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Thought in the absence of attention

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THOUGHT IN THE ABSENCE OF ATTENTION

A Thesis
Presented to
The Faculty of
Western Washington University

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Kurt Braunlich
July, 2010

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MASTER'S THESIS

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Abstract

Although many researchers have been unsuccessful in doing so, I was able to partially replicate Dijksterhuis' (2004) "unconscious thought" effect. I found that participants who were distracted with the performance of an irrelevant task made better decisions than participants who engaged in conscious thought or participants who made immediate-decisions. Task directions and population differences in the evaluation of option attributes likely represent confounding variables that can disrupt the unconscious thought effect. While Dijksterhuis has argued that his findings necessitate the existence of an unconscious thought process capable of operating in the absence of attention, I suspect that there is a more parsimonious explanation. I suggest that participants may develop implicit preference as they read the attribute statements, and that the behavioral expression of this preference is moderated by thought condition.

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Figure 2. Experiment 3: Percentages of participants in each thought condition that chose the attractive option. Participants in the 2.5 minute distraction condition chose the attractive car most frequently (*M*=57%). Participants in the 4-minute distraction condition chose the attractive option slightly less frequently (*M*=50%). Participants in the 1-minute distraction condition (*M*=41%) chose the attractive option less frequently than participants in the 4-minute distraction condition. Participants in the conscious thought (*M*=31%) and immediate-decision (*M*=31%) conditions identified the attractive option least frequently.

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Thought in the Absence of Attention

Western Philosophic tradition has long extolled the virtues of rational thought. In Phaedrus, Plato described the rational, or conscious, mind as a charioteer struggling to maintain control of two powerful horses; one with a noble and virtuous temperament and the other with a base and vile character (c. 360 BC). In The Republic, he described a utopian republic governed by a philosopher king, a man able to exert rational control of his unruly emotions (c. 360 BC). This idea of the rational mind as an entity independent from the emotions, and even independent from the body itself, has persisted into modernity. We can see it clearly in the writing of Descartes, who questioned the veracity of all information received from the senses and who built his philosophy upon one fact he did not question: *"cogito ergo sum"* or *"I think, therefore I am"* (1647/1903). Classical conceptions of the relationship between cognition and emotion are still strongly influential today.

Modern researchers, however, have found that the relationship between conscious and unconscious thought processes is more complex than previously assumed. We now know that our behavior is directly influenced by processes of which we are unaware. Researchers have demonstrated that behavior is affected by stimuli that are not consciously perceived (Murphy & Zajonc, 1993), by information that was consciously perceived but forgotten (Ebbinghaus, 1885/1964; Korsakoff, 1889 as reported in Schacter, 1987; Claparede, 1911, as reported in Johnson et al., 1985; Johnson et al., 1985), and by cognitive processes of which we are unaware (Betsch et al., 2001; Bechara & Damasio, 1997; Bechara et al., 2005; Dijksterhuis, 2004). Wilson and Schooler (Wilson, 1991; Wilson et al., 1993) have shown that we sometimes make better decisions

when we do not engage in conscious thought. Dijksterhuis and colleagues (Dijksterhuis, 2004; Dijksterhuis et al., 2006; Bos et al., 2008) have recently argued that we are capable of actively processing information even while our conscious resources are distracted with the performance of a non-related task.

While Dijksterhuis' findings are intriguing, they provide inconclusive evidence to posit the existence of an active implicit thought system. It is more parsimonious to conclude that his results reflect coordination between active explicit thought processes and passive implicit emotional processes. The latter conjecture also provides a better fit with other research.

Non-Conscious Perception and Preference Development

Pierce and Jastrow (1885) were the first researchers to show a discrepancy between perception and conscious experience. They asked participants to discriminate between various stimuli in terms of weight and brightness. The differences between these stimuli attributes were successively reduced until participants reported no confidence in their ability to discriminate between them. When asked to guess, however, participants were able to perform at rates significantly better than chance. This finding demonstrates that we are able perceive more information from the exogenous world than we are aware, and represents the first evidence of subliminal perception.

Almost 100 years later, Kunst-Wilson and Zajonc (1980) used the mere exposure effect (Zajonc, 1968) to investigate whether subliminal stimuli could influence preference. Participants were shown 20 octagonal shapes for 1 millisecond (ms) each, and then were given a discrimination test in which they were asked to differentiate between familiar and novel stimuli. As expected, in a direct recognition task, performance was no

better than chance. However, in an indirect preference task, in which participants were asked report how much they liked each shape, participants tended to prefer the familiar shape. These preference judgments depended not only upon the subliminal perception of intrinsic properties (such as weight, brightness or shape) of exogenous objects, but upon memories concerning the perception of these objects.

Murphy and Zajonc (1993) presented participants with a number of Chinese characters preceded by the subliminal presentation (4 ms.) of positive or negative affective primes. They were able to manipulate subsequent ratings of attractiveness for these characters by controlling the emotional content of the primes. Interestingly, when the same primes were presented supraliminally (1000 ms.) this effect was not found. Whereas irrelevant subliminal emotional content affected preference, irrelevant supraliminal content did not. This finding suggests that the process underlying the effect of subliminal primes is both automatic (it requires no conscious effort) and diffuse (it is affected by irrelevant factors, such as temporal proximity). It also suggests that conscious evaluative processes either disrupt the effect of the subliminal primes or discount the source of the affective response.

Amnesia and Non-Conscious Influences on Affective Preference

Eduard Claparede (as cited in Johnson et al., 1985) was the first to report evidence for non-conscious emotional memory in a patient with anterograde amnesia. Although this patient was unable to remember past interactions with the doctor (Claparede had to introduce himself each time they met), her behavior was clearly influenced by their past interactions. To demonstrate this point, Claparede hid a pin in his hand one day, and upon shaking his patient's hand, pricked her with it. Although she was unable to recall this

event, she refused to shake his hand the next time they met, explaining that "sometimes people hide pins in their hands."

Johnson and colleagues (1985) investigated affective preference development in a population of amnesic Korsakoff's patients. In their first experiment, they presented these patients and several age-matched alcoholic controls with several unfamiliar Korean melodies. In a subsequent recognition test, controls demonstrated high accuracy in differentiating between novel and familiar melodies. Patients, however, were unable to do so at rates significantly above chance. Interestingly, in a preference task, patients' subjective ratings of the melodies clearly differentiated between the novel and familiar tunes. In a second experiment, these researchers presented the same participants with fictional biographical information describing a good person and a bad person. In a direct memory test given 20 days later, patients displayed less explicit knowledge for this information than control participants. However, when given an indirect test, 78% of patients demonstrated preference for the good character. Amnesic patients, like normal participants are therefore influenced by the mere exposure effect. Moreover, these findings represent additional evidence of distinct explicit and implicit memory systems.

Non-Conscious Cognitive Processes and Preference Development

In certain situations, rational thought can lead to less desirable decisions than no thought at all. Wilson and Schooler (1991) have found that the choices made by students who consciously analyzed reasons for strawberry jam preference were less likely to coincide with expert rankings than were those made by students who did not consciously analyze reasons for their preference. Similarly, they found that the choices made by students who consciously analyzed their reasons for choosing a college course

corresponded less-well with expert choice. A different group of participants, who heeded their "gut" feelings instead of analyzing their reasons for preference, was also more satisfied with their choices for posters two-weeks later. Wilson and Schooler (1991) have proposed that we do not have conscious access to the reasons for our subjective preference and so, when we are asked to engage in rational thought processes, we tend to inappropriately weight those reasons which are available to consciousness. Again, it seems that these rational thought processes either mask or disrupt the process of implicit preference development.

Betsch and colleagues (Betsch et al., 2001; Betsch et al., 2006) have provided insight concerning this non-conscious process. They have proposed that implicit components of memories for various options are stored separately from explicit components in a hypothetical memory structure dubbed the value account. Information stored in this account is developed through a cumulative process that occurs during the perception of information concerning various options. This process reflects a gradual accumulation of preference that occurs in a single memory store as novel information is processed. Betsch and colleagues have supported this conjecture through findings in a stock-preference task. Participants were shown information concerning share values of stocks either under conditions of divided attention (the implicit cognition condition) or undivided attention (the explicit cognition condition). While the preferences of participants in the explicit condition reflected a mathematical average of share information, preferences of participants in the divided attention condition suggested a summative process. This is an interesting distinction, as the calculation of a mathematical average requires the active manipulation of memories concerning individual shares. A

summative process requires no memory for individual shares, but only for the cumulative value of these shares. Betsch and colleagues (Betsch et al., 2001; Betsch et al., 2006) therefore suggested that implicit preferences are developed during the perception of relevant information. Although explicit knowledge of this information may be lost, the cumulative value of this information (which is stored in the value account) is capable of influencing subsequent behavior.

Bechara and Damasio (Bechara et al., 1997; Bechara & Damasio, 2005) have suggested that the development of this type of unconscious knowledge is dependent on emotional processes, and that this knowledge exerts its behavioral influence by directly affecting our somatic states. They have supported this hypothesis through research with the Iowa Gambling Task (IGT). In this task, participants are given a chance to win money by drawing cards from four decks of cards. Unbeknownst to participants, two decks are advantageous, yielding a net monetary reward if consistently drawn. The remaining decks are risky, yielding larger rewards, but ultimately yielding a net loss if consistently drawn. Normal participants typically display an increase in advantageous behavior (an increased proportion of draws from the advantageous decks) before they are able to express explicit knowledge for the advantageous strategy. This finding is interpreted as evidence of implicit knowledge of the advantageous strategy.

When Bechara and Damasio (1997) measured skin conductance response (SCR), a measure associated with emotional arousal, during performance of the IGT, they found that inexperienced normal participants displayed SCR when they received monetary reward or punishment. Normal participants with moderate experience displayed SCR preceding all draws, and highly-experienced participants displayed elevated SCR

preceding draws from the risky decks only. Participants with amygdalar lesions, however did not display advantageous behavior and did not show elevated SCR at any point during the task (Bechara and Damasio, 2005). Participants with lesions to the ventromedial prefrontal cortex (VMPFC) similarly did not show advantageous behavior, and showed elevated SCR only when they experienced reward or punishment. Based on these findings, the researchers argued that the amygdala is critically involved in the mediation of somatic states induced by *primary inducers*. Primary inducers are exogenous stimuli that carry emotional value acquired through innate predispositions towards, or through experience with, these stimuli. These researchers have also suggested that the VMPFC mediates somatic states induced by *secondary inducers,* endogenous stimuli (such as memories) that carry emotional salience.

Bechara and Damasio's somatic marker hypothesis (SMH) extends Betsch's value account hypothesis by specifying the means by which unconscious evaluative information is expressed behaviorally. Critically, while we may be aware of the physiological sensations associated with the emotional reaction to a given stimulus, we might not have explicit knowledge concerning the events that gave rise to these feelings. For instance, while we may know that we are deathly afraid of horses by the beating in our chests and the weakness in our knees, we may not necessarily remember the specific childhood event that was the original source of this association.

Thought in the Absence of Attention

Like Wilson and Schooler (1991), Dijksterhuis (Dijksterhuis, 2004; Dijksterhuis et al, 2006a) has argued that rational thought can lead to less desirable decisions than no thought at all. He has demonstrated that for specific types of problems, participants who

engage in rational thought actually perform worse than participants who make immediate-decisions, and participants who spend an equal amount of time engaged in the performance of an irrelevant task.

In a typical unconscious thought experiment, participants are asked to choose between four normatively-ranked options (e.g., various cars, various apartments or various roommates), each of which is described by 12 attribute options. The attractive option is typically described by 8 positive attribute sentences (e.g., *"The Hatsdun car has a nice paint job"*) and 4 negative attribute sentences (e.g., *"The Hatsdun car does not have cupholders"*). Conversely, the unattractive option is typically described by 4 positive attribute statements and 8 negative attribute statements. Two moderately-attractive options are typically included to increase the difficulty of the decision task. Each of these options is typically described by 6 positive and 6 negative attribute statements. Each attribute sentence is presented one a time on a computer screen, for three seconds each and in random order.

After all of the 48 attribute sentences are presented, participants are divided into three thought conditions: an *immediate-decision* condition (in which participants are asked to make decisions immediately after reading the attribute sentences), a *conscious thought* condition (in which participants are given 2-4 minutes to think carefully before making a decision), and a *distraction condition* (in which participants are distracted for 3-4 minutes with the performance of an N-Back task or an anagram puzzle problem task).

After completing the requirements of the various thought conditions, participants are typically asked to rate each of the options on a Likert-type scale and/or to simply identify the best option. Dijksterhuis has reported two interesting findings. The first is

that participants in the distraction condition typically display better preference than participants in the immediate-decision condition. The second is that participants in the conscious thought condition typically do not display better preference than participants in the immediate-decision condition (Figure 1). This second finding is not wholly surprising, as it closely mirrors Wilson and Schooler's (1991; 1993) findings.

Dijksterhuis' first finding, that participants in the distraction condition tend to perform better than participants in the immediate-decision condition, however, is something of a puzzle. Dijksterhuis has argued that this finding necessitates the existence of a cognitive process that is capable of evaluating option-relevant information in the absence of attention. However, I suspect a more parsimonious explanation.

Alternative Explanation

As mentioned, in a successful replication of an unconscious thought experiment, participants in the distraction conditions typically demonstrate significantly better preference than participants in the conscious thought and immediate-decision conditions. Dijksterhuis has argued that this finding necessitates the existence of an unconscious cognitive process that is capable of actively evaluating and manipulating declarative attribute knowledge while participants are engaged in the performance of an irrelevant task. It seems more parsimonious, however, to suspect that participants may develop implicit emotional preference for the various options (i.e., a sense of gist or a "gut-feeling", or a "value store") as they read the attribute sentences (Lassiter et al., 2009) and that the behavioral expression of this preference is moderated by thought condition. This explanation would provide a closer fit with findings described by other researchers

(Bechara & Damasio, 2005; Bechara, Tanel, & Damasio, 1997; Betsch et al., 2001; Johnson et al., 1985; Murphy & Zajonc, 1993; Wilson & Schooler, 1991; Zajonc, 1968).

As the attractiveness of the various options is operationalized by the ratio of positive to negative attribute statements used to describe them, it is not advantageous to engage in excessive analysis of individual attribute statements. A participant who acts in accordance with the outcome of a summative evaluative process will likely express more accurate preference than participants who do not consider all attribute statements. As the development of implicit preference likely reflects a summative process (Betsch et al, 2001; Betsch et al., 2006), all participants likely tend to develop relatively accurate implicit preference during the attribute display block. Participants who make decisions in accordance with this implicit preference will likely tend to express the strongest relative preference for the operationally-defined attractive option. It is less likely that the expressed preference of participants who engage in rational analysis of specific attribute statements will reflect the operationally-determined normative ranking.

