MAKING COMPLEX DECISIONS: UNCONSCIOUS OR ONLINE PROCESSES?

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by
Jamie Kiss
Summer 2010
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DEDICATION

I am truly thankful to my family and friends. Their love and support has inspired and guided me throughout my academic career. Thank you for all that you have done for me.
ACKNOWLEDGEMENTS

I would like to offer my heartfelt gratitude to Dr. Martinus van den Berg. His guidance, encouragement, and mentorship throughout this investigation has made this thesis possible. I am grateful for his advice and patience with me along the way. I would also like to thank Dr. Brian Oppy for his support. A special thanks to Chad Mortensen for the assistance he provided me throughout my graduate studies.
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ABSTRACT

MAKING COMPLEX DECISIONS: UNCONSCIOUS OR ONLINE PROCESSES?

by

Jamie Kiss

Master of Arts in Psychology
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Previous studies (Dijksterhuis, 2004; Dijksterhuis et al., 2006) suggest that complex decisions are best when left for the unconscious to decide; however, there is a great deal of criticism and a lack of supporting evidence for unconscious decision-making. This investigation was designed to clear up the uncertainty about unconscious decision-making. One hundred-sixty undergraduates were asked to either memorize characteristics or form an impression of four cars. They were asked to rate each car either immediately or after a three-minute period in which they engaged in one of three modes of thought. Results revealed that the difference in instruction had an effect on decision-making; however, no support was found for unconscious decision-making. It is suggested that decisions were made online, as information was coming into working memory. The exact mental processes that occur during complex decision-making are still unclear.
CHAPTER I

INTRODUCTION

It is a common belief that the best decisions are made after a period of careful, conscious deliberation. We are aware of what alternatives exist and what the consequences may be for each decision to be made. We actively consider the positive and negative aspects, make pro and con lists, and focus on what aspects matter most to us. Decisions can range from dichotomous and simple – a ham or turkey sandwich, to complex and multi-faceted – buying a car and evaluating the alternatives of things like price, features, color, and dependability. One thing remains the same: we are faced with numerous decisions on a daily basis. So how is it that we should make decisions in order to get the best results? And should we do anything differently when that decision is complex?

Decision-making has been studied for decades in various disciplines: psychology, economics, statistics, political science, cognitive science, business, medicine, law, and many others. Some of the most significant work in decision-making has been done by Kahneman and Tversky (Kahneman & Tversky, 1972; Tversky & Kahneman, 1973; Tversky & Kahneman, 1974). Kahneman and Tversky’s work centers on heuristics, fallacies, and biases. These researchers aimed to uncover how it is that people make decisions; more specifically, how they categorize and predict the likelihood of events. Kahneman and Tversky found that because of the limitations in attentional
capacity, heuristics are frequently used. A heuristic is one of the shortcuts that can be used to obtain a solution.

One of the most researched heuristics is the representativeness heuristic. This heuristic is a judgment rule in which an estimate of the probability or likelihood of an event is determined by one of two features, how similar the event is to the population of events it came from or whether the event seems similar to the process that produced it (Kahneman and Tversky, 1972). For example, if six coins were tossed and landed heads, tails, tails, heads, tails, heads and another six coins were tossed and landed tails, tails, tails, heads, heads, heads, most would say that the first results are more likely. This is because the first results appear to be more representative of a random process.

Another of the highly researched heuristics is the availability heuristic, or “...the ease with which relevant examples can be remembered” (Tversky and Kahneman, 1973). People use these heuristics as shortcuts to make decisions without really thinking them through. An individual who is relatively young might experience the availability heuristic while trying to decide which car will last longer, a Honda versus a Ford. A Honda quickly comes to mind because you can easily remember seeing a greater number of older Hondas on the road whereas trying to remember seeing an old Ford on the road is more difficult. Although these heuristics are somewhat successful at coming up with the right solutions, they are not perfectly reliable. There are still many important situations where mindful thought is a must.

Thinking about decision-making as a conscious deliberation among alternatives assumes that these decision-making processes are happening in working
memory. Baddeley describes our working memory as a place where conscious mental effort is applied (Baddeley & Hitch, 1974). While Baddeley proposed that our limited short-term memory is only a small part of working memory, the working memory system still has limited capacity. The limitations exist in how much work can be done at once, in other words, how much each slave system is taxed and is pulling resources from the central executive. When a decision becomes complicated because it has too many components, we drain our reserve of attentional resources. For example, when deliberating among different characteristics of a car in order to make a decision on which to buy, there are many processes operating in working memory. One slave system, the visuospatial sketchpad, is visualizing a new characteristic while the central executive may be incorporating it into a car that we already have in mind. The other slave system, the phonological loop, rehearses and retains your preference on a previous car while your central executive weighs and measures which characteristics bear more weighting and how the cars compare to one another. Often times, when too much information is given with a choice to be made, and the limits of working memory are reached, forgetting pertinent aspects and getting stuck remembering only a few is common. Through chunking information together we are able to pack many smaller pieces of information into one bigger piece in order to get more information into working memory, however there still can be too much. So what happens when there is too much information for our working memory to manage?

In the last several years, Dijksterhuis and his colleagues (Dijksterhuis, 2004; Dijksterhuis et al., 2006; Dijksterhuis et al. 2009; Dijksterhuis & Meurs, 2006;
Dijksterhuis & Nordgren, 2006; Dijksterhuis & van Olden, 2006) created experiments aimed to uncover how we are successful at making complex decisions even though our attentional resources are so limited. They agree that in order to make good decisions two things are required: first, enough processing capacity, and second, skills sophisticated enough to integrate complex information. Even though Baddeley’s Working Memory Model has a somewhat large capacity and a few sophisticated parts, these are still inferior to what is needed for complex decision-making. Dijksterhuis predicted that when there is a complex issue at hand, one too demanding for our working memory to handle, we can stop paying attention to the task altogether and instead allow our supposedly unlimited unconscious to aid the decision-making process by integrating the complex information.

