

EVIDENCE FOR UNCONSCIOUS THOUGHT IN COMPLEX
DECISIONS: THE RESULT OF A METHODOLOGICAL
ARTIFACT OR OF AN ACTIVE THOUGHT PROCESS?

by

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ABSTRACT

Previous research has suggested that a period of unconscious thought can result in judgments that are equal or superior to those of conscious thought (Dijksterhuis, 2004). The existence of unconscious thought as a decision-making process is controversial. In fact, it has been suggested that unconscious thought is not a process rather the evidence supporting it is the result of a methodological artifact (Lassiter et al., in press) that only occurs when participants can retrieve online judgments. This thesis attempts to resolve this controversy. Participants received information describing 4 cars (acquisition stage) that were described by twelve dichotomous attributes (e.g., good/poor mileage). The best car possessed mostly positive characteristics and the worst car had mostly negative characteristics. Participants were told before or after the information was presented, that they would be forming an impression of the four cars. They were then allowed to think about the cars consciously for 4 minutes, were distracted for 4 minutes (unconscious thought), or were asked to make an immediate decision without thinking. When the instructions to form an impression were received before acquiring the information, the participants could form online judgments during acquisition. These could later be retrieved when participants reported their attitudes. When the instructions to form an impression were received after participants acquired the information, they could not form online judgments, but could form only memory-based judgments after the information was presented. Without online judgments, participants are forced to rely on memory-based judgments. Thus, if participants in the unconscious-thought condition formed more favorable attitudes toward the best car relative to the attitudes formed by the participants in the other two conditions, a thought process must be occurring. Additionally, these attitudes should transfer to choosing the best car as well. However, the results of this thesis failed to replicate previous research (Lassiter et al., in press) as the dependent measures failed to reach significance.

INTRODUCTION

“Consciousness succumbs all too easily to unconscious influences, and these are often truer and wiser than our conscious thinking.”

--Carl Gustav Jung

Conventional wisdom holds that in order to make an accurate and correct decision, an individual must first absorb all relevant information, and then analyze it using a process of conscious deliberation. For example, when graduating, a student is confronted with the myriad possibilities relating to post-graduation opportunities. Should they attend an institute of higher learning, should they jump right into the job market, or should they live on the generosity of the taxpayer? Some decisions are relatively simple, and our conscious processes can handle these with little difficulty: clearly, a life lived under the umbrella of welfare would be sub-optimal. However, when that individual attempts to decide between starting a career and pursuing further education, the optimal decision becomes less clear. This is especially true when a person is faced with the multitude of schools, programs, states, job markets, salaries per education level, and the other aspects involved in determining the direction of one's life. That is a lot of information to examine concurrently and adequately due to the limited capacity of conscious thought (Daneman & Carpenter, 1980; Miller, 1956; La Pointe & Engle, 1990).

But decision making is not necessarily limited to conscious processes. Rather, many researchers have suggested the existence of dual-processes (for a review, see Evans, 2008) such that conscious- and unconscious- processes (which possess a nearly limitless capacity) assist in decision making and judgments. In fact, Dijksterhuis (2004;

Dijksterhuis & Nordgren, 2006) has argued that unconscious processes are often less prone to errors and are more capable of handling large amounts of information at once relative to conscious processes. For example, in several experiments reported by Dijksterhuis, participants who were prevented from consciously thinking about information for a period of 3 to 4 minutes formed better decisions than did participants who spent that amount of time consciously processing the information. Furthermore, recent research indicates that participants feel better about their decisions that are formed via unconscious versus conscious processes (Dijksterhuis & van Olden, 2006). However, the idea that an active unconscious thought process forms better decisions than a conscious process has sparked controversy within the psychological literature (e.g., González-Vallejo, Lassiter, Bellezza, & Lindberg, 2006; Payne, Samper, Bettman, & Luce, 2008). Indeed, some research suggests that there are boundary conditions to this phenomenon (e.g., Bos, Dijksterhuis, & van Baaren, 2008; Payne et al., 2008). Further, some have argued that the evidence indicating that unconscious processing results in better decisions than conscious processing is actually the result of methodological artifacts rather than a meaningful finding (e.g., Lassiter, Lindberg, González-Vallejo, Bellezza, & Phillips, in press).

This thesis discusses conscious and unconscious thought in decision making, particularly as outlined by Dijksterhuis and Nordgren's (2006) Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006). Qualifications to this theory are then discussed in addition to recent experiments by Lassiter et al. (in press) which introduce the possibility that previous interpretations of data supporting the superior decision-making

abilities of unconscious thought are erroneous. Specifically, Lassiter et al. (in press) suggest that the evidence indicating that unconscious thought results in superior decision making is due to a methodological artifact. Ultimately, an experiment was conducted for the present thesis in an attempt to address the shortcomings of prior research and demonstrate that unconscious thinking can occur and lead to decision making that is at least on par with the decisions rendered via conscious processes.

Conscious Thought and its Limitations

Conscious thought, as defined by Dijksterhuis and Nordgren (2006, p. 96), is “object-relevant or task-relevant cognitive or affective thought processes that occur while the object or task is the focus of one’s conscious attention.” Two aspects of this definition are important. First, conscious thought consists of thoughts that specifically pertain to an object, idea, or task. Second, attention is necessary for conscious thought to occur. Specifically, to be considered conscious thought, the object, idea, or task that is being considered must also be the focus of the individual’s attention. Therefore, attention is a key factor when discriminating between conscious and the unconscious thinking (González et al., 2006).

A large amount of evidence suggests that individuals have a limited pool of resources that can be utilized for conscious cognitive functioning. In particular, individuals attempting to organize and comprehend large amounts of information, are hindered by an inability to hold sufficient information in working memory (Daneman & Carpenter, 1980). Working memory refers to the capacity of an individual to store and

manipulate pieces of information for a brief period of time. Regardless of the information type (e.g., words, numbers, letters, etc.), people cannot remember and consider much more than seven items at any given time (Miller, 1956). For example, when choosing an apartment, an individual must remember that apartment A is 7 miles from campus, costs 350 dollars a month, has quiet neighbors, does not allow pets, has onsite parking, has three bedrooms, one bathroom, and has hardwood floors. Apartment B on the other hand is two miles from campus, costs 400 dollars a month, has noisy neighbors, two bedrooms, one bathroom, and has carpet. To choose between the apartments, one must remember fourteen pieces of information, which is twice the average capacity of human working memory. As a result, an individual attempting to decide between the two apartments is certain to make a decision on only a subset of all the information given, likely leading to a sub-optimal decision. However, if the situation is less complex, conscious thought may be able to efficiently use that information to make a better decision (Dijksterhuis et al., 2006).

In addition to being limited by working memory capacity, conscious thinking is also prone to biases and heuristics that can lead to sub-optimal or irrational decisions. These heuristics are mental shortcuts or rules of thumb that are used to aid decision making when an individual's cognitive resources are directed elsewhere or when there is too much information to process simultaneously. However, use of these mental shortcuts can often result in suboptimal decisions relative to when individuals consider all relevant information (Tversky & Kahneman, 1974). For instance, individuals often underutilize base rate information and Bayesian statistics when making complex decisions involving

judgments of likelihood. For example, a participant might read a story about a college student who likes sci-fi shows, is neat and orderly, shows excellent math skills, and is rather shy. The participants might also learn that only 5% of students at this university are engineering or computer-science majors, and that the vast majority of students major in humanities and social sciences. Nonetheless, because the college student displays many characteristics that seem representative of engineers or computer science majors, participants will overestimate the likelihood that the college student's major is engineering or computer science. Because the student seemed so similar to the stereotypical engineer or computer science major, participants relied solely upon this similarity (representativeness heuristic) when deciding to what major the participant belonged. Although, people sometimes recognize that they are using these heuristics, individuals still commonly fail to account for base rates. Rather, people continue utilizing a variety of heuristics like the representativeness heuristic described above (Kahneman & Tversky, 1974; Payne, Bettman, Coupey, & Johnson, 1992).

Presumably, these mental shortcuts developed to allow the mind to overcome situations in which individuals are not inclined or capable of devoting their full attention to the problem at hand. These rules of thumb are helpful in situations that prevent an individual from thinking carefully about a problem, or when an individual wants to make rapid judgments about a situation. For example, a busy man would not be able to devote large amounts of thought to finding a job, dealing with his family, paying the bills, and finding a place to live. The man would have to choose where to direct his efforts, and where to rely on heuristics to simplify decisions for him. These adaptations in human

reasoning abound in conscious thought, and although these heuristics can be helpful, sometimes they can also cause sub-optimal or irrational choices, as illustrated above.

