to a lower decision quality, than neutral or positive emotional states.

Table 1

Number of Participants (N), Average scores (M) and Standard Deviations (SD) on the differentiation indeces of participants in the immediate, conscious, unconscious, positive unconscious, and negative unconscious conditions.

Condition	<i>Differentiation Index 1</i>		<i>Differentiation Index 2</i>		N
	M	SD	M	SD	
<i>Immediate</i>	1.17	1.33	.85	1.18	54
<i>Conscious</i>	.78	1.50	.69	1.28	46
<i>Unconscious</i>	.86	1.36	.74	1.14	29
<i>Positive Unconscious</i>	.64	1.59	.55	1.38	42
<i>Negative Unconscious</i>	.95	1.29	.85	1.07	37

*See appendix 2 for test statistics and visual representation of results of both differentiation indices.

Chapter 6: Conclusions and Discussion

The present research failed to provide support for the *deliberation-without-attention* hypothesis, which states that a brief period of unconscious thought - as opposed to other modes of decision making - would be beneficial while engaging in complex decision tasks. In fact, we did not find any differences in decision quality between the five conditions of this experiment. The obtained results match those of a large number of other studies that were not able to confirm the benefits of unconscious thought (Lassiter et al., 2009; Payne et al., 2008); Rey et al., 2009; Thorsteinson & Withrow, 2009; Waroquier et al., 2009).

A possible methodological deficiency of the present study might be the existence of ceiling effects due to a too easy decision task. The present experiment was constructed in such a way, that the presented information about the mobile phones was too much to make sense of through conscious thinking. Thus, if unconscious thought is not allowed to influence the decision (in the immediate choice and conscious condition) it would be expected that the percentage of participants that chose the best phone would equal the expected value of guessing for the best phone (25%). However, as can be seen in appendix 2.5, it appeared that in all five conditions approximately 50% of the participants were able to choose the best mobile phone. Immediately after the information was presented, half of all participants already knew which phone was best. It would be easier to identify a pure unconscious thought effect, if the difficulty of the decision task would have been higher - and the best phone could only be guessed at the chance level of 25%. Because if the unconscious mind really has more processing capacity than the conscious mind, then this would only light up if the unconscious mind is able to process information that is too much and complex for the conscious mind. Thus, at the moment the information becomes easier to process for the conscious mind - as in the present study - it becomes more difficult to identify a pure effect of the unconscious.

Despite the emotional manipulation being effective, a positive or negative emotional state did not turn out to make any difference on the quality of decisions. The non-significant results of the present study seem puzzling, when considering the fact that in the past numerous studies have pointed out the influence of positive or negative emotional states on decision making.

A possible explanation for this inconsistency might be the influence of demand characteristics, which means that participants might be aware of the purpose of the manipulation and as a result change their behavior accordingly. According to Martin Orne

(1969) Participants do not react to experimental stimuli as separate events, but they perceive them in the context of the whole experiment. Furthermore, Weber and Cook (1972) identified a number of roles participants could take on as a result of demand characteristics. For example, the good participant role means that participants identify the experimenter's hypotheses and subsequently want to confirm them. In the present study, it could be possible that the manipulation was not as effective as the participants said it to be. It was obvious that the purpose of the manipulation was to elicit emotional states. Since the manipulation check consisted of asking the participants explicitly about their feelings, it could have been possible that they would give the answer that was most desirable given the manipulation they received. For example, even if participants do not feel happier after the manipulation, they might reason that they should feel happier, because they were asked to think about happy events during the manipulation.