These researchers’ ideas were tested in several experiments that followed a similar experimental format. Participants were presented with a decision to be made, such as choosing one of four hypothetical cars. Each participant was subjected to a 2 (mode of thought: conscious vs. unconscious) × 2 (complexity of choice: simple vs. complex) factorial design (Dijksterhuis et al., 2006). The participants were each shown a list of characteristics that described a particular car. In the simple choice group, four characteristics were given for each car. In the complex choice group, twelve characteristics were given for each car. One car had 75% positive and 25% negative characteristics, one had 75% negative and 25% positive characteristics, and the other two cars had 50% positive and 50% negative characteristics. All cars were scored on the same characteristics but with differing values that were conceptualized dichotomously – either a car has a small trunk or a large trunk. After reading about all cars and their
characteristics, participants were then separated into two thought groups. The conscious thought group viewed all characteristics for all cars and then consciously thought about them for four minutes before deciding on the desired car. The unconscious thought group viewed all characteristics for all cars and then was distracted by another task (i.e. solving anagrams) for four minutes before deciding on the desired car. Dijksterhuis believed that becoming actively engaged in a task other than solving the problem at hand enabled unconscious thought. In their other experiments Dijksterhuis and his colleagues also added a third mode of thought group as a baseline or control group. The participants in this group made their decisions immediately after being presented with all characteristics and were not given any time to think or to be distracted (Dijksterhuis, 2004). Participants were then asked to rate their attitudes on each of the cars. Attitude differences were scored by subtracting the attitude rating of the worst car from the attitude rating of the best car.

Surprisingly, this new research produced a finding counterintuitive to that of conscious deliberation and supportive of Dijksterhuis’ hypothesis. Those in the unconscious thought condition rated the better cars higher than those in the conscious thought condition. These researchers concluded that decisions made about complex issues are better when you are prevented from thinking consciously about the choices. This enables your large and sophisticated unconscious to integrate, polarize, and organize information. Only the simple decisions benefited from conscious deliberation (Dijksterhuis et al., 2006). Dijksterhuis’ research revisits the Freudian idea of an
unconscious (Freud, 1900) not just as a place where memories are repressed, but as a working and dynamic place in our minds.

This new direction for decision-making out of awareness started a widespread examination of conscious versus unconscious decision-making. In a series of studies done by Dijksterhuis, as well as other researchers in the field, many intriguing and surprising results came forth. For example, Dijksterhuis and van Olden (2005) asked participants to rate their attitudes toward posters they viewed, and then take their favorite home. These researchers found that post-choice satisfaction was higher for those in the unconscious thought group. In another examination of unconscious decision-making, it was established that the unconscious organizes, integrates, and polarizes information and is not just a passive mechanism, but a highly active one. However, in order to engage in unconscious thought, it is necessary to have a goal, like the solution of a problem (Bos et al., 2008).

Each of these studies supporting superior unconscious decision-making led to A Theory of Unconscious Though (Dijksterhuis & Nordgren, 2006). It includes six principles that contrast the difference between conscious and unconscious thought. The Unconscious Thought Principle says that there are two modes of thought: one with attention (conscious thought), the other without attention (unconscious thought). Conscious thought happens in our awareness whereas unconscious thought happens when our attention is directed elsewhere. The Capacity Principle explains that conscious thought is limited to seven, plus or minus two items, originally proposed by Miller (1956), whereas unconscious thought has a much larger capacity. The Bottom-Up versus
Top-Down Principle explains that conscious thought engages in top-down processing where things are integrated schematically, and unconscious thought engages in bottom-up processing where things are integrated aschematically. This principle also makes clear that when a decision is being made, unconscious thought slowly integrates information to form an objective summary. The Weighting Principle says that in complex decision-making, conscious thought leads to suboptimal weighting, however unconscious thought has the ability to efficiently weight the relative importance of items. The Rule Principle states that conscious thought works well with precise rules and exact answers, whereas unconscious thought gives estimations, much like Tversky and Kahneman’s (1974) idea of heuristics. Lastly, the Convergence versus Divergence Principle explains that conscious thought is convergent and unconscious thought is divergent. This explains why unconscious thought is better when the decision that is to be made needs creative thinking.

Although the studies on which the Unconscious Thought Theory is based produced some significant results, there were more results presented that did not obtain significance. One example of this is in Dijksterhuis’ first experiment in 2004. Here, significance was not reached when conscious and unconscious thinkers were directly compared. These types of weak results did not go unnoticed by other researchers in the field. Much criticism soon followed focusing on the small sample sizes, the limitations to the laboratory, and that the effects were artifacts of the instructions given.

In 2008, Acker tried to replicate Dijksterhuis’ findings as well as compile a meta-analysis on 17 experiments (six of which were done by Dijksterhuis and his
colleagues) that had been done on unconscious versus conscious decision-making. In Acker’s replication, the format of Dijksterhuis and colleagues was followed closely, only Acker used a word search as the distracter task instead of an anagram problem. Acker’s attempt to replicate previous findings failed, as his findings suggested that the clearest difference between the cars was obtained by the conscious thinkers, and the worst distinction was achieved by the unconscious thinkers. In the meta-analysis portion of this study, Acker shows that within the 17 experiments, the results are inconsistent and leave many questions unanswered. Only 5 of the 17 obtained statistical significance. These five experiments did provide evidence to the advantage of unconscious thought, but they also had the smallest sample sizes. Different distracter tasks were used in several of the experiments, and Acker’s meta-analysis showed that the distracter task made a difference in the results. Decision-making was also found to be measured in different ways across the 17 experiments, possibly explaining the very different results. Overall, Acker concluded that, “there is little guarantee that unconscious thought will truly be a good aid when faced with complex and important decisions” (2008, p. 308).

In a different critical examination of Dijksterhuis’ results, Lassiter et al. (2009) stated that Dijksterhuis has ignored significant work in the areas of judgment and decision-making. Lassiter argued that the results could be better explained by a classic study in cognitive psychology by Hastie and Park (1986). Hastie and Park claim that people make decisions in two ways: online or memory-based. Online operations happen as relevant information comes in from the environment and is still available in working memory. Decisions being made online are continually updated in the working memory
system as new pieces of information are acquired. The end decision or preference is stored in long-term memory and the specific bits of information upon which the final decision is based are forgotten. On the other hand, memory-based operations rely solely on the pieces of decision relevant information that were encoded into long-term memory. Memory-based decisions happen later based on what is recalled from the given information. However, sometimes judgments can happen spontaneously, even when there is no instruction to do so. This Online Spontaneous Judgment (Hastie & Park, 1986) can happen depending on the nature of the situation; social judgments, new and unexpected events, or even seeing items that are distinctively associated with certain things can lead one to make a judgment even when he or she has no reason to.