It certainly seems plausible that participants in the conscious thought condition, who were instructed to engage in careful rational thought, would report the outcome of their rational thought processes rather than their "gut feeling". These participants likely engage in rational analysis of declarative memories for attribute statements and, as Wilson and Schooler suggested (Wilson & Schooler 1991; Wilson et al., 1993), tend to place excessive weight on those attributes that are available to consciousness. In Dijksterhuis' paradigm, they likely tend to make decisions in accordance with the outcome of these rational processes.

As participants in the immediate-decision condition likely have better declarative knowledge of the attribute statements than participants in the distraction and conscious-thought conditions, it is possible that this declarative knowledge might discourage the behavioral expression of implicit preference. Participants in the immediate-decision condition may have equivalent implicit preference for the attractive option as participants in the distraction condition, but may be discouraged from expressing it.

Whereas Dijksterhuis has posited that implicit preference changes during the performance of the distraction task, within the framework outlined above, implicit preference would remain stable during this time.

Inconsistent Replication

Another important concern about Dijksterhuis' work is that the results have not been consistently replicated by other researchers. Thorsteinsen and Withrow (2009) conducted two studies designed to replicate Dijksterhuis' experimental paradigm within an undergraduate population at the University of Idaho. Four normatively-ranked apartments were each described by 15 attribute statements. Each of the 60 attribute statements was presented one at a time for four seconds each. The order of attribute presentation was random, but the attribute statements were blocked by apartment. After the stimulus display, participants were divided into three conditions. In the conscious thought condition, participants were given four minutes to think carefully about "which apartment they liked best." Participants in a memory aid condition spent four minutes listing the reasons for their preference. Participants in the unconscious thought condition spent four minutes completing an N-Back task. These researchers did not include an

immediate-decision condition. Thorsteinsen and Withrow found no significant difference in apartment preference between modes of thought.

Newell and colleagues (2008) conducted a pilot study designed to assess the importance of 16 apartment dimensions. In Experiment 1, they used only the five highest and five lowest attribute dimensions across all apartments. This is somewhat of a departure from Dijksterhuis' paradigm, as Dijksterhuis rejected the extreme dimensions and used only those that were of moderate importance. Participants in Newell and colleagues' study were students at the University of New South Wales, Australia. Forty attribute sentences describing the four apartments were presented in random order for four seconds each. After the stimulus display, participants were divided into immediate-decision, conscious thought (4 minutes), and distraction conditions (4 minutes of an anagram puzzle problem task). The researchers observed that participants in all conditions tended to choose the apartment that matched their idiosyncratic ratings of attribute importance. They found, however, no evidence that unconscious thought is preferable to conscious thought.

In a second experiment, Newell and colleagues used the same attribute sentences as Experiment 1, but displayed them all at one time via an "information board" that was displayed for three minutes. Participants were then divided into four conditions: a conscious thought condition (8 minutes), a distraction condition (8 minutes of anagram puzzle problems), a conscious thought with information condition (participants were able to see the information board during the eight minutes of conscious thought) and an immediate-decision condition. As in Experiment 1, the researchers did not find evidence that unconscious thought may be preferable to conscious thought. In a third experiment,

Newell and colleagues attempted to directly replicate Dijksterhuis' 2006 study. They used the attribute statements provided in the online supplemental information to Dijksterhuis' study (Dijksterhuis, 2006b), and increased their sample size to increase statistical power. Again, however, they were unsuccessful in replicating Dijksterhuis' finding.

Rey and colleagues (2009) also used the attribute statements provided in the online supplementary info for Dijksterhuis' 2006 experiment (2006b) to investigate the unconscious thought effect within student population at the University of Bourgogne in France. Participants in the immediate-decision condition performed best while distracted participants performed only slightly better than conscious thinkers.

Acker (2008) conducted a meta-analysis of several published and unpublished studies investigating Dijksterhuis' effect. He found that results were inconsistent and provided little evidence of active unconscious thought. Several members of Dijksterhuis' lab, however, are currently conducting a meta-analysis of over 30 published and several unpublished studies (Strick et al., 2009) and suggest that the unconscious thought phenomenon has a moderately strong effect size (.402). It is difficult to understand why this discrepancy exists, but it should be noted that many that a majority of failed replications seem to be occurring outside of the Netherlands.

To establish the existence of the unconscious thought effect and to investigate my hypotheses about alternative explanations, I conducted three experiments. All experiments were conducted in private rooms via personal computer running Inquisit by Millisecond Software.

Experiment 1

In Experiment 1, I sought to replicate Dijksterhuis' methods as reported in his 2004 paper. In addition, in order to assess implicit preference, and to determine whether participants in all thought conditions hold equivalent implicit preference for the attractive option, I included a semantic priming task. If I was successful in replicating the unconscious thought effect, I predicted that participants in the immediate-decision and distraction conditions would demonstrate equivalent performance in this task. If participants in the distraction condition demonstrated stronger preference for the attractive option via the semantic priming task than participants in the immediate-decision condition, this would support Dijksterhuis' conjecture that participants actively process information during the distraction condition. I began by piloting a number of attribute statements that would be used to describe four apartments.

Pilot Study

I informally piloted 40 original attribute statements about apartments on a mixed-gender group of 15 graduate and undergraduate students at WWU. I asked participants to rate the attractiveness and the importance of each attribute statement via a ten-point scale. I selected only attribute statements that were moderately influential. The attribute statements included in the experiment can be found in Appendix A.

Method

Participants. Seventy-eight undergraduate psychology students at WWU participated in exchange for partial course credit. Assignment to thought condition was randomly determined.

Procedure and materials.

Practice blocks. After completing consent forms, participants were advised that they would be *"presented with a list of sentences describing various apartments"* and would be "*asked to make decisions based upon this information."* They were also advised that they would *"participate in two different kinds of tasks: the '2' Back task and the 'Reaction Time' task."*

Participants then completed a practice two-back task consisting of 11 items. The *N*-back task (in this case, a 2-Back task) is a challenging working memory task. In it, a seemingly random sequence of numbers is presented in the center of the computer screen. Each number is presented one at a time and participants are asked to indicate whether the displayed number matches the number that was presented *n*-back in the sequence. In the present 2-back task, participants are asked to press the space bar to indicate when the displayed number was the same as the number displayed 2-back in the sequence.

The 2-back practice block repeated until participants were able to perform the task with 80% accuracy. After completing this practice block, participants then performed a practice semantic priming task. In this practice block, two words were shown in quick succession and participants were asked to indicate whether the second word was positive or negative. The primes (the initial word of each pair) were musical instruments (e.g., *"Tuba", "Violin", "Bassoon", "Guitar")* and the second items were either positive (e.g., *"Wonderful", "Pleasure", "Honest"*) or negative words (e.g., *"Awful", Disaster", "Nasty"*).

Each trial was preceded with a 1000ms pause, at which time a fixation point ("+") appeared in the center of the computer screen for 300ms. This fixation point served to

alert participants as to the location of the subsequent prime and target words. After the fixation point appeared, the prime was presented in the same location for 600ms. The prime was followed by a blank screen for 100ms, after which a positive or negative target word was presented.

To indicate the valence of the second word, participants were asked to press keys on the left side (the "a" key) and right side (the "5" key located in the number pad) of the keyboard, which were clearly marked with temporary yellow stickers. These keys were counterbalanced between participants. Participants were encouraged to *"respond as fast as possible",* even if that led them *"to make a few errors."* If participants pressed the wrong key, a red "Error" message would flash on the computer screen. The practice block consisted of 8 trials.

Initial instructions. Before completing the practice blocks, participants were informed that they would be presented with information about apartment choices and that they would then be asked to make decisions based on this information. After completing the practice blocks, participants were informed that they had completed the practice blocks, and that the experiment was about to start. Complete instructions are available in Appendix B.

Timing and format. Each of the 48 attribute sentences used to describe the four apartment options was presented in random order, one at a time, in the center of the computer screen for four seconds. After all sentences had been displayed, participants were divided into their randomly-assigned thought condition: immediate-decision, conscious thought, or distraction. Participants in the immediate-decision condition were asked to make decisions immediately after the sentences had been displayed. Participants

in the conscious-thought condition were given three minutes think carefully about their reasons for preference. Participants in the distraction condition performed a two-back task for three minutes.

After completing the requirements of the various thought conditions, half of the participants first rated the attractiveness of each of the apartments and then completed the semantic priming task. The other half of the participants first completed the semantic priming task, and then rated each of the options. The rating task involved rating each of the apartments in random order. Participants were asked to provide responses via a ten-point Likert-type scale in which "1" was anchored with the phrase *"Extremely Unattractive"* and 10 was anchored with the phrase *"Extremely Attractive"*. (A complete list of anchors is available in Appendix B). The semantic priming task was the similar to practice semantic priming task completed before the attribute display period, however, the primes were now the attractive (the Canterbury Apartment) and the unattractive (the Heatherstone Apartment) options.

As mentioned, participants were either asked to press a button on the right side of the keyboard (the "5" key located in the number pad) or on the left side of the keyboard (the "A" key). Both keys were marked with yellow stickers. Half of the participants were asked to press the right button in response to a good target word, and the left button in response to a bad target word. The other half of participants were asked to press the left button in response to a good target word, and the right button in response to a bad target word. RT was measured from the onset of the target word. A 200ms pause followed each trial.

After performing the semantic priming task and rating the options, participants then chose the best apartment. They then indicated their confidence in this choice via a ten-point Likert-type scale. "1" was anchored with the phrase *"Not Confident at All"* and 10 was anchored with the phrase *"Completely Confident"*. Participants were then asked to recall, via a free-response format, all of the attractive and unattractive features of this apartment.

Results

Rating task. For all participants, there was a significant main effect of apartment in the rating task $F(3,225) = 15.53$, $MSE = 4.07$, $p < .01$, *partial* $\eta^2 = .172$. Across conditions, participants tended to rate the attractive apartment ($M = 7.04$, $SD = 1.52$) higher than the first ($M = 5.55$, $SD = 2.1$) and second ($M = 6.23$, $SD = 1.95$) moderately attractive apartments. The unattractive apartment ($M = 4.95$, $SD = 1.95$) was rated as less attractive than all other options. There was no main effect of thought condition $F(2,75) = .91$, $MSE = 2.30$, $p = .41$, *partial* $\eta^2 = .024$. The key interaction between thought condition and option was also not significant, $F(6,225) = .428$, $MSE = 4.07$, $p = .86$, *partial* $\eta^2 = .011$. Cell means can be found in Table 1.

To account for possible carry-over effects from the semantic priming task, I analyzed rating task results for only those participants who took the rating task before the semantic priming task. There was a significant main effect of apartment, $F(3,111) = 15.07$, $MSE = 3.70$, $p < .01$, *partial* $\eta^2 = .29$. These participants tended to rate the attractive option ($M = 7.28$, $SD = 1.45$) as being more attractive than the first ($M = 5.3$, $SD = 2.12$) and second ($M = 6.48$, $SD = 1.71$) moderately attractive apartments. All other apartments were rated as more attractive than the unattractive apartment ($M = 4.6$, $SD =$

2.02). There was no main effect of thought condition $F(2,37) = .62$, $MSE = 2.64$, $p = .544$, *partial* $\eta^2 = .032$. The key interaction was also not significant, $F(6,111) = .78$, $MSE = 3.70$, $p = .59$, *partial* $\eta^2 = .041$. Cell means can be found in Table 2.

Semantic priming task. Semantic priming data were analyzed with a 3x4 mixed ANOVA. For all participants, there was no main effect of option on overall RT, $F(1,75) = .25$, $MSE = 647.65$, $p = .62$, *partial* $\eta^2 < .01$. The interaction between apartment and thought condition was not significant, $F(2,75) = 0.721$, $MSE = 647.65$, $p = .49$, *partial* $\eta^2 = .02$. There was no interaction between target and thought condition, $F(2,75) = .11$, $MSE = 879.65$, $p = .89$, *partial* $\eta^2 < .01$. There was no interaction between apartment and target, $F(1,75) = .01$, $MSE = 897.18$, $p = .09$, *partial* $\eta^2 < .01$. The key three-way interaction between thought condition, apartment and target was not significant, $F(2,75) = .38$, $MSE = 897.18$, $p = .69$, *partial* $\eta^2 = .01$. Cell Means can be found in Table 3.

To account for possible carry-over effects from the rating task, I analyzed SP results for only those participants who took the semantic priming task before the rating task. For these participants, there was a significant main effect of apartment, $F(1,35) = 5.94$, $MSE = 532.06$, $p = .02$, *partial* $\eta^2 = .15$. Regardless of thought condition, these participants were faster to respond to the attractive option ($M = 569.37$) than to the unattractive option ($M = 578.51$). There was no main effect of thought condition, $F(2,35) = .08$, $p = .93$ *partial* $\eta^2 < .01$. The interaction between apartment and thought condition approached significance, $F(2,35) = 2.63$, $MSE = 532.06$, $p = .09$, *partial* $\eta^2 = .13$. Participants in the conscious thought condition were faster to respond to the unattractive option ($M = 568.43$, *standard error* = 18.95) than were participants in the immediate-decision condition ($M = 577.65$, *standard error* = 17.55). Participants in the unconscious

thought condition were slowest to respond to the unattractive option (M = 589.44, *standard error*=18.95). The interaction between target and thought condition was not significant $F(2,35) = .98$, $MSE = 661.73$, $p = .39$, *partial* $\eta^2 = .05$. The interaction between target and apartment was also not significant, $F(1,35) = .151$, $MSE = 661.73$, $p = .70$, *partial* $\eta^2 < .01$. The key 3-way interaction between thought condition, target and apartment was also not significant, $F(2,35) = 1.73$, $MSE = 661.73$ $p = .19$, *partial* $\eta^2 = .09$. Cell means can be found in Table 4

Choice task. There were no significant differences between thought conditions in the proportion of participants who chose the attractive apartment, $\chi^2(2, n = 78) = 0.37$, $p = .83$, *phi* = .07. Simple effects analyses also did not reveal any differences between the distraction condition and the immediate decision condition, $\chi^2(1, n = 52) = .27$, $p = .606$. There was also no significant difference in the proportion of participants in the conscious thought and distraction conditions who chose the attractive option $\chi^2(1, n = 50) = .30$, $p = .59$. Cell means can be found in Table 5.

Confidence. Differences between conditions for participant's ratings of confidence in identifying the best option was not significant $F(2,75) = .06$, $p = .94$, $MSE = 0.48$, *partial* $\eta^2 < .01$.

Free recall. Because I was unsuccessful in replicating the unconscious thought effect, I did not analyze the free-recall data.

