

UNIVERSITY OF CENTRAL OKLAHOMA
Edmond, Oklahoma
Jackson College of Graduate Studies

A Replication, Evaluation, and Criticism of Unconscious Thought Theory

A THESIS

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of requirements for

the degree of

MASTER OF ARTS IN EXPERIMENTAL PSYCHOLOGY

By

KEIA JAMES ATKINSON

Edmond, Oklahoma


2014

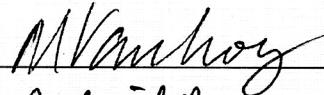
A REPLICATION, EVALUATION, AND CRITICISM OF UNCONSCIOUS
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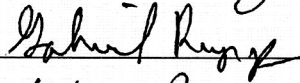
A THESIS


APPROVED FOR THE DEPARTMENT OF PSYCHOLOGY

April 22, 2014


_____ Dr. Robert Mather, Committee Chairperson


_____ Dr. Mickie Vanhoy, Committee Member


_____ Dr. Gabriel Rupp, Committee Member


_____ Dr. Merry Buchanan, Committee Member

Abstract

Modern social psychology has incorporated into the literature a number of theories and effects that were highly counter-intuitive at the time they were introduced, yet have formed a body of literature claiming to demonstrate these effects. Unconscious Thought Theory (UTT) was developed as a novel take on complex decision-making that aligned with folk wisdom advising people to “sleep on it” when tasked with an important choice (Dijksterhuis & Nordgren, 2006). After being exposed to “better” or “worse” attributions regarding a number of stimulus items, participants either immediately made a choice, waited 3 minutes, or performed a distraction task. Participants in the last condition performed significantly better, providing a basis for UTT. Following the publication of the original work, a number of replications and nonreplications have been published attempting to pin down the phenomena, with varying degrees of success. To correct methodological shortcomings in other work, 57 participants rated the importance of a number of attributes that were then attached to a number of choice alternatives, then engaged in one of the three thought conditions. When correcting for participant weights, those in the conscious thought condition performed most in alignment with their stated preferences, but the relationship was insignificant. Without correcting for participant weights the effect of the condition was marginally significant, identical to the original results (Dijksterhuis, 2004). This demonstrates that the UTT is not a good basis to go about understanding human cognition.

Keywords: unconscious thought theory (UTT), decision-making, replication

Dedication

This thesis is dedicated to my wonderful and patient wife Andi Atkinson, my best friend Kristofer Thompson, my mother Dr. Susanne Currier, and to my advisor Dr. Robert Mather. Without their guidance and support none of this would have been possible.

Acknowledgments

I would like to give special thanks to the Office of Research and Grants for making this project possible and providing partial funding. I would like to thank the College of Education and Professional Studies and the Psychology Department for providing me with the opportunity to complete the project.

I would also like to thank Dr. Mather, Dr. Vanhoy, Dr. Rupp, and Dr. Buchanan for providing me with guidance, advice, and encouragement throughout this project.

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Chapter 1: Introduction

Folk wisdom states that when tasked with a particularly difficult problem, it is oftentimes useful to step away from the problem for a short period of time and return to it in order to look at it with “fresh eyes.” More often than not, when faced with a difficult decision regarding life choices, my parents would tell me to “sleep on it,” a strategy I still employ to this day. Similarly, while distracted or accomplishing some task unrelated to the previous problem, people have epiphanies in which it seems as though a light bulb has come on, the solution suddenly illuminated, distinguishing it from the normal cacophony of mental noise. These phenomena are different but interrelated, as both require a period of inactivity or distracted activity for the full force of one’s mental acumen to be put to good use. In these scenarios something is happening for these cognitions to eventually bubble up to the surface of consciousness; were nothing happening it is unlikely that the solution to the problem would be so readily arrived at when it was previously inaccessible. Rarely is this strategy applied to important decisions made in life. Instead, a common refrain offered by teachers, mentors, parents, and life coaches when faced with a difficult choice is to make a list of pros and cons, evaluate and weigh them, compare the totals, and then make a decision.

This type of reasoned cost-benefit analysis may appear to be the most effective way to make a decision, but some doubts have persisted throughout the history of psychology. Early psychoanalytic practitioners, Sigmund Freud included, believed that the unconscious held the keys to the mental kingdom, with decisions from the unconscious being better in a holistic sense (Dijksterhuis, 2004). The concept of the

unconscious has changed significantly over the course of a century, however, as have the implications for decision-making.