Based on Hastie and Park’s (1976) research, Lassiter et al. believed Dijksterhuis’ findings to be an artifact of the instructions given to participants. He thought it was possible that the unconscious thought group did better when given the instruction to “form an impression,” as Dijksterhuis gave, because participants were more likely to engage in online decision-making and integrate new decision relevant information as it was acquired. Essentially, by the time all of the information has come into working memory, the decision has been made. Participants then stored this one piece of information in long-term memory, and later used it to report their final decisions. Even though the unconscious thought group was distracted by the anagram task for four minutes before making their final decision, they were still able to recall the one piece of information stored in long-term memory. On the other hand, the conscious group might have fared more poorly because when they were asked to “think carefully”, they did not
default to their stored first impression, but rather took this as an order to recall specific characteristics and make a memory based judgment, overriding their initial feeling. With four cars having twelve characteristics each, this amount of information was too large and unorganized to make a good decision. These participants’ decision-making skills were severely limited and impaired, and they tended to recall a few random characteristics and used only those few to make a decision.

In Lassiter’s study, the goal was to incorporate the research done by Hastie and Park and answer the question of whether the instruction given prior to viewing all characteristics influences how well decisions are made for each mode of thought. Lassiter’s experiment began much the same as the standard Dijksterhuis format. Four cars were presented with twelve characteristics each. A similar positive / negative distribution of characteristics was used here as well. However, before the characteristics were shown, participants were either asked to a “form an impression” or “memorize” the characteristics. After all characteristics were shown participants were then either asked to think carefully for four minutes, or complete an anagram for four minutes. After the time elapsed, participants then gave their attitude toward each car on a scale of -25 (very negative) to +25 (very positive).

In order to obtain the results, Lassiter used a Strength of Preference Index (SPI) originally used by Dijksterhuis and van Olden (2005) and Dijksterhuis et al. (2006). This number was found by subtracting the average attitude score toward the three worse cars (lowest number of positive characteristics) from the attitude score of the best car (highest number of positive characteristics). The larger the SPI score, the stronger the
preference for the best car. Half of Lassiter’s results were supportive of Dijksterhuis’ work. The unconscious thought group who were asked to solve anagrams and were distracted from conscious deliberation, had higher SPI scores when they were asked to form an impression. However, when asked to memorize the characteristics their SPI scores were lower. On the other hand, the conscious thought group, who were asked to think carefully had higher SPI scores when they were asked to memorize the characteristics, and lower SPI scores when they were asked to form an impression. Lassiter’s hypotheses were supported, and his study showed that the instructions given prior to seeing the cars’ characteristics made an impact on decision-making.

Not only the empirical findings of Dijksterhuis have been critically examined, also the Unconscious Thought Theory that is based on these findings has received criticism. Gonzalez et al. (2008) investigated numerous pieces of influential research in the areas of cognition and social psychology. She and her colleagues found that many of these works demonstrated that unconscious processes can effect judgments and evaluations. However, contrary to Dijksterhuis’ claims, these pieces of research say that the unconscious is limited. For example, Greenwald’s research shows the unconscious as “. . .cognitively less sophisticated” (1992, p.766), and not as clearly separated from conscious thought. Gonzalez et al. (2008) also tells of a study (Betsch et al., 2001) where participants were shown advertisements on a computer screen while stock share information flashed on random areas of the screen. In this experiment, participants in fact made accurate evaluations of the stock shares, yet were unable to provide specific numbers or averages of the shares. The participants who were most successful at this
were in the immediate decision group, not the unconscious thought group. This work was cited by Dijksterhuis et al. (2006), but was not really supportive of his sophisticated unconscious thought. Unconscious Thought Theory fails to survive a rigorous examination from the point of view of several decades of research in cognitive psychology.

In summary, there is no consensus about unconscious decision-making and the best way to make complex decisions. The question still remains: How should we make complex decisions? The present investigation’s purpose is to clear up this uncertainty. It consists of three parts: 1) to provide a thorough investigation of Lassiter et al. (2009) and Dijksterhuis et al. (2006) using all conditions and techniques in order to examine all variables and interactions in a carefully controlled design, 2) to obtain subjective characteristic ratings in order to determine which car is best for each individual participating in the experiment, and 3) to create a dependent variable that accurately measures the quality of each individual’s decision-making.

In order to achieve a thorough investigation in this experiment, all parts of the previous studies had to be followed as closely as possible while also providing clearer instructions that gave participants the expectation of what they should exactly be doing. In both Dijksterhuis et al. 2006, and Lassiter et al. 2009, no immediate thought group was present. However, an immediate thought group has frequently been used in other unconscious vs. conscious decision-making studies and was incorporated into the present experiment as another way to study online decision-making. By obtaining data from participants that made decisions immediately, with no time for analyzing the group of
characteristics as a whole, it will allow for a closer examination into online decision-making that took place in working memory as the information was coming in. As a way to study more about moderator variables, a fourth mode of thought was added. This mode of thought was called passive-unconscious and was created to investigate what specific conditions benefit unconscious thought. The previous unconscious thought condition, where participants solve anagrams, is called active-unconscious thought in the present experiment.

Another difference in this study lies in the memory-based condition. As Hastie and Park’s (1986) research states that online judgments are often made spontaneously, it was imperative that this investigation take their advice and ensure that no previous judgment has been made and also to motivate the participants to use the information that had been stored in their long term-memories. To attend to these issues the participants in the memory-based condition were motivated to use the information by being asked to recall the information at a later time. Participants were also asked not to rate this car for themselves, rather to rate it for a family with two children. Because all participants were undergraduate students at a residential college this ensured that virtually no participant had rated the cars this way prior to being given the instruction to do so.

Besides the addition of an immediate thought condition and careful control over spontaneous online decisions, this study also attempted to measure decision-making quality with less bias. In all of the previous experiments the “best” car was always determined by how many positive and negative characteristics it contained. Herein lies a problem: how did the previous experimenters know what characteristics were important
to the individual participants? Instead of asking participants about their likes and dislikes, cars were haphazardly determined as best and worst by the experimenters. To avoid this bias, the present experiment asked each participant to rate each characteristic on how important it is. Based on these ratings a subjective car rating for each car was determined for every single participant.