Discussion

Experiment 1 represents a failure to replicate the unconscious thought effect using the methods described in the first study of Dijksterhuis' 2004 paper. Although I predicted no interaction between thought condition and preference in the semantic priming task,

this result is somewhat meaningless, as the participants in the distraction condition did not demonstrate more accurate preference via the rating or choice tasks than participants in the immediate-decision condition.

In an unintentional deviation from Dijksterhuis' paradigm, the same attribute dimensions were not used across all options. In other words, while one apartment was described as "*having a good gym"* the attribute statements concerning the other options did not describe a gym at all. At this point it is unclear whether this deviation may have affected the results. However, this increase in the number of unique descriptors may have decreased the complexity of the attribute display, thereby facilitating the development of advantageous preference. This conjecture is supported by the finding that participants in all thought conditions were able to differentiate between the attractive and unattractive options. Additionally, participants were more successful at differentiating between the attractive (M = 7.04) and unattractive (M = 4.96) options than were Dijksterhuis' participants (attractive option M = 6.18, unattractive option M = 5.38). It is possible that participants in the present study developed strong preference as they read the attribute statements, and that the subsequent performance of the various thought conditions was insufficient to alter this preference.

It is also possible that the task instructions delivered prior to the attribute statement display block may have disrupted the unconscious thought effect. Lassiter et al. (2009) were successful in replicating the effect when they instructed participants to form impressions of each option, but was unsuccessful when he asked participants to memorize the statements. They found that participants who performed a distractor task performed best when instructed to form impressions of the various options. They also

found that participants in the conscious thought condition performed best when given instructions to memorize the attribute statements. I instructed participants to form impressions of the various options and to remember the various attribute sentences. The combination of both sets of instructions may have disrupted the unconscious thought effect.

Experiment 2

Experiment 2 was an attempt to directly replicate the methods used by Dijksterhuis in the first experiment of his 2006 paper (Dijksterhuis et al, 2006a). I also used the same attribute statements (Dijksterhuis et al., 2006b). There were two deviations from Dijksterhuis' experimental paradigm: first, participants performed a two-back task rather than a set of anagram puzzle problems and second, participants in the distraction condition performed a semantic priming task either before or after the rating task. Dijksterhuis has used the two-back task in a number of successful experiments, so it is unlikely that this deviation affected the results.

Method

Participants. Seventy-three undergraduate psychology students at WWU participated in exchange for partial course credit. Assignment to thought condition was randomly determined.

Procedure and materials.

Practice blocks. As in Experiment 1, all participants performed a practice two-back task and a practice semantic priming task before the attribute display. These practice tasks were as described above.

Initial instructions. Before completing the practice blocks, participants were informed that they would be shown many sentences describing four different cars: the "*Nabusi*", the "*Dasuka*", the "*Kaiwa*", and the "*Hatsdun"*. They were also informed that their job would be to choose the best car. Complete instructions are available in Appendix C.

Timing and format. The 48 attribute sentences (available in Appendix D) were presented in random order. Each sentence was presented in the center of the computer screen for 8 seconds. After each of the sentences had been displayed, participants were divided into their randomly-assigned thought conditions: immediate-decision, conscious thought, or distraction. Participants in the immediate-decision condition were asked to make decisions immediately after the sentences had been displayed. Participants in the conscious-thought condition were given four minutes to deliberate and were instructed to "*take this time to think very carefully about the cars"*. Participants in the distraction condition performed a two-back task for four minutes.

After completing the requirements of the various thought conditions, half of the participants first completed the rating task and then the semantic priming task. The other half of the participants first completed the semantic priming task, and then rating task. The rating task and semantic priming task followed the same format as outlined in Experiment 1. After completing the SP and rating tasks, participants were asked to identify the best car, were asked to indicate their confidence in this choice and then were asked to recall as many attractive and unattractive features about this car as possible.

Results

Rating task. For all participants, there was a significant main effect of car $F(3, 210) = 38.79$, $MSE = 3.20$, $p < .01$, *partial* $\eta^2 = .36$. The attractive car ($M = 7.04$, $SD = 1.78$) was rated as more attractive than the first moderately-attractive car ($M = 6.64$, $SD = 1.81$), which was rated as more attractive than the second moderately-attractive car ($M = 5.23$, $SD = 1.59$), which was rated as more attractive than the unattractive car ($M = 4.20$, $SD = 1.61$). There was no main effect of thought condition, $F(2, 70) = .62$, $MSE = 2.04$, $p = .54$, *partial* $\eta^2 = .02$. The interaction was also not significant, $F(6, 210) = .77$, $MSE = 3.20$, $p = .6$, *partial* $\eta^2 = .02$. Cell means can be found in Table 6.

To account for possible carry-over effects from the semantic priming task, I analyzed rating task results for only those participants who took the rating task before the semantic priming task. For participants these participants, there was a significant main effect of car $F(3, 96) = 19.04$, $MSE = 3.32$, $p < .01$, *partial* $\eta^2 = .37$. The attractive car ($M = 7.60$, $SD = 1.52$) was rated as more attractive than the first moderately-attractive car ($M = 6.37$, $SD = 2.04$), which was rated as more attractive than the second moderately-attractive car ($M = 5.2$, $SD = 1.8$), which was rated as more attractive than the unattractive car ($M = 4.46$, $SD = 1.58$). There no significant main effect of thought condition $F(2,32) = 1.37$, $MSE = 2.33$, $p = .27$, *partial* $\eta^2 = .08$. The predicted interaction was also not significant $F(6, 96) = .79$, $MSE = 3.32$, $p = .58$, *partial* $\eta^2 = .05$. Cell means can be found in Table 7.

Across conditions, there were no differences in response latency during the rating task, $F(1,70) = .25$, $p = .78$, *partial* $\eta^2 = .01$. There was also no main effect of car

$F(3,210) = .67$, $p = .57$, *partial* $\eta^2 = .01$. Nor was there an interaction, $F(6,210) = 8.32$, $p = .23$, *partial* $\eta^2 = .04$.

Semantic priming task. For all participants, there was no significant main effect of option $F(1,70) = .66$, $MSE = 2221.04$, $p = .42$, *partial* $\eta^2 = .01$. There was also no main effect of thought condition, $F(2,70) = .03$, $MSE = 19617.70$, $p = .97$, *partial* $\eta^2 < .01$. There was also no interaction between car and thought condition $F(2,70) = .19$, $MSE = 2221.04$, $p = .83$, *partial* $\eta^2 < .01$. There was no interaction between car and target, $F(1,70) = .56$, $MSE = 906.57$, $p = .46$, *partial* $\eta^2 = .01$. The key interaction between car, target and thought condition was not significant, $F(2,70) = .2$, $MSE = 906.57$, $p = .818$, *partial* $\eta^2 = .01$. Cell means can be found in Table 8.

To account for possible carry-over effects from the rating task, I analyzed SP results for only those participants who took the semantic priming task before the rating task. There was no significant main effect of car, $F(1,33) < .01$, $MSE = 464.14$, $p = .99$, *partial* $\eta^2 < .01$. There was no significant main effect of thought condition, $F(2, 33) = .32$, $MSE = 21230.94$, $p = .72$, *partial* $\eta^2 = .020$. The interaction between car and thought condition was not significant, $F(2, 33) = .79$, $MSE = 464.14$, $p = .46$, *partial* $\eta^2 = .046$. The interaction between car and target was not significant, $F(1, 33) = .46$, $MSE = 829.14$, $p = .5$, *partial* $\eta^2 = .01$. The interaction between car, target and thought condition was also not significant, $F(2, 33) = .09$, $MSE = 829.14$, $p = .911$, *partial* $\eta^2 = .01$. Cell means can be found in Table 9.

Choice task. There were no significant differences in the proportion of participants in each thought condition who chose the attractive option, $\chi^2(2, n = 73) = 1.74$, $p = .42$. There was also no significant difference in the proportion of participants in

the immediate-decision and distraction conditions who chose the attractive option $\chi^2(1, n = 55) = .1.52, p = .22$. Nor was there a significant difference in the proportion of participants in the conscious thought decision and distraction conditions who chose the attractive option $\chi^2(1, n = 48) = .01, p = .94$. Cell means can be found in Table 10.

Confidence. Between thought conditions, participants did not indicate significant differences in their confidence of choice $F(2,72) = .38$, $MSE = .681$, $p=.68$, *partial* $\eta^2 = .01$.

Free recall task. Because I was unsuccessful in replicating the unconscious thought effect, I did not analyze the free-recall data.

Discussion

Experiment 2 was a literal replication of an experiment outlined in Dijksterhuis' 2006 paper (Dijksterhuis et al., 2006a; Dijksterhuis et al., 2006b). I used the same attribute sentences and procedure (with the exception of the semantic priming task and use of the two-back instead of a puzzle problem task). I found no evidence of unconscious thought. Participants in the distraction condition did not display more accurate preference for the attractive option than did participants in other conditions. This was true for results in the rating task, the choice task and the semantic priming task.

Participants in all thought conditions were better able to differentiate between the attractive ($M = 7.04$), and unattractive ($M = 4.201$), options than were Dijksterhuis' participants (attractive option $M = 6.18$, unattractive option $M = 5.38$). As in Experiment 1, the decision task may have been too easy. I suspected that participants may not have assigned equivalent importance to all attribute statements. To investigate this possibility,

I conducted a pilot study of 116 car attribute statements, including 21 used by Dijksterhuis (Dijksterhuis et al., 2006).

Pilot Study

Eighty-one WWU undergraduate psychology students participated in exchange for partial course credit. Participants read each of the attribute statements in random order, and were asked to indicate their attitude concerning each statement via a 10-point Likert-type scale. For each question, 1 was anchored with the phrase *"Extremely Negative"* and 10 was anchored with the phrase *"Extremely Positive"*.

WWU undergraduate students rated some of Dijksterhuis' statements to be heavily influential while others were relatively unimportant. For instance, the statement *"The car gets good gas mileage"* received an average rating of 9.03 while the statement *"The car is available in very few colors"* received an average rating of only 5.07. Complete pilot study results can be found in Appendix E.

It is likely, therefore, that participants in Experiment 2 disregarded unimportant statements and based their decisions only upon those that they considered to be important. Many of the researchers who have sought to replicate the unconscious thought effect have also used the attribute sentences provided in the supplementary information of Dijksterhuis' 2006 paper. It is likely that differences in the way subject populations evaluate these sentences, may disrupt the effect.

In Experiment 3, I excluded six of Dijksterhuis' original attribute statements because they were excessively influential. I selected statements based on their average importance rating. I rejected statements that received average ratings above 8.24 or below 3.19. I also rejected those in which the positive version of the statement was substantially

more or less influential than the negative version of the statement. For instance, the statement, *"The car is available in very few colors"* received an average rating of 5.04, but its positive counterpart, *"The car is available in many different colors"* received an average rating of 7.4. I also excluded statements with larger standard deviations. Additionally, I excluded statements that contradicted other statements.

Experiment 3

As mentioned, Lassiter et al. (2009) observed that participants in the conscious thought condition performed best when given instructions to memorize the attribute statements and that those participants in the distraction condition performed best when instructed to form impressions of the various options. They also administered a Need-For-Cognition-Scale, and found that participants with higher need for cognition were more successful in differentiating between the attractive and unattractive options than were participants with lower need for cognition. Accordingly, they have suggested that the unconscious thought effect does not result from an effortless process (as Dijksterhuis has argued), and that implicit preference is developed "online", while participants read the attribute sentences. Unfortunately, they did not include an immediate-decision condition. Nor did they offer an explanation for why participants in the immediate-decision condition would make less-desirable decisions than participants in the distraction condition.

I suspect that Lassiter and colleagues were correct in thinking that implicit preference is developed while participants read the attribute statements. It also seems likely that participants in the conscious thought condition would tend to make decisions

in accordance with the output of their rational thought processes and disregard their implicit preference.

Explicit memory deteriorates more quickly than implicit memory (Ebbinghaus, 1885/1964; Korsakoff, 1889 as reported in Schacter, 1987; Claparede, 1911, as reported in Johnson et al., 1985; Johnson et al., 1985; Reber 1993). Therefore, as explicit memory is forgotten during the performance of the two-back task, implicit preference likely remains. The forgetting of explicit information may therefore encourage the behavioral expression of implicit knowledge.

Relatively accurate explicit memory for the attribute sentences discourages participants in the immediate-decision condition from expressing their implicit preference. To investigate this hypothesis, I included a free-recall task in Experiment 3. I predicted that participants in the immediate-decision condition would demonstrate better free-recall performance than participants in the distraction condition and would also demonstrate less-accurate preference for the attractive option.

Additionally, if the behavioral expression of this preference is moderated by thought condition, it is likely that it could also be moderated by task instructions. To investigate this hypothesis in the rating task I asked half of the participants to report their feelings concerning each option and half to report their attitudes. I predicted that when encouraged to describe their feelings, participants in all thought conditions would make better decisions than participants encouraged to describe their attitudes.

In order to investigate the possibility that the duration of the distraction task might affect the unconscious thought effect, I included distraction conditions of 1, 2.5 and 4

minutes in duration. I had no a priori predictions about the relative performance of participants in each of these distraction conditions.

It is well known that explicit memory can be affected by the order in which items are presented (Deese & Kaufman, 1957). Order effects may also influence preference (Mayo & Crocket, 1964). When asked to recall a list of stimuli immediately after it been presented, participants typically demonstrate primacy and recency effects; they tend to remember stimuli that appeared early and late in the stimulus display. After a period of delay, recency effects typically disappear and participants tend to demonstrate primacy effects. Order effects, therefore, may differentially influence participants in the various thought condition. Participants in the immediate-decision condition might be influenced by primacy and recency effects while participants in the distraction condition might be influenced most strongly by primacy effects.

To investigate this hypothesis, it would be necessary to manipulate the order of attribute statements. In Experiment 3, I did not do this, but instead investigated correlations between the presented order of attribute sentences and preference in an effort to provide justification for future research.

Method

Participants and materials. One-hundred and ninety-three undergraduate psychology students at WWU participated in exchange for partial course credit. Assignment to thought condition was randomly determined.

Procedure.

Practice blocks. As in Experiments 1 and 2, all participants performed a practice two-back task and a practice semantic priming task before the attribute display. Practice blocks were as outlined above.

Initial instructions. After completing the practice blocks, participants were informed that they had completed the practice blocks, and that the experiment was about to start. They were informed that they would be shown sentences describing four different cars: the "*Nabusi*", the "*Dasuka*", the "*Kaiwa*", and the "*Hatsdun*". Before reading the attribute statements, participants received instructions to form impressions of each car. Complete instructions can be found in Appendix F.

