

SHIFTING GOALS FOR UNCONSCIOUS THINKERS: USING REEVALUATION
TO TEST BETWEEN FUZZY INTUITION AND
AN ACTIVE UNCONSCIOUS

by

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ABSTRACT

Accumulating evidence suggests that slow deliberative processes may actively integrate information even while conscious attention is distracted away from task-relevant activities (Dijksterhuis, 2004). In typical experiments supporting this idea, participants receive complex information about target objects and then report judgments on those targets immediately, after 3min in which to think, or after a 3min distraction task that arguably disrupts conscious thinking but not unconscious thinking. Typical results demonstrate that individuals form better judgments in the latter condition relative to participants in other conditions, a finding dubbed the Deliberation-Without-Attention effect. This effect is predicted and well explained by Unconscious Thought Theory. However, an alternative explanation derived from the Fuzzy-Trace Theory of memory may account for observed patterns of results without assuming an active, sophisticated unconscious thought process. To date, no published research directly tests these two potential alternatives. The current experiment intends to conclusively test between Unconscious Thought Theory and Fuzzy-Trace Theory as alternative explanations for the effect by shifting the goal for successful judgments after the information is presented. According to Unconscious Thought Theory, an active unconscious thought process should be able to reevaluate information according to an updated goal. A passive memory process, on the other hand, is by definition unable to engage in this type of active reevaluation. Data show both memory and unconscious thought processes are at work. As predicted by Fuzzy-Trace Theory, decisions tend to generally reflect overall evaluations rather than updated goals. However, participants who are comfortable with ambiguity do reevaluate information during a distraction period when they have the goal to do so. This finding cannot be rectified with Fuzzy-Trace Theory, strongly suggesting that Fuzzy-Trace Theory is not a viable comprehensive explanation for the Deliberation-Without-Attention effect.

INTRODUCTION

“Intuition will tell the thinking mind where to look next” – Jonas Salk

Careful deliberation and conscious thought has long been folk psychology’s ‘best practice’ for making decisions about complex information. Benjamin Franklin suggested as early as 1772 that complex decisions “are difficult chiefly because while we have them under consideration all the reasons pro and con are not present to the mind at the same time” (Franklin, 1772; 1956). Here Franklin recognized a fundamental finding in modern psychological research: Conscious processes have limited capacity to devote to complex tasks (e.g., Norretranders, 1998). Further, Franklin (1772) noted that an incomplete set of information available to conscious processing causes “various purposes or inclinations to alternatively prevail.” That is, because conscious processing is unable to simultaneously consider and weigh all elements of a decision problem, judgments are necessarily biased relative to decision-making that uses all relevant information (Kahneman, 2011; Tversky & Kahneman, 1974). To bypass this fundamental cognitive constraint, Franklin recommended that people create a list of pros and cons so that all information is available on paper while they think carefully about such decisions.

Yet, other folk wisdom like the old idioms “sleep on it” and “go with your gut” runs contrary to the idea that challenging problems are best solved through deliberative processing. In fact, another esteemed thinker, Albert Einstein, was a notable advocate for intuition as a useful problem-solving tool. Einstein suggested that certain problems are only solved using intuitive processes; “there will come a point in everyone’s life where only intuition can make the leap ahead, without ever knowing precisely how” (Issacson,

2007). This quote suggests the existence of multiple modes of ‘thought,’ and furthermore, that these modes are dissociated and, at times, hidden from each other. These contrary suggestions are difficult to rectify. When facing a complicated choice, should individuals deliberately evaluate the problem or rely on intuition? Recent psychological research suggests that both strategies are useful and, at present, is exploring the circumstances under which each strategy leads to optimal information-based decisions and preferences.

In particular, Unconscious Thought Theory (UTT; Dijksterhuis & Nordgren, 2006) suggests that individuals can actively process complex information *unconsciously*, (i.e., without reflective awareness) and form logical intuitions and judgments as a result. Further, the theory suggests that unconscious modes of thought are less prone to bias than conscious processes because they rely upon vast (vs. limited) mental resources. Thus, when faced with a complex decision, people may form more rational preferences through unconscious (or intuitive) processes relative to conscious (or deliberative) processes. In typical tests of this theory, individuals are asked to form an impression of a set of 3 to 4 attitude objects (e.g., cars). Each object is associated with a number of positive and negative characteristics such that one object is associated with mostly positive characteristics, one with mostly negative characteristics, and the other(s) with a balance of positive and negative characteristics. After individuals encounter this complex set of information, they indicate the degree to which they prefer each object (or which object they would choose) either immediately, after a period of directed thought, or after an equivalent period of distraction in which individuals can arguably think unconsciously while conscious processes are distracted from the evaluation task. Counterintuitively,

participants who are distracted commonly reach normatively better decisions than participants in the other two groups (i.e., prefer the most positive object over the most negative object). Dijksterhuis and colleagues dubbed such results the ‘Deliberation-Without-Attention’ (DWA) effect, given participants seem to deliberate about the information even though conscious processes attend to the distracting task rather than the evaluation task.

Although UTT accounts for this pattern of data, Fuzzy-Trace Theory (FTT) may also explain the DWA effect without inferring unconscious modes of thinking (Brainerd & Reyna, 1990). In this conception the DWA effect emerges not as a result of unconscious deliberation, but because participants encode and may retrieve different representations in memory to inform their judgments. More specifically, in DWA paradigms individuals may interpret decision problems with exact verbatim and broad gist representations. Exact verbatim representations bias decision-making because they only depict a subset of the decision problem. Broad gist representations are ‘fuzzy’ *estimates* but in contrast to verbatim, they capture the entirety of the decision problem (i.e., they are less prone to bias). Importantly, gist memory is more durable over time than verbatim memory. Prolonged distraction interferes with retrieval of biased verbatim more so than gist representations. According to FTT then, distraction may facilitate accuracy not because it promotes unconscious thought-processes, but because more accurate gist representations (vs. verbatim) inform judgments to a greater degree. To date, no research has directly tested between these two plausible accounts of the effect. Thus, the current thesis seeks to test which of these two theories better accounts for the DWA effect.

Unconscious Thought Theory and Intuition

Unconscious Thought Theory provocatively suggests that individuals can integrate information and form decisions and preferences using conscious *and/or* unconscious modes of thinking (Dijksterhuis & Nordgren, 2006). This theory defines conscious thought as “object-relevant or task-relevant cognitive or affective processes that occur *while* the object or task is the focus of one’s conscious attention” (italics added; Dijksterhuis & Nordgren, 2006, p. 96)¹. Alternatively, it defines unconscious thought as “object-relevant or task-relevant cognitive or affective processes that occur while consciousness is directed elsewhere” (Dijksterhuis & Nordgren, 2006, p. 96). These definitions propose that the *process* of thought may be either conscious or unconscious, and implicitly suggests that *outputs* from both conscious and unconscious processes may become conscious given facilitating conditions (Dijksterhuis, 2010).

As illustrated by Franklin and subsequent psychological research, conscious processing has limited capacity (e.g., Schneider & Shiffrin, 1977). Unconscious processes, on the other hand, are less constrained by capacity limitations. In direct comparison, quantitative estimates suggest that conscious processing can accommodate 40-60 bits per second, whereas similar estimates of total processing capacity are on the

¹Definitions of consciousness have circled around for nearly one hundred years frequently returning to the subjective, phenomenological experience of the mind. Subjective awareness of thought defines whether an experience is unconscious (i.e., one does not know that an experience is happening or has happened) or conscious (one reports awareness of the experience). The pitfall in this definition is that metacognition may not allow for discrimination between awareness of the process and the result (output) of thought. This is an important consideration that is not resolved in the current experiment but it is important to be mindful of this challenge when evaluating the proposed definitions.

order of 10 to 11 million bits per second. According to Dijksterhuis and Nordgren (2006), much of this enormous processing capability is not necessarily tied to or directly accessible to conscious processes. Because of differences in capacity, Dijksterhuis and colleagues conclude that conscious thought is often less useful compared with unconscious thought when individuals make decisions from complex and rich information (for example, see Dijksterhuis, 2010; Dijksterhuis, Bos, Nordgren, and van Baaren, 2006; Dijksterhuis & Nordgren, 2006; Ham, van den Bos, & Doorn, 2007).

However, UTT also suggests that unconscious thought is not universally superior to conscious thought. As Dijksterhuis and Nordgren (2006) propose, unconscious thought only outperforms conscious thought when the information under consideration is sufficiently complex. They suggest that unconscious thought provides *rough estimates* of a decision problem that are relatively independent of the problem's complexity. That is, unconscious-thought processes output general appraisements for all types of decision problems. Further, the approximate nature of unconscious modes of thought arguably allows for a larger capacity (i.e., integration of larger amounts of information; Dijksterhuis & Nordgren, 2006). Alternatively, conscious thought provides *precise estimates* and is additionally able to systematically apply complex rules to problems. Although conscious thought is easily able to solve multi-step algebraic equations, no existing evidence suggests that unconscious thought performs similar rule-based calculations (Dewall, Baumeister, & Masicampo, 2008; Payne et al., 2008; Steimer, Fiedler, & Hütter, 2013; Wilson, 2002). But, decision problems that contain too much information overwhelm the limited capacity of conscious processing.

Following this, Dijksterhuis and Nordgren (2006) predicted that conscious modes of thought would result in superior decision-making for simple problems, but inferior decision-making for complex problems relative to the general estimates produced by unconscious modes of thought. Dijksterhuis and colleagues (2006) provided evidence for this prediction by demonstrating that unconscious thought produced rough estimates for both simple and complex problems. In contrast, conscious thought resulted in poor decisions for complex problems but more accurate decisions for relatively simple decision problems. Thus, unconscious thought facilitates judgments at both levels of complexity; but outperforms conscious thought only at complex problems because conscious thought is overwhelmed or unable to consider all decision-relevant information simultaneously (Dijksterhuis & Nordgren, 2006).

Research data further suggest that this unconscious mode of thought integrates information in a *systematic* (rather than purely associative) and *goal-dependent* (active rather than passive) manner; characteristics of human cognition previously associated with conscious processes (Bargh, 1994; Dijksterhuis, 2010; Dijksterhuis & Nordgren, 2006). This bold proposal sparked a profusion of research further examining the DWA effect.

Deliberation-Without-Attention Effect: An Example

In his seminal work demonstrating the DWA effect, Dijksterhuis (2004) ultimately asked undergraduate students to make a choice between four apartments. First, participants were instructed to form a general impression of each apartment and were informed that they would later select one of them. Next, participants viewed

characteristics one by one about each of the four apartments, in random order. For example, the title “Apartment 1” appeared on a computer screen along with the short description “has an unfriendly landlord” (Dijksterhuis, 2004, p. 589). Each apartment was paired with 12 unique statements, each of which was positive or negative. Further, a ‘best choice’ apartment was paired with 8 positive and 4 negative characteristics, a ‘worst choice’ with 4 positive and 8 negative statements, and the remaining 2 ‘neutral choice’ apartments with 6 positive and 6 negative statements. Participants viewed each randomly ordered statement sequentially for 4s each. After encoding, each participant was assigned to one of three thought conditions. Participants in the first condition, labeled ‘immediate decision’ condition by Dijksterhuis (2004), immediately provided their attitude towards each of the apartments. Participants in the ‘conscious’ (or directed) thought condition were instructed to “very carefully think about what you think of each of the four apartments” for a period of 3min (Dijksterhuis, 2004, p. 589). Finally, participants in the ‘unconscious’ (or distracted) thought condition immediately engaged in the ‘2-back’ distractor task for a period of three minutes. Previous research has demonstrated that this task is resource intensive and likely demands all available conscious attention (Jonides et al., 1997). Dijksterhuis (2004) hypothesized that although participants’ conscious thinking processes were fully engaged in the demanding task, unconscious processes could continue integrating information and output fairly accurate decisions regarding the apartments. Furthermore, he expected that distracted participants would not be biased by incomplete conscious representations of the complex problem.

Participants subsequently provided ratings of each apartment on a 10-point scale ranging from extremely positive to extremely negative. Dijksterhuis (2004) constructed a composite accuracy measure by taking the difference score of attitudes towards the ‘best’ apartment and the ‘worst’ apartment. Participants who provided an immediate judgment and those who ‘thought’ for three minutes showed little preference for the ‘best’ apartment compared with the ‘worst’ apartment, but those who were distracted strongly preferred the ‘best’ apartment to the ‘worst’ apartment (Dijksterhuis, 2004). This pattern of data, since replicated with a variety of different targets (e.g., roommates, automobiles, jobs) was the first empirical observation of the DWA effect.

Evidence for a Systematic Process

A third experiment conducted by Dijksterhuis (2004) suggested that unconscious thought works systematically rather than associatively. Participants in this experiment were exposed to the same paradigm described above with one crucial difference; each participant was asked to provide importance ratings for each of the presented characteristics. Again, participants who were distracted before making a choice more strongly preferred the ‘best’ to the ‘worst’ option compared with those in immediate decision and directed-thought conditions. Additionally, Dijksterhuis (2004) found that the correlation between subjective importance ratings of each characteristic and eventual choice was strongest for distracted thinkers. A purely associative process cannot account for this pattern of results. An associative account predicts that only positive or negative valence is related to final judgments and that subjective weighting of each characteristic is unrelated to judgments for distracted thinkers.