A Dual Process Approach

Many theorists, and much research evidence, support dual-process models of decision making and judgment formation (e.g., Evans, 2003, 2008; Dijksterhuis & Nordgren, 2006; Wegner, 1989). These dual-process models suggest that there are mental processes that are slow, effortful, and conscious and others that are relatively quick, effortless, automatic, and unconscious. Individuals use the more effortful processes when they have the time, attention, ability, or resources to devote to the process. However, when individuals are distracted, overloaded, or busy, they will rely more on the unconscious thought processes (or “deliberation-without-attention” as referred to by Dijksterhuis et al., 2006). Importantly, a key difference between conscious- and unconscious-processes is the level of attention that individuals can devote to either process.

Unconscious Thought

Conscious thought has traditionally been thought of as more flexible and capable of effectively tackling complex issues. Alternatively, unconscious thought was considered more limited in function and only suited to making quick, simple decisions (Dijksterhuis, 2004). However, Dijksterhuis et al. (2006) have recently suggested that the

unconscious processes might be well suited to make complex decisions, perhaps even better suited than conscious processes.

Capabilities of the Unconscious

The limited nature of conscious thought prevents individuals from using large amounts of information to make a decision because it is difficult to think consciously about multiple pieces of information at the same time. As a result, when individuals are having trouble making a decision, it is not uncommon for them to stop thinking consciously about a problem. After a period of time, the individual will often find that the solution simply comes to mind. Dijksterhuis (2004) proposed that this was due to an unconscious thought process with an enormous processing capacity, and that this unconscious process is capable of dealing with the vast amounts of sensory information that is received every second. Consequently, Dijksterhuis (2004) suggested that the unconscious processing system should be capable of utilizing other large amounts of information in order to make decisions.

Based upon the concept of an active, decision-making unconscious, Dijksterhuis (2004) tested two hypotheses. First, he hypothesized that individuals will make better decisions in complex situations that allow unconscious thought (but not conscious thought) relative to those situations that prevent both conscious and unconscious thought. Secondly, individuals will make better decisions in complex situations that allow only unconscious thought relative to conscious thought.

Dijksterhuis (2004) conducted a series of experiments to test his hypotheses. All of the experiments followed a basic 4-stage pattern (pre-acquisition instruction,

acquisition, post-acquisition instruction or post-acquisition task, and judgment; Lassiter et al., in press). In the pre-acquisition phase, Dijksterhuis instructed participants to form an impression of the information that was about to be presented. Second, in the acquisition phase, he presented participants with 48 pieces of information about the four objects of interest (e.g., apartments or roommates). The pieces of information were presented visually for the participants to read and were arranged in a random order for each participant. The intent behind using 48 pieces of information was to create a situation that differentiated high- and low- capacity systems. Specifically, this much information should overload the limited capacity of conscious thought yet still allow for the larger-capacity unconscious system to function. Of the 48 pieces of information, each of the four apartments (or roommates) was represented by 12 pieces of information. In order to avoid a poor decision in a complex situation, it is not only important to choose the best option, but it is also important to also discriminate and determine the worst option. Therefore, Dijksterhuis arranged the information so that this was possible. The best apartment or roommate had 8 positive attributes and 4 neutral or negative characteristics, and the worst had 8 negative and 4 positive characteristics. There were two neutral targets as well, with an equal mix of 6 positive and 6 negative characteristics. The purpose, of these extra options was to make the overall situation more complex.

After the acquisition phase, participants encountered the post-acquisition stage. In this stage three separate conditions were created, a conscious-thought condition, an unconscious-thought condition (in which conscious thought was inhibited), and an immediate-decision condition (severely limited conscious or unconscious thought was

possible). Participants in the immediate-decision condition were instructed to provide their attitude toward each of the four apartments (or roommates) immediately after they received the information. Participants in the conscious-thought condition were given the post-acquisition instructions to think carefully about the four apartments, and were given 3 minutes to do so (the post-acquisition task). Participants in the unconscious-thought condition received no instruction but performed a distracter post-acquisition task (to prevent conscious thought) for 3 minutes. Specifically these participants engaged in the 2-back task (Jonides, Schumacher, Smith, Lauber, Awe, Minoshima, et al., 1997) in which participants are presented with a series of numbers (flashed individually), and instructed to press a specific key if the current number matches the one that was presented 2 numbers ago. After the post-acquisition task, all participants moved on to the judgment phase, and reported their attitudes toward each of the four apartments (or roommates).

Participants in Dijksterhuis' first experiment demonstrated more favorable attitudes about the best apartment when they were in the unconscious- or conscious-thought conditions, relative to the immediate-decision condition. This supports the hypothesis that individuals will make better decisions in situations that allow only unconscious thought or conscious thought relative to those situations that prevent both conscious and unconscious thought. However, it does not support the hypothesis that individuals will make better decisions in complex situations that allow only unconscious thought relative to conscious thought. Still it is important to note that the results of this first experiment demonstrated that even with only unconscious thought, participants were

capable of making good decisions. In other words, despite having no opportunity to consciously consider relevant information, participants in the unconscious-thought condition made decisions that were similar to those made when conscious thought was possible. Overall, these results support the existence of an unconscious thought process similar to that of conscious thought.

In addition to providing their attitudes towards the four apartments, the participants in Dijksterhuis' (2004) Experiment 2 also chose the apartment they considered the best. The results of this measure demonstrated that participants in the unconscious-thought condition chose the best apartment significantly more often than participants in the conscious-thought and immediate-decision conditions (neither of which differed from the other). The way in which the participants reached their decisions also differed between the groups. Participants could have reached their decision by considering each piece of information separately, by considering small subsets of the information, or by utilizing a comprehensive view of all of the material (global judgment). All participants were asked if they had utilized this comprehensive global judgment or if they relied on only one or two pieces of information to make their decision. Participants in unconscious-thought condition based their decision on a global judgment more often (55.6% of the time) than the participants in the conscious-thought condition (26.5%). Dijksterhuis (2004) proposed that this indicated that participants in the unconscious-thought condition utilized a more comprehensive view of all of the information than did participants in the conscious-thought condition. Dijksterhuis (2004) suggests this is a result of conscious thought's limited capacity, which leaves it less

capable of forming global judgments. However, unconscious thought is capable of relatively limitless processing. As a result, it can simultaneously and efficiently process large quantities of information in order to render accurate, global judgments. This supports the idea that unconscious thought will result in better decisions when a situation is complex (see Dijksterhuis et al., 2006). Further, these findings were replicated in Experiment 3 using roommates instead of apartments.

Experiment 4 was identical to Experiment 2 except that, instead of measuring attitudes, Dijksterhuis measured recognition for the attributes that described each of the three roommates (rather than apartments). If participants recognize more positive and less negative attributes for the best candidate, and more negative and less positive attributes of the worst candidate, their memory has become polarized. Any polarization indicates that the attributes that are recognized by the participants are considered to be more important than the traits that are not recognized. Dijksterhuis (2004) predicted that the participants in the unconscious-thought condition would make better decisions because they recognize more positive attributes and fewer negative attributes of the best candidate, and more negative and less positive attributes of the worst candidate. However, this polarization should not occur for the participants in the immediate-decision condition because they are given no opportunity to consider the attributes of the roommates. Indeed, the participants in the immediate condition recognized an equal number of positive, neutral, and negative characteristics of all roommates. They showed no polarization because they were not given the opportunity to consider which attributes were important. Participants in the unconscious- and conscious-thought conditions

showed increased recognition of the positive characteristics that described the best roommate and the negative characteristics of the worst roommate, but showed decreased recognition for all of the attributes of the neutral roommate. This pattern of polarization is important because it illustrates an active thought process in the conscious- and unconscious-thought conditions (Dijksterhuis, 2004). Additionally, this indicates that both thought conditions regarded the traits of the neutral candidate as less important for their decision, which demonstrates an effective organizational capability of unconscious, not just conscious thought.

Simple Versus Complex Decisions: Following the original unconscious thought experiments, Dijksterhuis et al. (2006) tested the assumption that unconscious thought is superior to conscious thought when making complex decisions but is not necessarily superior for making simple decisions. Dijksterhuis et al. (2006) suggest that when a decision involves large amounts of information it becomes complex. In order to test whether unconscious or conscious thought was better at complex decisions, they varied the amount of information that participants were given about 4 cars.