Timing and format. Each of the 48 attribute sentences (available in Appendix G) were presented in random order in the center of the computer screen for 4 seconds. After these sentences had been displayed, participants were divided into 5 thought conditions: immediate-decision, conscious thought, 1 minute distraction, 2.5 minute distraction or 4 minute distraction. Participants in the immediate-decision condition were asked to make decisions immediately after the sentences had been displayed. Participants in the conscious-thought condition were given four minutes to deliberate and were instructed to *"Please take this time to think very carefully about the advantages and disadvantages of each car."*

After completing the requirements of the various thought conditions, participants were asked to rate the attractiveness of the various cars via a 10-point Likert-type scale. They were either asked to rate their attitude (e.g., *"Please indicate your attitude concerning the Hatsdun"*) or were asked to rate their feelings concerning each option

(e.g., *"Please describe your feelings concerning the Hatsdun"*). For both sets of instructions, the Likert scales were identical; 1 was anchored with *"Extremely Negative"* and 10 was anchored with *"Extremely Positive"*.

After rating each of the options, participants performed a free-recall task for the positive and negative features of each car. Participants then identified the best car and indicated their confidence in this choice.

Results

Rating task. Across all thought conditions, there was a significant main effect of car, $F(3,564) = 18.61$, $MSE = 3.26$, $p < .01$, *partial* $\eta^2 = .09$. However, the observed pattern did not follow the normative pattern perfectly. The attractive car ($M = 6.24$, SD=1.89) was rated as more attractive than the second moderately attractive car ($M = 6.08$, $SD = 1.69$). The second moderately attractive car was rated as more attractive than the first moderately attractive car ($M = 5.09$, $SD = 1.783$). The unattractive car ($M = 5.23$, $SD = 1.74$), however, was rated as more attractive than the second moderately attractive car. This deviation from the normative ranking likely reflects the increased difficulty of the decision task that may have resulted from the use of attribute statements with minimal importance.

There was no significant main effect of thought condition $F(4,188) = 1.93$, $MSE = 3.83$, p=.11, *partial* η^2=.04. The interaction between option and thought condition was also not significant $F(12, 564) = 1.15$, $MSE = 3.26$, p=.32, *partial* η^2=.02. Cell means can be found in Table 11.

There was no main effect of rating task instructions (attitude vs. feel), $F(1, 183) = .2$, $p=.65$, *partial* $\eta^2 < .01$. There was also no interaction between rating task instructions and thought condition $F(4, 183) = .19$, $p=.94$, *partial* $\eta^2 < .01$.

For all participants there was no significant main effect of option on latency in the rating task, $F(3,564) = 1.88$, $MSE = 2.26$, $p = .13$, *partial* $\eta^2 = .01$. There was no significant main effect of thought condition, $F(4,188) = 1.34$, $MSE = 2.30$, $p = .26$, *partial* $\eta^2 = .03$. There was also no significant interaction, $F(12,564), = .96$, $MSE = 2.26$, $p=.49$, *partial* $\eta^2 = .02$. These results provide evidence that participants in immediate decision and distraction conditions did not spend more time deliberating after completing the requirements of the various thought conditions than did participants in the conscious thought condition.

Free-recall task. On average, participants recalled only 24% of the attribute statements ($M = 11.68$, $SD = 4.92$). For participants in all thought conditions, there was a significant main effect of car on the total number of attribute statements correctly recalled, $F(3, 555) = 12.23$, $MSE = 0.02$, $p < .01$, *partial* $\eta^2 = .06$. Participant recalled the most attribute statements describing the attractive option ($M = 28.68\%$). Participants recalled fewer attribute statements describing the first ($M = 24.08\%$) and second ($M = 23.95\%$) moderately-attractive options. They recalled the fewest statements concerning the unattractive option ($M = 21.00\%$) There was no effect of thought condition, $F(4, 185) = 1.97$, $MSE = 0.04$, $p = .43$, *partial* $\eta^2 = .02$. The interaction was not significant $F(12, 555) = 1.07$, $MSE = 0.02$, $p = .39$, *partial* $\eta^2 = .02$. Cell means can be found in Table 12.

For participants in all thought conditions, there was a significant main effect of car on the number of positive attribute statements correctly recalled, $F(3, 537) = 56.63$,

MSE < 0.01, $p < .01$, *partial* $\eta^2 = .24$. Participants recalled the greatest percentage of positive attribute sentences describing the attractive option *(M* = 19.18%). They recalled fewer attribute statements describing the first (*M* = 13.04%) and second (*M* = 12.63%) moderately attractive options. They recalled the fewest attribute statements describing the unattractive option (*M* = 7%). There was no significant main effect of thought condition, $F(4, 179) = 0.403$, *MSE* = 0.01, $p = .81$, *partial* $\eta^2 < .01$. There was also no interaction, $F(12, 537)=1.07$, *MSE* < 0.01, $p = .38$, *partial* $\eta^2 = .02$. Cell means can be found in Table 13.

For participants in all thought conditions, there was a significant main effect of car on the percentage of negative attribute statements recalled, $F(3, 540) = 7.39$, *MSE* = 0.01, $p < .01$, *partial* $\eta^2 = .04$. All participants tended to recall more negative attributes about the unattractive car (*M* = 14%) than the first (*M* = 11.56%) and second (*M* = 12%) moderately attractive cars. They recalled the fewest negative statements about the attractive car (*M* = 10.13%). There was no significant main effect of thought condition, $F(4, 180) = .46$, *MSE* = 0.01, $p = .76$, *partial* $\eta^2 = .01$. The interaction approached significance, $F(12, 540) = 1.75$, *MSE* = 0.01, $p = .05$, *partial* $\eta^2 = .04$. A graph of the interaction can be found in Figure 4. Cell means can be found in Table 14.

Intrusions. Intrusions were defined as any incorrect attribute recalled describing a particular option. For participants in all thought conditions, there was no significant main effect of car on the total number of intrusions recalled, $F(3,555) = 1.63$, *MSE* = 1.43, $p = .18$, *partial* $\eta^2 = .01$. There was also no main effect of thought condition, $F(4,185) = .53$, $p = .71$, *partial* $\eta^2 = .01$. There was also no interaction, $F(12, 555) = 1.11$, *MSE* = 1.43, $p = .35$, *partial* $\eta^2 = .02$. Cell means can be found in Table 15.

For participants in all thought conditions, there was a significant main effect of car on the number of positive intrusions recalled, $F(3,537) = 13.01$, $MSE = 0.67$, $p < .01$, *partial* $\eta^2 = .07$. All participants had more positive intrusions for the unattractive car ($M = 1.18$, $SD = 1.05$) than the two moderately attractive cars (*Means* = 0.81 and 0.94, *SD's* = 0.84 and 0.85). They displayed fewest positive intrusions for the attractive car ($M = 0.64$, $SD = 0.8$). There was no significant main effect of thought condition, $F(4, 179) = 1.28$, $MSE = 1.13$, $p = .28$, *partial* $\eta^2 = .03$. There was also no interaction, $F(12, 537) = 1.11$, $MSE = 0.67$, $p = .35$, *partial* $\eta^2 = .02$. Cell means can be found in Table 16.

For participants in all thought conditions, there was a significant main effect of car on the number of negative intrusions recalled $F(3, 540) = 3.71$, $MSE = 0.64$, $p = .01$, *partial* $\eta^2 = .02$. Participants in all thought conditions tended to have more negative intrusions for the attractive option ($M = 0.91$, $SD = 0.84$) and the first moderately-attractive option ($M = 0.91$, SD=1.00) than the second moderately attractive option ($M = 0.81$, $SD = 0.78$). Participants had the fewest negative intrusions for the unattractive option ($M = 0.65$, $SD = 0.82$), There was no significant main effect of thought condition, $F(4, 180) = .49$, $MSE = 1.03$, $p = .74$, *partial* $\eta^2 = .01$. The interaction was significant, $F(12, 540) = 2.26$, $MSE = 0.64$, $p = .01$, *partial* $\eta^2 = .05$. While participants in the immediate-decision, conscious thought and 2.5 minute distraction conditions tended to recall more negative intrusions concerning the attractive option than the unattractive option, participants in the 1-minute distraction and 4-minute distraction conditions tended to recall more negative attributes concerning the unattractive option than the attractive option. Cell means can be found in Table 17.

Choice task.. Participants in the 2.5 minute distraction condition chose the attractive car most frequently (M = 57%), $\chi^2(4, n = 190) = 8.62$, $p = .07$, $phi = 0.21$. Participants in the 4-minute distraction condition chose the attractive option slightly less frequently (M = 50%). Participants in the 1-minute distraction condition (M = 41%) chose the attractive option less frequently than participants in the 4-minute distraction condition. Participants in the conscious thought (M = 31%) and immediate-decision (M = 31%) conditions identified the attractive option least frequently (Figure 2, Table 18).

When the distraction conditions were condensed, the effect of thought condition on choice reached significance, $\chi^2(2, n = 190) = 6.72$, $p = .04$, $phi = .187$. Participants in the distraction conditions (M=50%) tended to choose the attractive option more frequently than participants in the conscious thought (M = 31%) or immediate-decision (M = 31%) conditions. Complete results can be found in Table 19.

To investigate the unconscious thought effect specifically, I conducted a number of simple effects analyses. I compared the proportion of participants in each distraction condition who identified the attractive car to the proportion of participants in the immediate-decision condition who chose the attractive car.

Immediate-decision condition vs. 1-minute distraction condition. There was no difference in the ratio of participants who chose the attractive option in the immediate-decision and 1 minute distraction conditions, $\chi^2(1, n = 79) = .86$, $p = .35$, $phi = .10$.

Immediate-decision condition vs. 2.5 -minute distraction condition. There was a significant difference in the proportion of participants who chose the attractive option in the immediate-decision and the 2.5 minute distraction conditions, $\chi^2(1, n = 91) = 5.962$, $p = .02$, $phi = .26$. Of the 45 participants in the immediate-decision condition, 31% chose

the attractive option. Of the 46 participants in the 2.5 minute distraction condition, 57% chose the attractive option. As more participants in the 2.5 minute distraction condition chose the attractive car than did participants in the immediate-decision condition, this finding lends support to the unconscious thought effect.

Immediate-decision condition vs. 4 -minute distraction condition. There was a difference that approached significance in the proportion of participants who chose the attractive option in the immediate-decision and the 4- minute distraction conditions, $\chi^2(1, n = 77) = 2.81$, $p = .09$, *phi*= .19. Of the 45 participants in the immediate-decision condition, 45% chose the attractive option. Of the 32 participants in the 4-minute distraction condition, 50% chose the attractive option.

Immediate-decision condition vs. conscious-thought condition. To investigate whether participants in the conscious thought condition demonstrated relatively poor preference, I compared the proportion of participants in this condition who chose the attractive car to the proportion of participants in the immediate-decision condition who chose the attractive car. There was no significant difference in the proportion of participants who chose the attractive option in the immediate-decision and the conscious-thought conditions, $\chi^2(1, N = 80) < .01$, $p = .98$, *phi* < .01.

Confidence. Between thought conditions, participants did not indicate significant differences in their confidence concerning their choice of the best car, $F(4,97) = .45$, $MSE = 0.85$, $p = .77$, *partial* $\eta^2 = .02$.

Post-hoc analyses. I originally predicted that participants with better free-recall performance would be less likely to make decisions in accordance with their implicit preference. Accordingly, I predicted that participants with relatively accurate explicit

memory would be less likely to choose the attractive car or rate it highly. I predicted that conditions in which a higher proportion of participants chose the attractive car, participants would also tend to recall fewer attribute statements for the attractive car. In the choice task, a greater proportion of participants in the 2.5-minute distraction condition tended to choose the attractive option than did participants in the immediate-decision condition. When I compared the number of attribute statements describing the attractive car correctly recalled between these two conditions, I found that participants in the immediate-decision condition recalled significantly more attributes than did participants in the 2.5 minute distraction condition, $F(1,270) = 5.49$, $MSE = 2.29$, $p = .02$ (Figure 3). Between these three thought conditions, there were no significant differences in the number of attribute statements correctly recalled describing any of the other options

There was no significant difference in the proportion of participants who chose the attractive option in the conscious-thought and immediate-decision conditions. Similarly, there was no significant difference in the number of correctly recalled attribute statements describing the attractive option, $F(1,270) = 0.56$, $MSE = 2.29$, $p = .45$.

Relationship between rating score and number of attribute sentences correctly recalled. Participants in all thought conditions who rated the attractive option more favorably tended to recall a greater number of correct attribute statements describing it than did participants who rated it less-favorably, $r(187) = 26$, $p < .01$. Additionally, participants who tended to rate the second-moderately attractive option favorably also tended to recall a greater number of attribute statements describing it than participants who rated it less-favorably, $r(187) = .22$, $p=.03$.

In the immediate-decision condition, participants who tended to rate the attractive option more favorable also tended to recall a greater number of correct attribute statements describing it than participants who rated it less-favorable, $r(28) = .37$, $p = .04$. Participants who rated the second-moderately attractive option more favorable also tended to recall a greater number of correct attribute statement describing it, $r(28) = .62$, $p < .01$. No relevant correlations were significant in the conscious thought condition.

In the 1-minute distraction condition participants who rated the attractive option more favorable also tended to recall a greater number of correct attribute statements describing it than participants who rated it less favorable, $r(61) = .28$, $p = .03$. This relationship was also true for the second moderately-attractive option. Participants who rated this option more favorable also tended to recall a greater number of correct attribute statements, $r(61) = .26$, $p = .04$.

In the 2.5 minute and 4-minute distraction conditions, no relevant correlations were significant. These findings suggest that in the conscious thought, immediate-decision and 1-minute distraction conditions, participants who recall a greater number of attribute sentences also tend to display better preference. Lassiter has demonstrated that participants in the conscious thought condition tend to display better preference when instructed to memorize the attribute statements than when instructed to form impressions of the various options. This finding provides evidence that accurate explicit memory can facilitate the accuracy of preference for participants who make decisions in accordance with conscious thought processes.

It is interesting to note that no relevant correlations were found in the 2.5 and 4-minute distraction conditions. These were the conditions in which I found evidence

supporting the unconscious thought effect in the choice task. Although there was no significant evidence of unconscious thought in the rating task, the lack of relevant correlations with free-recall task performance provides evidence that the these participants did not engage in rational analysis of the attribute statements.

Order effects. Order effects were coded as positive or negative primacy and recency scores. Of the 12 attribute statements used to describe an option, primacy scores reflect the number of positive or negative attribute sentences that occurred first.

The order of the 12 attribute statements used to describe each option was coded as primacy and recency scores. Primacy scores represent the number of positive or negative attribute sentences that were presented first in the list. For example a score of +4 would mean that four positive statements describing a particular option were presented before the first negative sentence. A score of -4 would mean that four negative statements preceded the first positive statement. Similarly, recency scores represent the number of positive or negative attribute statements presented at the end of the 12 attribute statement list used to describe a particular option. An "order" score was also calculated for each option by summing the primacy and recency scores.