Further, within several experiments Bos, Dijksterhuis, and van Baaren (2011) found evidence that individuals weight information during periods of distraction. In one of these experiments, participants first learned about four fictional automobiles. As in previous protocols, each car had differing ratios of valence characteristics. However, in this case ‘quality’ cars had eight negative but low-importance characteristics and four positive, high-importance characteristics (characteristics were previously tested for importance and valence). Conversely, ‘frequency’ cars were described by eight low-importance but positive characteristics and four high-importance but negative characteristics (Bos et al., 2011). That is, frequency cars had *more*, but less important positive attributes whereas quality cars had *fewer*, but more important positive attributes. Participants then either immediately rated each car for quality or were distracted for 5min before making their ratings. Distracted participants showed more positive attitudes towards quality over frequency cars compared with those who provided their attitudes immediately. Again, this finding strongly suggests that unconscious thought-processes are systematic. If the process were solely characterized by associative connections, distracted participants would have preferred cars that were paired with a higher quantity (frequency) of positive traits. A follow-up experiment replicated this finding with individual subjective preferences instead of normatively pretested characteristics (Bos et al., 2011). This body of evidence strongly suggests that unconscious thought-processes output decisions after systematically weighting information based on its relevance to the decision problem at hand.

Distraction also facilitates meaningful information-integration in experiments using more elaborate stimuli. For instance, Handley and Runnion (2011) found that after distraction, participants were more sensitive to the strength of auditory persuasive messages. Participants in their experiment listened to a persuasive message that contained either strong or weak arguments supporting a proposed senior comprehensive exam. Importantly, this message was played at a high rate of speech (220 words per minute) that individuals could comprehend, but not consciously elaborate on (according to Smith & Shaffer, 1995). After listening to the fast message, participants reported their attitudes about the proposed plan either immediately or after 3min of directed or distracted thought. The authors found that only participants who were distracted subsequent to the message presentation differentiated between strong and weak arguments about the comprehensive senior exams (Handley & Runnion, 2011). Specifically, distracted thinkers found the message significantly more convincing if it contained strong rather than weak arguments, whereas directed thinkers and immediate deciders did not. Furthermore, this effect was not dependent on individual recall of persuasive message content, further suggesting that unconscious thought is capable of systematic information processing beyond simple associative connections (Handley & Runnion, 2011, see Handley, Rivers, Yosai, & Jackson, in preparation for similar findings).

Goal-Dependence

Bos and colleagues (2008) conducted a series of experiments that provide some of the clearest evidence that unconscious thought is a goal-directed process. Participants in one such experiment formed an impression of a target individual named Jeroen based on

a series of 18 sentences about him that clustered around three dimensions (intelligence, athleticism, and political affiliation). After viewing this information, participants were or were not told that the Jeroen portion of the experiment was over and subsequently all participants solved anagrams for a period of 4min (Bos et al., 2008). Thus, some participants still held the goal to form an impression of Jeroen during the distraction period. According to UTT, only participants with the goal for further processing should show evidence of further information integration. After the anagram task, participants freely recalled any characteristics about Jeroen they could remember. Participants with a goal to further process information about Jeroen showed higher ‘clustering’ in the order of recalled information around the three dimensions (Bos et al., 2008). That is, goal-directed participants recalled the information in a more systematic order than those who thought the impression-formation experiment was over. Bos and colleagues (2008) therefore conclude that unconscious modes of thought meaningfully organize information into a coherent representation that emerges after the distraction period.

In a third experiment, Bos et al. (2008) provide further compelling evidence for the goal-dependence of unconscious thought. In the experiment, participants encountered information about two different types of targets (three cars and three roommates). Like previous experiments, each type of target had a ‘best,’ ‘worst,’ and ‘filler’ choice. After encountering target information, participants were told that they would later only select *either* a car or roommate. All participants then completed a distracting task and subsequently evaluated both cars and roommates despite what they were told earlier. Participants rated targets more accurately when they had an accurate judgment goal prior

to the distraction period. That is, participants asked to think about the best roommate provided accurate judgments for the roommate but not the car after a period of distraction and vice versa (Bos et al., 2008). Both of these experiments strongly suggest that unconscious integration requires appropriate processing goals.

Controversy and Alternative Accounts

UTT sparked a wave of research that both provided bolstering evidence and generated skepticism of effect and theory. In fact, by December 2011, Strick, Dijksterhuis, Bos, Sjoerdsma, and van Baaren (2011) meta-analyzed 92 experiments exploring the DWA effect in the judgment and decision-making literature (note that many more DWA experiments in other frameworks exist). Along with replications and extensions of the effect are several critiques of both the DWA effect and UTT (e.g., Bekker, H. L., 2008; Gonzalez-Vallejo, Lassiter, Bellezza, & Lindberg, 2008; Lassiter, Lindberg, Gonzalez-Vallejo, Bellezza, & Phillips, 2009; Newell & Shanks, 2013; Newell, Wong, Cheung, & Rakow, 2009; Waroquier, Marchiori, Klein, & Cleeremans, 2009). As Bargh (2011) notes in a review of the UTT literature, this is not the first theory regarding automaticity and cognition that initially met stiff criticism. For example, only 33 years ago the unconscious activation of affect was a controversial topic in social cognition (see Zajonc, 1980). Perhaps Bargh's (2011, p. 629) prediction that a systematic, goal-dependent unconscious mode of thought represents, "possibly the last extension of automaticity within cognitive science" will likewise bear out in the data. Current findings are promising but also suggest that much work remains.

Researchers have proposed several alternative explanations to explain the DWA effect, but for the most part these alternatives do not explain the totality of the data as well as UTT (e.g., Lassiter et al., 2009). Perhaps the most viable alternative explanation for the DWA effect can be derived from Fuzzy-Trace Theory (Brainerd & Reyna, 1990). Both UTT and FTT make largely overlapping predictions, but for very different reasons. Importantly, the two theories diverge sufficiently to allow for inferential tests. Indeed, the experiment reported within this thesis directly tests the opposing predictions of these theories to assess which best accounts for the DWA effect.

Fuzzy-Trace Theory

Fuzzy-Trace Theory was developed to explain patterns of decision-making across the human lifespan and research suggesting that reasoning is largely independent of individual differences in working memory capacity (Brainerd & Reyna, 1990; Reyna & Brainerd, 1995; Reyna & Farley, 2006)². According to FTT, the brain encodes two types of representations in a parallel process. These two types of memory differ in the quality of the representation and the magnitude of executive resource required to maintain them in the face of delay and distraction. The first type is a surface representation referred to as the ‘verbatim trace.’ This verbatim trace contains precise details of the stimuli including quantitative and literal information. These fragile representations quickly decay (e.g. after a delay or distraction) unless rehearsed in working memory. The second representation

² Note that FTT as an overarching explanation for human *memory* processes has largely failed to fully account for research data (see for example Hutchison & Balota, 2005). However, predictions derived from the theory create a compelling framework for further investigation of the DWA effect.

consists of a ‘gist’ trace that contains a broad, qualitative, distillation of the presented information (Brainerd & Reyna, 1990). Top-down contextual processes such as emotion perception, cultural history and worldviews, and previous experiences can constrain the content of gist traces such that they are ‘weighted’ according to the individual’s life experience (Reyna, 2004). FTT suggests that gist representations form automatically and may encompass several different levels of evaluation along a continuum of specificity, from broadest (“this is good”) to more specific (“this is good with respect to ‘X’”). Importantly, these representations are relatively robust to decay and interference (Brainerd & Reyna, 1990). That is, they do not usually require extensive rehearsal for successful retrieval after delay or interference.

In decision-making situations, individuals can reach judgments using combinations of gist and verbatim representations of the problem in question. Further, the differences between gist and verbatim representations and the extent to which individuals utilize these representations when making judgments explain systematic biases in decision-making (Kühberger & Tanner, 2010; Reyna & Farley, 2006). Notably, FTT predicts that individuals generally rely on the broadest gist available when making a decision or reaching a judgment; this is described as the ‘fuzzy processing preference’ (Brainerd & Reyna, 1990; Reyna, 2004). FTT further suggests that the fuzzy processing preference facilitates decision-making in most situations because broad gist representations often adequately capture the nature of the decision problem (Brainerd & Reyna, 1990). But several illustrations also provide evidence that reliance on broad gist

representations can lead to errors in probability weighting and inadequate assessments of risk (e.g., Reyna, 2004; Reyna & Lloyd, 2006).

However, individuals may also consider verbatim information in addition to gist. This is critical for problems that require the application of complex decision rules. When a problem can be *fully* processed using verbatim representations, decision quality will be relatively high. When problems are more difficult, it is unlikely that verbatim representations are able to capture the decision problem comprehensively and thus use of verbatim information may interfere with decision quality. Reyna and colleagues have examined decision-making in complex environments such as medical contexts (Reyna et al., 2003; Reyna & Lloyd, 2006). They find that, relative to novices, medical experts are more effective because they rely on intuitive more than rule-based processes. These intuitive processes are less precise but accurately represent the complicated context of many medical problems. Novices on the other hand, are more likely to consult verbatim representations that are exact but capture only a portion of the overall context. The subset of represented information then carries more weight than is appropriate, thus biasing the final judgment (Brainerd & Reyna, 1990). Experts have the added advantage of intuitively knowing which details they should weigh heavily and which should be weighed less or ignored. Novices do not have this intuitive efficiency and may try to retrieve and use as much verbatim information as possible when deciding. Again, this strategy is effective for simple situations where the entirety of the decision problem can be represented, but fails when complexity becomes overwhelming and individuals can only retain a subset of the information. The implications of these findings strongly

parallel the UTT dichotomy between rule-following and intuitive processes. FTT predicts that decision-makers in complex contexts make suboptimal decisions when they consult biased subsets of decision-relevant information (i.e., relatively haphazard verbatim traces).

Fuzzy-Trace Theory and the DWA Effect

Like UTT, FTT predicts that distracted individuals will make normatively better choices when decision-problems become complex. Differences in decay rates and susceptibility to interference from intervening distraction influence the extent to which participants consult verbatim and gist information when making decisions. In the DWA paradigm, the availability of verbatim representations is confounded with condition assignment. Specifically, only participants in immediate and conscious thought conditions have access to fragile and potentially biasing verbatim information. Verbatim traces are available for those in the immediate-decision conditions because the interval between the presentation of the information and the decision is short. Participants in the directed-thought condition decide several minutes after viewing target information but have no constraints on cognitive resources. Thus, these individuals can rehearse and maintain a subset of verbatim representations over the intervening thought period. As discussed earlier, participants in these two conditions may make suboptimal judgments because the set of verbatim information they can retrieve is only a subset of the total problem. In contrast, the task that distracted thinkers complete prevents rehearsal of verbatim representations, which causes them to decay. Participants in distraction conditions would have to rehearse verbatim information over a fairly long interval and do

so *while* engaging in a purposefully resource-demanding task (e.g., n-back, anagrams). These conditions preclude rehearsal of verbatim representations in working memory and thus, participants are unlikely to consult these representations when making their decisions. Gist representations then guide final choices, increasing distracted participants' accuracy relative to those in immediate decision and directed-thought conditions. FTT suggests that distraction does not necessarily enhance intuitive processing; rather distraction simply reduces the biasing influence of more precise processing reliant on the retrieval of verbatim information.

In a similar vein, Damian and Sherman (2013) investigated the extent of rule-based and intuitive processing in directed and distracted thought conditions in the DWA effect. These two types of processing can be thought to roughly mirror precise verbatim and inexact gist processes proposed by FTT. They theorized that conscious and unconscious thinking modes would consist of different proportions of rule-based and intuitive processing. Specifically, 1) distracted thinking might increase intuitive processing (or increase its contribution to decision-making); 2) directed thinking might increase the contribution of rule-based processing; or that 3) directed thinking might increase the contribution of both rule-based and intuitive modes of processing (Damian & Sherman, 2013).

Normally in the DWA paradigm, rule-based and intuitive processing act in concert to facilitate decision-making, but Damian and Sherman (2013) created tasks to dissociate the two processes. Participants in a first experiment provided judgments after reading several well-studied judgment and decision-making scenarios. Decision scenarios

consisted of *congruent* trials (i.e., both rule-based and intuitive processing pointed to similar judgments) or *incongruent* trials (rule-based and intuitive processing pointed to opposing judgments). After reading through each problem, participants were either assigned to a period of distracted or directed thought. Damian and Sherman (2013) used a Process-Dissociation Procedure (PDP) to estimate the relative contributions of rule-based and intuitive processing for both directed and distracted thinkers (Jacoby, 1991). Estimates suggested that both distracted and directed thinkers employed similar levels of intuitive processing. Distracted thinkers used rule-based processing to a lesser degree than directed thinkers (Damian & Sherman, 2013).