In the pre-acquisition stage, participants were told that they would choose a car from amongst 4 options, the Hatsdun, the Dasuka, the Kaiwa, and the Nabusi. In order to make the decision simple or complex, Dijksterhuis et al. (2006) varied the number of attributes that described each of the cars. Participants were randomly assigned to receive information about the four cars that were either described by four attributes (simple decision) or 12 attributes each (complex decision). Dijksterhuis et al. (2006) predicted that for complex situations, participants in the unconscious-thought condition relative to

the participants in the conscious-thought condition would choose the best car more. However, for simple situations they predicted that participants in the conscious-thought condition would choose the best option equally often. Next, during the acquisition stage participants were presented with the information about the cars. The Hatsdun was the best choice (attributes were 75% positive), the Dasuka and the Kaiwa were neutral (50% positive), and the Nabusi was the worst choice (25% positive). The participants were then randomly assigned to think consciously for four minutes (conscious-thought condition) or were distracted for four minutes by solving anagrams (unconscious-thought condition). Following the period of thought (or distraction), participants chose one car from amongst the four choices. As predicted, when the situation was complex, participants in the unconscious-thought condition chose the best car (the Hatsdun) more often than the participants in the conscious-thought condition. But when the decision was simpler, participants in the conscious-thought condition chose the best car more often than participants in the unconscious-thought condition.

This pattern of results demonstrated that conscious thought should not be considered the best method for decision-making in all situations. Rather, unconscious thought and conscious thought each excel at different types of decisions. Dijksterhuis et al. (2006) suggested that this was due to the top-down nature of conscious thought, and the bottom-up nature of unconscious-thought. When situations are complex, the limited resources of conscious thought cause it to mainly work in a top-down fashion (Dijksterhuis & Nordgren, 2006). Top-down processing occurs when active mental representations guide and influence the processing of new information. This top-down

processing allows consciousness to work more efficiently by filling in the blanks with already active information. In simple decisions, this is more efficient than bottom-up processes (e.g., unconscious thought) and should result in better conclusions. Top-down processing can move beyond information that is given, but is influenced by the individuals' expectations and other active representations. However, this influence can cause top-down processing to fill in the blanks incorrectly. At times, this guidance leads to conclusions that are based more on these representations than on the actual information in the environment. Therefore, due to its limited capacity and susceptibility to bias, conscious thought often results in incorrect or limited judgments, particularly when situations are complex and demand attention to the specifics of a situation (Dijksterhuis et al., 2006).

Because the unconscious is relatively unlimited in processing capacity, it should not require the activation of mental representations to aid in information processing. Therefore when situations are complex, unconscious thought works in a bottom-up fashion. This bottom-up method is an ever-evolving process in which incoming information guides the further processing of new information (i.e., processing free of expectations and active mental representations). As a result, much of the bias introduced by expectancies and other representations during conscious thought, are not introduced. This type of processing allows unconscious thought to process complex information easily, and better than conscious processes (Dijksterhuis et al., 2006). However, because top-down processes are more efficient, conscious thought may be used for simpler

decisions (where there is less room for error) with little fear of faulty interpretations (Dijksterhuis & Nordgren, 2006).

Limitations of Unconscious Thought:

Much research supports the idea that an active unconscious process can produce better decisions than when conscious or unconscious thought is prevented (Dijksterhuis & Nordgren, 2006, Bos et al., 2008). However, more recent research has uncovered some boundary conditions to unconscious processing (Dijksterhuis et al., 2006; González-Vallejo et al., 2006; Acker, 2008; Payne et al., 2008; Lassiter et al., in press). Specifically, research has demonstrated that unconscious thought may underperform relative to conscious thought when an individual has to assign weights to different variables (Payne et al., 2008). Moreover, unconscious thought will not demonstrate effective decision making in the absence of an impression-formation goal (Bos et al., 2008)

Weighting: Payne and colleagues (2008) suggested that when participants in unconscious-thought conditions outperform the participants in conscious-thought conditions (Dijksterhuis, 2004), it may not have been due to an active unconscious process. Rather, forcing participants in the conscious-thought condition to think for 3-4 minutes may have actually hurt their performance, thus giving the appearance that unconscious thought was more effective for decision making. Payne argues that instructing participants to think for a fixed amount of time imposes artificial restraints on

participants' natural thought processes, causing them to think too long and potentially second guess themselves, or not allowing them to think long enough. Payne et al. hypothesized that participants would make better decisions if they were allowed to consciously think as long as they wanted (self-paced) than if they were forced to think for 4 minutes (fixed-time) as Dijksterhuis (2004) had participants do. Second, they proposed that unconscious thought may be less successful when a complex decision requires weighting different characteristics. Weighting occurs when an individual places greater emphasis on a particular trait or characteristic (e.g., value) and uses the characteristic more heavily in the final decision. To test these hypotheses, participants were presented with a gambling scenario and were given information about the probability of winning money (pWin) at each of 4 casinos. Like Dijksterhuis' apartments (2004), Payne et al. (2008) created an option (e.g., casino) that had the objectively best outcome for winning (pWin). The high probability of winning anything (pWin) may make one choice seem like the best option, however there are other values that may determine the best choice. In addition to pWin, Payne et al. (2008) manipulated the expected value (EV) of a win at each of the four casinos. Objectively, the casino with the highest expected value (HiEV) is a better choice than the casino with the highest chance of winning (pWin) anything. A problem for the gambler (participant) arises when pWin and EV are undistinguished. For example, table A costs \$1.00 to play and the player has a 50% chance of winning \$2.00. Table B costs \$1.00 and the player has a 33% chance of winning \$5.00. If the player goes to table A six times, the player will spend \$6.00 and win an average of three times, earning \$6.00. Thus, the expected value for table A is zero (\$6.00 - \$6.00). If the player

goes to table B six times, the player will spend \$6.00 and will win an average of 2 times, earning \$10.00. This means that the expected value for table B is \$4.00 (\$10.00 - \$6.00). This is confusing for gamblers because the probability of winning anything is higher at table A (50%), than table B (33%). But the highest expected value (HiEV) for winning is at table B. Therefore, the player can only hope to profit if they play at table B, which has the higher expected value. However, individuals will often choose the table with the highest chance of winning (pWin), when rationally they should choose the table with the highest expected value (HiEV).

Forcing participants to think for a certain amount of time may cause them to second guess their decision and choose the casino with the highest EV less often than the other conditions. Payne et al. (2008) hypothesized that freeing participants from this time restriction should prevent them from second guessing themselves and allow them to form a more rational decision. Payne et al. (2008) predicted that the participants in the self-paced conscious-thought conditions would choose the casino with the highest-EV more often than the participants in the fixed-time (4 min.) conscious thought- and unconscious-thought conditions.

For simplicity, the casinos from Payne et al.'s (2008) Experiment 2 will be used for discussion. The four different casinos differed in a couple of ways. First, participants were told that individuals will win $\frac{3}{4}$ of the time at the Rio (best: pWin), $\frac{1}{2}$ of the time at the Luxor (neutral), $\frac{1}{2}$ of the time at the Platinum (neutral), and $\frac{1}{4}$ of the time at the Sahara (worst: pWin). Secondly, the casinos differed in the expected value (EV) of a win. Specifically, participants learned that the payout was \$5.75 at the Luxor (best: HiEV),

\$4.50 at the Rio (neutral), \$4.25 at the Platinum (neutral), and \$1.50 at the Sahara (worst: EV). Thus the highest chance of winning (pWin) was at the Rio, and the highest value (HiEV) was at the Luxor. After receiving the information about the various casinos, participants were randomly assigned to consciously think for 4 minutes(fixed-pace), think consciously for as long as they pleased (self-paced), be distracted for 4 minutes (unconscious thought), or make an immediate decision after the information was presented. In his Experiment 2, Payne et al. (2008) found that there were no significant differences found between the conditions for p(win). However, the self-paced condition more often chose the casino with the highest expected value than did the unconscious thought and fixed-time conscious-thought conditions, which did not differ from each other.

Payne et al. (2008) demonstrated that requiring participants to think consciously for a fixed-amount of time hinders their decisions relative to those participants who were allowed to think consciously for any amount of time they chose. Therefore, the differences that Dijksterhuis (2004) observed between unconscious thought and conscious thought may have been limited to situations in which conscious thought is artificially constrained. However, it is possible that this interpretation is limited to situations in which choices involve different weights or expected values (Payne et al., 2008).

Self-paced thought may be a more accurate measure of how individuals make decisions in the world. So when the participants in the self-paced condition outperform the participants in the unconscious-thought condition, it casts a measure of doubt on

whether unconscious thought is superior to conscious-thought under normal conditions. Therefore, the generalizability of Dijksterhuis' (2004) results may be limited to situations that require a decision to be made over a fixed period of time. Second, the poor performance of unconscious thought relative to self-paced conscious thought violates the assumption made by Unconscious Thought Theory (Dijksterhuis & Nordgren, 2006) that unconscious thought is better at making decisions when weighting is required. Dijksterhuis and Nordgren (2006) suggest that when a person has to determine the expected value of different options, unconscious thought processes should perform better than conscious thought processes. Rather, it appears that unconscious thought does not process weighted information very well (Payne et al., 2008). Therefore, although unconscious thought might at times produce good decisions, this good performance may be limited to situations that do not involve weighting.