An important drawback of the present study is its design. Considering that there are three different emotional states (positive, neutral, and negative) and three different thought modes (unconscious, conscious, immediate), the preferred design of a study on the influence of emotional state and thought mode on decision quality, would be a full factorial design with nine different experimental conditions. The major reason of not using such a design is that the emotional manipulation is at the same time the distraction task in the unconscious thought conditions, used to stimulate unconscious thought. Therefore, if the emotional manipulation would also have been included in the immediate- and conscious thought conditions, *after* the presentation of the attributes of the mobile phones, this would most likely lead to a period of unconscious thought, and that is not desirable in a immediate- or conscious thought condition. A possible solution to this problem is performing the emotional manipulation *before* the presentation of the information and using a different distraction task in the unconscious thought conditions. However, the drawbacks to this solution are twofold. At first, it might be possible that the emotional manipulation will be flattened at the moment of actually thinking about which phone is preferred most, because the presentation of the information about the mobile phones takes a couple of minutes. And secondly, the emotional manipulation could influence the way in which the presented information is encoded. For example, Forgas, Goldenberg and Unkelbach (2009) showed that a negative emotional state improved memory accuracy. It is not desirable that participants are better able to remember the presented information, so performing the emotional manipulation before the information is presented does not seem to be an option. Future researchers should try to find a way in which a full factorial design can be used while making sure that the above mentioned risks are prevented.

Another major drawback of the present study - and other studies that have been conducted within the unconscious thought paradigm - is the number of factors that can be varied while methodological design between studies. There are numerous factors that have to be taken into account while designing the experiment. Since unconscious processes cannot be observed directly, it is extremely important that each study tries to measure them in the same way. If the methodological design of each study within the unconscious thought paradigm varies, then it will become very hard to draw any valid conclusions on the existence of an unconscious thought effect, since there are numerous confounds that could account for the difference in results. Considering the present study for example, it is possible to vary at least some of the following factors: *duration of information presentation*; *duration of conscious thinking/distraction task*; *kind of distraction task*; *kind of product alternative*; *measurement of dependent variable (MC or dimensions)*.

Recently, a meta-analysis has been published that searched for possible explanations of the variance in effect sizes between different studies. Felix Acker (2008) conducted an analysis comprising a total of 17 experiments within the unconscious thought paradigm. Overall, a slight positive effect of unconscious thought conditions was observed, as compared with conscious or immediate conditions, although these results were not significant. This implies that it is too early to conclude that unconscious thought *always* benefits decision quality with complex decisions. It could be possible that the unconscious thought effect is genuine, but only under certain conditions. Acker identified a moderator of the effect sizes of the studies within the unconscious thought paradigm. It turned out that effect sizes were significantly larger if the information concerning the different product alternatives was presented as a block (all items simultaneously), rather than individually. Since the information in the present study was presented individually, the non-significant results could be explained by the moderating influence of the individual presentation format.

Additionally, Strick et al. (2010) performed a moderator analysis, which had to explain the variance in effect sizes between studies. It turned out that more than two thirds of the variance in effect sizes could be ascribed to systematic factors. One of those factors was the *complexity of the decision problem*. The analysis revealed that the effect size was significantly stronger when the decision problem was complex. Another factor that systematically influenced variance in effect size was *presentation format* (also found in the analysis of Acker, 2008). Effect size was stronger if information about the product alternatives was presented clustered rather than individually. The third identified factor was *presentation materials*, which means that effect size was stronger if pictures of the product

alternatives were added to the product information. Finally, it turned out that *distracter task type* also systematically influenced variance in effect size, which was stronger if word search puzzles were used, as compared to other distracter tasks.

In total there have been identified four different methodological factors that systematically influence variance in effect sizes. Thus, the merit of unconscious thought processes on decision quality could possibly be conditioned by those factors. The present study only honors one of them: *complexity of the decision problem*. The present experiment did not include pictorial information; the information was presented individually and not clustered; and autobiographical recall was used as a distracter task, instead of word search puzzles. Therefore it is possible that the obtained results are non-significant due to not honoring the conditions under which the unconscious thought processes seem to perform most strongly. The moderator analysis by Strick et al. (2010) that identified those conditions was published one year after the period in which the present experiment was conducted and thus it was not possible to include those condition in the design of this study.

Future Research

Future research within the unconscious thought paradigm should take into account the conditions under which the effect sizes are strongest. By keeping methodological factors constant, the possibility of those factors influencing the results will be kept to a minimum. Due to this isolation of the unconscious thought effect, more valid conclusions about its nature can be drawn. Additionally, more studies have to be conducted on the nature of unconscious thought processes, to further identify factors that might influence its strength. The results of the previously mentioned meta-analyses should be interpreted with care, because of the low number of included experiments.