Lastly, as Acker (2008) found in his meta-analysis, decision quality was determined in several different ways. Some experiments took an average attitude of the three worse cars and subtracted it from the attitude toward the best car, others took just the worst cars subtracted from the best cars, etc. Although these all measured the strength of how one car was preferred over another, they did not measure the quality of how well each individual made their own decision. By taking their subjective car rating and subtracting their actual car rating, we determined actual individual decision quality.

In the past few years, the work done by Dijksterhuis and his colleagues has been the subject of a great deal of criticism. Although there are numerous claims against unconscious decision-making, Dijksterhuis has continually obtained results that show unconscious thought as superior in complex decision-making. Given the research done with online decision-making (Hastie and Park, 1986) it is hypothesized that if participants are in the Impression condition, Dijksterhuis’ results will be replicated. That is, if participants are asked to form an impression, those in the active-unconscious thought group will have superior complex decision-making compared to those in all other groups.

It is also hypothesized that the results found by Lassiter et al. (2009) will be reproduced in this experiment. By adding a condition where participants were asked to
memorize all of the characteristics instead of to just form an impression of the cars, Lassiter was able to show that Dijksterhuis’ findings may have been an artifact of the instructions given prior to seeing the characteristics. I too hypothesize that those in the memory-based condition will make the best decisions when asked to think about the characteristics whereas those asked to form an impression will make better decisions when distracted from thinking.

Lassiter et al. (2009) was successful at showing that the instructions given to participants matter, however he did not include an immediate decision-making condition. This condition has been added to the present experiment because it is of the utmost importance in determining the strength and existence of unconscious decision-making. Because this study is refined with additional conditions, it is expected that there will be further findings. Again, considering the research done by Hastie and Park (1986), it is hypothesized that those in the immediate decision group will do just as well as those in the unconscious thought group when asked to form an impression. Those in the immediate decision group might even do better than the rest according to Betsch et al. (2001). In the memory-based condition, those in the conscious thought group will make the better decisions.

Lastly, Acker (2008) found that changing the distracter task in the unconscious conditions makes a difference in the results. As Bos et al. (2008) found, in order to engage in unconscious decision-making, there must be a goal. In this experiment, those in the active-unconscious condition have the goal of solving anagrams whereas those in the passive-unconscious condition do not have a goal – they are asked to relax
and simply watch a clip of a sit-com. Therefore, it is hypothesized that those in the active-unconscious condition will make better decisions than those in the passive-unconscious condition.

In sum, there are four hypotheses in this investigation. First, if participants are asked to form an impression, those in the active-unconscious thought group will have superior complex decision-making compared to those in all other groups. Second, those in the memory based condition will make the best decisions when asked to think about the characteristics, whereas those asked to form an impression will make better decisions when distracted from consciously thinking about their decision. Third, those in the immediate decision-making group will do just as well as those in unconscious thought group when asked to form an impression. And fourth, those in the active-unconscious thought group will make better decisions than those in the passive-unconscious thought group.
CHAPTER II

METHODOLOGY

Participants

One hundred-sixty California State University, Chico undergraduate students participated in this experiment. Participants were recruited using flyers posted in the halls, as well as hearing the experiment announced in their classes. Participants were 67% female and 33% male, with an average age of 22 ($M = 21.79; SD = 4.47$), and an average academic standing, as evidenced by their GPA, of 3.07 ($SD = 0.53$). Most participants were awarded extra credit for their participation.

Design

There were two independent variables in this experiment: Instruction and Mode of Thought. The Instruction variable consisted of two different sets of instructions: to either form an impression of the cars or to memorize the cars’ characteristics. In both conditions, participants were told they would see a list of 12 characteristics that described four different cars, and that each car would be scored on each of the 12 characteristics. In the condition asking participants to form an impression, designed to replicate Dijksterhuis’ studies (Dijksterhuis, 2004; Dijksterhuis et al., 2006), they were asked to form an opinion of the cars and decide how interested they would be in owning each car. They were also told they would be asked to report their opinion. In the memory
condition, designed to replicate Lassiter et al. (2009), the instructions were to do their best to memorize as many of the characteristics as possible by using memory techniques such as rehearsing or visualizing the information in mind. They were then told that they would later be asked to recall these characteristics.

The Mode of Thought variable consisted of four different states of mind used to make decisions: conscious, immediate, active-unconscious, and passive-unconscious. In the conscious condition, participants were asked to think about the cars’ characteristics for three minutes prior to rating the cars. In the immediate condition, participants were asked to immediately rate the cars after viewing all 48 characteristics. In the active-unconscious condition, participants were asked to complete an anagram task for three minutes before rating the cars. Lastly, in the passive-unconscious condition, participants were asked to sit back, relax, and watch a clip of a popular television comedy for three minutes prior to rating the cars. Car ratings and recall of characteristics would were measured in all conditions.

The two independent variables, Instruction and Mode of Thought, were crossed to yield eight experimental conditions. This resulted in a 4 Mode of Thought (conscious vs. immediate vs. active-unconscious vs. passive-unconscious) X 2 Instruction (memorize vs. form an impression) between-subjects design.

Experimental Materials

The materials used in this experiment consisted of the descriptions of four cars (each with 12 characteristics), a car-rating sheet, a characteristic rating sheet, a recall
sheet, an anagram task, a three-minute clip of a *Friends* episode (Carlock & Halvorson, 2002, minutes 9:12-13:12), and a demographic information sheet. The materials were included in a Microsoft PowerPoint presentation as well as a packet that was given to each participant and returned after completion. The PowerPoint consisted of 11 to 12 pages including: (a) one page of informed consent, (b) one page of general instructions, (c) two pages of condition specific instructions, (d) four pages of car descriptions, (e) one page for car ratings, (f) one page for recalling the characteristics, (g) one page for rating each characteristic, and (h) one page with a debriefing. See Appendix A for an example of one of the presentations. Each packet was assembled to match the PowerPoint and provide space for each participant’s responses. See Appendix B for a sample packet.