Across all 5 thought conditions, only the attractive option recency score was significantly correlated with its rating, $r(184) = .15$, $p = .04$. Correlations can be found in Table 21.

In the immediate-decision condition, no relevant comparisons were significantly correlated, however, a positive relationship between the attractive option rating and the order score approached significance, $r(43) = .25$, $p = .09$. A negative relationship

between the attractive option rating and the unattractive primacy score also approached significance, $r(43) = -.254$, $p = .09$. Correlations can be found in Table 22.

In the conscious thought condition, there was a marginally significant positive relationship between the rating for the first moderately-attractive option and its primacy score $r(30) = .33$, $p = .08$. Correlations can be found in Table 23. In the 1-minute distraction condition, several correlations approached significance. A negative relationship between the unattractive option rating and its recency score approached significance, $r(29) = -.30$, $p = .10$. A negative relationship between the unattractive option rating score and the attractive option order score also approached significance, $r(29) = -.33$, $p = .07$. Correlations can be found in Table 24.

In the 2.5-minute distraction condition, the negative relationship between the moderately-attractive rating and its order score approached significance, $r(44) = -.26$, $p = .08$. Correlations can be found in Table 25. In the 4-minute distraction condition, the positive relationship between the attractive option rating and its primacy score was significant, $r(30) = .42$, $p = .02$. Correlations can be found in Table 26.

Discussion

In the rating task, participants were able to differentiate between the cars, so the attribute display was not overly complicated. Participants held only slightly stronger preference for the attractive ($M = 6.24$), and unattractive options ($M = 5.23$) than did Dijksterhuis' participants (attractive option $M = 6.18$, unattractive option $M = 5.38$). However, I was unsuccessful in replicating Dijksterhuis' unconscious thought effect in the rating task; the critical interaction between thought condition and option was not present in this task. Rating task instructions (attitude vs. feel) also did not affect ratings

for the various cars. However, a significantly higher proportion of participants in the 2.5 minute distraction condition chose the attractive option than participants in the immediate-decision or conscious thought conditions.

It is unclear why the key interaction between thought condition and option was significant in the choice task but not significant in the rating task. It is possible that there was less pressure to select the correct answer in the ratings task than in the choice task. Therefore, participants in all thought conditions, including the conscious thought and immediate-decision conditions might be more likely to make decisions based upon implicit preference when rating each option than when choosing an option. More research is needed in this area.

In the free-recall task, there was no interaction between thought condition and option in the total number of attribute statements correctly recalled. However, the interaction concerning the number of negative attribute statement correctly recalled approached significance. In addition, the interaction concerning the number of negative intrusions was significant. It is unclear why the key interaction was significant for negative statements, but not for positive statements. More research is needed in this area.

As mentioned, a significantly higher ratio of participants in the 2.5 minute distraction condition chose the attractive option than in the immediate-decision condition. A higher ratio of participants in the 4-minute distraction condition also tended to identify the attractive option than in the immediate-decision condition, however, this effect was only marginally significant. I interpreted these findings in support of the unconscious thought effect.

Participants in the 2.5 minute distraction condition also tended to recall fewer attribute statements describing the attractive option than did participants in the immediate-decision condition. I interpret these findings in support of my hypothesis that participants with better explicit knowledge may be less-likely to act in accordance with their implicit preference. It is unclear why there was a positive relationship between explicit knowledge and rating for a particular option. This finding seems to contradict my hypothesis. However, the unconscious thought effect was not apparent in the rating task, and it is unknown whether the direction of these relationships would change if the unconscious thought effect were found.

I investigated the hypothesis that rating task directions might influence the effect. I encouraged some participants to express their attitudes and encouraged others to express their feelings. There were no significant differences in rating task performance between these two groups. It is possible that this manipulation was insufficient to affect the results. Future researchers may wish to include more elaborate instructions either encouraging participants to make decisions in accordance with their "gut feeling" or based on conscious processes.

Ratings for several options were significantly correlated with indices representing the order in which attribute statements were presented. Future researchers may wish to manipulate the presentation order of attribute statements. If it is possible to control the unconscious thought effect via the presented order of attributes, this will also provide evidence that preference is developed only "online", as participants read the attribute statements.

General Discussion

Dijksterhuis has argued that the unconscious thought effect necessitates the existence of an unconscious cognitive process that is capable of actively processing attribute information even while participants are distracted with the performance of an unrelated task. Dijksterhuis wrote that *"unconscious thought is expected to turn an initial, disorganized set of information into a clearer and more integrated representation of information in memory…unconscious thought leads to representations that become more polarized"* (2004, p.593). I conducted the experiments described above to investigate a somewhat more parsimonious explanation; that participants develop implicit preference as they read the attribute sentences and that the behavioral expression of this preference is moderated by thought condition.

Many researchers (Bechara & Damasio, 2005; Bechara, Tanel, & Damasio, 1997; Betsch et al., 2001; Johnson et al., 1985; Murphy & Zajonc, 1993; Wilson & Schooler, 1991; Zajonc, 1968) have observed that implicit preference develops as participants perceive attribute information, and that this preference can often persist even after participants no longer have declarative knowledge of the attribute information. Betsch and colleagues (2009) have demonstrated that the process of implicit preference development is summative. Because Dijksterhuis operationally defines the attractiveness of a given option by the ratio of its positive and negative attributes, participants who engage in a summative evaluative process will be more likely to make decisions in accordance with this operationally-defined normative ranking than participants who do not consider all attribute sentences. I therefore hypothesized that participants who heeded

their “gut feelings” would be more likely to make decisions in accordance with this normative ranking than participants who engaged in rational thought.

Dijksterhuis has reported several successful replications of the unconscious thought effect. As his experimental paradigm requires that participants treat the various attribute statements with equal importance, researchers should conduct pilot studies to determine how their participants will evaluate the attribute statements. I found that WWU undergraduate students considered some of Dijksterhuis’ attribute statements to be highly important and considered others to be highly unimportant. Participants in Experiment 2, therefore, may have disregarded those statements that they considered to be highly unimportant , and may have based their decisions only upon those attribute statements that they considered to be important. In Experiment 3, I presented only attribute statements that the WWU undergraduate population had rated as moderately-important via the pilot study, and obtained my best results.

In three experiments, I investigated the hypothesis that implicit preference develops while participants read the attribute statements, and that the behavioral expression of this preference is moderated by thought condition. In Experiments 1 and 2, I investigated the hypothesis that implicit preference, as measured via a semantic priming task performance, does not change during the performance of the two-back task. As predicted, the interaction between option, target and thought condition was not significant in either experiment. This finding is somewhat meaningless, however, as I was unsuccessful in replicating the unconscious thought effect via the choice or rating tasks.

In Experiment 3, I investigated the hypothesis that relatively accurate explicit memory for attribute statements might discourage participants from making decisions

based on “gut feeling”. I predicted that participants in the immediate-decision condition would be able to recall a greater number of attribute statements than participants in the distraction condition, and therefore would also be more likely to make decisions based on conscious processes.

I found that participants in the distraction condition did tend to recall fewer correct attribute statements than participants in the immediate-decision condition. Additionally, a larger proportion of participants in the distraction condition chose the attractive option than in the immediate-decision condition. I interpret these results in support of my conjecture that the behavioral expression of implicit knowledge may be moderated by explicit knowledge.

It is unclear why I was successful in replicating the unconscious thought effect via the choice task, but unsuccessful in doing so via the rating task. In addition, and contrary to my hypothesis, I found a positive correlation between the number of correct attribute statements recalled and the strength of expressed preference for the attractive option. It is, however, possible that the direction of this relationship would change if I had been successful in replicating the unconscious thought effect via the rating task.

Future researchers may wish to include multiple dependent variables in their experiments, as my results seem to indicate that the unconscious thought effect can be moderated by task type.

In addition, it may be valuable to manipulate instructions for tasks occurring after the performance of the various thought conditions. In Experiment 3, I encouraged one group of participants to report their attitudes, and another group of participants to describe their feelings concerning the various options. I found no differences in rating

task performance between these two groups; however, differences between these sets of instructions may have been insufficient to affect rating task performance.

In Experiment 3, I found a number of significant correlations between indices representing the order in which attribute statements describing a particular option were presented and option ratings. It may be possible to influence preference for the various options through manipulation of attribute statements presentation order.

With increasing duration of the distraction condition, explicit memory for the attribute statements will fade. Implicit preference, however, will likely remain. If the behavioral expression of implicit preference is moderated by explicit knowledge, then after several days, when almost all explicit knowledge has been forgotten, participants may still be able to demonstrate accurate preference. However, participants encouraged to engage in conscious thought prior to making their decisions, might display relatively deleterious preference. Increase in the duration of the distraction condition may allow researchers to use attribute statements of greater importance.

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Figure 1.

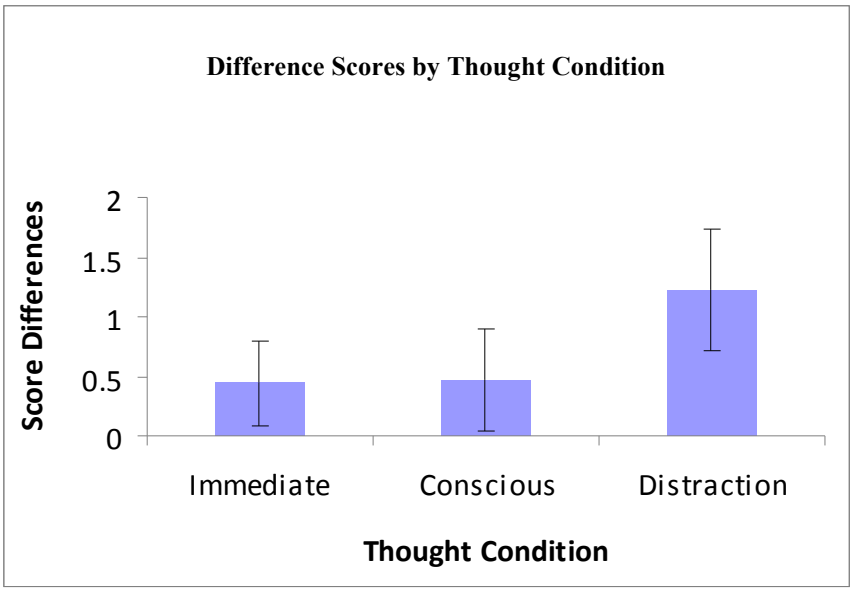
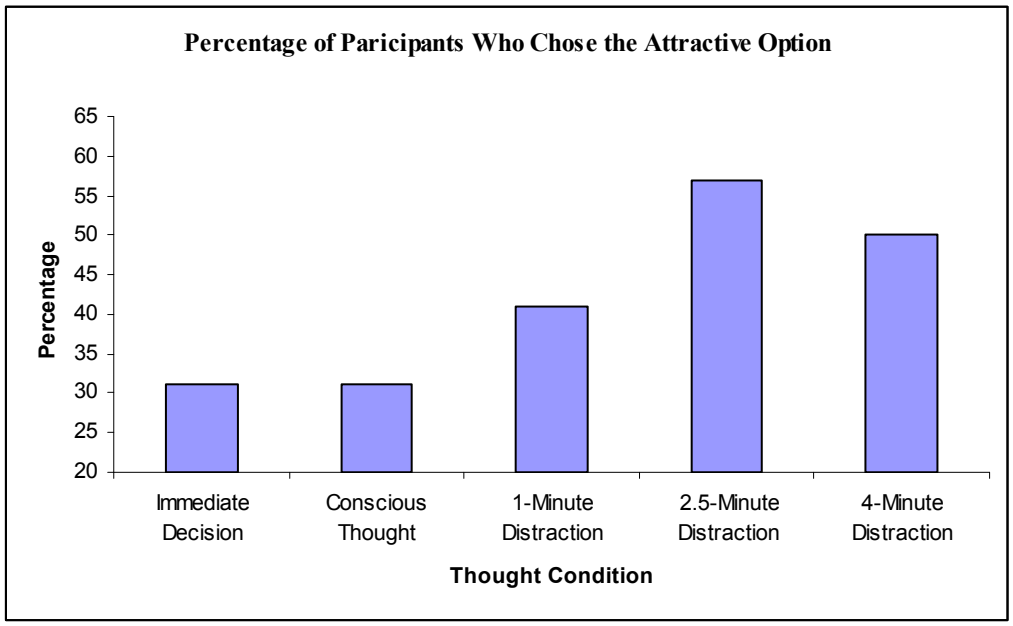

Difference Scores by Thought Condition
Score Differences
2
1.5
1
0.5
0
Immediate
Conscious
Distraction
Thought Condition

Figure 2.


Percentage of Paricipants Who Chose the Attractive Option
Percentage
65
60
55
50
45
40
35
30
25
20
Immediate Decision
Conscious Thought
1-Minute Distraction
2.5-Minute Distraction
4-Minute Distraction
Thought Condition

.

Figure 3.

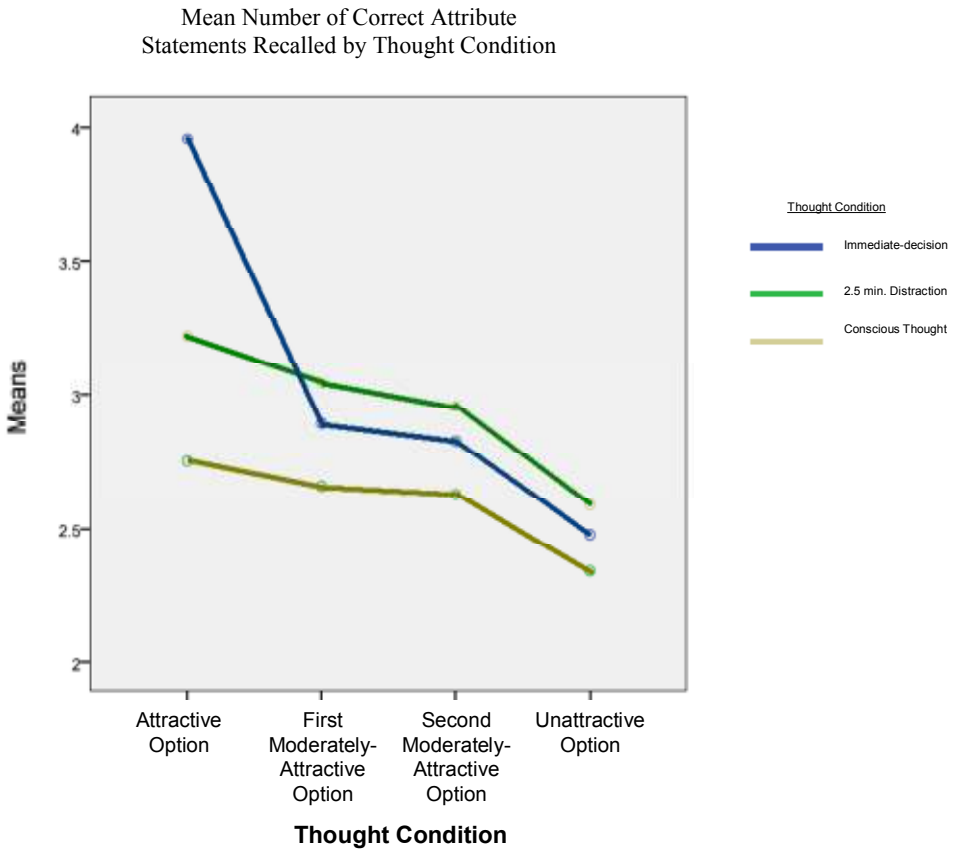

Mean Number of Correct Attribute Statements Recalled by Thought Condition
Means
4
3.5
3
2.5
2
Attractive Option
First Moderately-Attractive Option
Second Moderately-Attractive Option
Unattractive Option
Thought Condition
Thought Condition
Immediate-decision
2.5 min. Distraction
Conscious Thought

Figure 4.