Goal Dependency: Clearly, unconscious thought performs poorly when weighting is required, but unconscious thought is bounded in other ways as well. Recent research has demonstrated that unconscious thought will not produce good decisions without an impression-formation goal (similarly to conscious thought; Bos et al., 2008). This characteristic of conscious and unconscious thought was demonstrated in an experiment by Bos et al. (2008), using the standard 5-stage Dijksterhuis paradigm. Modifying Dijksterhuis' (2004) procedures slightly, Bos et al. (2008) did not include an immediate-decision control condition instead they created a mere-distraction control condition. In the mere-distraction condition, participants were never told to form an impression. Specifically, all participants were told in the pre-acquisition phase that they would

receive information about 4 different types of cars. They were instructed to read 12, randomly presented pieces of information about each of the four cars. In the post-acquisition instruction phase, the participants in the conscious- and unconscious-thought conditions were told that they would form an impression of the four cars, whereas participants in the mere-distraction condition were told that they were done with that portion of that experiment. The conscious-thought condition was then allowed to think for 4 minutes and the unconscious thought and mere-distraction conditions completed a word-search puzzle. Participants in the unconscious-thought condition formed more favorable attitudes toward the best car than did either of the other two conditions which did not differ significantly. Therefore, much like conscious thought, unconscious thought does not always process information well. Rather, it only does so when an information-processing goal is activated prior to a period of distraction.

Unconscious thought often leads to a better decision than conscious thought, however this superiority is qualified by important boundaries. First, if the decision requires individuals to weight different items according to their expected value, unconscious thought may not lead to optimal decisions. Second, unconscious thought will not produce good decisions without an impression-formation goal or another type of information-processing goal.

Is the Evidence for Unconscious Thought an Artifact?

Recent research by Lassiter et al. (in press) suggests that the above evidence for an active unconscious-thought process actually results from a methodological artifact rather than an actual phenomenon. Lassiter et al. (in press) cite earlier work regarding

online versus memory-based judgments (Hastie & Park, 1986) as the basis for their assertion. Hastie and Park (1986) proposed that individuals form online and memory-based judgments in different situations. Specifically individuals form online judgments while information is being stored in working memory (i.e., during acquisition). This is called online judgment formation because the judgment is constantly being updated when new information is added to working memory and after old information is forgotten. Once made, online judgments are stored in long-term memory and the basis of the judgment is forgotten. Other times individuals do not form judgments while information is encoded into working memory. Rather, they form judgments later based on the pieces of information that are left in working memory or integrated into long-term memory. These are called memory-based judgments and occur when participants learn that previously presented information was important and should be considered in forming a judgment. The participants are then forced to rely on the retrieval of the previous information from memory. Lassiter et al. (in press) argued that the Dijksterhuis paradigm created a situation in which participants thinking consciously formed memory-based judgments whereas participants who were distracted retrieved online judgments. Further, as a result of making judgments in different ways, individuals in Dijksterhuis' conscious- and unconscious-thought conditions formed judgments of different quality, as elaborated below.

Lassiter et al. (in press) suggested that previous results (e.g., Dijksterhuis, 2004; Dijksterhuis et al., 2006) resulted from instructions that artificially hindered judgments made using conscious thought. Specifically, telling participants to form an impression

causes them to form an online judgment during the acquisition phase of the Dijksterhuis paradigm. When conscious thought participants are later told to think carefully, the participants do not rely on this online judgment. Rather, Lassiter et al. (in press) propose that the instructions to think carefully are viewed by the participants as a command to recall specific information that was encountered during acquisition. Therefore, participants attempt to use recalled information to form a memory-based judgment. Importantly at this point, participants are left with only a minimal amount of information that is retained in memory, leading to a sub-optimal memory-based judgment (Lassiter et al., in press). Additionally, Lassiter et al. (in press) suggest that during the judgment stage the participants in the unconscious-thought condition simply retrieve the online judgment (which used fresh information that was a good basis for a judgment) that they formed during acquisition. Therefore, Lassiter et al. (in press) argue that conscious thought underperforms relative to unconscious thought in the Dijksterhuis paradigm because an insufficient amount of information was maintained in memory, thus rendering incomplete, any memory-based judgment. Both Payne et al. (2008), and Lassiter et al. (in press) suggest that conscious-thought instructions may hinder conscious-thought which calls into question whether Dijksterhuis' results truly support the operation of an unconscious thinking system.

To test the possibility that the evidence for unconscious thought is an artifact, Lassiter et al. (in press) followed the five basic steps of Dijksterhuis' (2004) paradigm. Lassiter et al. made some important changes however. Specifically, in the pre-acquisition stage, some of the participants were randomly assigned to receive the traditional

instructions to form an impression (impression condition), whereas the other participants were told to memorize the upcoming information (memorization condition). In the memorization condition, participants were not told to form an impression and Lassiter et al. reasoned that memorization instructions should prevent the participants from forming an online judgment during information acquisition. During the acquisition phase the participants were then presented with information regarding four fictional cars (see Bos et al., 2008). All of the participants then progress through the paradigm as conducted by Dijksterhuis (2004). The participants in the conscious-thought condition receive the post-acquisition instructions to think carefully for 4 minutes and the participants in the unconscious-thought condition re-arranged anagrams to form new words, for the same amount of time. The conscious- and unconscious-thought participants then reported their judgments. As predicted, participants who received the pre-acquisition instructions to form an impression replicated Dijksterhuis (2004) results. Specifically, the participants in the unconscious-thought condition showed more favorable attitudes toward the best car than the participants in the conscious-thought condition. However, the participants who were told to memorize the information showed the opposite results such that the conscious-thought condition formed accurate attitudes. Lassiter et al. (in press) stated that when given memorization instructions, the unconscious thought participants did worse than the conscious thought participants for a number of reasons. First, because they were not told to form an impression, the participants in the unconscious-thought condition should not have formed online judgments during acquisition. Therefore, they had no judgment to retrieve from memory during the judgment stage. Second, because they were

distracted, they were unable to form memory-based judgments after the acquisition stage. Third, participants in the conscious-thought condition were able to use their memory to make judgments after the acquisition stage. By telling the participants to memorize the information, Lassiter et al. further enhanced the memory-based judgments of the participants in the conscious-thought condition. However, the participants in the unconscious-thought condition received no enhancement from the instructions. These results are consistent with the idea that the evidence for unconscious thought is an artifact.

Problems with Lassiter et al. (in press): Although Lassiter et al.'s (in press) results cast doubt on the idea that unconscious thought can produce decisions comparable to those produced by conscious-thought, there is reason to be skeptical about their conclusions. Lassiter et al. (in press) failed to include a control condition in which participants rendered an immediate decision without conscious or unconscious thought. Without this control condition, it is impossible to determine whether conscious or unconscious thought is performing sub-optimally or well overall. For instance, although distracted participants made poorer decisions than conscious-thought participants in Lassiter et al.'s (in press) memorization conditions, the decisions produced by the participants in the unconscious-thought condition may have been better than would have been observed in the participants in an immediate-decision condition. Without the control condition it is still not clear whether an unconscious-thought process can produce good decisions. Furthermore, when participants receive impression-formation instructions before acquisition, they are given no chance to think when making an immediate decision

(Lassiter et al., in press). Presumably, they can only retrieve the online judgment that was formed during acquisition and would show the same preferences evidenced in the unconscious-thought condition. However, Dijksterhuis (2004; Dijksterhuis et al., 2006; Dijksterhuis & Nordgren, 2006, Dijksterhuis & van Olden, 2006; Bos et al., 2008) has consistently demonstrated that when making complex decisions, participants in the unconscious-thought condition outperform participants in the conscious thought and immediate-decision conditions. The fact that participants in the immediate-decision condition generally form worse judgments than participants in the “unconscious-thought” conditions indicates that later, participants in the unconscious-thought conditions are not merely retrieving an online judgment. Rather, it indicates that an active process is causing the participants in the unconscious-thought conditions to form superior judgments relative to the participants in the immediate-decision conditions. Therefore, Lassiter et al.’s (in press) explanation might explain why conscious thought has not performed as well as unconscious thought (Dijksterhuis, 2004), but is silent on whether unconscious thought is a better decision maker than no unconscious or conscious thought (e.g., immediate decisions).