**The Cars**

The characteristics used to describe each car were the same attributes used by Dijksterhuis et al. (2006). Car “A” had nine positive and three negative characteristics (75% positive), cars “B” and “C” each had six positive and six negative characteristics (50% positive), and car “D” had nine negative and three positive characteristics (25% positive). A full list of characteristics used is shown in Table 1.

**Procedure**

All data were collected in a university computer lab in groups ranging from one to eighteen. Participants were randomly assigned to one of the eight experimental conditions. As the participants entered the room, they were asked to sit at a computer of their choice. After all participants were seated at a computer, they were guided to a
Table 1.

_A list of the 12 attributes for each car. A score of “1” implies positive value, “0” implies negative value._

<table>
<thead>
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<th>Characteristics</th>
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<th>Car “B”</th>
<th>Car “C”</th>
<th>Car “D”</th>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Ease of Shifting</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cup-holders</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sunroof</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Standards</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Quality of Sound System</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

| Sum | 9   | 6   | 6   | 3    |
website and asked to click on a designated link. This link opened the PowerPoint presentation and participants immediately pressed F5 in order to bring the informed consent to full screen. Participants were then asked to wait patiently at this screen while the packets were passed out. The experimenter then presented the informed consent and general guidelines for the experiment aloud as the participants followed along on their own screens. All participants were made aware that they could withdraw from the study at any time.

The next set of instructions informed the participants they would see a list of 12 characteristics that described four different cars. Depending on the condition assigned, participants were then either asked to form an impression of each car or to memorize as many characteristics as possible for each car. The order in which the cars were presented was counterbalanced, and the characteristics were presented individually for eight seconds each (this ensured closest replication of previous studies). After the presentation of all 48 characteristics, participants of both conditions were asked to either 1) rate the cars immediately after viewing all of the characteristics, 2) think carefully about each car, 3) complete an anagram task, or 4) watch a clip from a popular television sit-com. These last three tasks went on for three minutes each. After their task, participants were asked to rate each car by making a mark on a line that was labeled from -25 (extremely negative) to +25 (extremely positive).

For those participants who were asked to form an impression of the cars, their ratings consisted of their own attitudes of each car. For the other half of participants, who were asked to memorize the characteristics, their ratings were to be based on how well
each car fit a family with two children. This particular question was asked in order to avoid the on-line spontaneous judgments that happen even when there is no instruction to do so (Hastie & Park, 1986).

Upon completion of rating all four cars, participants were then given five minutes to write down as many characteristics as they could for each car, as well as note the types of memorization techniques used. Next, each participant was asked to rate the characteristics that had been presented for each car. Since each car was described by the same set of characteristics, just with differing values (i.e. had a large trunk or had a small trunk), the characteristics were presented in general form (i.e. trunk size). Those who were asked to form an impression of the cars rated the characteristics based on their own opinions whereas those who were asked to memorize each car’s characteristics rated the characteristics based on how well they fit a car for a family with two children. To rate the characteristics, participants wrote a number from 0 (does not matter at all) to 25 (very important). Lastly, the experiment concluded with a debriefing page. Participants were asked to turn in their packets and signed informed consent in order to receive a credit slip.
CHAPTER III

RESULTS

To determine if previous findings could be replicated, decision-making was first measured by the same Strength-of-Preference Index used by Dijksterhuis and van Olden (2005) and Dijksterhuis et al. (2006). In Dijksterhuis’ studies, all of his participants were asked to form impressions of the cars; therefore, in this first analysis, only the data from those asked to form impressions of the cars was used. A one-way analysis of variance was used to test the effect of Mode of Thought (conscious, active-unconscious, passive-unconscious, immediate) on Strength of Preference. This test did not obtain statistical significance, $F(3, 76) = .92, p = .43$, and thus failed to replicate any of Dijksterhuis’ findings. The data did not even point in the direction predicted by Dijksterhuis. Figure 1 displays the effect of Mode of Thought on Strength of Preference.

The Strength-of-Preference Index was also used in an attempt to replicate Lassiter et al. (2009). This time, decision-making was analyzed as a function of two factors: Instruction (form an impression, memorize) and Mode of Thought (conscious, active-unconscious, passive-unconscious, immediate). The 2X4 factorial analysis of variance found the main effect for Instruction to be significant, $F(1, 152) = 11.20, p = .001$, but the main effect for Mode of Thought did not reach significance, $F(3, 152) = .41, p = .74$. Those asked to form an impression made better decisions as a whole. Additionally, while Lassiter found a significant interaction in his experiment, there was
Figure 1. The effect of Mode of Thought on Strength of Preference

no significant interaction between Instruction and Mode of Thought, \( F(3, 152) = .69, p = .56 \).

Before analyzing the data using the Quality of Decision variable, the characteristic ratings data were analyzed for reliability. To be sure this new measure would work, it was important to first determine if participants rated the characteristics in a meaningful way. A one-way analysis of variance was used to compare each of the 12 characteristics across the two Instruction levels. To avoid false alarms with these data, the \( \alpha \)-level was set at .01. Several of the analyses were at or near significance. See Table 2 for a list of statistics for each characteristic. These data support the notion that the characteristic ratings were reliable.
Table 2.