Furthermore, the unconscious thought paradigm came into existence around the year 2004, which makes it a relatively young research area. Since then, a wide array of experiments have been conducted, but there is still much to be learned. The ecological validity of the performed studies is very low. In real life it not very likely that one will only have three minutes to think consciously about the purchase of a mobile phone or an apartment. Moreover, a recent study by Thorsteinson and Withrow (2009) pointed out that if participants in the conscious thought condition were allowed to make notes about the information of the product alternatives, they were better able to identify the best product alternative than participants in the conscious thought condition that were not allowed to make

notes. It is not uncommon for people to write down notes while making a decision. Most studies within the unconscious thought paradigm use a conscious thought procedure that is absolutely not similar to real life situations in which people consciously think about a product purchase. Unfortunately, it is extremely difficult to perform research about decision making in real life situations, because it is hard to perform manipulations and control variables in non-lab studies.

Another interesting field of future research is the possible influence of different emotional states on the way in which unconscious thought processes affect decision quality. The present study did not find any significant differences between the normal unconscious thought condition and the emotionally primed (positive and negative) unconscious thought conditions. However, it is possible that the effect would have been significant if the factors that systematically influenced variance in effect size were taken into account. Future research could take these factors, together with the methodological drawbacks of the present study, into account.

Managerial Implications and General Conclusion

Managers are frequently confronted with difficult decisions; decisions that cannot be made by solely weighing the advantages and disadvantages and making deliberate, purely rational choices. Most complex decisions can be approached - but not embraced - by rationality. There are still some factors influencing the world around us that bypass human understanding. As science makes progress, we keep growing towards a complete understanding of those factors, but until then, there will always be some risk involved in decision making.

The implications of Dijksterhuis' *deliberation-without-attention* hypothesis (2004) were that it would in some situations be beneficial to stop thinking consciously about complex decisions and let the unconscious mind do its work in providing the best answer. This decision strategy had to sound quite attractive to most managers, because much valuable time would be saved by adhering to such a strategy. One can simply proceed with other tasks at work, while the unconscious mind processes the information concerning the complex decision and comes up with the most effective solution.

However, as the present study indicates, it is too soon to draw any valid conclusions about the positive influence of unconscious thought processes on the quality of decisions. Both meta-analysis point in the direction of a genuine effect, but the number of studies that

provide inconsistent results is too large to ignore. Future research will have to point out if it will be better to leave complex decisions to our unconscious minds. Until then, managers have to keep relying on the old rational modes of decision making.

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Appendix 1: Materials

List of mobile phone attributes for each alternative, inspired on the experiment by Dijksterhuis and his colleagues (2006).

The Samkia (best phone)		The Motosung (average phone)	
The Samkia is frail	-	The Motosung is robust	+
The Samkia has a long lasting battery	+	The Motosung has a medium battery	±
The Samkia has no GPS system	-	The Motosung has no GPS system	-
The Samkia has a 5 megapixel camera	+	The Motosung has a 5 megapixel camera	+
The Samkia has multiple games	+	The Motosung has one game	±
The Samkia large buttons for texting	+	The Motosung has large buttons for texting	+
The Samkia has a good signal receive	+	The Motosung has a medium signal receive	±
The Samkia is large	-	The Motosung is small	+
The Samkia has high storage memory card	+	The Motosung has a medium memory storage	±
The Samkia has no ability to play mp3	-	The Motosung no ability to play mp3	-
The Samkia has a large screen	+	The Motosung has a small screen	-
The Samkia has internet access	+	The Motosung has no internet access	-
(8+; 4-)		(4+; 4±; 4-)	
The Noberry (average phone)		The Siemerola (worst phone)	
The Noberry is frail	-	The Siemerola is robust	+
The Noberry has a long lasting battery	+	The Siemerola has a short lasting battery	-
The Noberry has no GPS system	-	The Siemerola has no GPS system	-
The Noberry has a 5 megapixel camera	+	The Siemerola has a 5 megapixel camera	+
The Noberry has multiple games	+	The Siemerola has no games	-
The Noberry has tiny buttons for texting	-	The Siemerola tiny buttons for texting	-
The Noberry has a good signal receive	+	The Siemerola has a good signal receive	+
The Noberry is large	-	The Siemerola is large	-
The Noberry has small memory storage	-	The Siemerola has small memory storage	-
The Noberry has the ability to play mp3	+	The Siemerola has the ability to play mp3	+
The Noberry has a small screen	-	The Siemerola has a small screen	-
The Noberry has internet access	+	The Siemerola has no internet access	-
(6+; 6-)		(4+; 8-)	