However, it is possible that the results of Lassiter et al. (in press) further support the goal dependency of unconscious thought (Bos et al., 2008). Bos et al. (2008) demonstrated that without an impression-formation goal, unconscious thought does not produce good decisions. Therefore, when participants were given the memorization instructions, they lacked the impression-formation goal that is necessary for unconscious thought to form good impressions. Indeed, Bos et al. (2008) would have also predicted

that when given memorization-instructions, the participants in the unconscious-thought condition would not form better judgments relative to the participants in the conscious-thought condition. Rather, Bos et al. (2008) may have proposed that the memorization instructions prevent unconscious thought from forming good decisions, thereby causing participants in the unconscious-thought condition to underperform. Furthermore, giving participants memorization-instructions may have artificially facilitated memory-based judgments in the conscious-thought condition. Ironically, the sub-optimal performance of unconscious thought and the better performance of conscious thought may have created an artifactual effect for Lassiter et al. (in press). Specifically, by telling participants to memorize the information, Lassiter et al. (in press) may have caused participants in the conscious-thought condition to form artificially better memory-based judgments relative to when they do not receive memorization instructions. The following experiment is designed to cleanly explore the existence of unconscious thought. Specifically, the experiment should eliminate situations that artificially enhance or hinder unconscious and conscious thought, thereby cleanly determining if and when unconscious-thought might produce good decisions.

Experiment Overview

The aim of the current thesis is to determine whether unconscious thinking produces good decisions and whether it can lead to accurate decisions relative to conscious thinking or an immediate “gut” decision. Although much research supports this idea (Dijksterhuis, 2004; Dijksterhuis et al., 2006; Bos et al., 2008), the work of Lassiter

et al. suggests that the results of that research can be explained as the result of methodological artifacts rather than a true unconscious process. The current experiment will include conditions that do not create the problematic artifacts that Lassiter et al. (in press) identified, thereby allowing for a clean test of the possibility that unconscious thought can lead to accurate decisions.

The Unconscious Thought Theory (UTT) of Dijksterhuis and Nordgren (2006) and the unconscious thought as an artifact (UTA) hypothesis (Lassiter et al., in press) actually make many similar points. Both proposals agree that without an impression-formation goal, unconscious thought will not form good judgments. Additionally, both positions hold that having an impression-formation goal is necessary for participants in the unconscious-thought condition to outperform participants in the conscious-thought condition (Bos et al., 2008; Lassiter et al., in press).

The difference between the UTT and the unconscious thought as an artifact UTA hypothesis hinges on the importance that is placed on the pre-acquisition instructions. The UTA hypothesis implies that the instructions to think carefully artificially hinder conscious thought and contribute to the evidence for an unconscious-thought process. On the other hand, UTT suggests that even when participants are given the goal after acquisition they should be able to retroactively access the information during the period allotted for either conscious or unconscious thought (although at this point there will be less information to use). Therefore, it is only important that the participants receive an impression goal any time before the subsequent period of deliberation (i.e., conscious thought) or distraction (i.e., unconscious deliberation). Supporting this idea, UTT

researchers have utilized both pre-acquisition impression-formation instructions (Dijksterhuis, 2004) and post-acquisition impression-formation instructions (Bos et al., 2008), and in both instances, researchers found the same results. However, this timing of impression-formation instructions has not yet been explicitly varied in a single experiment. The current thesis is important because by varying the timing of impression-formation instructions, it creates conditions in which both online and memory-based judgments are possible, and conditions in which online judgments are not possible.

The current thesis tests whether online judgments are necessary to cause the superior performance of participants in the unconscious-thought condition relative to participants in the conscious-thought condition. By varying the timing of impression-formation instructions, it is possible to eliminate online judgment formation altogether. Specifically, participants will not form online judgments if they do not receive impression-formation instructions prior to acquiring the relevant information. Rather, if the participants are instructed to form an impression after information acquisition, they must rely on their memory for the information, resulting in memory-based judgments. On the other hand, the participants who are told to form an impression in the pre-acquisition stage will form online judgments for later retrieval, and will not be required to form memory-based judgments (though participants who think consciously may do so). This variation of timing allowed for a direct test of the assertion that unconscious thought is an artifact of previous methodologies (Lassiter et al., in press). Additionally, the judgments of participants in the unconscious- and conscious-thought conditions can be compared to

those of participants in the immediate-decision control condition for a baseline assessment of how well unconscious or conscious thought is performing.

The experimental procedure of this thesis will directly replicate the procedure of Lassiter et al. (in press), with a few noteworthy differences. In the pre-acquisition stage, all of the participants received a cover story telling them that they are about to hear an audio recording about four cars, and that they will evaluate the audio quality of this recording. Via random assignment, about half of the participants were given additional instructions to form an impression of the four cars. The other half of participants received the same impression-formation instructions after the information was presented. For the post-acquisition task stage, participants were randomly assigned to think consciously, engage in a distraction task (i.e., think unconsciously), or to make an immediate decision.

Hypotheses

Hypothesis 1: Participants in the unconscious-thought condition who receive the pre-acquisition instructions to form an impression will show more favorable attitudes toward the best car than the conscious thought and immediate-decision conditions.

Giving the impression-formation instructions to participants prior to acquisition replicates the conditions used in previous research (Dijksterhuis & Nordgren, 2006; Lassiter et al., in press). According to Dijksterhuis and Nordgren (2006), individuals who experience distraction following acquisition can think unconsciously, and as a result will generate more favorable attitudes toward the best car relative to participants who consciously think about their decision or make an immediate decision. Thus, the

predictions made by Dijksterhuis and Nordgren (2006) and those of Hypothesis 1 are the same.

According to Lassiter et al. (in press), all of the participants who receive impression-formation instructions before receiving the information will form an impression as they hear the information (online judgment). However, the participants who think consciously will discard these judgments when told to think carefully after information acquisition. The conscious thought participants will then attempt to make a memory-based judgment, but will have retained insufficient information in memory. As a result, their judgments will be less accurate. The participants in the unconscious-thought condition and immediate-decision conditions will not discard their online judgments, and should retrieve them during the judgment stage. Therefore, Lassiter et al. (in press) would predict that the participants in the immediate decision and unconscious-thought conditions will display more favorable attitudes toward the best car relative to the participants in the conscious-thought condition. This prediction of Lassiter et al. (in press) is not congruent with previous research (Dijksterhuis, 2004) or Hypothesis 1 which predicts that the participants in the conscious thought and immediate-decision conditions will not display significantly different attitudes toward the options.

Hypothesis 2: Participants in the unconscious-thought condition who receive the post-acquisition instructions to form an impression will show more favorable attitudes toward the best car than the conscious thought and immediate-decision conditions.

According to Lassiter et al.'s explanation, if an impression-formation goal is not activated prior to acquisition participants will be forced to retrieve information from

memory to form memory-based judgments. Additionally, Lassiter et al. would suggest that this retrieval is only possible for participants in the conscious-thought condition. In other words, the conscious-thought condition will have a period of time to form a memory-based judgment, but the unconscious thought and immediate-decision conditions will be prevented from doing so. Lassiter et al. would predict that because the participants in the unconscious thought and immediate-decision conditions do not have an online judgment to retrieve, the judgments of these participants will be poorer than participants in the conscious-thought condition. Therefore, this prediction is inconsistent with Hypothesis 2, and the predictions of Dijksterhuis and Nordgren (2006).

According to Bos et al. (2008) participants require an impression-formation goal in order to process information. Thus, when an impression-formation goal is present, Dijksterhuis and Nordgren (2006) would predict a replication of previous results (e.g., Dijksterhuis, 2004; Bos et al., 2008). Specifically, Dijksterhuis and Nordgren (2006) would predict that the participants in the unconscious-thought condition will display more favorable attitudes toward the best car relative to the participants in the conscious thought and immediate-decision conditions. This explanation is consistent with Hypothesis 2.

Hypothesis 3: Participants in the immediate-decision condition who receive the impression formation instructions prior to the acquisition phase should show more favorable attitudes toward the best car than participants in the immediate-decision condition who receive the instructions in the post-acquisition stage.

Participants who are instructed to form an impression after the acquisition stage will not form an online judgment, but will attempt to form a memory-based judgment. Unfortunately, participants in the immediate-decision conditions are given no time to think, so they will not form a good memory-based judgment. Essentially, they will be forced to guess as to which car is the best.

On the other hand, impression-formation instructions that are provided before the information is presented will cause participants to form an online judgment during acquisition. Because the participants are not given a chance to think, they will also not be capable of forming a memory-based judgment. However, the participants who received impression-formation instructions before the acquisition stage will have an online judgment to retrieve. Therefore, participants who receive impression-formation instructions before versus after acquisition will be able to retrieve a judgment and will display more favorable attitudes toward the best car.