A second experiment likewise supported this conclusion. Participants in this experiment sequentially completed four DWA paradigms and then chose between three apartments, cars, roommates, and vacation spots (Damian & Sherman, 2013). A source character, 'Joe' informed participants of half the information and 'Bill' gave the other half. To separate rule-based from intuitive processing in incongruent trials, participants were instructed that 'Bill' provided inaccurate descriptions and thus should be ignored. Based on the stimuli removed using the 'ignore' manipulation, rule-based and intuitive processing each pointed to different target choices. Again, Damian and Sherman (2013) compared responses on incongruent trials with congruent trials to calculate estimates of each process. Results indicated that intuitive processing was constant across thought condition but that rule-based processing was higher for directed thinkers relative to distracted thinkers.

Rule-based and intuitive processes might be thought of as (inexact) analogs for verbatim and gist memory representations. The previous study suggests that *something* about distraction leads to diminished rule-based processing. As UTT suggests, unconscious thought is largely incapable of following strict rules or logic but provides rough intuitive estimates about a decision-problem (Dijksterhuis & Nordgren, 2006). Rule-based processing is effective when problems do not overwhelm conscious capacity. Intuitive estimates better capture complex decision-problems because the estimates capture the entirety of the decision-problem without bias. However, a FTT explanation suggests that rule-based processing largely depends on precise representations (verbatim) of the decision problem (Brainerd & Reyna, 1990). According to FTT, these precise traces do not persist through distraction and thus attenuates the impact of rule-based processing on final judgments.

Fuzzy-Trace Theory and DWA: An Example

Consider the seminal study within the unconscious thought literature to illustrate how FTT explains DWA findings. Dijksterhuis (2004) presented participants with four cars each described by 12 characteristics. While encoding information about the cars, participants store both verbatim ('Car A had great gas mileage') and gist representations ('Car B was best overall'). After viewing the information, participants are assigned to one of three groups prior to providing target evaluations. Participants in 'immediate decision' and 'conscious thought' conditions feel that Car B was best overall but are also able to retrieve a limited number of verbatim memory cues to assist in decision-making. If the information set is small, verbatim cues may accurately represent the problem (i.e., they

represent a full set of information). But when the information set is large, verbatim cues can represent only a fraction of the decision-problem. Participants may then reject intuitive, gut feelings and decide based on the subset of information that is retrievable. In the present example, participants ‘feel’ that Car B was best but may not retrieve information to support their intuition. In aggregate, participants make suboptimal decisions when they reject intuition in favor of verbatim information (Car A had great gas mileage). On the other hand, participants in distraction conditions must complete a task requiring extensive executive resources (e.g., n-back). The distraction period renders verbatim representations that require rehearsal irretrievable. Thus, distracted participants decide which car is preferable based on intuitive gist, leading to more accurate judgments. Distracted participants, like experts, decide effectively using intuitive processes founded on gist problem representations.

What Fuzzy-Trace Cannot (Easily) Explain

Bos and colleagues (2008) provided compelling evidence that the effects observed in the DWA paradigm are goal-dependent. When participants were told that they would report their attitudes later, they performed best when distracted. When participants either thought the judgment task was complete (thus not requiring a further report) or were misled about the later judgment task, distraction afforded no benefit (Bos et al., 2008). Because of the passive mechanism underlying the FTT account, it is difficult to explain the goal-dependency of the DWA effect. Specifically, FTT posits that verbatim traces are rendered inaccessible because of distraction, independent of processing goals, leaving individuals to rely on gist representations formed while the information was presented. In

Bos et al.'s (2008) Experiment 3, participants received information about potential roommates and cars, and according to FTT should have formed gist representations of both stimulus sets. The goal participants received to form a judgment about either roommates or cars is irrelevant to FTT given participants already had a gist representations of both stimulus sets. Thus, according to FTT participant should report good judgments about both stimulus sets after a period of distraction. But, Bos et al. (2008) found that participants only reported good judgments about the set for which they had a goal (subsequent to the information presentation) to form an impression. From this, it appears that participants engaged in goal-directed unconscious thought after the information presentation, and did not merely access the previously formed gist representation.

However, FTT could explain the Bos et al. (2008) findings provided one assumption. As mentioned above, FTT predicts that participants in Bos et al.'s (2008) Experiment 3 should form independent gist impressions for both roommates and cars during information presentation. After participants form these representations, they received a goal to form an impression of either the roommates or cars. This processing goal may have enhanced the activation and accessibility of the goal-congruent gist representation. Further, given the other gist representation was no longer relevant (seemingly), it may have decreased in activation or perhaps been inhibited. Thus, if one assumes that subsequent processing goals can influence the accessibility of recently formed gist representations; FTT could explain the results of Bos et al.'s (2008) Experiment 3. In that experiment, participants in the distraction condition formed good

judgments only about the goal-relevant information set because their goal-congruent gist representation was more accessible than the goal-irrelevant gist representation.

As it stands, then, FTT could potentially still explain the DWA effect, even regarding the moderating effects of processing goals demonstrated by Bos et al. (2008). Importantly, participants in Bos et al.'s (2008) Experiment 3 should have formed gist representations for two sets of information, roommates and cars. And, if subsequent processing goals can influence the activation of these gist representations, it is impossible to test whether UTT or FTT better explains the DWA effect using that design. To test between these two theories, it is necessary to create a context in which participants form one broad gist impression while the information is presented (not two), then introduce a processing goal that would lead to an impression of the information that is dissociated from the gist impression. If participants report poor performance judgments but good judgments in line with the original gist impression, this would support FTT. If participants form good judgments consistent with the new processing goal, this supports UTT. Based on this logic, the current experiment directly tests the explanatory power of UTT and FTT in the DWA effect.

Current Project

Theoretical Logic

The current study intends to conclusively test between Unconscious Thought Theory and Fuzzy-Trace Theory as alternative explanations for the Deliberation-Without-Attention effect. On one hand, UTT suggests that following the presentation of

information (e.g., car attributes), individuals unconsciously think about the information while they are distracted—in line with a current processing goal—and form good goal-relevant judgments as a result (Dijksterhuis & Nordgren, 2006). Alternatively, FTT suggests that individuals form global gist impressions while they receive information (e.g., “this car seems best, this one seems worst”), forget verbatim representations when they are distracted, and simply report gist impressions after a sufficient delay. According to FTT, people make good judgments after the delay period because they recall only the broad gist representation (and not verbatim ones) they made while the information was presented, not because of any active, goal-directed, process that occurred after the information was presented.

Given this, if participants receive a specific processing goal after information is presented (e.g., evaluate the performance qualities of the cars), UTT would predict they should unconsciously think about the information and make judgments that are in line with that goal. However, FTT would predict that participants would simply report gist impressions formed during encoding. If the goal is to form a general ‘impression’ during encoding, gist representations will consist of global attitudes based on all of the presented information. Goals that are revised following information encoding will not alter the impression formed during encoding if conscious processes are immediately distracted. Therefore, timing of goal revision does not matter according to FTT but does matter according to UTT. According to Bos et al. (2008), unconscious integration is goal-dependent. If a misleading goal for evaluation is present during the thought period, unconscious processes will produce output in accordance with the misleading goal. Thus,

simply by introducing this goal revision at two different time points, one group of distracted thinkers can operate on a misleading goal while other distracted thinkers have an appropriate goal; from this, the current experiment can conclusively test between the two theoretical explanations.

The current experiment subtly shifts processing goals such that broad gist representations formed during information encoding do not facilitate judgments regarding the new goal. In this experiment, all participants form a general impression of 3 cars during encoding and are later told to evaluate the cars based on their performance characteristics (a small subset of the total information presented). An active unconscious process according to UTT is capable of updating impressions based on revised processing goals provided a sufficiently long period of distraction. FTT, on the other hand, suggests that gist representations will not update during a distraction period. In Bos et al. (2008), participants form gist impressions of two decision targets (roommates and cars) that facilitate both types of decision. When the goal was later revised, it may have further activated the online impression of the target set it referenced. In the current experiment, a single broad gist is formed and this gist interferes with accurate judgments. When participants encounter the goal revision manipulation, the representation for the entire target set is activated (i.e., representations for all cars rather than either cars or roommates). This procedure rules out the potential artifact from Bos and colleagues' (2008) findings.

FTT does not distinguish between goal revisions that precede or follow the distraction period (although such goals prior to the *encoding* period would enhance

decisions according to the theory). UTT on the other hand, requires that revised goals *precede* the distraction period allowing for adequate time to appropriately weight information unconsciously.

Experiment Overview: Shifting Goals for Unconscious Thinkers

Participants in the current experiment form general impressions about three cars. After encoding characteristics about each car, participants are assigned to 1 of 4 conditions. In the first, participants learn they should consider only the performance aspects of each car and then immediately evaluate the cars (immediate decision or ‘ID’ condition). A second group learns the updated goal (process for performance aspects) and then has the opportunity to think about the cars for 3min before evaluating them (directed thought or ‘DT’ condition). Participants in the final two groups complete a distraction task (2-back) for a period of three minutes. One of these groups learns of the updated goal *prior* to the distraction task (unconscious thought or ‘UT’ condition) and the other group does not learn of the goal until *afterwards* (mere distraction or ‘MD’ condition). Immediately after the 3min period in these last three conditions, participants evaluate the cars.

The experimental procedure is reminiscent of Experiment 3 by Bos and colleagues (2008). Participants in that experiment formed impressions of two sets of targets (cars and roommates). Prior to the distraction period, participants encountered an updated goal to process *either* cars or roommates. In the current procedure, participants encounter a single set of three cars that diverge in quality when considering goals to

process all attributes about the cars or goals to focus on a subset of performance-related attributes. That is, cars are of ambivalent quality; the optimal car with respect to the comprehensive processing-goal is clearly suboptimal with respect to the performance processing-goal. Bos et al. (2008) in contrast used targets whose optimal evaluations were invariant to processing goals (i.e., the optimal roommate choice remained so whether or not the goal was in place to evaluate roommates). In their study, broad gist representations facilitated decisions for both roommate *and* car evaluations. In the current experiment, gist representations formed in response to general impression-formation goals interfere with optimal decision-making regarding car performance. Critically, UTT and FTT make divergent predictions regarding performance decisions in this paradigm.

Predictions and Hypotheses

Both Unconscious Thought Theory and Fuzzy-Trace Theory make two predictions with respect to performance-related evaluations and one prediction with respect to overall evaluations in the current experiment.

Hypothesis 1a. UTT predicts that participants in the distraction condition who receive the performance-evaluation goal before the distraction period will prefer the best performance to the worst performance car to a greater extent than other conditions (selecting and ranking it above others, and having more positive attitudes towards it than the other cars). Participants in the immediate-decision condition will perform suboptimally because they do not have time to engage in unconscious thought. Participants given 3 minutes to consciously deliberate about the cars will be biased by the small subset of information that they can consciously process; again resulting in

suboptimal decisions. Participants who learn of the performance evaluation goal *after* the distraction period again will not have time to integrate performance information unconsciously (although they can integrate information overall in line with the general impression goal that was active for them while experiencing the distraction). Finally, those who learn of the performance goal *before* the distraction period have both the time and appropriate goal for unconscious processes to integrate information during the distraction period and output sound performance judgments.

$$H_{a1a}: UT > IM + DT + MD$$

$$H_{o1a}: UT \leq IM + DT + MD$$

Hypothesis 1b. UTT predicts that, among distracted participants, those who receive the performance goal before distraction will outperform participants who receive the goal after distraction. UTT posits that unconscious integration is goal-directed and will thus only output goal-consistent representations when the processing goal is given *before* the distracted thought period.

$$H_{a1b}: UT > MD$$

$$H_{o1b}: UT \leq MD$$

Hypothesis 2a. FTT predicts that participants in both distraction conditions will prefer the best performance to the worst performance car to a lesser extent than participants who are not distracted. Participants in the immediate-decision and directed-thought conditions will have access to both gist and verbatim representations of the cars. In this setup, gist representations (which should just pertain to overall impressions) will bias judgments away from an optimal performance choice. However, verbatim

representations will facilitate performance-judgment accuracy because the performance subset of characteristics consists of only four items. Even without any information about the cars, participants have a 33 percent chance of selecting correctly. Those who remember even one performance characteristic for all 3 cars (e.g., car A has excellent horsepower relative to the other cars) are significantly more likely to select the correct performance car. And, remembering three characteristics about a particular car allows a definitive assignment for that car. Participants in distraction conditions are unable to rehearse fragile verbatim representations in working memory over the thought period and as such, can only consult (faulty) global gist representations when evaluating the cars. The timing of goal presentation is irrelevant to the Fuzzy Trace account and thus, no differences should arise between the two distraction groups.