Appendix 2: Statistics

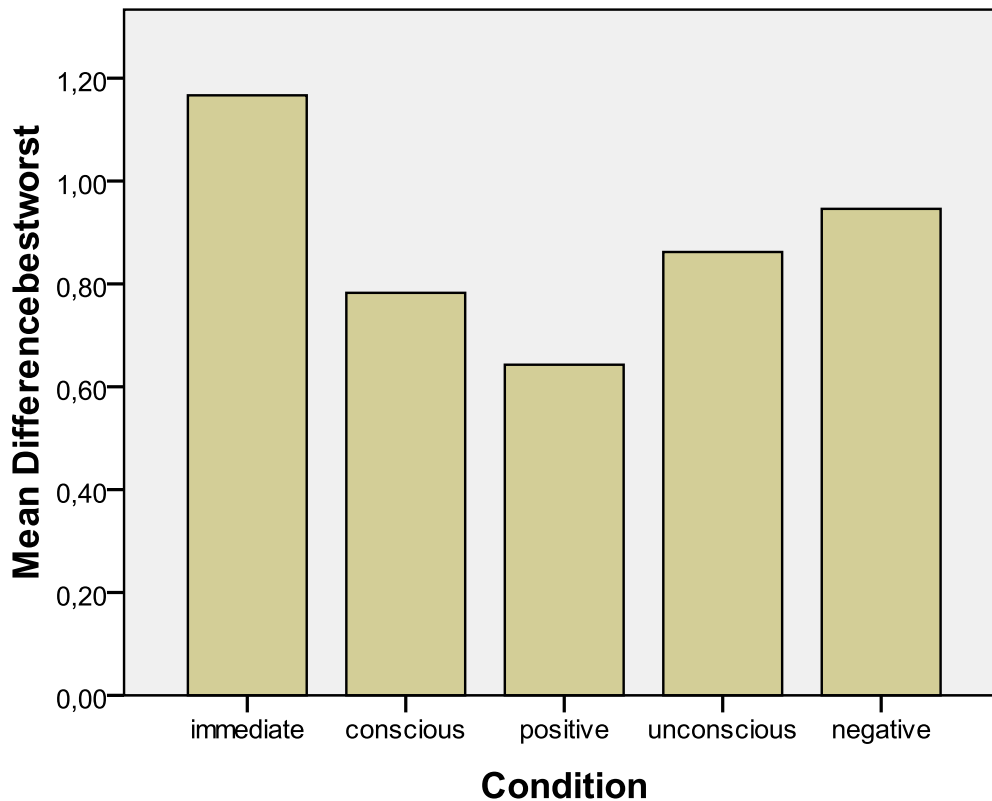
2.1. ANOVA: differentiation index * condition

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7,364 ^a	4	1,841	,911	,459
Intercept	154,179	1	154,179	76,280	,000
Conditie	7,364	4	1,841	,911	,459
Error	410,309	203	2,021		
Total	584,000	208			
Corrected Total	417,673	207			

a. R Squared = ,018 (Adjusted R Squared = -,002)

2.2. Mean differentiation index for each condition



2.3. ANOVA: differentiation index (2) * condition

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2,699 ^a	4	,675	,453	,770
Intercept	106,916	1	106,916	71,714	,000
Conditie	2,699	4	,675	,453	,770
Error	302,647	203	1,491		
Total	417,889	208			
Corrected Total	305,346	207			

a. R Squared = ,009 (Adjusted R Squared = -,011)

2.4. Mean differentiation index (2) for each condition