METHOD

Participants and Design

One-hundred and twenty-five participants were recruited from the Introductory Psychology subject-pool and from the Hosaeus Athletic Complex at Montana State University. Of these 125 participants, 65 were male, 60 were female, and the average age was 20.31 yrs ($SD = 2.5$). Participants from the subject pool received course credit, whereas participants from the athletic center received \$5 compensation for their participation.

Participants were randomly assigned to receive impression-formation instructions before (pre-acquisition) or after (post-acquisition) receiving 48 pieces of information about 4 cars. Orthogonal to this manipulation, participants were randomly assigned to consciously think about the information (conscious-thought condition), to engage in a distraction task after receiving the information (unconscious-thought condition) or to make a decision immediately after receiving the information (immediate-decision condition). Thus, the current experiment employed a 2 (Timing of Instruction: pre- vs. post-acquisition) X 3 (Thought: conscious vs. unconscious vs. immediate) design.

Procedure

Participants were seated in front of the computer which ran MediaLab experimental software (which presented all information and recorded all of the participants' responses). The experimenter gave participants a consent form informing them that they would be presented with information in "various written, video, or audio

formats, and would be asked to respond to various aspects of the messages.” At this time, participants were also instructed to wear headphones for the duration of the experiment. Many instructions and the key information were presented to participants over these headphones. Use of the headphones also minimized the amount of auditory distraction participants experienced during the experiment. Next, all of the participants were informed (pre-acquisition) that they were going to hear a recorded message and that they would evaluate the audio quality of the message. This cover story gave participants a reason to listen to the message without evaluating the content. Via random assignment, some participants were further instructed (pre-acquisition) to form an impression of the four cars about which they would soon receive information, whereas the other participants were not told to form an impression at this time (these participants received these instructions later in the post-acquisition stage). Next, in the acquisition stage, all of the audio-recorded car characteristics were presented in a random order to the participants. These characteristics described four fictional cars: the Dasuka, the Nabusi, the Kaiwa, and the Hatsdun (Bos et al., 2008; Lassiter et al., in press). Each of the cars was represented by 12 dichotic attributes (e.g., sunroof/no sunroof, good/poor mileage, good/poor service, etc.) for a total of 48 attributes. Of the four cars, the Hatsdun was the best overall (most of its traits were positive). The Kaiwa and Dasuka were neutral options, and the Nabusi (the worst option) possessed a majority of negative traits (see Appendix A).

Those participants who did not receive impression-formation instructions earlier were now told (post-acquisition) that the experiment was investigating their impressions

of the four cars. All participants then entered the post-acquisition and judgment phases. At this point, participants were randomly assigned to think carefully about the information for 4 minutes (conscious-thought condition), complete anagrams for 4 minutes before reporting their judgments (unconscious-thought condition), or to make an immediate judgment. Next, participants proceeded to the judgment phase in which all participants reported their attitudes for each of the four cars, and chose one car as the best option. More specifically, participants rated their attitudes for the four cars on an eleven point attitude scale (in which 1 = very positive, 6 = neutral, 11 = very negative). They were then asked to choose the best car amongst the Hatsdun, Kaiwa, Dasuka, and Nabusi. These measures were directly borrowed from Lassiter et al. (in press).

Independent Variables

The current experiment consisted of a 2 (Timing: pre- vs. post-acquisition) X 3 (Thought: conscious vs. unconscious vs. immediate) design.

Thought: Just as in previous experiments using the Dijksterhuis paradigm, the participants were randomly assigned to the conscious-thought, unconscious-thought, or immediate-decision (no-thought) conditions. After the information acquisition stage, the participants in the conscious-thought condition received the instructions, “You have now read all of the attributes for the four cars. For the next four minutes please very carefully think about what you think of each of the four cars.” The participants in the conscious-thought condition were given no task separate from thinking carefully. However, the participants in the unconscious-thought condition were instructed thus, “For this task, you

will be given a scrambled word and your task will be to unscramble it. Please type the word that can be formed by unscrambling the letters.” This anagram task (e.g., napteu = untape) from Lassiter et al. (in press) should have prevented conscious thought about the cars, and thereby only allow unconscious processes to occur. The participants in the immediate-condition provided their attitudes and choice immediately after acquiring the information and were not given time to “think carefully” or unconsciously.

Timing: The participants who received the impression formation instructions before acquisition read these instructions, “The first part of this experiment is also concerned with the way in which we form an impression on the basis of a number of attributes. In a few moments you will listen to a series of attributes, each recorded item will contain information about one of four cars. Please listen to these sentences carefully, studying each one until the next recording plays. Do not be concerned with memorization--there are far too many individual items to remember. Try instead to form an overall impression of what each car is like. At the end of the session, we will ask you a series of questions concerning the impressions that you have formed for the four cars.” Other participants were randomly assigned to receive impression-formation instructions after the acquisition phase. These instructions were identical except that the past tense was used (e.g., “The first part of this experiment was also concerned with the way in which we form an impression on the basis of a number of attributes. You have just listened to a series of attributes...”).

These impression-formation instructions should activate an impression-formation goal, which according to Bos et al. (2008) is necessary for unconscious thought (and

conscious thought) to actively process the information. The impression-formation goal should be activated regardless of whether the instructions were provided before or after acquisition (Bos et al., 2008). By varying the timing, comparisons can be made that demonstrate whether or not previous results (Dijksterhuis, 2004; Dijksterhuis et al., 2006) were due to an artifact of methodologies. As mentioned above, participants were randomly assigned to receive impression-formation instructions before or after the acquisition (information presentation) stage. Those participants who received the instructions pre-acquisition were equivalent to participants in the standard Dijksterhuis paradigm. According to Lassiter et al. (in press) these participants were able to form online judgments during the acquisition stage. Furthermore, Lassiter et al. (in press) propose that the participants in the unconscious thought and immediate-decision conditions should be able to retrieve these online judgments, whereas conscious thought participants should use a memory-based process to form judgments. However, the conscious thought participants' memory for the car attributes will be insufficient to form an accurate memory-based judgment. Therefore, conscious-thought participants will not form judgments that are as favorable to the best car relative to the unconscious thought and immediate decision participants.

Those participants who received the impression-formation instructions after the acquisition stage should not have had an impression-formation goal activated during information acquisition. Since an impression-formation goal is required for participants to consciously or unconsciously process the information (Bos et al., 2008) the participants will not form online judgments during the acquisition phase. As a result,

participants will have no online judgment to retrieve during the judgment stage. Rather, participants can only form judgments of the information based on what they recall from the acquisition phase. Therefore, if there is a difference in the quality of the judgments made by participants (who received the impression formation instructions after acquisition), in the unconscious versus conscious condition, this difference cannot be attributed to the differential influence of online versus memory-based judgments which Lassiter et al. (in press) proposed was responsible for the effect.

Varying the timing of the impression-formation instructions before and after acquisition allows for an essential comparison between the participants of the immediate-decision. Neither condition's participants will have had the opportunity to form a memory-based judgment as they were not given time to think consciously or unconsciously. However, the participants who received an impression-formation goal before acquisition will form an online judgment while they receive the information. The participants for whom the impression-formation goal was activated after acquisition will be prevented from forming both online and memory-based judgments. Therefore, participants in the immediate decision stage should show more favorable attitudes toward the best car when they received the impression-formation goal before versus after acquiring the information. If the impression-formation instructions are provided after-acquisition, participants in the unconscious-thought condition should still outperform the immediate-decision condition. This would indicate that the participants in the unconscious-thought condition were forming better judgments, which is important because it would indicate that they were not retrieving online judgments.

Dependent Measures

After progressing through the first four stages of the Dijksterhuis paradigm, the participants in the current experiment responded on dependent measures in the judgment stage. Of the four cars that the participants evaluated, the Hatsdun was the represented by the highest number of positive qualities (best) the Nabusi the least (worst), and the Kaiwa and Dasuka were neutral. All dependent measures used by Lassiter et al. (in press) were employed in the current experiment.

Attitude Measures: During the judgment stage, participants indicated their attitudes toward each of the four cars. Participants were provided 4 eleven-point scales with each scale corresponding to one of the four cars (Hatsdun, Kaiwa, Dasuka, and Nabusi). On each scale, a 1 indicated a “very positive” attitude, a 6 indicated a “neutral,” attitude and an 11 indicated a “very negative” attitude toward the evaluated car. However, in order to facilitate understanding, these attitude values were reverse scored for the results section so that larger numbers indicate a more positive attitude.

Car Choice Measure: In the judgment stage, participants were also asked, “If you had to choose one of the cars, which one would you choose?” The car choices were displayed on the screen in text and participants choose one by clicking on it with the pointer of their computer mouse. If participants choose the Hatsdun most often, then they will have made the best choice. Therefore, similarly to the attitude measure this measure can indicate car preference.