In summary, participants able to retrieve verbatim information in the decision-making process and will benefit relative to those relying only on gist. Thus, FTT predicts that participants who are not distracted will form more accurate preferences compared with those who are, with no differences between the two distraction conditions.

$$H_{a2a}: UT + MD < IM + DT$$

$$H_{o2a}: UT + MD \geq IM + DT$$

Hypothesis 2b. FTT predicts that the timing of processing goal presentation will not impact processes that occur during the distraction period. Thus, participants in the UT condition will perform comparably to those in the MD condition. This hypothesis from FTT is the null prediction from hypothesis 1b.

Hypothesis 3. FTT and UTT make identical predictions with respect to evaluations based on *overall* impression goals. Both theories predict that verbatim information will bias preferences with respect to overall evaluations because participants can at best retain a subset of the overall information. However, gist representations will facilitate overall judgments after distraction according to FTT, and participants can unconsciously think about all information during distraction according to UTT. Both distraction groups received a goal to form overall impressions of each car and expect they will be asked for these impressions at a later time. Following this, UTT predicts that individuals in both distracted groups should engage in unconscious thought. FTT also predicts that both distracted groups should perform comparably well, but only because they have facilitating gist representations when making judgments about the cars.

$$H_{a3}: UT + MD > IM + DT$$

$$H_{o3}: UT + MD \leq IM + DT$$

METHOD

Participants and Design

Four hundred and fifty undergraduate students (59.1% Female; mean age 20.23) attending Montana State University participated in the experiment. Participants were enrolled in an introductory psychology course and received experimental course credit for their participation. Twenty participants were removed from analysis for aberrant data patterns. Specifically, these include four participants who were under age 18 and 16 for whom an experimenter noted significant abnormalities during experimental sessions (e.g., fire alarm going off during the experiment). Participants were randomly assigned to 1 of 4 experimental conditions (immediate decision, ID; directed thought, CT; distraction with evaluation goal, UT; mere distraction, MD) of a between-subjects design. The 430 participants were roughly evenly distributed across condition (IM N=108, CT N = 108, UT N = 107, MD N = 107).

Procedure

Participants provided informed consent, and then were presented with a brief introduction to experimental procedures. Each participant was seated at an individual computer-workstation with intervening dividers, and between 1 and 5 participants participated in each experimental session.

To begin the experiment, participants were told that they would learn about three different cars and should form an impression of each car. Participants then viewed one of

three car names simultaneously with one attribute from a set of 16 attributes that described each car. Each of these car-attribute pairs was displayed in a random order on the monitor display one at a time for a total of 48 pairings. One of the cars was clearly the ‘best’ choice based on *all* presented attributes (i.e., described by a majority of positive attributes), whereas another was clearly the ‘worst’ (i.e., described by a majority of negative attributes) and another ‘neutral’ (i.e., described by a balance of positive and negative attributes). Likewise, one car was clearly the ‘best’ choice based on a subset of *performance* attributes (i.e., most of its performance attributes were positive), whereas the other two were equally ‘poor’ choices in comparison (i.e., most of their performance attributes were negative). Importantly, cars that were objectively ‘best’ choices holistically were ‘poor’ choices when considering only the performance subset (and vice-versa for the objectively ‘worst’ overall choice). This is described in further detail in the stimuli section.

Following the presentation of all car attributes, participants were randomly assigned to 1 of the 4 thought conditions. In brief, participants in the first condition immediately provided their assessments of the cars. In the second, participants were given a goal to consider the performance attributes of each car and then were asked to ‘think about’ each of the cars for 3min. Participants in the last two conditions engaged in a highly distracting (i.e., attention-consuming) task for 3min. In one of these ‘distraction’ conditions, participants were instructed to consider the performance attributes of the cars just prior to the distraction task; in the other, this instruction was presented after the distraction task. Each of these conditions is further detailed in the ‘independent variable’

section below. After participants received the goal, or after they received the goal and experienced a particular intervening 3min period, they completed dependent measures including: Measures of their performance car selection and overall car selection, attitudes about the performance of each target car, attitudes about the overall quality of each target car, car rank-ordering for both performance and overall dimensions, and exploratory items. Following all dependent measures, participants were fully debriefed and thanked for their participation.

Stimuli

Targets

Targets consisted of three fictional car names developed by Dijksterhuis and colleagues (2006); these were ‘Datsun,’ ‘Kiawa,’ and ‘Hatsdun.’ Prior research demonstrated that students perceive these names as being equally positive (Rivers, et al., 2013). For each experimental participant, the computer randomly assigned each car-target name to one pre-constructed attribute set, such that the car names and associated set of characteristics were counterbalanced.

Attributes

Three sets of 16 attributes were generated, each to describe 1 of 3 different cars. Overall then, participants viewed 48 attribute-target pairs. Each attribute referenced a broad category of car quality such as “fuel efficiency,” “safety in adverse weather,” or “overall value.” In addition, each statement received 1 of 3 valence magnitudes; either

“excellent,” “acceptable,” or “poor.” An example statement reads as follows: “Rated as “Good” in side impact crash tests” (see Appendix A).

Similar to the original Deliberation-Without-Attention paradigm (Dijksterhuis, 2004), each car was paired with a specific ratio of valence characteristics. The objectively ‘best’ overall car received a ratio of 8 ‘Excellent’ ratings, 4 ‘Acceptable’ ratings, and 4 ‘Poor’ ratings (see appendix A). The objectively ‘worst’ overall car received 4 ‘Excellent,’ 4 ‘Acceptable,’ and 8 ‘Poor’ ratings, and the ‘distractor’ car received 4 ‘Excellent,’ 6 ‘Acceptable,’ and 6 ‘Poor’ characteristics. Yet, unique to this experiment, each car also received a selected ratio of positive to negative *performance* characteristics. This ratio was constructed such that both the overall ‘best’ and ‘neutral’ cars received 1 ‘Excellent’ and 3 ‘Poor’ performance characteristics, and thus were equally ‘poor’ performance cars. Further, the ‘worst’ overall car received 3 ‘Excellent’ and 1 ‘Poor’ performance characteristics, and was the best performance car. The set ratios were constructed such that the objectively ‘best’ overall car is a ‘co-worst’ performance car, whereas the objectively ‘worst’ overall car is the ‘best’ performance car.

Additionally, the lists were constructed such that each assigned ‘best,’ ‘worst,’ and ‘neutral’ choice on both criteria could be objectively determined. Specifically, each car was described by the same 16 attributes, but for each attribute, one car was poor, another acceptable, and the other excellent. Given this, under no circumstance could participants’ unique preferences lead them to prefer the ‘neutral’ or ‘worst’ choice on a specific criterion (unless it is assumed that one can prefer a ‘Poor’ rating to a rating of ‘Acceptable’ or ‘Excellent’). The computer randomly presented the 48 statements, each

for four seconds with an intervening 500ms visual mask (Dijksterhuis, 2004). The mask consisted of a string of random upper and lower case letters and replaced the text for both the car name and attribute descriptor.

Independent Variables

Thought Condition

After viewing all target-attribute pairings, participants were randomly assigned to experimental conditions. In each of these conditions, all participants were (at some point) instructed to adopt a specific goal to evaluate the performance characteristics of the cars (i.e., adopt a “performance goal”). Within this instruction text, participants were explicitly informed that performance characteristics include attributes like ‘horsepower,’ ‘top speed,’ ‘acceleration,’ and ‘high speed handling.’

Participants assigned to the immediate-decision (IM) condition were instructed to adopt a performance goal, then immediately completed dependent measures. Participants assigned to the directed thought (or conscious-thought; CT) condition were likewise instructed to adopt a performance goal, but were further instructed to think about the cars for 3min before completing the dependent measures. Specifically, the computer displayed a screen on a 3min timer that read, “For the next three minutes, consider the three different cars and the characteristics you read about.”

Participants in the distracted thought (or unconscious-thought; UT) condition were instructed to adopt a performance goal, and subsequently completed a 3min ‘2-back’ task (Jonides et al., 1997). During the 2-back task, the computer monitor

sequentially displayed a series of digits one at a time for 2s each. Participants were asked to indicate by pressing the computer space bar any instance in which the number currently displayed matched the number displayed two digits ago. Previous research has demonstrated that the levels of memory updating and maintenance required by the 2-back is highly resource-dependent (Jonides et al., 1997), such that participants who are engaged in the task will be unable to consciously deliberate about the cars. Unconscious Thought Theory suggests however, that unconscious modes of thought operate despite distraction (Dijksterhuis & Nordgren, 2006). As discussed earlier, the research of Bos and colleagues (2008) strongly suggests that unconscious integration will only output accurate judgments if appropriate goals are in place during the thought period. Thus, per Bos et al. (2008), participants should think about performance attributes unconsciously because they have the goal to evaluate car performance prior to the thought period. It is also plausible that participants in the UT condition would have unconscious thought about overall impressions, as they help that goal initially and were not disabused of that goal.

In contrast, participants in the mere distraction (MD) condition completed the '2-back' distraction task, *after which* they received the performance goal. Immediately after learning about the performance goal, these participants completed dependent measures. According to UTT, participants in the MD condition had appropriate goals to think unconsciously about the *overall*, but not *performance*, attributes during the distraction period. UTT predicts that MD participants should perform comparably to immediate

deciders and directed thinkers on performance-related judgments, but better than these conditions on overall judgments.

In contrast to the UTT prediction, FTT suggests that participants in both MD and UT conditions should form comparably accurate judgments on both *overall* and *performance* measures. In this formulation, verbatim memory representations are eliminated in both distraction conditions and the goal is irrelevant because the process is passive during the distraction period.

Dependent Variables

Overview of Assessment Procedure

After completing respective thought manipulations, participants provided explicit evaluations of each car. For each of the following dependent measures, participants completed the critical dependent measures first based on their specific goal to evaluate only performance characteristics, and then again for overall preference based on the full set of characteristics. That is, participants first selected 1 of the 3 cars, reported attitudes towards each car, and rank-ordered each car on the subset of '*performance characteristics*.' After providing performance-specific assessments, participants then selected, rated attitudes, and rank-ordered each car based on '*any and all of the characteristics associated with each car*.'

A short introduction prefaced ratings for performance characteristics and participants were frequently reminded on each measure that the rating should be based only on performance attributes. The introduction specifically stated that, "we would like

to know your attitudes towards each car based on their PERFORMANCE. Remember that this includes ACCELERATION, HIGH SPEED HANDLING, SPEED, and HORSEPOWER.” After participants completed performance-specific measures they read that, “now, we would like you to consider each car’s OVERALL characteristics. These include any and all of the characteristics associated with each car, NOT JUST the performance. Another car may have better performance, but now we would like you to focus on each car’s OVERALL QUALITY.”

Car Selection

Participants were reminded of the evaluation criterion (either performance or overall) and were asked to choose 1 of the 3 cars. The car names were presented in a fixed order (Dasuka, Kiawa, Hatsdun) and participants checked one box next to the car name of their preference. This item was the initial dependent measure collected.

Attitude Towards Each Car

Participants were then asked to report their attitude towards each of the cars presented. Specifically, each participant was asked “How would you rate the ([CAR]’s performance/[CAR] overall)?” Again, participants first encountered items for performance and then for overall ratings. As in the choice measure, each of the three car names was filled in the [CAR] placeholder and participants evaluated each car in a fixed order (Dasuka, Kiawa, Hatsdun). Participants evaluated each car by selecting a box on an eleven-point scale ranging in increments of 5 from +25 (*Very Positive*) to -25 (*Very Negative*).

A composite difference score was created for performance evaluations by subtracting judgments of the two poor cars from the rating of the best performance car (see Dijksterhuis, 2004, experiments 1 & 4). Because there were 2 poor car choices and a single best car, the rating of the best car was multiplied by 2 before subtracting the ratings towards poor performance cars. Thus, a more positive difference score indicated higher preference for the objectively best car relative to poor cars.

Similarly, a composite difference score was created for overall evaluations by subtracting attitudes of the objectively poor overall car choice from the rating of the best overall car choice. Again, positive difference scores indicate a greater preference for the objectively good car choice relative the poor car choice.

Car Ranking

Participants rank-ordered each of the three cars from top preference to lowest preference (again for both performance-specific and overall evaluations). Each of the car names appeared in a small text box on the left half of the computer display. To perform the ranking task, participants clicked on each box with the computer-mouse cursor, moved the box to the right half of the computer display, and then released the mouse when the car was in the desired position. Participants positioned the car boxes such that their first choice was placed above the other two less desirable cars, intermediate choice directly underneath, and least preferred car underneath the two previous. After placing each box, participants were asked to confirm their rankings before continuing.

Exploratory Measures

In addition to the critical dependent measures, participants completed a series of exploratory measures. Specifically, participants provided self-ratings of their previous experience with car repairs, whether they watched car racing competitions, need for locomotion (Kruglanski et al., 2000), and need for cognitive closure (Webster & Kruglanski, 1994). Briefly, experience with cars and need for cognitive closure moderated the pattern of results such that those high in previous car experience and those low in the need for cognitive closure generally benefited more from a period of distracted thought. Need for cognitive closure is further discussed below. Additionally, participants completed a simple recognition task to further investigate what memory representations might be informing judgments in each condition. No significant differences by condition emerged with respect to the recognition measure. Finally, participants completed the automated OSPAN task measuring working memory capacity (Unsworth, Heitz, Schrock, & Engle, 2005). Again, no significant patterns emerged on this exploratory measure.