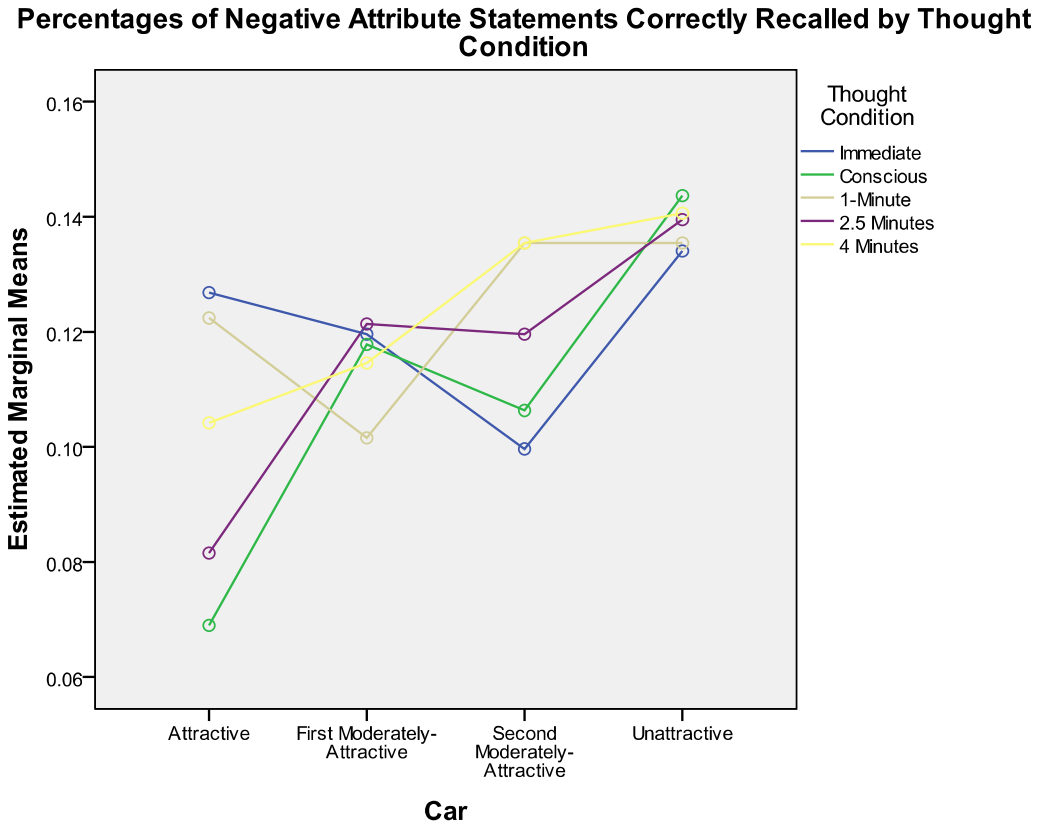

Percentages of Negative Attribute Statements Correctly Recalled by Thought Condition
Estimated Marginal Means
0.16
0.14
0.12
0.10
0.08
0.06
Attractive
First Moderately-Attractive
Second Moderately-Attractive
Unattractive
Car
Thought Condition
Immediate
Conscious
1-Minute
2.5 Minutes
4 Minutes

Table 1

Experiment 1, Rating Task: Mean Apartment Ratings

Option	Thought Condition	Mean (SD)	N
Attractive	Immediate	7.07 (1.59)	28
	Conscious	7.08 (1.38)	26
	Distraction	6.96 (1.65)	24
	Total	7.04 (1.52)	78
1'st Moderately Attractive	Immediate	5.46 (2.12)	28
	Conscious	5.31 (2.22)	26
	Distraction	5.92 (1.98)	24
	Total	5.55 (2.1)	78
2'nd Moderately Attractive	Immediate	6.18 (1.68)	28
	Conscious	6.08 (2.19)	26
	Distraction	6.46 (2.02)	24
	Total	6.23 (1.95)	78
Unattractive	Immediate	5.36 (2.02)	28
	Conscious	4.65 (2.02)	26
	Distraction	4.79 (1.79)	24
	Total	4.95 (1.95)	78

Table 2

Experiment 1, Rating Task: Mean Apartment Ratings

Option	Thought Condition	Mean	(SD)	N
Attractive	Immediate	7.36	(1.28)	14
	Conscious	7.36	(1.69)	14
	Distraction	7.08	(1.44)	12
	Total	7.28	(1.45)	40
1'st Moderately Attractive	Immediate	5.14	(2.41)	14
	Conscious	4.71	(1.86)	14
	Distraction	6.17	(1.9)	12
	Total	5.3	(2.11)	40
2'nd Moderately Attractive	Immediate	6.86	(1.61)	14
	Conscious	6.36	(1.98)	14
	Distraction	6.17	(1.53)	12
	Total	6.48	(1.71)	40
Unattractive	Immediate	4.93	(1.98)	14
	Conscious	4.5	(2.38)	14
	Distraction	4.33	(1.72)	12
	Total	4.6	(2.02)	40

Table 3

Experiment 1, Semantic Priming Task: Mean Reaction Times

Option	Thought Condition	Mean (SD)	N
Attractive	Immediate	574 (66.19)	28
	Conscious	587 (94.04)	26
	Distraction	582 (72.63)	24
	Total	581 (77.54)	78
1'st Moderately Attractive	Immediate	573 (70.06)	28
	Conscious	592 (96.48)	26
	Distraction	592 (67.48)	24
	Total	585 (78.64)	78
2'nd Moderately Attractive	Immediate	574 (62.65)	28
	Conscious	584 (93.47)	26
	Distraction	588 (64)	24
	Total	582 (73.96)	78
Unattractive	Immediate	582 (71.49)	28
	Conscious	587 (85.53)	26
	Distraction	592 (63.43)	24
	Total	587 (73.4)	78

Table 4

Experiment 1, Semantic Priming Task: Mean Reaction Times

Option, Target Valence	Thought Condition	Mean (SD)	N
Attractive, Positive	Immediate	569.8 (56.48)	14
	Conscious	568.1 (83.15)	12
	Distraction	569 (63.88)	12
	Total	569 (66.26)	38
Attractive, Negative	Immediate	568.7 (67.96)	14
	Conscious	571.3 (71.76)	12
	Distraction	569.3 (47.88)	12
	Total	569.7 (61.94)	38
Unattractive, Positive	Immediate	572.4 (55.93)	14
	Conscious	576.3 (86.6)	12
	Distraction	580.9 (61.27)	12
	Total	576.3 (66.76)	38
Unattractive, Negative	Immediate	582.9 (70.7)	14
	Conscious	560.6 (62)	12
	Distraction	598 (72.74)	12
	Total	580.6 (68.57)	38

Table 5

Experiment 1, Choice Task: Proportions of Participants Who Chose the Attractive Option

Thought Condition	Count/Proportion	Chose Other Option	Chose Attractive Option	Total
Immediate-Decision	Count	16	12	28
	Proportion	0.57	0.43	1
Conscious Thought	Count	15	11	26
	Proportion	0.58	0.42	1
Distraction	Count	12	12	24
	Proportion	0.5	0.5	1
Total	Count	43	35	78
	Proportion	0.55	0.45	1

Table 6

Experiment 2, Rating Task: Mean Apartment Ratings

Option	Thought Condition	Mean (SD)	N
Attractive	Immediate	7.2 (1.85)	25
	Conscious	7.08 (1.84)	24
	Distraction	6.83 (1.71)	24
	Total	7.04 (1.78)	73
1'st Moderately Attractive	Immediate	6.72 (1.88)	25
	Conscious	6.46 (1.93)	24
	Distraction	6.75 (1.67)	24
	Total	6.64 (1.81)	73
2'nd Moderately Attractive	Immediate	5.76 (1.51)	25
	Conscious	4.83 (1.66)	24
	Distraction	5.08 (1.5)	24
	Total	5.23 (1.59)	73
Unattractive	Immediate	3.96 (1.49)	25
	Conscious	4.46 (1.69)	24
	Distraction	4.21 (1.67)	24
	Total	4.21 (1.61)	73

Table 7

Experiment 2, Rating Task: Mean Apartment Ratings

Option	Thought Condition	Mean (SD)	N
Attractive	Immediate	8.31 (1.11)	13
	Conscious	7.33 (1.3)	12
	Distraction	7 (1.94)	10
	Total	7.6 (1.52)	35
1'st Moderately Attractive	Immediate	6.46 (2.26)	13
	Conscious	6.17 (2.04)	12
	Distraction	6.5 (1.96)	10
	Total	6.37 (2.04)	35
2'nd Moderately Attractive	Immediate	5.85 (1.77)	13
	Conscious	4.75 (1.6)	12
	Distraction	5 (2)	10
	Total	5.23 (1.8)	35
Unattractive	Immediate	4.15 (1.57)	13
	Conscious	4.75 (1.6)	12
	Distraction	4.5 (1.65)	10
	Total	4.46 (1.58)	35

Table 8

Experiment 2, Semantic Priming Task: Mean Reaction Times

Option, Target Valence	Thought Condition	Mean (SD)	N
Attractive, Positive	Immediate	551 (139.34)	25
	Conscious	529.8 (69.4)	24
	Distraction	535.4 (68.96)	24
	Total	538.9 (98.04)	73
Attractive, Negative	Immediate	539.5 (73.62)	25
	Conscious	545.6 (60.4)	24
	Distraction	546.3 (66.14)	24
	Total	543.7 (66.18)	73
Unattractive, Positive	Immediate	536 (87.73)	25
	Conscious	525.6 (55.25)	24
	Distraction	533.1 (65.83)	24
	Total	531.7 (70.32)	73
Unattractive, Negative	Immediate	536.1 (93.25)	25
	Conscious	543.6 (58.64)	24
	Distraction	546.2 (67.45)	24
	Total	541.9 (73.95)	73

Table 9

Experiment 2, Semantic Priming Task: Mean Reaction Times

Option, Target Valence	Thought Condition	Mean (SD)	N
Attractive, Positive	Immediate	549.2 (128.35)	12
	Conscious	534.9 (80)	12
	Distraction	524.3 (67.6)	12
	Total	536.1 (93.45)	36
Attractive, Negative	Immediate	541.5 (75.9)	12
	Conscious	549.7 (68.25)	12
	Distraction	529.3 (54.64)	12
	Total	540.2 (65.46)	36
Unattractive, Positive	Immediate	549.5 (102.74)	12
	Conscious	531.1 (59.77)	12
	Distraction	518.2 (54.23)	12
	Total	532.9 (74.4)	36
Unattractive, Negative	Immediate	554.1 (89.88)	12
	Conscious	548.3 (66.42)	12
	Distraction	528.1 (58.18)	12
	Total	543.5 (71.53)	36

Table 10

Experiment 2, Choice Task: Proportions of Participants Who Chose the Attractive Option

Thought Condition	Count/Proportion	Chose Other Option	Chose Attractive Option	Total
Immediate-Decision	Count	15	10	25
	Proportion	0.6	0.4	1
Conscious Thought	Count	8	10	18
	Proportion	0.44	0.56	1
Distraction	Count	13	17	30
	Proportion	0.43	0.57	1
Total	Count	36	37	73
	Proportion	0.49	0.51	1

Table 11

Experiment 3, Rating Task: Mean Apartment Ratings

Option	Thought Condition	Mean	(SD)	N
Attractive	Immediate	6.13	(2.12)	46
	Conscious	5.97	(1.58)	35
	Distraction	6.06	(2.01)	34
	Total	6.8	(1.67)	46
1'st Moderately Attractive	Immediate	6.06	(1.95)	32
	Conscious	6.24	(1.89)	193
	Distraction	5.07	(2.02)	46
	Total	5.06	(1.78)	35
2'nd Moderately Attractive	Immediate	5.5	(1.52)	34
	Conscious	5.15	(1.71)	46
	Distraction	4.66	(1.79)	32
	Total	5.09	(1.78)	193
Unattractive	Immediate	6.46	(1.63)	46
	Conscious	6.34	(1.43)	35
	Distraction	5.35	(1.61)	34
	Total	6.22	(1.65)	46

Table 12

Experiment 3, Free Recall Task: Percentages of Correct Attribute Statements Recalled

Option	Thought Condition	Mean	SD	N
Attractive	Immediate	32.97%	18.75%	46
	Conscious	22.92%	13.88%	32
	1-min. Distraction	29.66%	16.94%	34
	2.5 min. Distractkon	26.81%	14.58%	46
	4 min. Distraction	29.95%	16.51%	32
	Total	28.68%	16.50%	190
1'st Moderately Attractive	Immediate	24.09%	13.29%	46
	Conscious	22.14%	11.32%	32
	1-min. Distraction	24.51%	15.34%	34
	2.5 min. Distractkon	25.36%	15.31%	46
	4 min. Distraction	23.70%	11.99%	32
	Total	24.08%	13.59%	190
2'nd Moderately Attractive	Immediate	23.55%	18.28%	46
	Conscious	21.88%	13.01%	32
	1-min. Distraction	21.57%	12.83%	34
	2.5 min. Distractkon	24.64%	17.65%	46
	4 min. Distraction	28.13%	17.16%	32
	Total	23.95%	16.23%	190
Unattractive	Immediate	21.00%	13.00%	46
	Conscious	20.00%	15.20%	32
	1-min. Distraction	18.00%	13.10%	34
	2.5 min. Distractkon	22.00%	13.10%	46
	4 min. Distraction	23.00%	12.40%	32
	Total	21.00%	13.30%	190