RESULTS

Attitude Measures

To test whether participants were able to discriminate between the best car option (Hatsdun) and the other cars, a strength-of-preference index (Dijksterhuis & van Olden, 2006; Lassiter et al., in press) was created by subtracting the average attitude toward the three cars with the fewest positive attributes from the attitude for the best car. Higher numbers on this index indicated a preference for the Hatsdun, the best car. This strength-of-preference index was analyzed using a 2 (timing: pre-acquisition or post-acquisition) X 3 (thought: unconscious, conscious, or immediate decision) between-subjects Analysis of Variance (ANOVA). Separate analyses were conducted including gender as a factor, but there were no main effects or interactions involving gender. Therefore the reported analyses do not contain gender as a factor. Contrary to predictions, both the main effect of timing $F(1,125) = .862, p = .355$, and the main effect of thought $F(2, 125) = .317, p = .729$, failed to reach significance. There was also no significant interaction between the timing and thought variables $F(2, 125) = .352, p = .704$. These null results do not provide support for any of the hypotheses, and even fail to replicate previous results based on comparable methods (e.g., Lassiter et al., in press).

Given the null results above, an analysis was also conducted just on the participants' attitudes toward the best car (Hatsdun) and separately, participants' attitudes toward the worst car. Participants' attitudes for the individual cars were submitted to the same ANOVA used above. For attitudes toward the Hatsdun both the main effect of

timing $F(1,125) = .040, p = .841$, and the main effect of thought $F(2, 125) = .784, p = .459$, failed to reach significance. There was also no significant interaction between the timing and thought variables $F(2, 125) = .696, p = .501$. The participants' attitudes toward the worst car (the Nabusi) also displayed no statistically significant main effects of timing $F(1, 125) = 1.014, p = .316$, and thought $F(2, 125) = .372, p = .690$, (see Table 1 for means and standard errors). The results also indicated no significant interaction between timing and thought $F(2, 125) = .153, p = .858$. Thus, these additional analyses also did not provide support for any of the hypotheses.

To determine whether there was a difference in attitude ratings among the cars, a 2(timing: before vs. after acquisition) X 3(thought: conscious, unconscious, immediate decision) X 4(Attitude: Hatsdun, Kaiwa, Dasuka, Nabusi) repeated measures ANOVA was conducted. Thought and Timing were used as between-subject variables, and participants' attitudes were used as a within-subjects variable. There was a main effect of the subjects attitudes on the overall differences between the attitude ratings $F(3, 125) = 19.811, p < .001$. However, there were no significant two- or three-way interactions between attitude, timing, and thought (all p 's $> .05$). This indicates that participants were able to comprehend the information that was presented, and integrate it to determine that the Hatsdun was the best car.

Car Choice

Participants were asked to choose one of the cars as the best option. If the participants choose the Hatsdun more often than the other cars, then they are capable of

determining which car was the best. To determine if participants chose the best option (Hatsdun), this variable was re-coded into choices of “Hatsdun” (1) and “Not Hatsdun” (0). The relationship between the independent variables (timing and thought) and the car choices of the participants was analyzed using a binomial logistic regression. However, both main effects and the interaction failed to reach significance (All *Wald's* were less than 1, all *p*-values > .640). The null results for the car choice measure also failed to support any of the hypotheses or replicate the results of comparable experiments (Lassiter et al., in press).

Table 1. Attitude measures as a function of timing and thought.¹

Thought	Timing			
	Before Acquisition		After Acquisition	
	M	SE	M	SE
Strength of Preference				
Conscious thought	1.26 ^a	.585	1.64 ^a	.470
Unconscious Thought	1.65 ^a	.455	1.52 ^a	.512
Immediate Decision	1.56 ^a	.511	1.30 ^a	.483
Hatsdun				
Conscious thought	7.75	.422	8.00	.294
Unconscious Thought	8.25	.354	8.36	.352
Immediate Decision	8.28	.877	7.74	.340
Dasuka				
Conscious thought	6.95	.569	6.50	.496
Unconscious Thought	6.50	.550	7.09	.470
Immediate Decision	6.67	.554	5.96	.472
Kaiwa				
Conscious thought	7.20	.408	6.45	.584
Unconscious Thought	7.60	.489	6.95	.477
Immediate Decision	7.50	.345	7.43	.366
Nabusi				
Conscious thought	5.33	.686	6.14	.611
Unconscious Thought	5.70	.493	6.50	.599
Immediate Decision	6.00	.714	5.91	.565

Note. Attitudes were measured on an 11-point scale (1 = very positive", 11 = "very negative"), but were reverse scored so that higher numbers indicate a more positive attitude.

¹ Means do not differ at $p < .05$ unless otherwise noted.

^a Larger values indicate a preference for the Hatsdun.

GENERAL DISCUSSION

Dijksterhuis (2004) conceptualized unconscious thought as an active process that is capable of making decisions that are at least as good as those made by conscious thought. Previously, unconscious thought had been relegated to simple decision making for decisions that could not be made using conscious thought (e.g., when an individual's cognitive resources were not available due to distraction). Yet, Dijksterhuis found across many experiments that individuals who were provided with much information formed better decisions if they were distracted from thinking about that information versus thinking consciously about it for several minutes. These results suggest that an active unconscious-thought process considered the information and formed a good decision. Following research revealed that unconscious thought seemed to be more capable of making good decisions than conscious thought when decisions are complex versus simple (Dijksterhuis et al., 2006), the advantage of unconscious thought seemed to be goal dependent (Bos et al., 2008), and unconscious thought forms better decisions when making non-weighted versus weighted decisions (Payne et al., 2008).

However, Lassiter et al. (in press) suggested that although unconscious thought appears to result in superior decisions, it may be more likely that conscious thought is constrained by Dijksterhuis' (2004) methodology. Specifically, due to the instructions received before information acquisition, all participants formed good online judgments and these judgments were used by participants in the distraction conditions. However, participants who were instructed to think about the information before forming judgments

considered the sparse information that they could remember rather than the online judgment. As a result, these participants formed sub-optimal memory-based judgments. Although Lassiter's explanation and evidence could explain previous evidence for unconscious thought in decision making, it did not rule out the possibility that unconscious thought can result in good decisions. The goal of the present thesis and reported experiment was to investigate this possibility by averting the methodological artifact Lassiter noted in prior research.

The reported experiment followed Lassiter et al.'s (in press) methodology closely, but provided participants with instructions to form an impression based on information either before or after they received the information. It was reasoned that participants who received these instructions after knowledge acquisition would not form online judgments during acquisition, but rather would form memory-based judgments. It was suggested that evidence indicating that participants in the distraction conditions formed better judgments than the other participants would cleanly support Dijksterhuis' (2004) idea that unconscious thought can produce good decisions, even when only memory-based decisions are possible. However, the reported experiment yielded no statistically significant results in support of the advanced hypotheses. Rather, the only finding in this experiment is that participants formed more favorable attitudes toward the best of four cars indicating that they made accurate decisions regardless of experimental manipulations.

Explaining the Null Results

Implications and Limitations

The current experiment was nearly an exact replication of Lassiter et al. (in press) and utilized most of the same MediaLab instructions, stimuli, and files. However, a few minor adjustments were made to preserve the new cover story. Specifically the information about the cars that Lassiter et al. (in press) presented visually was presented auditorily in the present experiment. Further, the present experiment included conditions in which the impression-formation goal was either presented before or after acquisition. Consequently, the only major deviation from previous materials was that the participants heard the characteristics of the four cars instead of reading them. Despite the methodological similarities to Lassiter et al., the current experiment failed to produce any main effects of goal timing, thought type, or an interaction between the two. It is possible that the new cover story and the audio format limited the participants' memory for the information or the ability of the participants to integrate the information as required for a good decision. However, it is doubtful that these differences were responsible for the failure to replicate Lassiter et al.'s (in press) findings as the information was presented at a normal conversational speed. Additionally, the repeated measures ANOVA demonstrated that participants formed more favorable attitudes toward the best car than the worst car. Furthermore, a chi-square analysis was conducted on participants' car choices, indicating that individuals chose the Hatsdun as the superior car 40% of the time which was significantly more often than they chose the other cars (i.e., Kaiwa = 22%, Dasuka = 18%, Nabusi = 19%), , $\chi^2(3) = 15.448, p < .001$. Overall then, these analyses

indicate that participants were able to integrate and process the audio information adequately and favor the best car. However participants' judgments based on that information were simply not influenced by the variables manipulated in the experiment.