Need for Cognitive Closure

Webster and Kruglanski (1994) developed the *Need for Cognitive Closure* scale to assess individual tolerance of ambiguity in everyday life. Their initial examination and several following, found that self-report ratings on the scale predicted patterns of behavior and cognition in ambiguous contexts. Most relevant to this experiment, Kruglanski and Webster (1996) found that those high in Need for Closure were generally less cognitively flexible and tended to foreclose on judgments prematurely presumably to

mitigate the discomfort triggered by ambiguity. Those low in Need for Closure conversely were more flexible and tended to suspend judgment until after deliberation about the problem in question. Additionally, five factors emerged from the Need for Closure scale. *Discomfort with ambiguity* measures the extent to which negative emotions arise in response to ambiguous situations. Those who are high in *close-mindedness* are less likely to seek out information from others, instead relying on self-generated attitudes. *Predictability* refers to the preference for contexts that have systematic, predictable possibilities. *Order seeking* is the response to preferences in predictability where known contexts are sought over novel ones. Finally, individuals high in *decisiveness* prefer to rapidly foreclose on judgments rather than deliberate or delay a decision (Webster & Kruglanski, 1994).

Need for Closure and comfort with ambiguity may extend to unconscious deliberation as well. The DWA task is highly ambiguous; participants learn that they will be asked for their impressions of the three cars but then only slowly encounter information about each car. Furthermore, it is unlikely that strong preferences develop for one car over others; especially when participants can use two different criterion for evaluation. Because of the ambiguous nature of the DWA task, those high in Need for Closure may seek strategies to minimize the discomfort with the procedure (Webster & Kruglanski, 1994). For example, those high in Need for Closure might foreclose on judgments about the cars prior to the thought period, thus prematurely satisfying goals for evaluation and stifling goal-dependent unconscious thought processes. Following this,

UTT predicts that the DWA pattern will be more apparent for those low in Need for Closure compared with those who are high in Need for Closure.

RESULTS

Performance Evaluations

Analysis Plan

Logistic regression models were constructed for dichotomous outcome variables (correct car choice and top rankings) to predict the percentage of correct decisions by condition. One-way Analyses of Variance (ANOVA) with thought condition as a between-subjects factor tested preferences obtained through car attitude ratings.

Additionally, planned contrasts were generated to test theoretical predictions of the two theories. The first 2 contrasts tested the main predictions of Unconscious Thought Theory (Hypotheses 1a and 1b). The first comparison testing Hypothesis 1a, tested whether participants in the unconscious-thought condition chose (and ranked highest) the best performance car more often than participants in all other conditions (i.e., $UT > IM + CT + MD$). The second comparison, testing Hypothesis 1b, tested whether participants in the unconscious-thought condition chose (and ranked highest) the best performance car more often than participants who also engaged in the distraction task, but received the performance goal afterward ($UT > MD$; note that Fuzzy Trace Theory assumes the null hypothesis here, see Hypothesis 2b ($UT = MD$)). A third planned comparison tested the remaining prediction of Fuzzy Trace Theory (Hypothesis 2a), that overall participants who experienced distraction after the information would choose (and rank highest) the best performance car less often than participants who did not experience distraction (i.e., $UT + MD < IM + CT$). It should be noted that this set of contrasts is not orthogonal.

Some statisticians contend that non-orthogonal contrasts may inflate type I error. However, as Keppel and Wickens (2004) note, an appropriate number of theoretically meaningful non-orthogonal planned contrasts are preferred to meaningless or difficult to interpret orthogonal contrasts. Further, they suggest that type I inflation is minimal for *planned, theoretical* contrasts and thus, applying a correction is overly conservative.

Performance Car Selection and Ranking

Thought condition did not predict the likelihood that participants chose the best performance car in the omnibus logistic model, $\chi^2(3) = 4.15, p > .05$. The planned contrasts testing the predictions of UTT were not significant. Specifically, participants in the UT-condition were as likely to choose the best performance car as participants in all the other conditions, $\chi^2(1) = 1.83, p > .05$ (Hypothesis 1a; see Table 1). Further, participants in the two distraction conditions were equally likely to choose the best performance car, $\chi^2(1) = 0.19, p > .05$ (Hypothesis 1b). Thus, these analyses did not support the predictions of UTT and in fact, the null finding of Hypothesis 1b provides some support for FTT that predicts that both distraction groups should perform comparably. The final planned comparison was marginally significant, but in the opposite direction predicted by FTT (Hypothesis 2a). Specifically, participants in the two distraction conditions were marginally more likely to choose the best performance car relative to participants in the other two conditions, $\chi^2(1) = 2.96, p = .09$. On the whole, this pattern of results for performance car selection is inconsistent with both UTT and FTT. The pattern of likelihoods for performance car selection was most consistent with UTT but did not approach significance (see Table 1). FTT receives some support from

the null finding in Hypothesis 1b (also Hypothesis 2b) but caution is advised when interpreting null findings especially when the result of FTT Hypothesis 2a was not supported.

Table 1. Percentage of Participants Correctly Selecting and Ranking Best Car by Thought Condition and Evaluation Type

Thought condition	Perform. Selection M (SD)	Perform. Rank M (SD)	Overall Selection M (SD)	Overall Rank M (SD)
Immediate (IM)	0.31 (.47)	0.35 (.48)	0.55 (.50)*	0.33 (.47)
Conscious (CT)	0.25 (.44)*	0.25 (.44)*	0.54 (.50)*	0.38 (.49)
Unconscious (UT)	0.37 (.49)	0.39 (.49)	0.59 (.49)*	0.39 (.49)
Mere Distract. (MD)	0.35 (.48)	0.36 (.48)	0.56 (.50)*	0.32 (.47)

Note: *Significantly different from chance performance

Thought condition did not predict the likelihood that participants correctly ranked the best performance car in the omnibus logistic model, $\chi^2(3) = 5.57, p > .05$ (see Table 1). As with the choice measure, the planned contrasts testing the predictions of UTT were not significant. Participants in the UT-condition were as likely to rank the best performance car highest as participants in all other conditions, $\chi^2(1) = 1.78, p > .05$ (Hypothesis 1a). Further, participants in the two distraction conditions were equally likely to rank the best performance car highest, $\chi^2(1) = 0.19, p > .05$ (Hypotheses 1b and 2b). Thus, these analyses did not support the predictions of UTT and in fact, the null finding of Hypothesis 1b is predicted by FTT but inconsistent with the predictions of UTT. The final planned comparison was again marginally significant in the opposite direction predicted by FTT (Hypothesis 2a). Specifically, participants in the two

distraction conditions were marginally more likely to correctly rank the best performance car relative to participants in the other two conditions, $\chi^2(1) = 2.89, p = .09$. Again, the pattern of likelihoods fell in the UTT-predicted direction but did not approach significance. Thus, results from the ranking task do not highlight relative support for either UTT or FTT.

Performance Attitudes

The one-way ANOVA testing attitude difference scores of the best performance car against preferences towards the other two poor choices was not significant, $F(3, 426) = 0.17, p > .05$. Planned contrasts testing Hypothesis 1a, 1b, and 2a were not significant ($t[426] = .03, p > .05$; $t[426] = 0.52, p > .05$; $t[426] = 0.33, p > .05$ respectively). The pattern of means fell in the direction predicted by UTT but the difference did not approach significance (see Table 2). Again, although the pattern of means was consistent with hypotheses 1a, 1b, and 2a, neither FTT nor UTT received meaningful support based on results from the attitude difference measures.

Table 2. Mean Attitude Difference Scores by Thought Condition and Evaluation Type

Thought condition	Performance M (SD)	Overall M (SD)
Immediate (IM)	-0.42 (22.69)	4.63 (16.61)
Conscious (CT)	-1.62 (25.60)	4.44 (13.66)
Unconscious (UT)	0.79 (24.84)	7.57 (13.25)
Mere Distraction (MD)	-0.33 (24.70)	6.26 (15.06)

Overall Evaluations

Analysis Plan

Logistic regression models were constructed for dichotomous outcome variables (correct car choice and top rankings) to predict the percentage of correct decisions by condition. One-way ANOVA with thought condition as a between-subjects factor tested preferences obtained through car attitude difference scores. Additionally, planned contrasts were generated to test a single shared theoretical prediction of the two theories. Specifically, both theories predict that distracted participants will outperform those who are not distracted (Hypothesis 3).

Overall Car Selection and Ranking

Thought condition did not predict the likelihood that participants chose the best overall car in the omnibus logistic model, $\chi^2(3) = 1.81, p > .05$. Further, the planned contrast testing Hypothesis 3 was not significant, $\chi^2(1) = 0.48, p > .05$. Likewise, the model predicting correct ranking of the overall best car was not significant, $\chi^2(3) = 1.81, p > .05$, nor was the planned contrast testing Hypothesis 3, $\chi^2(1) < .01, p > .05$. The pattern of proportions for selection, but not ranking, data fell in the predicted direction but did not approach significance (see Table 1). The findings of overall car selection and ranking do not support either UTT or FTT predictions.

Overall Attitudes

The one-way ANOVA testing attitude difference scores of the best overall car against the worst choice was not significant, $F(3, 426) = 1.08, p > .05$. The planned

contrast testing Hypothesis 3 was marginally significant, $t(426) = 1.68, p = .09$.

Specifically as predicted by UTT and FTT, participants in distraction conditions had more positive appraisals of overall best car relative to the overall poor car choice, thus providing some support for both theories (see Table 2).

Exploratory Analyses: Decisiveness

For exploratory purposes, thought condition (dummy coded for each hypothesis), self-reported decisiveness (centered; Webster & Kruglanski, 1994), and the interaction between the two were entered into regression models to predict car choices and rankings (logistic), and attitudes (linear). Participants who scored greater than 15 on the ‘lie detection’ subscale of the Need for Closure scale were removed from these analyses (see Webster & Kruglanski, 1994). To illustrate the findings in tables and figures, participants were split into tertiles of self-rated decisiveness although the analyses used the full range of decisiveness ratings. It was expected that the UTT hypotheses laid forth in this thesis should receive stronger support at lower levels of participants’ decisiveness.

Performance Car Selection and Ranking

To explore Hypothesis 1a, IM, CT, and MD conditions were combined and compared against the UT condition. This analysis of the choice measure revealed a main effect of condition such that participants in the UT condition outperformed those in the other conditions, $\chi^2(1) = 4.44, p = .04$. Importantly, the analysis indicated a significant interaction between condition and decisiveness, $\chi^2(1) = 4.78, p = .03$ (see Table 3), such that the difference between the UT condition and other conditions was greater at lower

levels of decisiveness (see Figure 1). Further, the analysis revealed a significant main effect of decisiveness within the UT condition such that as decisiveness decreased, there was a *greater* likelihood that participants chose the best performance car, $\chi^2(1) = 4.78, p < .05$. However, there was no main effect of decisiveness within the combination of all other conditions, $\chi^2(1) = 0.36, p > .05$. The results of this exploratory analysis provided support for Hypothesis 1a at lower levels of decisiveness. This analysis of the rank measure revealed no significant for effect of condition ($\chi^2[1] = 0.42, p > .05$), interaction between the condition and decisiveness ($\chi^2[1] = 1.29, p > .05$), or main effect of decisiveness within the UT ($\chi^2[1] = 0.27, p > .05$) or the other conditions combined ($\chi^2[1] = 0.27, p > .05$). Participants in the UT condition performed comparably to those in other conditions regardless of decisiveness level. Although not significant, the pattern for rank data paralleled that of the selection data.

To explore Hypothesis 1b, the MD condition was compared against the UT condition, excluding the other conditions. The analysis of the choice measure revealed no significant effect of condition ($\chi^2[1] = 1.06, p > .05$) nor an interaction between condition and decisiveness ($\chi^2[1] = 1.32, p > .05$). Thus, participants performed comparably in both distraction conditions regardless of decisiveness level. Yet, the analysis revealed a significant main effect of decisiveness within the UT condition such that as decisiveness decreased, there was a greater likelihood that participants chose the best performance car, ($\chi^2[1] = 4.75, p < .05$), whereas the main effect of decisiveness was not significant in the MD condition decisiveness ($\chi^2[1] = 0.39, p > .05$). That decisiveness moderates decision

quality for one group of distracted participants and not the other is entirely consistent with UTT but difficult to rectify with FTT.