Table 13

Experiment 3, Free Recall Task: Percentages of Correct Positive Attribute Statements Recalled

Option	Thought Condition	Mean	SD	N
Attractive	Immediate	20.29%	12.25%	46
	Conscious	16.95%	9.04%	29
	1-min. Distraction	19.89%	10.02%	31
	2.5 min. Distractkon	18.66%	11.00%	46
	4 min. Distraction	19.53%	11.32%	32
	Total	19.16%	10.89%	184
1'st Moderately Attractive	Immediate	12.14%	7.80%	46
	Conscious	11.78%	7.56%	29
	1-min. Distraction	15.86%	8.43%	31
	2.5 min. Distractkon	13.22%	10.77%	46
	4 min. Distraction	12.24%	8.98%	32
	Total	13.00%	8.91%	184
2'nd Moderately Attractive	Immediate	13.59%	10.88%	46
	Conscious	12.07%	7.25%	29
	1-min. Distraction	9.68%	7.48%	31
	2.5 min. Distractkon	12.68%	11.07%	46
	4 min. Distraction	14.58%	9.70%	32
	Total	12.64%	9.74%	184
Unattractive	Immediate	7.00%	6.90%	46
	Conscious	7.00%	7.30%	29
	1-min. Distraction	6.00%	6.80%	31
	2.5 min. Distractkon	8.00%	6.50%	46
	4 min. Distraction	9.00%	7.20%	32
	Total	7.00%	6.90%	184

Table 14

Experiment 3, Free Recall Task: Percentages of Correct Negative Attribute Statements Recalled

Option	Thought Condition	Mean	SD	N
Attractive	Immediate	12.68%	9.74%	46
	Conscious	6.90%	5.92%	29
	1-min. Distraction	12.24%	7.63%	32
	2.5 min. Distractkon	8.15%	6.91%	46
	4 min. Distraction	10.42%	7.63%	32
	Total	10.18%	8.06%	185
1'st Moderately Attractive	Immediate	11.96%	8.36%	46
	Conscious	11.78%	6.87%	29
	1-min. Distraction	10.16%	7.84%	32
	2.5 min. Distractkon	12.14%	8.73%	46
	4 min. Distraction	11.46%	6.61%	32
	Total	11.58%	7.82%	185
2'nd Moderately Attractive	Immediate	10.00%	9.10%	46
	Conscious	11.00%	7.70%	29
	1-min. Distraction	14.00%	6.60%	32
	2.5 min. Distractkon	12.00%	9.10%	46
	4 min. Distraction	14.00%	9.90%	32
	Total	12.00%	8.70%	185
Unattractive	Immediate	13.00%	9.50%	46
	Conscious	14.00%	9.20%	29
	1-min. Distraction	14.00%	8.10%	32
	2.5 min. Distractkon	14.00%	9.00%	46
	4 min. Distraction	14.00%	9.30%	32
	Total	14.00%	9.00%	185

Table 15

Experiment 3, Free Recall Task: Numbers of Total Intrusions Recalled

Option	Thought Condition	Mean	(SD)	N
Attractive	Immediate	1.46	(1.31)	46
	Conscious	1.81	(1.26)	32
	1-min. Distraction	1.21	(0.95)	34
	2.5 min. Distractkon	1.67	(1.37)	46
	4 min. Distraction	1.41	(1.32)	32
	Total	1.52	(1.26)	190
1'st Moderately Attractive	Immediate	1.65	(1.46)	46
	Conscious	1.56	(1.22)	32
	1-min. Distraction	1.35	(1.18)	34
	2.5 min. Distractkon	1.89	(1.72)	46
	4 min. Distraction	1.97	(1.64)	32
	Total	1.69	(1.48)	190
2'nd Moderately Attractive	Immediate	1.83	(1.77)	46
	Conscious	1.72	(1.11)	32
	1-min. Distraction	1.82	(1.29)	34
	2.5 min. Distractkon	1.83	(1.29)	46
	4 min. Distraction	1.34	(0.94)	32
	Total	1.73	(1.35)	190
Unattractive	Immediate	1.96	(1.76)	46
	Conscious	1.94	(1.61)	32
	1-min. Distraction	1.68	(1.47)	34
	2.5 min. Distractkon	1.67	(1.14)	46
	4 min. Distraction	1.63	(1.24)	32
	Total	1.78	(1.46)	190

Table 16

Experiment 3, Free Recall Task: Numbers of Positive Intrusions Recalled

Option	Thought Condition	Mean	(SD)	N
Attractive	Immediate	0.57	(0.83)\	46
	Conscious	0.66	(0.77)	29
	1-min. Distraction	0.58	(0.67)	31
	2.5 min. Distractkon	0.67	(0.85)	46
	4 min. Distraction	0.75	(0.84)	32
	Total	0.64	(0.8)	184
1'st Moderately Attractive	Immediate	0.87	(0.81)	46
	Conscious	0.79	(0.73)	29
	1-min. Distraction	0.71	(0.82)	31
	2.5 min. Distractkon	0.87	(1.00)	46
	4 min. Distraction	0.75	(0.76)	32
	Total	0.81	(0.84)	184
2'nd Moderately Attractive	Immediate	0.96	(1.01)	46
	Conscious	1.1	(0.77)	29
	1-min. Distraction	1.03	(0.80)	31
	2.5 min. Distractkon	1	(0.87)	46
	4 min. Distraction	0.59	(0.62)	32
	Total	0.94	(0.85)	184
Unattractive	Immediate	1.37	(1.25)	46
	Conscious	1.38	(1.15)	29
	1-min. Distraction	1.1	(0.94)	31
	2.5 min. Distractkon	1.22	(0.92)	46
	4 min. Distraction	0.78	(0.83)	32
	Total	1.18	(1.05)	184

Table 17

Experiment 3, Free Recall Task: Numbers of Negative Intrusions Recalled

Option	Thought Condition	Mean	(SD)	N
Attractive	Immediate	0.89	(0.80)	46
	Conscious	1.34	(0.90)	29
	1-min. Distraction	0.69	(0.78)	32
	2.5 min. Distractkon	1	(0.82)	46
	4 min. Distraction	0.66	(0.79)	32
	Total	0.91	(0.84)	185
1'st Moderately Attractive	Immediate	0.78	(0.89)	46
	Conscious	0.79	(0.77)	29
	1-min. Distraction	0.75	(0.76)	32
	2.5 min. Distractkon	1.02	(1.06)	46
	4 min. Distraction	1.22	(1.33)	32
	Total	0.91	(0.99)	185
2'nd Moderately Attractive	Immediate	0.87	(1.05)	46
	Conscious	0.72	(0.59)	29
	1-min. Distraction	0.84	(0.72)	32
	2.5 min. Distractkon	0.83	(0.71)	46
	4 min. Distraction	0.75	(0.67)	32
	Total	0.81	(0.78)	185
Unattractive	Immediate	0.59	(0.88)	46
	Conscious	0.76	(0.87)	29
	1-min. Distraction	0.72	(0.92)	32
	2.5 min. Distractkon	0.46	(0.59)	46
	4 min. Distraction	0.84	(0.85)	32
	Total	0.65	(0.82)	185

Table 18

Experiment 3, Choice Task: Proportions of Participants Who Chose the Attractive Option

Thought Condition	Count/Proportion	Chose Other Option	Chose Attractive Option	Total
Immediate-Decision	Count	31	14	45
	Proportion	0.7	0.3	1
Conscious Thought	Count	24	11	35
	Proportion	0.7	0.3	1
1 min. Distraction	Count	20	14	34
	Proportion	0.6	0.4	1
2.5 min. Distracton	Count	20	26	46
	Proportion	0.4	0.6	1
4 min. Distraction	Count	16	16	32
	Proportion	0.5	0.5	1
Total	Count	111	81	192
	Proportion	0.6	0.4	1

Table 19

Experiment 3, Choice Task: Proportions of Participants Who Chose the Attractive Option

Thought Condition	Count/Proportion	Chose Other Option	Chose Attractive Option	Total
Immediate-Decision	Count	31	14	45
	Proportion	0.7	0.3	1
Conscious Thought	Count	24	11	35
	Proportion	0.7	0.3	1
Distraction	Count	56	56	112
	Proportion	0.5	0.5	1
Total	Count	111	81	192
	Proportion	0.6	0.4	1

Appendix A
Attribute Statements Used in Experiment 1

Attractive Option
1 = "The Canterbury apartment has fresh paint"
2 = "The Canterbury apartment has good parking"
3 = "The Canterbury apartment has a washing machine"
4 = "The Canterbury has modern appliances"
5 = "The Canterbury neighborhood is very nice"
6= "The landlord at the Canterbury is really nice"
7 = "The Canterbury is close to a bus line"
8 = "The storage at the Canterbury apartment is good"
9 = "The bedroom at the Canterbury apartment is small"
10 = "The Canterbury apartment is fairly small"
11 = "The Canterbury apartment is not very close to a grocery store"
12= "The Canterbury apartment has no air conditioning"

First Moderately Attractive Option
1 = "The landlord of the Brandywine apartment is friendly"
2 = "Your would-be neighbors at the Brandywine are very friendly"
3 = "The Brandywine apartment has a washing machine"
4 = "The Brandywine apartment has a balcony"
5 = "There is good parking at the Brandywine"
6 = "The Brandywine apartment has fresh paint"
7 = "Your friends don't live very close to the Brandywine apartment"
8 = "The Brandywine apartment is in an unattractive building"
9 = "There is not much storage at the Brandywine"
10 = "The refrigerator is a bit leaky at the Brandywine"
11 = "The Brandywine does not have a dishwasher"
12= "The kitchen in the Brandywine is a bit small"

Second Moderately Attractive Option
1 = "There is a fireplace at the Albermarle"
2 = "There is a good gym at the Albermarle apartment"
3 = "The Albermarle has a dishwasher"
4 = "The Albermarle apartment is in an attractive building"
5 = "The carpet at the Albermarle is new"
6 = "The kitchen in the Albermarle is quite large"
7 = "The landlord at the Albermarle is a bit unfriendly"
8 = "There is a poor view at the Albermarle"
9 = "There is no washing machine at the Albermarle"
10 = "There is not much storage at the Albermarle"
11 = "The Albermarle is not very close to a grocery store"
12= "The bedroom at the Albermarle is a bit small"

Unattractive Option
1 = "The Heatherstone apartment is fairly large"
2 = " The Heatherstone is close to a grocery store"
3 = "Your friends live close to the Heatherstone apartment"
4 = "The Heatherstone has a washing machine"
5 = "The Heatherstone is somewhat noisy"
6 = "The Heatherstone is located on a busy street"
7 = "The Heatherstone has poor parking"
8 = "The carpet at the Heatherstone is a bit dirty"
9 = "The Heatherstone apartment has outdated appliances"
10 = "The Heatherstone has thin walls"
11 = "The Heatherstone has no dishwasher"
12 = "The Heatherstone has limited hot water"

Appendix B

Instructions Used in Experiment 1

First Page

Welcome to the "Apartment Experiment"
We would like to examine how people make complex decisions.
In this experiment, we will look at apartment choices. You will be presented with a list of sentences describing various apartments, and will be asked to make decisions based upon this information.
You will also be asked to participate in two different kinds of tasks. The "2" Back task and the "Reaction Time" task.
When you are ready, we will begin by practicing these two tasks.

Two Pages Prior to Attribute Statement Display Block

Great! You have completed the training. We can now begin the experiment.
In the next step, you will be shown many sentences describing 4 different apartments:
The "Brandywine", the "Albermarle", the "Heatherstone", and the "Canterbury".
Your job is to remember this information, and form an impression of each apartment.
You will be asked about your preferences and memory for each apartment later in the experiment.

One-Page Prior to the Attribute Statement Display Block

You will not need to press any buttons. Just do your best to remember the information.
If you have any questions, please ask the experimenter now.
If you are ready to begin the presentation, please press the right colored key ("R")

Conscious Thought Condition Instructions

"You now have 3 minutes to think very carefully about your preferences for the 4 apartments."

Rating Task:

1 = "Please rate the attractiveness of the Albermarle apartment:"
2= "Please rate the attractiveness of the Brandywine apartment:"
3="Please rate the attractiveness of the Canterbury apartment:"
4="Please rate the attractiveness of the Heatherstone apartment:"

Rating Task Anchors

1 ="Extremely Unattractive"; 2="Very Unattractive "; 3="Unattractive";4="Somewhat Unattractive";5="Slightly Unattractive"; 6="Slightly Attractive";7="Somewhat attractive";8="Attractive";9="Very Attractive";10="Extremely Attractive"

Choice Task

“Of the four apartments (The Brandywine, the Heatherstone, the Canterbury and the Albermarle) which would you choose?”

Confidence Task

"How confident are you that this is the best apartment for you?"

Confidence Task Anchors

1="Not Confident at All";2="Not Very Confident";3="Moderately Confident";4="Very Confident"; 5="Completely Confident"

Appendix C
Instructions Used in Experiment 2

First Page
Welcome to the "Car Buying Experiment".
We would like to examine how people make complex decisions.
In this experiment, we will look at car choices. You will be presented with a list of sentences describing various cars, and will be asked to choose the best car.
You will also be asked to participate in two different kinds of tasks. The "2-Back" task and the "Reaction Time" task.
When you are ready, we will begin by practicing these two tasks.

Two-Pages Prior to the Attribute Statement Display Block
Great! You have completed the training. We can now begin the experiment.
In the next step, you will be shown many sentences describing 4 different cars:
The "Nabusi", the "Dasuka", the "Kaiwa", and the "Hatsdun".
Your job is to choose the best car.

One Page Prior to Attribute Statement Display Block
You will not need to press any buttons. Just do your best to remember the information.
If you have any questions, please ask the experimenter now.
If you are ready to begin the presentation, please press the right colored key ("R").

Conscious Thought
"Please take this time to think very carefully about the cars"

Rating Task
1 = "Please indicate your attitude concerning the Hatsdun:"
2= "Please indicate your attitude concerning the Kaiwa:"
3="Please indicate your attitude concerning the Dasuka:"
4="Please indicate your attitude concerning the Nabusi:"

Rating Task Anchors
1 ="Extremely Negative"; 2="Very Negative "; 3="Negative";4="Somewhat Negative";5="Slightly Nevative"; 6="Slightly Positive";7="Somewhat Positive";8="Positive";9="Very Positive";10="Extremely Positive"]

Confidence Task
"How confident are you that this is the best car for you?"