Possible Weak Effects: It is possible that the current experiment did not yield statistically significant results because unconscious thought produces decisions that are only slightly better than those produced by conscious thought. Consistent with this possibility, a meta-analytic review conducted by Acker (2008) reported that only five of 17 experiments testing the superior decisions of unconscious thought actually produced effect sizes with confidence intervals that were above zero. This suggests that if unconscious thought does yield superior decisions, this effect is very small and rarely obtained. Indeed, this meta-analysis suggests that unconscious thought will only produce better decisions than conscious thought in about 30% of experiments, making the null results of the present experiment in line with the majority of findings in this area of research. Therefore, it is possible that the current experiment did not obtain results because unconscious thought does not actually produce better decisions than conscious thought, or because there was insufficient power to find the small advantage of unconscious thought over conscious thought.

Artifactual Interpretations: Rather, limits placed upon conscious thought by the Dijksterhuis paradigm may be responsible for the evidence which suggested the superior decision-making ability of unconscious thought. Dijksterhuis et al. (2006) point out that participants perform equally well after a period of distraction (unconscious thought)

when the decision is simple or complex. However, relative to unconscious-thought participants, conscious-thought participants perform well when a decision is simple and perform poorly when a decision is complex. Therefore, the observed differences between conscious- and unconscious-thought participants are not due to any change or benefit due to unconscious thought, rather conscious thought is simply performing better or worse depending on the amount of information that is presented. Additionally, Payne et al. (2008) demonstrated that when participants are compelled to think consciously for longer than they would normally, their performance suffers. Payne et al. (2008) suggested that making participants thinking longer than they would naturally hurt their decisions, and that when conscious thought was unconstrained, participants formed good decisions. This explanation is similar to the artifactual explanation of Lassiter et al. (in press) which also incriminates the methodology of the Dijksterhuis paradigm as responsible for producing superior decisions via distraction (unconscious thought).

Limitations of the Dijksterhuis Paradigm: In this area of research, participants in the unconscious-thought conditions typically form more favorable attitudes toward the best options (e.g., apartments, roommates) than the participants in the conscious-thought condition. Along with these good decisions, participants show polarization, which is greater recognition for the positive attributes of the best option, and the negative attributes of the worst option (Dijksterhuis, 2004). Dijksterhuis and Nordgren (2006) suggested that this pattern of results indicated that the unconscious processing system demonstrated effective decision making abilities, and was capable of differential recognition for important and unimportant information (i.e., polarization). Therefore

Dijksterhuis and Nordgren (2006) declared that unconscious thought should be considered an active process. However, there is reason to suspect that this interpretation of the evidence is not accurate.

Specifically, the good decisions made by the participants in the unconscious-thought condition might merely be the result of online judgment retrieval (Hastie & Park, 1986; Lassiter et al., in press). Additionally, the memory polarization demonstrated by unconscious-thought participants may not be due to any organizational capability of unconscious thought. Rather, Turkey and Brewer (2003) demonstrated that an individual's memory for events may become polarized simply as a function of time. For example, they found that as time passed, witnesses recalled schema-consistent information in greater detail than schema-inconsistent information. Therefore, the 4-minute period of distraction used in the Dijksterhuis paradigm could allow participants in the unconscious-thought condition to recall more schema-consistent (positive) attributes about the best candidate.

Lassiter et al., (in press) suggested that online and memory-based decisions can explain the general Dijksterhuis (2004) effects, and Turkey and Brewer's (2003) results suggest that schema-consistent recall can explain the polarization. Therefore, two well known phenomena can explain Dijksterhuis' (2004) primary findings without postulating an unconscious-thinking process. As a result, it becomes necessary to test whether there is a genuine, active process behind the good decision-making ability of unconscious (Dijksterhuis, 2004), or whether the good decisions are the result of online judgment

retrieval (Hastie & Park, 1986) and schema-consistent recognition (Tuckey & Brewer, 2003).

Future Directions

Designing a Follow-Up Experiment

Despite the failure of this thesis to demonstrate significant results that definitively separate and validate unconscious thought from conscious thought, the current methodology does provide a guideline for future research. As explained above, varying the timing of the impression formation instructions (i.e. before and after acquisition) may still be used to test the differing explanations of Dijksterhuis (2004) and Lassiter et al. (in press). Additionally, the current design could be altered to make it more similar to that used by Lassiter et al. (in press) by presenting the information to participants visually and by changing the cover story to more closely resemble that used previously. However the methodologies of Lassiter et al. (in press) and the current thesis should only provide a basic guideline for future research as other changes are necessary. For instance, Payne et al (2008) demonstrated that having a fixed amount of time for conscious thought may hurt participants' performance, and that allowing participants to think for as long as they wished improved performance. Therefore, participants in the conscious-thought condition should no longer be constrained to think for 4 minutes. Rather, they should not be informed of a time limit and should be allowed to think for as long as they would like. Not only does this constraint hurt their performance in the lab, but it limits the

experiment's generalizability to situations in which individuals are forced to think for a fixed period of time.

Due to the problems with past research (Lassiter et al., in press) it is still unclear as to whether unconscious thought is an active process or is instead the result of a methodological artifact. Specifically, the question of whether participants are simply retrieving online judgments or forming new judgments during distraction has not been answered. It is important to answer this question because if participants in the unconscious-thought conditions are forming good judgments when online judgments are not possible then conscious thought is not the only route for processing complex information. Determining the decision-making ability of unconscious thought would provide further evidence supporting a shift in away from research focusing only on conscious thought. Further, if unconscious-thought participants make good decisions in the absence of online judgments, it would be possible to examine unconscious thought's abilities in other directions (e.g., persuasion, other complex decisions, and consumer behavior). Therefore, a follow-up experiment should again vary the timing in which the participants receive the impression-formation instructions and more closely follow the materials of Lassiter et al. (in press) by presenting information in a similar format. Additionally the design should not include time constraints that have been placed upon conscious and unconscious thought, thereby allowing for more generalization to complex decisions.

CONCLUSIONS

The reported experiment failed to determine whether the deliberation-without-attention (unconscious thought) effect is a methodological artifact (Lassiter et al., in press) or an active thought process (Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006). However, it does utilize a conceptually sound methodology (i.e., varying the timing of impression-formation instructions) for testing the two possibilities. While the exact reasons for the failure of the current experiment are difficult to determine, speculation does suggest that the previous evidence for unconscious thought is either the result of a weak effect, or is due to some combination of a methodological artifact (Lassiter et al., in press) and schema-consistent recognition (Tuckey & Brewer, 2003). However, the question of whether Dijksterhuis (2004) or Lassiter et al. (in press) was correct, still needs to be answered, because if Dijksterhuis (2004) is correct, unconscious thought has many useful applications in decision making, persuasion, marketing. On the other hand, if Lassiter et al. (in press) is correct, there are limits to the interpretation and generalizability of Dijksterhuis' (2004) results. Thus, further research will need to be conducted to determine which explanation is more accurate.

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APPENDIX A

ATTRIBUTES OF THE HATSDUN,
DASUKA, KAIWA, AND NABUSI

CAR ATTRIBUTES

The Hatsdun has good mileage
The Hatsdun has good handling
The Hatsdun has a large trunk
The Hatsdun is very new
The Hatsdun is available in many different colors
For the Hatsdun service is excellent
The Hatsdun has poor legroom
The Hatsdun has poor highway stability
The Hatsdun has cupholders
The Hatsdun has a sunroof
The Hatsdun is relatively good for the environment
The Hatsdun has a poor sound system
The Kaiwa has good mileage
The Kaiwa has poor handling
The Kaiwa has a large trunk
The Kaiwa is available in many different colors
For the Kaiwa service is excellent
The Kaiwa has plenty of legroom
The Kaiwa has good highway stability
The Kaiwa has no cupholders
The Kaiwa has no sunroof
The Kaiwa is fairly good for the environment
The Kaiwa has a poor sound system
The Kaiwa is old

The Dasuka has poor mileage
The Dasuka has good handling
The Dasuka has a small trunk
The Dasuka is available in very few colors
For the Dasuka service is poor
The Dasuka has little legroom
The Dasuka has good highway stability
The Dasuka has cupholders
The Dasuka has a sunroof
The Dasuka is not very good for the environment
The Dasuka has a good sound system
The Dasuka is new
The Nabusi has poor mileage
The Nabusi has poor handling
The Nabusi has a small trunk
The Nabusi is available in many different colors
For the Nabusi service is poor
The Nabusi has plenty of legroom
The Nabusi has poor highway stability
The Nabusi has no cupholders
The Nabusi has a sunroof
The Nabusi is not very good for the environment
The Nabusi has a poor sound system
The Nabusi is old