The analysis of the ranking measure for Hypothesis 1b revealed somewhat similar results to the choice measure. Again, there was not a significant main effect of condition, $\chi^2(1) = 0.06, p > .05$, nor was there a significant interaction between condition and decisiveness, $\chi^2[1] = 0.15, p > .05$. This suggests that participants performed comparably in both distraction conditions regardless of decisiveness level. Unlike the choice measure, there were similar main effects of decisiveness in each condition such that participants were more likely to rank the best performance car highest as decisiveness decreased. This tendency was significant in the MD condition, $\chi^2(1) = 4.19, p = .04$, but at best marginally significant in the UT condition, $\chi^2(1) = 2.48, p = .12$. Although these findings do not mirror the clear support for UTT evident in the selection data, FTT does not predict that decisiveness should moderate decision quality.

To explore Hypothesis 2a, the IM and CT conditions were combined and compared against the combined MD and UT conditions. The analysis of the choice measure for Hypothesis 2a revealed a significant main effect of condition, ($\chi^2[1] = 5.27, p = .02$). Contrary to FTT, distracted participants outperformed those who were not distracted. The interaction between condition and decisiveness was also significant, $\chi^2(1) = 5.40, p = .02$. Contrary to FTT Hypothesis 2a, distracted participants *outperformed* those who were not distracted and this difference was more pronounced at lower levels of decisiveness (UT + MD > IM + CT; see Figure 1). Further, the analysis revealed a significant main effect of decisiveness within the distraction conditions such that as

decisiveness decreased, there was a greater likelihood that participants chose the best performance car, ($\chi^2[1] = 4.37, p < .05$), whereas the main effect of decisiveness was not significant in the non-distraction condition ($\chi^2[1] = 1.56, p > .05$). Again, this pattern of results is inconsistent with FTT 2a that predicts lower performance for distracted participants and no relationship with self-reported decisiveness. UTT on the other hand can explain this data as long as the UT condition is driving decision accuracy (selection data from Hypotheses 1a and 1b suggests this may be the case). Additionally, that decisiveness moderates decision quality for distracted participants is predicted by UTT (again for the UT condition) but entirely inconsistent with FTT.

As discussed above (see results for Hypothesis 1b) the null prediction made by Hypothesis 2b received minimal support. Decisiveness was significantly related to decision quality for those in the UT condition but not those in the MD condition.

The analysis of the ranking measure for Hypothesis 2a revealed somewhat similar results to the choice measure. The analysis revealed no main effect of condition ($\chi^2[1] = 0.75, p > .05$), but did reveal a significant interaction between condition and decisiveness, $\chi^2(1) = 6.16, p = .01$. As for the choice measure, distracted participants outperformed those who were not distracted and this difference was more pronounced at lower levels of decisiveness. Further, the analysis revealed a significant main effect of decisiveness within the distraction conditions such that as decisiveness decreased, there was a greater likelihood that participants chose the best performance car, ($\chi^2[1] = 6.89, p < .05$), whereas the main effect of decisiveness was not significant in the non-distraction condition ($\chi^2[1] = 0.77, p > .05$). UTT Hypothesis 1a received increasing support with

respect to car selections as participant decisiveness decreased. UTT Hypothesis 1b received no support in either choice or rank data; the distraction conditions performed comparably regardless of decisiveness level. Hypothesis 2a received some support in the ranking data at higher levels of decisiveness but, at lower levels of decisiveness, this pattern reversed and ran contrary to predictions. Likewise, choice data ran contrary to FTT to a greater extent at lower levels of decisiveness.

Table 3. Percentage of Participants Correctly Selecting Best Car by Thought Condition, Decisiveness, and Evaluation Type

Thought condition	N	Overall Choice M (SD)	Perform Choice M (SD)
Lowest Tertile Decisiveness			
Immediate (IM)	14	0.36 (.50)	0.36 (.50)
Conscious (CT)	17	0.47 (.51)	0.24 (.44)
Unconscious (UT)	14	0.50 (.52)	0.29 (.47)
Mere Distraction (MD)	18	0.39 (.50)	0.22 (.43)
Highest Tertile Decisiveness			
Immediate (IM)	24	0.50 (.51)	0.25 (.44)
Conscious (CT)	18	0.50 (.51)	0.17 (.38)*
Unconscious (UT)	25	0.56 (.51)*	0.56 (.51)*
Mere Distraction (MD)	19	0.74 (.45)*	0.32 (.48)

Note: *Significantly different from chance performance

Performance Attitudes

To explore Hypothesis 1a, IM, CT, and MD conditions were combined and compared against the UT condition. This analysis revealed no significant effects (all $t_s \leq 1.23$, $p_s > .05$; see Figure 2). To explore Hypothesis 1b, the MD conditions were compared against the UT condition, excluding the other conditions. Likewise, this analysis revealed no significant effects (all $t_s \leq 1.25$, $p_s > .05$). Participants performed

comparably in both distraction conditions regardless of decisiveness (see Table 4). Finally, to explore Hypothesis 2a, the IM and CT conditions were combined and compared against the combined MD and UT conditions. This analysis revealed no significant effects (all $t_s \leq 1.11$, $p_s > .05$). Decisiveness did not moderate the effect of distraction (UT + MD versus IM + CT) on attitude difference scores. As discussed above (see results for Hypothesis 1a) the null prediction made by Hypothesis 2b received minimal support.

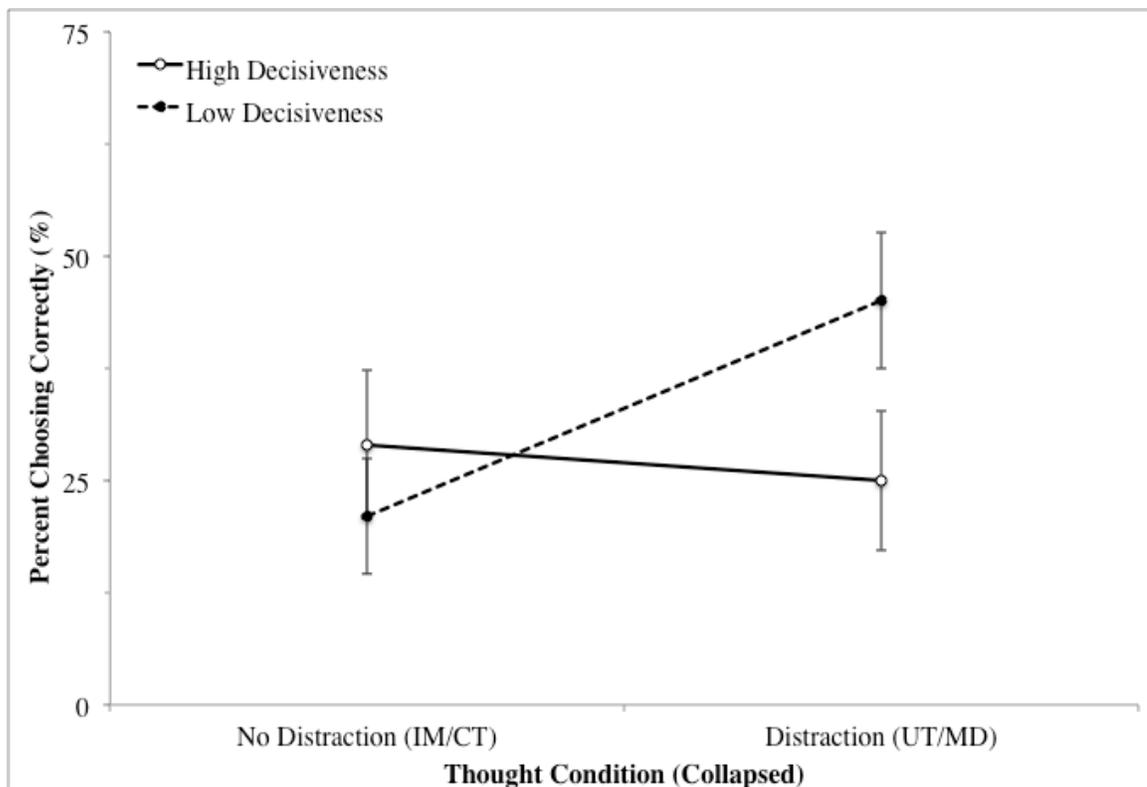


Figure 1. Proportion Correctly Selecting Best Performance Car by Thought Condition, Decisiveness Tertiles and Evaluation Type

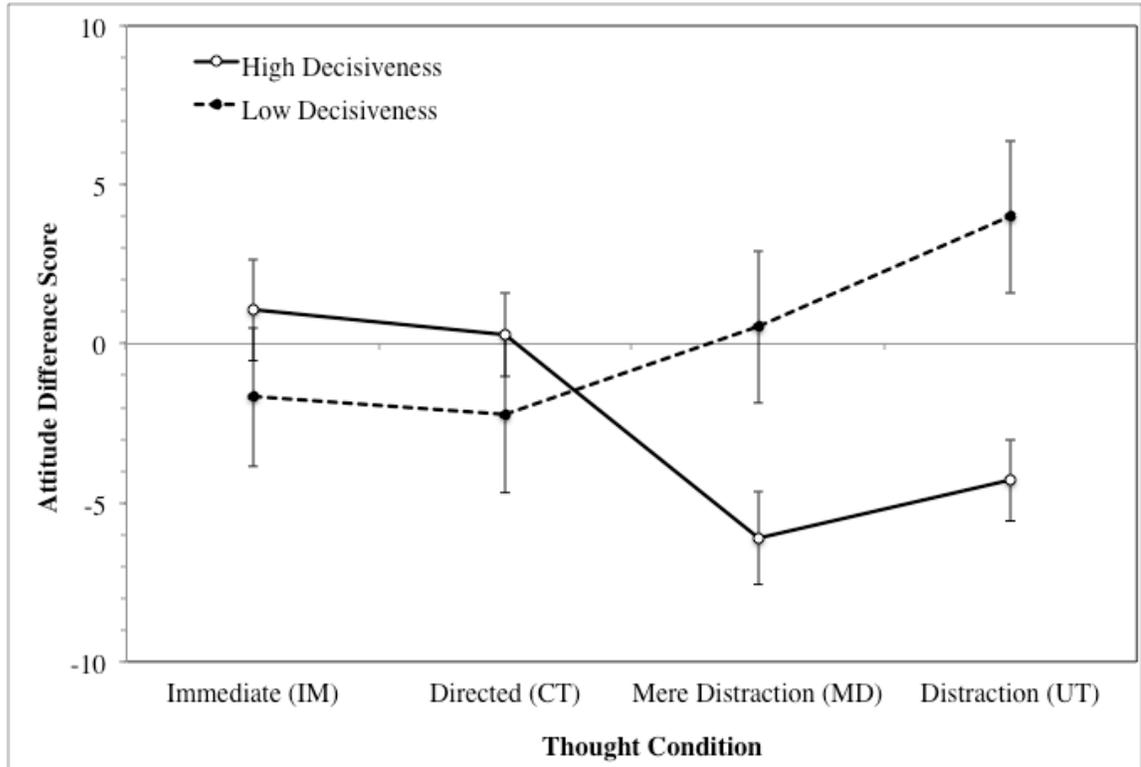


Figure 2. Performance Car Attitude Difference Scores by Thought, Condition, Decisiveness Tertiles, and Evaluation Type

The predictions made by UTT and FTT received little support. Interestingly, the pattern of means tended to fall in a direction consistent with UTT for low-decisive individuals and in a direction consistent with FTT for high-decisive individuals (see Table 4).

Overall Car Selection and Ranking

To explore Hypothesis 3, distraction conditions were combined and compared against conditions without distraction. When testing Hypothesis 3 no significant effects emerged for condition ($\chi^2[1] = 0.06, p > .05$). Similarly, no effect of decisiveness for distracted ($\chi^2[1] = 2.23, p > .05$), not distracted ($\chi^2[1] = 0.13, p > .05$), or the interaction

between decisiveness and condition ($\chi^2[1] = 0.08, p > .05$) emerged with respect to correct car selections. Again, for ranking data no main effect of condition ($\chi^2[1] < .01, p > .05$), decisiveness (distracted, $\chi^2[1] = .13, p > .05$; not distracted $\chi^2[1] = .18, p > .05$), or interaction ($\chi^2[1] = 0.31, p > .05$) emerged. Participants correctly selected and ranked the cars comparably across the two groups (UT + MD versus IM + CT) regardless of decisiveness.