Confidence Task Anchors
1="Not Confident at All";2="Not Very Confident";3="Moderately Confident";4="Very Confident"; 5="Completely Confident"

Appendix D
Attribute Statements Used in Experiment 2

Attractive Option
1 = "The Hatsdun has good mileage"
2 = "The Hatsdun has good handling"
3 = "The Hatsdun has a large trunk"
4 = "The Hatsdun is very new"
5 = "The Hatsdun is available in many different colors"
6 = "For the Hatsdun service is excellent"
7 = "The Hatsdun has poor legroom"
8 = "With the Hatsdun it is difficult to shift gears"
9 = "The Hatsdun has cupholders"
10 = "The Hatsdun has a sunroof"
11 = "The Hatsdun is relatively good for the environment"
12= "The Hatsdun has a poor sound system"
First Moderately Attractive Option
1 = " The Kaiwa has good mileage"
2 = " The Kaiwa has poor handling"
3 = " The Kaiwa has a large trunk"
4 = " For the Kaiwa service is excellent"
5 = "The Kaiwa is available in many different colors"
6= " The Kaiwa has plenty of legroom"
7 = " With the Kaiwa it is easy to shift gears"
8 = " The Kaiwa has no cupholders"
9 = "The Kaiwa has no sunroof"
10 = " The Kaiwa is fairly good for the environment"
11 = " The Kaiwa has a poor sound system"
12= " The Kaiwa is old"
Second Moderately Attractive Option
1 = " The Dasuka has poor mileage"
2 = " The Dasuka has good handling"
3 = " The Dasuka has a small trunk"
4 = " The Dasuka is available in very few colors"
5 = " For the Dasuka service is poor"
6= " The Dasuka has little legroom"
7 = " With the Dasuka it is easy to shift gears"
8 = " The Dasuka has cupholders"
9 = " The Dasuka has a sunroof"
10 = " The Dasuka is not very good for the environment"
11 = " The Dasuka has a good sound system"
12= " The Dasuka is new"
Unattractive Option
1 = " The Nabusi has poor mileage"
2 = " The Nabusi has poor handling"
3 = " The Nabusi has a small trunk"
4 = " The Nabusi is available in many different colors"
5 = " For the Nabusi service is poor"
6= " The Nabusi has plenty of legroom"
7 = " With the Nabusi it is difficult to shift gears"
8 = " The Nabusi has no cupholders"
9 = " The Nabusi has a sunroof"
10 = " The Nabusi is not very good for the environment"
11 = " The Nabusi has a poor sound system"
12= " The Nabusi is old"

Appendix E

Pilot Study Results

Attribute sentences are presented in order of mean rating of importance. Sentences in rows labeled "Dijksterhuis" were used by Dijksterhuis and colleagues (2006b). They were also used in my second experiment. Sentences in rows labeled "Exp. 3"represent sentences selected for inclusion in Experiment 3. Some of Dijksterhuis' attribute statements were considered to be very important while others were considered to be very unimportant.

Included in Dijksterhuis, Experiment 1 (2006b)= "Dijksterhuis."
Included in Experiment 3 = "Exp. 3"

Dijksterhuis/Exp. 3	Sentence	Mean	Std. Deviation	Median	Range
Dijksterhuis	The car gets poor gas mileage	2.25	1.19	2	4
	The car does not have air bags	2.40	1.76	2	8
	The car does not have a trunk	2.43	1.28	2	6
	The car has 200 thousand miles	2.79	2.00	2	9
	The car does not have good safety features other than seat belts	2.83	1.47	3	6
	The car has uncomfortable seats	2.91	1.31	3	9
Dijksterhuis	The car has poor handling	2.94	1.39	3	9
	You had another car of this brand, which you disliked	2.94	1.23	3	7
	The heat does not work very well	2.99	1.09	3	4
	Service for this car is expensive	3.13	1.68	3	9
Dijksterhuis + Exp. 3	The car is not very good for the environment	3.15	1.88	3	9
	A friend of yours had this type of car and frequently complained about it	3.19	1.56	3	9
Dijksterhuis + Exp. 3	The car has little legroom	3.23	1.36	3	6
	The air conditioning does not work well	3.28	1.41	3	7
Dijksterhuis + Exp. 3	With the car it is difficult to shift gears	3.28	1.43	3	9
	The car has a faint unpleasant smell	3.31	1.17	3	4
	The car seats only 2 people	3.37	1.70	3	9
Dijksterhuis + Exp. 3	The car has a poor sound system	3.45	1.10	3	5
	The tires on the car will need to be replaced soon	3.54	1.19	3	9
	The car has poor storage	3.57	1.04	4	6
	The seller of the car is rude	3.58	1.68	3	9
	The car does not have a very nice interior	3.63	1.22	3	9
	The owner is selling the car because s/he could not afford repairs	3.65	1.79	3	9
	The car has 150 thousand miles	3.65	2.00	3	9
Dijksterhuis + Exp. 3	The car has no cupholders	3.67	1.40	4	5
	It is not very quiet inside the car	3.69	1.09	4	6
	The car does not have a good sound system	3.71	1.32	4	9
	The car was in a major accident, but was repaired and looks fine	3.85	1.89	4	9
	The car will need a tune up soon	3.89	1.33	4	9
	The engine in the car is not very powerful	3.93	1.48	4	9
	The car has a salvaged title	3.94	1.43	4	6
	The car is a little too expensive for you	3.95	1.52	4	9
Dijksterhuis	The car has a small trunk	4.04	1.13	4	7
	The car has a tape player only	4.05	1.76	4	9
	The car has 100k miles	4.19	1.75	4	8
	The paint on this car is scratched	4.25	1.22	5	6
	The engine and exhaust are somewhat loud	4.27	1.76	4	9
	Your parents will probably dislike this car	4.27	1.62	4	9
	The car does not have 4-wheel drive	4.30	1.47	4	9
	There is a little bit of rust on the car (but it is only cosmetic)	4.36	1.44	5	7

Dijksterhuis/Exp. 3	Sentence	Mean	Std. Deviation	Median	Range
	The car was owned by a high school student	4.43	1.47	5	9
	Your boy/girlfriend will probably dislike this car	4.45	1.17	5	6
	The car does not have cruise control	4.81	1.42	5	8
Dijksterhuis	The car has no sunroof	4.90	1.10	5	8
	The car has manual windows	5.04	1.98	5	9
Dijksterhuis	The car is available in very few colors	5.07	1.12	5	7
	The car does not have GPS	5.10	1.24	5	9
	The car was owned by a college student	5.28	1.53	5	9
	The car has inexpensive rims	5.50	1.29	5	7
	The car has expensive rims	5.53	1.75	6	9
	The car does not have roof racks	5.54	1.26	5	6
	The car is an inexpensive brand	5.71	1.59	6	9
	Very many people drive this kind of car	5.86	1.69	6	9
	The car is used	6.01	1.37	6	6
	The car is an expensive brand	6.05	1.86	6	9
	The car has 50k miles	6.15	2.04	6.5	9
	The car has rear wheel drive	6.15	1.74	6	8
	The car has roof racks	6.23	1.54	6	8
	The car has front wheel drive	6.23	1.63	6	8
	Very few people drive this kind of car	6.41	1.61	6	7
	The owner is selling the car because s/he bought another car	6.93	1.35	7	6
	Your boy/girlfriend will probably like this car	7.09	1.40	7	9
	The car has 30 thousand miles	7.18	2.01	8	7
	The car has cruise control	7.20	1.18	7	5
Exp. 3	The seller of the car is friendly	7.21	1.13	7	6
	The car has GPS	7.28	1.46	7	8
Dijksterhuis	The car has a sunroof	7.28	1.36	7	9
Dijksterhuis	The car is available in many different colors	7.40	1.27	7	4
	Your parents will probably like this car	7.41	1.43	7	9
	The car has a satellite sound system	7.46	1.28	7	5
Dijksterhuis + Exp. 3	The car has cupholders	7.64	1.35	8	5
	The engine in the car is powerful	7.65	1.33	8	7
Exp. 3	A friend of yours had this type of car and raved about it	7.70	1.61	8	9
	The car has automatic windows	7.74	1.46	8	8
	The paint on this car is very nice	7.76	1.05	8	4
	The car has a cd player	7.78	1.22	8	5
Dijksterhuis	The car is fairly good for the environment	7.85	1.20	8	5
Exp. 3	The car has a pleasant smell	7.86	1.14	8	4
Exp. 3	The car seats 4-5 people	7.88	1.17	8	5
	The car was owned by a little old lady who rarely drove it	7.90	1.45	8	5
	The car was owned by mechanic	7.93	1.33	8	6
	The car has 10 thousand miles	7.94	2.13	8	9
	The engine and exhaust are very quiet	7.95	1.32	8	7
	The car has 4-wheel drive	7.98	1.53	8	9

Dijksterhuis/Exp. 3	Sentence	Mean	Std. Deviation	Median	Range
Exp. 3	The car has a nice interior	8.01	0.99	8	5
	The car is a pretty good deal	8.01	1.22	8	6
	The car has all-wheel drive	8.02	1.72	8	9
Dijksterhuis + Exp. 3	The car has a good sound system	8.02	1.11	8	4
Dijksterhuis + Exp. 3	The car has a large trunk	8.04	1.07	8	5
	The car has good storage	8.05	1.25	8	7
Dijksterhuis + Exp. 3	The car has good legroom	8.10	1.03	8	5
Dijksterhuis + Exp. 3	With the car it is easy to shift gears	8.12	0.99	8	4
	The car can play mp3's	8.13	1.31	8	7
	The car just had a tune up	8.14	1.11	8	5
Exp. 3	It is very quiet inside the car	8.19	1.23	8	7
Exp. 3	The air conditioning works well	8.24	1.01	8	4
	There is no rust on the car	8.26	1.03	8	4
Dijksterhuis	The car is very new	8.27	1.21	8	4
	The car has comfortable seats	8.28	0.92	8	5
	The car has a clean title	8.31	1.06	8	4
	The car is new	8.32	1.52	8	9
	The heat works well	8.40	0.88	8	4
	You had another car of this brand, which you liked	8.44	0.81	9	4
	The tires on the car are new	8.45	1.03	8	5
	Service for this car is inexpensive	8.54	1.11	9	4
Dijksterhuis	The car has good handling	8.66	0.90	9	4
	The car has never been in any accidents	8.69	1.02	9	4
	The car has good safety features in addition to seat belts	8.70	1.04	9	4
	The car has air bags	8.88	1.14	9	6
Dijksterhuis	The car gets good gas mileage	9.07	0.87	9	3

Appendix F
Instructions Used in Experiment 3

First Page:
Welcome to the "Car Buying Experiment".
We would like to examine how people make complex decisions.
In this experiment, we will look at car choices. You will be presented with a list of sentences describing various cars.
You will be asked to form an impression of each car so that you will be able to choose the best.
You will also be asked to participate in the "2-Back" task.
When you are ready, we will begin by practicing this task.

One Page Prior to Attribute Statement Display Block
Great! You have completed the training. We can now begin the experiment.
In the next step, you will be shown many sentences describing 4 different cars:
The "Nabusi", the "Dasuka", the "Kaiwa", and the "Hatsdun".
Your job is to form an impression of each car so that you will be able to choose the best.
You will not need to press any buttons.
If you have any questions, please ask the experimenter now.

Conscious Thought
"Please take this time to think very carefully about the advantages and disadvantages of each car.

Rating Task
Attitude Instructions.
1="Please indicate your attitude concerning the Hatsdun:"
2= "Please indicate your attitude concerning the Kaiwa:"
3="Please indicate your attitude concerning the Dasuka:"
4="Please indicate your attitude concerning the Nabusi:"
Feel Instructions.
1 = "Please describe your feelings concerning the Hatsdun"
2= "Please describe your feelings concerning the Kaiwa"
3="Please describe your feelings concerning the Dasuka"
4="Please describe your feelings concerning the Nabusi"

Rating Task Anchors for Survey Feel and Survey Attitude
1 ="Extremely Negative"; 2="Very Negative "; 3="Negative";4="Somewhat Negative";5="Slightly Negative"; 6="Slightly Positive";7="Somewhat Positive";8="Positive";9="Very Positive";10="Extremely Positive"

Confidence Task
"How confident are you that this is the best car for you?"

Confidence Task Anchors
1="Not Confident at All";2="Not Very Confident";3="Moderately Confident";4="Very Confident"; 5="Completely Confident"

Appendix G

Attribute Statements Used in Experiment 3

Attractive Option

1="The seller of the Hatsdun is friendly"
2=" The Hatsdun has a nice interior "
3=" The Hatsdun has cupholders"
4=" It is very quiet inside the Hatsdun "
5=" The Hatsdun has a pleasant smell"
6=" The Hatsdun seats 4-5 people"
7=" The Hatsdun has a good sound system "
8=" The Hatsdun has good storage "
9=" A friend of yours had a Hatsdun and frequently complained about it "
10=" The Hatsdun has little legroom "
11=" The air conditioning in the Hatsdun does not work well "
12="With the Hatsdun it is difficult to shift gears "

First Moderately-Attractive Option

1="The Kaiwa has good legroom "
2="The Kaiwa has cupholders "
3=" The seller of the Kaiwa is friendly "
4=" With the Kaiwa it is easy to shift gears "
5=" The air conditioning in the Kaiwa works well "
6=" The Kaiwa has a nice interior "
7=" A friend of yours had a Kaiwa and frequently complained about it "
8=" It is not very quiet inside the Kaiwa "
9=" The Kaiwa has a faint unpleasant smell "
10=" The Kaiwa has a poor sound system "
11=" The Kaiwa has poor storage "
12=" The Kaiwa seats only 2 people "

Second Moderately-Attractive Option

1="The Dasuka has a pleasant smell "
2="The Dasuka has a good sound system "
3="The Dasuka has good storage "
4="The Dasuka seats 4-5 people "
5=" A friend of yours had a Dasuka and raved about it "
6=" It is very quiet inside the Dasuka "
7=" The air conditioning in the Dasuka does not work well "
8=" The Dasuka does not have a very nice interior "
9=" The Dasuka has little legroom "
10=" The Dasuka has no cupholders "
11=" The seller of the Dasuka is rude "
12=" With the Dasuka it is difficult to shift gears "

Unattractive Option

1=" A friend of yours had a Nabusi and raved about it"
2=" The Nabusi has good legroom "
3=" The air conditioning in the Nabusi works well "
4=" With the Nabusi it is easy to shift gears "
5=" The Nabusi has a faint unpleasant smell "
6=" The Nabusi seats only 2 people "
7=" The Nabusi has a poor sound system "
8="The Nabusi has poor storage "
9= "The seller of the Nabusi is rude "
10= "The Nabusi does not have a very nice interior "
11= "The Nabusi has no cupholders "
12= "It is not very quiet inside the Nabusi "