A list of the 12 characteristics used for each car and their statistical values as obtained by a one-way analysis of variance comparing each characteristic across the two Instruction levels.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>P-Value</th>
<th>F-Value</th>
<th>Form an Impression Mean ± SE</th>
<th>Memorize Mean ± SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk Size</td>
<td>&lt;.001*</td>
<td>43.08</td>
<td>13.21 ± .74</td>
<td>20.04 ± .74</td>
</tr>
<tr>
<td>Color Options</td>
<td>&lt;.001*</td>
<td>47.47</td>
<td>11.51 ± .70</td>
<td>4.69 ± .70</td>
</tr>
<tr>
<td>Legroom</td>
<td>.001*</td>
<td>12.07</td>
<td>16.11 ± .71</td>
<td>19.61 ± .71</td>
</tr>
<tr>
<td>Cup-holders</td>
<td>.002*</td>
<td>10.33</td>
<td>14.45 ± .78</td>
<td>17.99 ± .78</td>
</tr>
<tr>
<td>Quality of Sound System</td>
<td>.004*</td>
<td>8.59</td>
<td>15.26 ± .76</td>
<td>12.13 ± .76</td>
</tr>
<tr>
<td>Ease of Shifting</td>
<td>.069</td>
<td>3.35</td>
<td>19.34 ± .66</td>
<td>17.62 ± .67</td>
</tr>
<tr>
<td>Service Plan</td>
<td>.070</td>
<td>3.33</td>
<td>18.20 ± .68</td>
<td>19.95 ± .68</td>
</tr>
<tr>
<td>Mileage</td>
<td>.194</td>
<td>1.70</td>
<td>21.53 ± .56</td>
<td>20.49 ± .56</td>
</tr>
<tr>
<td>Age of Car</td>
<td>.393</td>
<td>.732</td>
<td>17.90 ± .66</td>
<td>17.10 ± .66</td>
</tr>
<tr>
<td>Environmental Standards</td>
<td>.452</td>
<td>.567</td>
<td>15.76 ± .81</td>
<td>14.90 ± .81</td>
</tr>
<tr>
<td>Handling</td>
<td>.852</td>
<td>.035</td>
<td>20.73 ± .57</td>
<td>20.58 ± .57</td>
</tr>
<tr>
<td>Sunroof</td>
<td>.907</td>
<td>.014</td>
<td>8.55 ± .76</td>
<td>8.68 ± .76</td>
</tr>
</tbody>
</table>

Note.  * Significant at $p < .01$ level. Values represent means ± standard errors.
After ensuring that the characteristic ratings were a useful way to determine one’s subjective car rating, an analysis of variance could be used to test the effects of Instruction (form an impression, memorize) and Mode of Thought (conscious, active-unconscious, passive-unconscious, immediate) on the Quality of Decision. The 2X4 analysis of variance found the main effect for Instruction to be significant, \( F(1, 152) = 6.95, p = .009 \), but the main effect for Mode of Thought did not reach significance, \( F(3, 152) = 1.28, p = .28 \). Again, those asked to form an impression made superior decisions. Furthermore, there was no significant interaction between Instruction and Mode of Thought, \( F(3, 152) = 1.02, p = .38 \). Figure 2 displays the effect of Instruction on Quality of Decision.

![Figure 2. The effect of Instruction on Quality of Decision](image-url)
CHAPTER IV

DISCUSSION

There were four hypotheses in this investigation. First, it was hypothesized that if participants were asked to form an impression, those in the active-unconscious thought group would have superior complex decision-making compared to those in all other groups. Second, those in the memory based condition were expected to make the best decisions when asked to think about the characteristics, whereas those asked to form an impression were expected to make better decisions when distracted from consciously thinking about their decision. Third, those in the immediate decision-making group were hypothesized to do just as well as those in unconscious thought group when asked to form an impression. And fourth, those in the active-unconscious thought group were expected to make better decisions than those in the passive-unconscious thought group.

The goal of this study was to shed light on a few unanswered questions: Does unconscious decision-making exist? If unconscious decision-making does exist, how do people use it to make decisions? Over the last several years, Dijksterhuis has repeatedly produced results suggesting that there is unconscious decision-making, that it happens when one is distracted from thinking about the problem at hand, and that it is the superior form of complex decision-making. In spite of this, very few other researchers have succeeded in replicating Dijksterhuis’ findings. Instead, they have given numerous explanations as to how Dijksterhuis’ results can be accounted for by other, more
researched theories. This study belongs to the category of those unable to reproduce Dijksterhuis’ results.

In the attempt to reproduce the findings given by Dijksterhuis, I did not find support for unconscious decision-making. While matching the conditions used by Dijksterhuis, this study also incorporated the suggestions given by Acker (2008). In Acker’s meta-analysis, he claimed that the original distracter task used by Dijksterhuis, the anagram, was the only distracter task that led to superior unconscious decision-making. The anagram distracter task was used in this study, as well as the new passive distracter task of watching a clip of Friends. Neither of these gave signs of an advantage for the unconscious thought groups. While this study was aimed specifically at uncovering more details about the conditions and processes of unconscious decision-making, it might have been helpful if decisions of differing complexities were used as previous research in this area has done. This would enable researchers to compare easy to complex decisions in all modes of thought.

In this study, half of the participants were given the instruction to memorize the characteristics of the cars, similar to Lassiter et al (2009). Those in this memory-based condition were expected to make the best decisions when asked to think about the characteristics whereas those asked to form an impression were expected to make better decisions when distracted from thinking. The results showed that while the difference in the instructions (form an impression, memorize) did matter, the mode of thought did not. Those asked to form an impression made better decisions as a whole than those asked to memorize the characteristics. The expected interaction between instructions and mode of
thought was not found to be significant, indicating that unconscious thought was not more successful in the condition where participants were asked to form an impression.

When testing to see whether participants rated the characteristics in a meaningful way, it was found that trunk size, service plan, legroom, and cup holders were rated as more important attributes to have in a family car. These attributes aligned with the expectations of those desired in a family car. For example, a family carries more items in a car and would therefore benefit more from having a larger trunk than a single college student. In contrast, color options, ease of shifting gears, and quality of sound system were more important to the participants of this study, who were undergraduate students. From these findings I concluded that the characteristics were rated in a meaningful way and could be used in the computation of the Quality of Decision.

The inclusion of an immediate decision-making condition helped to show why it is that those asked to form an impression made better decisions. Those in the immediate condition were expected to do just as well, or even better than those who were distracted from thinking when asked to form an impression. In the end, those in the immediate thought condition made slightly better decisions, though non-significantly better. This is support for the notion that the participants engaged in online decision-making. In the other thought conditions, decisions were poorer because the initial online decision was either changed by thinking about a few different characteristics or forgotten because of a distracter task. By rating the cars immediately after seeing all characteristics, true online decisions were measured.
This study controlled for spontaneous online judgments and asked those in the memory-based group to rate how well each car would fit a family with two children. From the findings in this experiment, we can conclude that the memory-based group did more poorly because they were suddenly asked to make a decision they were not prepared for, and not all the information was available to them due to the limits of working memory. The group asked to form an impression of the cars may have done so well because their judgments were forming as the information was coming into the working memory system. This too suggests that decisions were made online and that only the initial judgments were available, not the material on which those judgments were based.