Chapter 2: Unconscious-Conscious to Automatic-Controlled

The artificial dichotomization between conscious and unconscious mental life is older than the discipline of psychology, described by Freud in some of his earliest works (1915/1964). As a physician he was primarily concerned with pathology, and his research (a term used broadly in this case) pointed to the unconscious as a primary source of mental anguish. In his description, the unconscious contained all the instincts, drives, and urges that exist outside of awareness yet still affect behavior, and when people experience mental distress the root of the problem often lay within this largely hidden psychic construct (Freud, 1917/1964). Included within the unconscious is the preconscious, existing somewhere between the conscious and unconscious mind. In this paradigm, the unconscious produced the best decisions, and then transferred them into the preconscious where the conscious mind could gain access to it in some disguised form. These decisions could then be uncovered through the psychoanalytic techniques proffered by Freud and others. Modern understandings of the unconscious have changed considerably, as Freudian techniques and analysis gave way to a more scientific understanding of the human psyche. Thus, the unconscious-conscious paradigm was replaced by the more testable automatic-controlled paradigm.

To better differentiate between the natures of the “conscious mind” and “unconscious mind,” psychologists developed new terminology surrounding automatic behavioral phenomena. Too much of the Freudian terminology presupposed the existence of constructs that were unfalsifiable, and thus a new, more specific terminology was required. In place of the “unconscious mind” came automatic processes, initially understood as processes that completely lack conscious control, with the opposite being

controlled processes (Bargh, 1982; Schneider & Shiffrin, 1977). The understanding of automaticity changed over the following years, and began to be evaluated along four dimensions: *awareness*, *efficiency*, *intention*, and *control*. An action is automatic if the individual acting has no awareness he/she is doing it, are doing it with minimal cognitive resources, have no intention to do it, or cannot control it (Andersen, Moskowitz, Blair & Nosek, 2007). The degree and type of automaticity vary based on how highly the action is measured on each of these dimensions, resulting in a continuum of automaticity rather than discrete categories of “automatic” and “controlled” (Bargh, 1994). As a result, a broad section of observable phenomena are explored within automaticity, such as priming effects, stereotype activation, and the more recently posited *unconscious thought effect*.

Chapter 3: Unconscious Thought Theory

For the purposes of this model, conscious thought is defined as “cognitive and/or affective task-relevant processes one is consciously aware of while attending to a task,” whereas unconscious thought “refers to cognitive and/or affective task-relevant processes that take place outside conscious awareness” (Dijksterhuis, 2004). This distinction between the two types of thought comprises the conscious-unconscious principle. Although unconscious mental processes affect decisions, memory, and appraisals, these processes are generally only capable of performing relatively simple cognitive tasks (Greenwald, 1992). Alternatively, Unconscious Thought Theory proposed a new type of automatic process that could effectively register and respond to stimuli in an efficient, bias-free manner without any conscious involvement. Conscious thought can also be thought of as thought with attention, whereas as “unconscious thought” is thought without attention (Dijksterhuis & Nordgren, 2006). Within this understanding is the core component of Unconscious Thought Theory: that what we call conscious processing is simply processing that is occurring constantly that we are then attending to, a spotlight on a running stream of consciousness. Unbound by the capacity and schematic constraints of conscious thought, unconscious thought would be able to “naturally” weigh the relative importance of far more information than conscious thought and arrive at a normatively better decision.

To illustrate this, a number of methodologically similar experiments compared the effects of conscious thought and “unconscious thought” when participants were faced with complex decision-making tasks (Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Nordgren & Dijksterhuis, 2006). Participants viewed a number of

attributes about four different objects, among which one was a normatively better option. If each choice-alternative had 12 attributions, one object would have 4 negative attributions and 8 positive attributions, one would have 6 negative and 6 positive attributions, and one would have 8 negative attributions and 4 positive attributions. A pilot study examining the attributions used eliminated attributions with extreme valence, leaving one option objectively better than the other three. Post hoc analysis further validated this assertion by overall examining preference probabilities for presented alternatives (Dijksterhuis, 2004). Participants were either asked to make a decision immediately after viewing stimulus and without deliberation, consciously deliberate for a number of minutes and then make a decision (conscious thought condition), or perform a distraction task for a number of minutes and then make a decision (“unconscious thought” condition).

With little variation, individuals in the immediate decision condition performed worst, with those in the conscious thought condition doing better, and the “unconscious thought” condition performing the best, as measured by the percentage of the sample that chose the normatively best alternative (Dijksterhuis, 2004; Dijksterhuis, Bos, Nordgren, & van Baaren, 2006; Nordgren & Dijksterhuis, 2006). Proponents claim this demonstrates processing occurred without attention, thus freeing the mind to make determinations based on objective observations rather than expectancies created in conscious thought. The ability to make better decisions following a period of distracted deliberation was termed the Unconscious Thought Effect (UTE, formerly the deliberation-without-attention effect). The five additional principles of Unconscious Thought Theory followed to describe the phenomena observed: the capacity principle, the

bottom-up-versus-top-down principle, the weighting principle, the rule principle, and the convergence-versus-divergence principle (Dijksterhuis & Nordgren, 2006). These principles describe a difference between the functioning of conscious and unconscious thought, and each principle has a number of corollaries.