Table 4. Mean Attitude Difference Scores by Thought Condition, Decisiveness, and Evaluation Type

Thought condition	High in Decisiveness		Low in Decisiveness	
	Performance <i>M (SD)</i>	Overall <i>M (SD)</i>	Performance <i>M (SD)</i>	Overall <i>M (SD)</i>
Immediate (IM)	1.07 (19.13)	0.00 (10.56)	-1.67 (30.74)	6.25 (19.75)
Conscious (CT)	0.29 (24.53)	2.06 (18.46)	-2.22 (27.82)	6.11 (12.19)
Unconscious (UT)	-4.29 (26.23)	8.93 (14.70)	4.00 (23.41)	3.40 (12.48)
Mere Distract. (MD)	-6.11 (29.88)	9.17 (16.56)	-2.89 (18.43)	0.53 (11.53)

Overall Attitudes

To explore Hypothesis 3, distraction conditions (MD + UT) and conditions without distraction (IM + CT) were again combined and compared against each other. No main effect emerged for condition ($t = 0.54, p > .05$). The interaction was significant ($t = 3.26, p < .01$). The predicted difference was more pronounced at higher levels of decisiveness (UT + MD > IM + CT) and the pattern reversed for those lower in decisiveness such that distracted participants tended to underperform relative to participants who were not distracted (UT + MD < IM + CT; see Table 4). For conditions without distraction, a significant main effect for decisiveness was found ($t = 2.37, p =$

.02). As self-reported decisiveness increased, so did preference for the best relative to the worst overall car. Likewise, a significant main effect for decisiveness was found for distracted participants ($t = 2.48, p = .01$). For distracted participants, as self-reported decisiveness increased so did preference for the best relative to the worst overall car.

GENERAL DISCUSSION

The present experiment sought to test between alternative accounts for the DWA effect. UTT proposes that an active, integrative, unconscious mode of thought occurs even while attention is directed away from a critical task (Dijksterhuis & Nordgren, 2006). On the other hand, FTT explains the effect as resulting from the differential availability of gist and verbatim memories following periods of distraction versus no distraction rather than inferring an unconscious mode of thought. Most critically, the theories make divergent predictions about the accuracy of decision-making when individuals are asked to reevaluate information *after* an encoding period. According to UTT, unconscious thought can actively ‘re-weight’ information *during distraction* in accordance with a new evaluative goal. FTT maintains that distraction simply eliminates the retrieval of biasing verbatim representations of the decision problem. Further, reevaluation will not occur during distraction and judgments will be based on general gist-based attitudes developed *during information encoding*.

The reported experiment tested these competing interpretations using a modified DWA paradigm. As in Dijksterhuis’ (2004) seminal work, participants in this experiment formed impressions of targets (cars in the present case) that were each paired with differing ratios of positively and negatively valenced attributes. After receiving the information, participants were assigned to 1 of 4 conditions and at some point encountered instructions to focus only on a subset of the total list of attributes; performance attributes. Participants in the first condition encountered the updated performance-evaluation goal and then immediately evaluated the cars (IM). Participants

in a second condition could think about the cars for 3min after encountering the performance-evaluation goal (CT). A third group learned of the performance-evaluation goal and subsequently engaged in a demanding distraction task for 3min (UT). Finally, participants in the fourth condition engaged in the distracting task and later encountered the updated performance-evaluation goal information (MD), just before reporting those evaluations. That is, after each of these groups learned of the updated goal, they engaged in a directed, distracted, or no performance-relevant thought period before they rated each car through the lens of the updated goal and in terms of global desirability.

UTT makes two main predictions about performance judgments in this experiment. Hypothesis 1a predicts that participants in the distraction condition who received the performance-evaluation goal prior to the distracting task (UT condition) would make more accurate judgments compared with the other 3 groups (UT > IM + CT + MD). Participants in the UT condition would have an appropriate goal to process the performance information and a sufficient period of distraction to unconsciously reevaluate previously encoded information. Participants in immediate decision and directed-thought conditions reach suboptimal judgments because they are biased by capacity limitations of conscious processing. Further, Hypothesis 1b predicts specifically that those in the UT condition would make more accurate judgments compared with participants who were distracted by receiving the performance-evaluation goal after the distracting task (i.e., the MD condition; UT > MD). Those in the MD condition had a sufficient period of distraction but did not have the performance-evaluation goal during

that period. Thus, unconscious thought processes were engaged, but evaluating information with respect to a different goal (i.e., just an overall goal).

When examining results from the entire sample, data lent no support to Hypothesis 1a. Participants in the UT condition reported comparable judgments with those in the other 3 conditions across the three performance-related dependent measures. Likewise, no pattern emerged supporting Hypothesis 1b; both groups of distracted participants made comparable judgments across the three performance-related dependent measures.

Likewise, FTT makes two main predictions. Hypothesis 2a predicts that participants who are distracted after receiving information will make less accurate performance judgments compared with those who are not distracted ($UT + MD < IM + CT$). According to FTT, distraction enhances participants' reliance on gist representations for reaching a judgment. In the present experiment, distracted participants should form gist representations of the cars overall, but not regarding performance per se. Thus, these individuals will not have a relevant gist representation or verbatim information, and their judgments should be poor as a result. Hypothesis 2b predicts that the timing of performance-evaluation goals is irrelevant and that distracted thinkers will make comparable judgments ($UT = MD$). In either case distraction eliminates biasing verbatim information for participants in both conditions. Thus, both will reach similar decisions based on previously encoded gist representations.

Moderate evidence ran contrary to Hypothesis 2a. Distracted participants tended to correctly select the performance car more often compared with those who were not

distracted. This finding, although only marginally significant, is quite inconsistent with both UTT (for the MD condition) and FTT. Both theories need extreme flexibility to account for this. For example, FTT might assume that in this experimental context, gist representations were retrievable for both overall and performance evaluations. However, this explanation would undercut the fuzzy processing preference assumption of the theory. UTT might explain the results by suggesting that participants unconsciously integrated information that helped them evaluate the cars with respect to performance as well as overall goals without the explicit direction to do so. Again, both possibilities seem unlikely. More likely the modification to target stimuli to create opposing judgments influenced participants in a different manner than predicted. Specifically, participants who were not distracted may have been biased by their overall representations of each car such that they used information unrelated to performance to inform their performance judgments to a greater extent than expected.

Finally, although Hypothesis 2b predicted a null result, data suggested that both groups of distracted participants made comparably accurate judgments. In the final analysis, this pattern of results was not completely consistent with either theory, with the exception of the null findings for Hypothesis 2b.

Hypothesis 3, which follows from both UTT and FTT, received moderate support. Those in distraction conditions had marginally more positive attitudes towards overall best car choices compared with poor overall choices. The selection and ranking measures on the other hand, provided support only in the pattern of observed selections.

Discussion of Exploratory Findings

I conducted exploratory analyses to more fully understand the nature of the pervasive null findings. Need for Closure and more specifically, the decisiveness subcomponent were expected to moderate the effects of thought condition. Specifically, UTT predicts that those *low* in decisiveness should exhibit more sensitivity to thought condition; performing relatively more accurately when in the UT condition. Those high in decisiveness should exhibit the DWA effect to a lesser extent.

When looking at decision-accuracy that was moderated by participant decisiveness, two divergent patterns appeared. As decisiveness increased, distracted participants significantly underperformed those who were not distracted on the attitude rating measure. This follows the pattern predicted by FTT Hypothesis 2a. However, it is possible to offer an explanation using a UTT account as well, given the result occurs among individuals high in decisiveness. Importantly, participants high in the need for decisiveness are less likely to deliberate over ambiguous decision-problems and more likely to foreclose prematurely on a judgment. Further, reaching a judgment about the cars serves to satisfy goals for an overall evaluation. Given unconscious thought is goal-dependent (i.e., only occurs in the presence of unfulfilled goals), these participants might feel they have already reached a sufficient judgment of the cars and thus not further pursue a goal to evaluate performance information in particular. In fact, the overall evaluation might seem sufficient as a performance evaluation as well among individuals who like to make decisions quickly. As a result, they will perform poorly on evaluation measures.

As decisiveness decreased, Hypotheses 1a and 1b received strong support. This idea is highly consistent with predictions made by UTT for the measure; that participants who suspend judgments until after the thought period will benefit most from a goal-directed distracted period. Participants in the UT condition were significantly more likely to select the optimal performance car compared with the other 3 conditions and participants in the UT condition also made marginally more accurate performance choices compared with those in the MD condition. Although the ranking and attitude data did not reach significance, all mean and likelihood patterns were consistent with these two hypotheses. Hypothesis 2a received minimal support as distracted thinkers were more likely to correctly select the best performance car, but this difference was likely driven by performance of those in the UT condition. Furthermore, the finding for Hypothesis 1b illustrated above refuted Hypothesis 2b; distracted participants were not equally likely to accurately select the best performance car. Those in the UT condition were more accurate than those in the MD condition. This pattern, entirely consistent with UTT, is difficult to rectify with the FTT interpretation of the effect.

Limitations

Comprehensive data from this experiment failed to conceptually replicate the DWA effect for performance and overall evaluations. Most critically for the present experiment, participants assigned to a standard ‘unconscious thought’ condition did not develop more accurate performance judgments compared with those assigned to other standard conditions of the DWA paradigm (immediate decision, directed thought, and

mere distraction). The current experiment used a similar number of targets (3) and total attributes (48) to previous DWA paradigms. Additionally, the current experiment failed to replicate the effects observed by Bos et al. (2008). Conceptually, the present thesis is quite similar in experimental protocol. In both experiments, participants formed a general impression of target stimuli and were subsequently asked to revise those impressions in line with an updated goal (refine the impression about 1 target type, cars or roommates, and disregard the other). The present experiment differed in that target stimuli consisted of only 1 target type (cars) and the goal revision may require more cognitive flexibility than Bos and colleagues' (2008) paradigm.

There are several possible reasons for these null findings. The first and most obvious is that perhaps differences in comfort with ambiguity led some participants to prematurely make judgments, thus precluding unconscious thought processes from digesting the decision-problem. Specifically, people high in the need for decisiveness may be less likely to benefit from goal-directed distraction. The results were more consistent with UTT for those low in decisiveness, although the data on the whole does not consistently support UTT over FTT.

A second possibility is that both memory processes similar or identical to FTT are at work in parallel to processes described by UTT. In other words, FTT and UTT might not be alternative explanations for the DWA, but rather the memory representations suggested by FTT as well as unconscious thinking processes independently influence judgments. If true, paradigms that directly pit these processes against each other might mask the individual effects of both processes with respect to aggregate judgments. When

should FTT processes predominately influence judgments in the DWA paradigm? When should UTT theory better predict judgments? These are questions that follow from the current experiment and remain unanswered for the time being. Instead of FTT versus UTT, future research may explore the contexts that predict judgments in line with each theory.

Finally, it is possible that the stimuli used in the reported experiment did not create ideal conditions under which to observe the DWA effect. Specifically, the attribute stimuli consisted of characteristic ratings (i.e., 'poor', 'acceptable,' 'excellent'). Interpretation of individual stimuli does not require weighting of any sort as the label serves for its own weight. In aggregate, of course, some integration is necessary for optimal judgments but perhaps not to the extent that previous experimental paradigms have used (e.g., Dijksterhuis, 2004). This procedure was employed to ensure that objective preferences could be determined with certainty, but follow-up examinations should increase complexity of the stimuli to optimize the potential to replicate the effect. In summary, unconscious thought processes might not have had the chance to fully demonstrate the effect relative to other conditions because the stimuli were not sufficiently elaborate.

Similarly, the DWA effect did not emerge for overall judgments. According to UTT, unconscious thought processes should be activated for participants in both distraction conditions. That is, the general impression goal should remain active for both groups over the distraction period (irrespective of whether performance-evaluation goal was added). In this case, mean attitudes and choice data did tend to fall in a pattern

consistent with UTT and FTT, but at the very least the pattern was weak. Specifically, distracted participants trended towards higher attitude preferences for the best overall option over the poorest option. A very small trend towards more accurate selection emerged as well, again with distracted participants slightly more accurate than those who were not as accurate. However, no consistent pattern similarly emerged for ranking data.

As discussed previously, the use of non-orthogonal contrasts may be problematic. Although previous statistical work suggests that planned, theory-based contrasts do not artificially inflate type I error; a full factorial design with two factors (thought and timing of goal revision) would allow for orthogonal theory-based contrasts. This design should be considered for any experimental follow-up.

Finally, the nature of the exploratory findings should be interpreted with caution. Specifically, participants completed several measures that may have moderated the effect (e.g., need for closure and its 5 subscales, need for locomotion, OSPAN, experience with cars, and recognition memory). While expertise and need for closure did indeed follow patterns predicted by UTT (higher experience with cars and those lower need for closure increased the size of the effect), collecting multiple potential effect-moderators nontrivially inflates type I error rates (see Simmons, Nelson, & Simonsohn, 2011). It is thus critical to follow-up this experiment and either conceptually or directly replicate these findings to bolster the strength of conclusions proposed here.

Future Directions

Theoretical work should continue to generate potentially more parsimonious accounts for the effect. Until viable accounts emerge, UTT remains the strongest framework for interpreting the DWA effect. An FTT account for the DWA effect necessarily assumes the untested assumption that post-encoding goals activate or inhibit one gist impression over the other. This is the only possible revision that rectifies the theory with the findings of Bos and colleagues (2008).