Surprisingly, a post-hoc analysis showed that although the participants rated the characteristics in a meaningful way, the characteristics themselves may not have been used in making decisions about the cars. The subjectively determined car ratings (what participants should rate each car according to his or her individual preference) had a very low correlation with the actual car ratings that were given. Also, Quality of Decision correlated very low with recall of the characteristics, that is, the number of items recalled correctly did not determine how good or bad a decision was ($r = -0.195$). Because it was shown that as a whole the characteristics were rated with thought, only one explanation remains for these findings: there were too many characteristics to remember and use to guide a decision. This would explain why the memory-based group did so poorly at deciding on the best car for a family with two children, even when they were given time to think about the characteristics. These participants simply did not have enough
information stored in memory to make an educated decision. They may have even become stuck on one or two specific characteristics and ignored other relevant information for each car. This would explain why even when memory was good, decisions were not always good. Building on these findings would provide tremendous opportunity for future research.

A limitation to this study could have been in the characteristic ratings. Although the characteristics were rated meaningfully as to how important each one was to each participant, the weight of individual characteristics may not have been fully captured. That is, one or two particular characteristic may have been deciding factors for which car was the best, and the individual characteristic ratings may not have accounted for this. In reality, looking at a list of characteristics may not even be the way people choose cars. Making the decision process more similar to real world decision-making would be beneficial. These limitations could be addressed in future research.

The fact that the individual characteristics were not used to make decisions and that better recall did not lead to better decisions is further support that the decisions must be made online while the information is presented rather than later after all information has been given. It seems as though the participants asked to form an impression did in fact engage in online decision-making, as did the participants in the memory-based condition. However, when the participants in the memory-based decision group were asked to rate how well each car would fit a family with two children (a question they were not expecting), they attempted to remember specific characteristics in order to make a decision. These participants were severely limited in recall because they
were not remembering individual characteristics, instead they too were engaging in online decision-making.

Gladwell (2007), author of *Blink: The Power of Thinking Without Thinking*, has become an expert in the field of making quick decisions. In his book, Gladwell aims to convince readers that decisions made quickly can be just as good as conscious deliberation, however it is important to be aware of when and when not to trust our instincts. He explains that we can shape or manage our unconscious reactions and learn how to control our snap judgments. The participants in this study were most likely overwhelmed by the number of items being presented and may have begun to pay less attention as time went on, casually reading each sentence and making a snap judgment in the end. In this experiment, half of the participants (those who received the instruction to form an impression) could be seen as experts on their own preferences about cars, and according to Gladwell, could make effective snap judgments. On the other hand, the other participants (those who received the instruction to make a non-spontaneous judgment based on their memory of the information) were not experts, as they were asked to rate the cars according to someone else’s preferences. This group could not make good snap judgments.

Recent research (Rey et al., 2009) tried to get around the memory limitations experienced in Dijksterhuis’ experiments by letting those in the conscious thought condition see all of the information while trying to make decisions. In this research, the immediate and unconscious thought conditions did not differ in decision-making ability (except the immediate decision-makers did give better descriptions), however the
conscious thought condition made significantly worse decisions than both of the other
two groups. Rey explains these findings not as a superior unconscious thought or online
decision-making, but as the further processing of too much information hindering
performance. He states that the participants asked to think about the characteristics might
use a more adaptive decision-making strategy that takes into account the bounded
capacities of the information processing system. When the problem is easy, the rational
approach combines all available information in an optimal way, whereas when there is a
complex decision to be made, we have bounded rationality that takes the first piece of
evidence that favors a decision. This information is even further support for online
decision-making.

If unconscious decision-making exists, the relationship to conscious decision-
making should be studied. Tasks are neither fully attentive nor fully automatic, and as of
yet there has been no clear separation of the conscious and unconscious (Shiffrin, 1977).
Also, it has been said that any theory that attempts to separate conscious and unconscious
thought must identify a relationship between the two (Jacoby et al., 1997). These
researchers even give three possible relationships between the conscious and the
unconscious: exclusive with no overlap, redundant, or independent. A relationship
between conscious and unconscious decision-making does not exist within the
Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006). The lack of clarity this
poses makes it impossible to understand what Dijksterhuis actually means when he refers
to the “unconscious”. A more careful consideration of the distinction between conscious
and unconscious might actually suggest that there is no such thing as completely
unconscious decision-making. This would explain why I found no support for unconscious decision-making.

While this study’s purpose was to clear up the uncertainty about unconscious decision-making, it is still ambiguous as to what mental processes are actually at work and how they have led to the effects in Dijksterhuis and Lassiter’s findings. When participants are asked to form an impression and then make a complex decision, these researchers have findings that show that mode of thought does make a difference, but we still do not know what exactly is going through the minds of the participants. It could be real unconscious decision-making, but on the other hand, it could be online decision-making in disguise. Because so many questions remain as to whether or not unconscious decision-making exists and if it does, under what conditions we engage in it, follow up studies are essential. This research points toward a tendency to make decisions online, however this was not studied specifically. Research that focuses more on online decision-making is the next step to see if unconscious decision-making truly exists. Until that time, it seems unwise to make complex decision about expensive purchases or life changing events without giving them at least some conscious consideration.
REFERENCES
REFERENCES


Informed Consent

In a few moments, you will engage in activities that test your long term memory on product information. You will be asked to fill out a sheet that collects information such as gender, age, GPA, and major. No other information about you will be recorded; thus, there will be no way to attach your judgments to your personal identity.

Your total participation time will not exceed 45 minutes.

This investigation conforms to the ethical guidelines of the American Psychological Association. The data we collect will be entirely confidential and will be used exclusively for this research.

You are also free to withdraw your participation now, or at any time during the study.

If you have any questions, please raise your hand and ask them now.

Thank you for your participation in this study. I greatly appreciate your contribution!

Instructions

1. Please follow along with me through the entirety of the study.

   This means DO NOT CLICK TO THE NEXT PAGE without instruction to do so. Also, please do not return to previous pages. The presentation will have some slides that I will instruct you to click through, and some slides are timed and will move along without you having to do anything. Your instructions will be clear for each slide.

2. Please FILL OUT THE FOLLOWING DEMOGRAPHIC INFORMATION SHEET that was provided to you. It looks like this:

   Sex (circle one): M  F
   Age: ______________________
   Academic Major: ______________________
   GPA: ______________________

3. Below the demographic information, please fill out and SIGN that you agree with the informed consent that I just read aloud.

4. TEAR ALONG THE DASHED LINE. At the end of the study you will turn in this portion in exchange for your extra credit slip.

   Please do not move on until instructed to do so.
Instructions

Soon you will see a list of 12 characteristics that describe 4 different cars. Each car will be scored on each of these 12 characteristics.

(EX. power windows)

As you are presented with this information, **FORM AN IMPRESSION** of the cars. In other words, form an opinion of the different cars.

Decide how much you like each car and how interested you would be in owning it. Because I am interested in your memory for product information, you will be asked to report your opinion.

*Please do not move on until instructed to do so.*

Car “A”

- Car “A” has good mileage
- Car “A” has good handling
- Car “A” has a large trunk
- Car “A” is very new
- Car “A” is available in many different colors
- Car “A” has an excellent service plan
- Car “A” has little legroom
- Car “A” is difficult to shift gears
- Car “A” has cup-holders
- Car “A” has a sunroof
- Car “A” is relatively good for the environment
- Car “A” has a poor sound system
Car “B”

- Car “B” has good mileage
- Car “B” has poor handling
- Car “B” has a large trunk
- Car “B” is old
- Car “B” is available in many different colors
- Car “B” has an excellent service plan
- Car “B” has plenty of legroom
- Car “B” is difficult to shift gears
- Car “B” does not have cup-holders
- Car “B” does not have a sunroof
- Car “B” is relatively good for the environment
- Car “B” has a poor sound system

Car “C”

- Car “C” has poor mileage
- Car “C” has good handling
- Car “C” has a small trunk
- Car “C” is very new
- Car “C” is available in a few different colors
- Car “C” has a poor service plan
- Car “C” has little legroom
- Car “C” is easy to shift gears
- Car “C” has cup-holders
- Car “C” has a sunroof
- Car “C” is not very good for the environment
- Car “C” has a good sound system
Car “D”

- Car “D” has poor mileage
- Car “D” has poor handling
- Car “D” has a small trunk
- Car “D” is old
- Car “D” is available in many different colors
- Car “D” has a poor service plan
- Car “D” has plenty of legroom
- Car “D” is difficult to shift gears
- Car “D” does not have cup-holders
- Car “D” has a sunroof
- Car “D” is not very good for the environment

- Car “D” has a poor sound system

In your packet you will find a page that looks like the one to the right.

For the next 3 minutes you will work on these anagrams.

Rearrange the letters of the words on the left to create new words in the blanks on the right. You must use all the letters to create new words.

I will notify you when the time is up, please do not move on until then.
Rate the Cars

Please rate your attitude toward each of the cars on the sheet provided in your packet.

Use the scale below to guide your thinking.

-25  ➔  0  ➔  +25

Extremely Negative  0  Extremely Positive

For each car, make a mark on the corresponding line that reflects your attitude toward that car.

Please do not move on until instructed to do so.

In the next page of your packet, you will find a page with empty boxes.

List as many characteristics as you can about each car in the corresponding box. Here is where I am asking you to recall the information you have been asked to remember.

You will have 5 minutes to complete this task.

I will notify you when the time is up, please do not move on until then.
Rate the Characteristics

On the sheet provided in your packet, please rate how much each of the characteristics matter to you when choosing a car.

Use the scale below to guide your thinking.

0  Does not matter at all  25  Really important

For each characteristic, write the number (between 0 and 25) that reflects your attitude toward that characteristic.

Please do not move on until instructed to do so.

Debriefing

Thank you again for participating in this study. The time you have taken to complete this experiment will help us to understand more about decision-making.

In studies done over the last few years, researchers have compared conscious to unconscious decision-making skills in terms of making the "right" decision. This research has uncovered a surprising finding: decisions that are made on really complex issues are "better" when you are prevented from thinking consciously about the choices. Researchers have come to this conclusion because our conscious awareness is restricted, due to the limitations of our working memory. On the other hand, our unconscious minds can make better decisions about complex issues, as this area is assumed to be unlimited. More recent studies aim to disprove this new theory stating that decisions are made in working memory while information is being presented and that our unconscious is not doing the work. Our research hopes to solve this debate.

We ask that you not discuss the information given in this study with any other students who may participate after you. It is vital that these possible participants not know anything about the study before their participation as it may effect the results of the study.

For more information about the results of this study you can e-mail me at Jamie.Kiss@yahoo.com after March 1, 2010.

Thank you for your time and participation!
APPENDIX B
Demographic Information

Sex (circle one):  M  F

Age: ______________

Academic Major: ______________

GPA: ______________

My signature below indicates that I am informed concerning the nature and intent of this research and that I consent to voluntarily participate. I am also aware that I may stop my participation at any time without any negative consequences.

Date: ______________

Name (print): ______________

Signature: ______________

Email / Phone # (optional): ______________
Anagram

Rearrange the letters of the words on the left to create new words in the blanks on the right. You must use all the letters to create new words.

Example: BAKE = beak

1. WAR =____________________
2. RUN =____________________
3. AIDE =____________________
4. SALT =___________________
5. SOUR =___________________
6. THERE =__________________
7. CLOUD =__________________
8. TROUT =__________________
9. VEINS =__________________
10. TIMES =__________________
11. VASES =__________________
12. HEARTY =_________________
13. DASHED =________________
14. LIMPED =_________________
15. NIGHTS =_________________
16. CINEMA =________________
17. DISEASE =________________
18. KITCHEN =________________
Rate the Cars

A  -25  0  +25

B  -25  0  +25

C  -25  0  +25

D  -25  0  +25
Use the space below to list as many characteristics as you can about each car.

Car A:

Car B:

Car C:

Car D:

Briefly note what types of memorization techniques you used:

___________________________________
___________________________________
Rate the Characteristics

0 ← Does not matter at all ← 25 ← Very important

1. Mileage ________
2. Handling ________
3. Trunk size ________
4. Age of car ________
5. Color options ________
6. Service plan ________
7. Legroom ________
8. Ease of shifting gears ________
9. Cup-holders ________
10. Sunroof ________
11. Environmental standards ________
12. Quality of sound system ________