Those low in decisiveness specifically appear to exhibit stronger patterns of the DWA effect and this finding may prove a promising avenue for future research. Broadly, this finding is consistent with recent evidence that inducing states of meditative acceptance can increase the availability of unconscious content. Specifically, those who meditated prior to a subliminal priming task were more likely to complete word fragments with subliminally presented words (Strick, Van Noorden, Ritskes, De Ruiter, & Dijksterhuis, 2012). Additionally, meditators were more likely to successfully complete Remote Associates Tests. That individual decisiveness moderates the observed pattern of results is entirely consistent with UTT and simultaneously problematic for FTT. Specifically it is difficult to imagine a situation where low-decisive individuals benefit more (i.e., form more accurate gist representations) from a goal presented prior to distraction compared with a goal presented following distraction.

Although previous work has examined self-reported evaluations of when judgments were formed in the DWA paradigm, the current work suggests that individual

differences in Need for Closure might predict this behavior (and perhaps more reliably; Strick et al., 2010). Specifically, perhaps researchers can experimentally manipulate comfort with ambiguity to increase the likelihood that participants will deliberate unconsciously prior to reaching judgments. Experimental evidence from Kruglanski, Shah, Pierro and Mannetti (2002) suggest that Need for Closure is indeed malleable and sensitive to task demands. If the Need for Closure state is movable, it follows that such manipulation has the potential to increase the rate of DWA effect replication in the lab.

REFERENCES CITED

- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of Social Cognition* (p. 1-40). Hillsdale, NJ: Erlbaum.
- Bargh, J. A. (2011). Unconscious thought theory and its discontents: A critique of the critics. *Social Cognition, 29*(6), 629-647.
- Bekker, H. L. (2008). Making choices without deliberating. *Science, 312*(5779), 1472
- Bos, M., Dijksterhuis, A., & van Baaren, R. (2008). On the goal-dependency of unconscious thought. *Journal of Experimental Social Psychology, 44*, 1114-1120.
- Bos, M. W., Dijksterhuis, A., & van Baaren, R. B. (2011). The benefits of “sleeping on things”: Unconscious thought leads to automatic weighting. *Journal of Consumer Psychology, 21*, 4-8.
- Brainerd, C. & Reyna, V. (1990). Gist is the grist: Fuzzy-trace theory and the new intuitionism. *Developmental Review, 10*, 3-47.
- Damian, R. I., & Sherman, J. W. (2013). A process-dissociation examination of the cognitive processes underlying unconscious thought. *Journal of Experimental Social Psychology, 49*(2), 228-237.
- Dewall, N., Baumeister, R., & Masicampo, E.J. (2008). Evidence that logical reasoning depends on conscious processing. *Consciousness and Cognition, 17*, 628-645.
- Dijksterhuis, A. (2004). Think different: The merits of unconscious thought in preference development and decision-making. *Journal of Personality and Social Psychology, 97*, 586-598.
- Dijksterhuis, A. (2010). Automaticity and the unconscious. In Susan T. Fiske, Daniel T. Gilbert, & Gardner Lindzey (Eds.), *Handbook of Social Psychology* (p. 228-267). Hoboken, NJ: John Wiley & Sons.
- Dijksterhuis, A., Bos, M. W., Nordgren, L. F., & van Baaren, R. B. (2006). On making the right choice: The Deliberation-Without-Attention effect. *Science, 311*(5763), 1005-1007.
- Dijksterhuis, A. & Nordgren, L. (2006). A theory of unconscious thought. *Perspectives on Psychological Science, 1*(2), 95-109.

- Franklin, B. (1772; 1956). Letter to Joseph Priestly. In *Mr. Franklin: A selection from his personal letters*. Whitfield J. Bell & Franklin W. Labaree (eds.). New Haven, CT: Yale University Press.
- Gonzalez-Vallejo, C., Lassiter, G. D., Bellezza, F. S., & Lindberg, M. J. (2008). "Save angels perhaps": A critical examination of unconscious thought theory and the deliberation-without-attention effect. *Review of General Psychology, 12*(3), 282-296.
- Ham, J., van den Bos, K., & Doorn, E. (2007) Lady justice thinks unconsciously: unconscious thought can lead to more accurate justice judgments. *Social Cognition, 27*, 509-521.
- Handley, I. M., Rivers, A. M., Yosai, E. R., & Jackson J. (in progress). Persuasion despite distraction: Automatically encoded information bypasses conscious but not unconscious processing.
- Handley, I. M., & Runnion, B. C. (2011). Evidence that unconscious thinking influences persuasion based on argument quality. *Social Cognition, 29*(6), 668-682.
- Hutchison, K. A., & Balota, D. A. (2005). Decoupling semantic and associative information in false memories: Explorations with semantically ambiguous and unambiguous critical lures. *Journal of Memory and Language, 52*, 1-28.
- Issacson, W. (2007). *Einstein: His life and universe*. New York: Simon and Schuster.
- Jonides, J., Schumacher, E. H., Smith, E. E., Lauber, E. J., Awh, E., Minoshima, S., et al. (1997). Verbal-working-memory load affects regional brain activation as measured by PET. *Journal of Cognitive Neuroscience, 9*, 462-475.
- Kahneman, D. (2011). *Thinking, fast and slow*. New York: Farrar, Straus and Giroux.
- Lassiter, G. D., Lindberg, M., Gonzalez-Vallejo, C., Bellezza, F., & Phillips, N. (2009). The deliberation-without-attention effect: Evidence for an artifactual interpretation. *Psychological Science, 20*, 671-675.
- Keppel, G., & Wickens, T. D. (2004). *Design and analysis: A researcher's handbook* (4th ed.). Upper Saddle River, NJ: Pearson Education.
- Kruglanski, A. W., Shah, J. Y., Pierro, A., & Manetti, L. (2002). When similarity breeds content: Need for closure and the allure of homogeneous and self-resembling groups. *Journal of Personality and Social Psychology, 83*, 542-555.

- Kruglanski, A. W., Thompson, E. P., Higgins, E. T., Atash, M. N., Pierro, A., Shah, J. Y., & Spiegel, S. (2000). To “do the right thing” or to “just do it”: Locomotion and assessment as distinct self-regulatory imperatives. *Personality Processes and Individual Differences, 79*(5), 793-815.
- Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of mind: “Seizing” and “freezing”. *Psychological Review, 103*(2), 263-283.
- Kühberger, A., & Tanner, C. (2010). Risky choice framing: Task versions and a comparison of prospect theory and fuzzy-trace theory. *Journal of Behavioral Decision Making, 23*(3), 314-329.
- Newell, B. R., & Shanks, D. R. (2013). Unconscious influences on decision making: A critical review. *Behavioral and Brain Sciences, 1*-78.
- Newell, B. R., Wong, K. Y., Cheung, J. C. H., & Rakow, T. (2009). Think, blink or sleep on it? The impact of modes of thought on complex decision making. *The Quarterly Journal of Experimental Psychology, 62*(4), 707-732.
- Norranders, T. (1998). *The user illusion: Cutting consciousness down to size*. New York: Viking.
- Payne, J., Samper, A., Mettman, J., & Luce, M. (2008). Boundary conditions on unconscious thought in complex decision-making. *Psychological Science, 19*, 1118-1123.
- Reyna, V. F. (2004). How people make decisions that involve risk: A dual-process approach. *Current Directions in Psychological Science, 13*(2), 60-66.
- Reyna, V. F., & Brainerd, C. J. (1995). Fuzzy-trace theory: Some foundational issues. *Learning and Individual Differences, 7*(2), 145-162.
- Reyna, V. F., & Farley, F. (2006). Risk and rationality in adolescent decision making: Implications for theory, practice, and public policy. *Psychological Science in the Public Interest, 7*(1), 1-44.
- Reyna, V. F., & Lloyd, F. J. (2006). Physician decision making and cardiac risk: Effects of knowledge, risk perception, risk tolerance, and fuzzy processing. *Journal of Experimental Psychology: Applied, 12*(3), 179-195.

- Rivers, A. M., Yosai, E. R., Handley, I. M., Hutchison, K. A., Stefani, K., Close, S., & Riemer, D. J. (2013, January). *Higher working memory does not help judgments reached in the deliberation-without-attention paradigm: Support for an unconscious thought interpretation*. Poster presented at the 14th annual meeting of the Society for Personality and Social Psychology, New Orleans, LA.
- Schneider, W. & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. *Psychological Review*, *84*(1), 1-66.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, *22*(11), 1359-1366.
- Smith, S. M., & Shaffer, D. R. (1995). Speed of speech and persuasion: Evidence for multiple effects. *Personality and Social Psychology Bulletin*, *21*(10), 1051-1060.
- Steimer, A., Fiedler, K., & Hutter, M. (2013). *Unconscious thought in syllogistic reasoning: When deliberation needs attention*. Poster presented at the 14th annual meeting of the Society for Personality and Social Psychology, New Orleans, LA.
- Strick, M., Dijksterhuis, A., & van Baaren, R. (2010). Unconscious-thought effects take place off-line, not on-line. *Psychological Science*, *21*, 484-488.
- Strick, M., Dijksterhuis, A., Bos, M., Sjeordsman, A., van Baaren, R., & Nordgren, L. (2011). A meta-analysis on unconscious thought effects. *Social Cognition*, *29*, 738-762.
- Strick, M., Van Noorden, T. H. J., Ritskes, R. R., De Ruiter, J. R., & Dijksterhuis, A. (2012). Zen meditation and access to information in the unconscious. *Consciousness and Cognition*, *21*, 1476-1481.
- Reyna, V. & Brainerd, C. (1995). Fuzzy-trace theory: Some foundational issues. *Learning and Individual Differences*, *7*, 145-162.
- Reyna, V. (2003). How people make decisions that involve risk: A Dual-process approach. *Current Directions in Psychological Science*, *13*, 60-66.
- Tversky, A. & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*, 1124-1131.
- Unsworth, N., Heitz, R., Schrock, J., & Engle, R. (2005). An automated version of the operation span task. *Behavior Research Methods*, *37*, 498-505.

- Waroquier, L., Marchiori, D., Klein, O., & Cleeremans, A. (2009). Methodological pitfalls of the unconscious thought paradigm. *Judgment and Decision Making*, 4(7), 601-610.
- Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology*, 67(6), 1049-1062.
- Wilson, T. (2002). *Strangers to ourselves: Discovering the adaptive unconscious*. Cambridge, MA: Harvard University Press.
- Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American Psychologist*, 35(2), 123-131.
- Zhong, C., Dijksterhuis, A., & Galinsky, A. D. (2008). The merits of unconscious thought in creativity. *Psychological Science*, 19(9), 912-918.

APPENDIX A

COMPREHENSIVE LISTING OF CAR ATTRIBUTES

Best Overall / Poor Performance

Rated as "Excellent" for braking system
Rated as "Excellent" for highway stability
Rated as "Excellent" in side impact crash tests
Rated as "Excellent" for maintenance record
Rated as "Excellent" in overall value
Rated as "Excellent" in head on crash tests
Rated as "Excellent" in fuel efficiency
Rated as "Acceptable" for exhaust emissions
Rated as "Acceptable" for trunk storage space
Rated as "Acceptable" for warranty coverage
Rated as "Acceptable" for safety in adverse weather
Rated as having a "Poor" sound system

Performance Characteristics

Rated as "Excellent" for horsepower
Rated as "Poor" for top speed
Rated as "Poor" for 0-60mph acceleration
Rated as "Poor" for high speed handling

Total Characteristics

Overall: 8 Excellent, 4 Acceptable, 4 Poor
Performance: 1 Excellent, 3 Poor

Poor Overall / Best Performance

Rated as "Excellent" for braking system
Rated as "Acceptable" for highway stability
Rated as "Acceptable" in side impact crash tests
Rated as "Acceptable" for maintenance record
Rated as "Acceptable" in overall value
Rated as "Poor" in head on crash tests
Rated as "Poor" in fuel efficiency
Rated as "Poor" for exhaust emissions
Rated as "Poor" for trunk storage space
Rated as "Poor" for warranty coverage
Rated as "Poor" for safety in adverse weather
Rated as having a "Poor" sound system

Performance Characteristics

Rated as "Excellent" for horsepower
Rated as "Excellent" for top speed
Rated as "Excellent" for 0-60mph acceleration
Rated as "Poor" for high speed handling

Total Characteristics

Overall: 4 Excellent, 4 Acceptable, 8 Poor
Performance: 3 Excellent, 1 Poor

Neutral Overall/Poor Performance

Rated as "Excellent" for braking system
Rated as "Excellent" for highway stability
Rated as "Excellent" in side impact crash tests
Rated as "Acceptable" for maintenance record
Rated as "Acceptable" in overall value
Rated as "Acceptable" in head on crash tests
Rated as "Acceptable" in fuel efficiency
Rated as "Acceptable" for exhaust emissions
Rated as "Acceptable" for trunk storage space
Rated as "Poor" for warranty coverage
Rated as "Poor" for safety in adverse weather
Rated as having a "Poor" sound system

Performance Characteristics

Rated as "Excellent" for horsepower
Rated as "Poor" for top speed
Rated as "Poor" for 0-60mph acceleration
Rated as "Poor" for high speed handling

Total Characteristics

Overall: 4 Excellent, 6 Acceptable, 6 Poor
Performance: 1 Excellent, 3 Poor