The Capacity Principle

The capacity principle states that conscious thought can contain a limited quantity of information (Dijksterhuis & Nordgren, 2006). Working memory, a proxy for the capacity of conscious thought, holds approximately seven items, +/- two (Miller, 1956). Although follow-up research has revised and clarified the capacity of working memory (Schiffrin & Nosofsky, 1994; Cowan, 2001), the very fact that it is limited is enough to demonstrate that conscious thought has a capacity significantly lower than the total volume of input we receive from the world. This limited capacity causes errors in judgment when engaging in decision tasks, and has been observed to have a negative impact on the ability of individuals to make unbiased, accurate assessments (Wilson & Schooler, 1991; Kahneman, 2003). Decision-making theories have long had to take into account the limited quantity of accessible information in order to predict decision-task outcomes, with the rationality of decisions bound by the quantity and the quality of information that created those judgments. As a result, models of bounded rationality have observed that decisions are often made intuitively (Kahneman, 2003), but from where does this intuition arise?

For proponents of UTT, “unconscious thought” does not have the same capacity limitations that often preclude optimal outcomes from coming to bear. Individuals exposed to 48 attributions about four apartments in the distracted-deliberation condition

were able to sort and cluster information in a way that allowed more correct decisions to be made (59%) than either the conscious-deliberation (47%) or immediate-choice (36%) conditions (Dijksterhuis, 2004). As the number of attributions is far more than the capacity of any individual's working memory, the higher number of correct decisions resulted from utilizing the entirety of the evidence rather than just the snapshot that conscious thought can view. If "unconscious thought" has the same capacity limitations as conscious thought, participants would have performed equally in the conscious thought and "unconscious thought" conditions.

The Bottom-Up-versus-Top-Down Principle

The bottom-up-versus-top-down principle describes conscious thought as working schematically, from a top-down perspective, with "unconscious thought" working aschematically, from a bottom-up perspective (Dijksterhuis & Nordgren, 2006). When cognitive resources are constrained, individuals must rely more upon schemas and the expectancies those schemas generate to make judgments about the world (Fiske & Neuberg, 1990; Macrae, Milne, & Bodenhausen, 1994). Given that cognitive resources in conscious thought are necessarily constrained relative to unconscious thought (as per the capacity principle), individuals engaged in conscious thought are more likely to employ biased judgments that emphasize the content of a preexisting schema over the content of presented stimuli. When individuals engaged in a person-memory task were presented with instructions designed to prime stereotype activations when evaluating another individual, conscious thought produced more biased judgments than did distracted deliberation (Dijksterhuis & Nordgren, 2006). According to UTT, the

information in integrated using bottom-up processes absent schematization, resulting in a more objective appraisal based on naturalistic weighting schemes.

The Weighting Principle

The weighting principle claims that the unconscious is able to weight the relative importance of informational stimuli in an efficient objective manner, in comparison to conscious thought that produces more biased judgments (Dijksterhuis & Nordgren, 2006). The bottom-up-versus-top-down principle tells us that conscious thought is schema-guided, and this process generates new cognitions that are consistent with schemas, blocks cognitions inconsistent with schemas, and reinterprets stimuli or cognitions to make them more consistent with schemas (González-Vallejo, Lassiter, Bellezza, & Lindberg, 2008). “Unconscious thought” is not schema-guided, and as a result is able to avoid the expectancies that these schemas create. Participants tasked with selecting among potential roommates first rated the importance of various attributes, with the desirability of each roommate option determined by the difference between the sum of the importance ratings for positive attributions and the sum of the importance ratings for negative attributions (Dijksterhuis, 2004, Experiment 3). Participants in the “unconscious thought” condition were more likely to choose the roommate that reflected their initial subjective weights than in either the conscious-deliberation condition or the immediate-choice condition, but differences between conditions were not statistically significant. In spite of this, the authors state that “unconscious thought” improves participants’ ability to make decisions in line with their personal system of weights, with conscious-deliberation having no such effect. Unfortunately, the correlations of each of

the conditions were not statistically significant from one another, resulting in weak experimental support for this principle.

The Rule Principle

The rule principle describes conscious thought as being able to follow strict rules and be precise, whereas “unconscious thought” is far more associative in nature (Dijksterhuis & Nordgren, 2006). Experimental support for this principle offered by some proponents of UTT encompasses two studies, one in which participants were asked to perform an arithmetic task in conscious and distracted conditions and one in which participants were exposed to valenced terms (e.g. “bad”) and matched negations of the same term (e.g. “not bad”) (Betsch, Plessner, Schwieren, & Gütig, 2001; Deutsch, Gawronski, & Strack, 2006). Participants in both studies were determined to have been unable to follow the rules that dictated each process, as participants used neither arithmetic rules nor the rules of negation in the production of an output. Instead, they arrived at rough estimates, and did not encode negated terms, encoding the non-negated terms instead. This reportedly demonstrates that “unconscious thought” cannot deal with propositional rules, such as those found in arithmetic.

Although participants in studies testing Unconscious Thought Theory also viewed negated attributions, participants received instructions indicating they would be evaluating and then selecting among a number of alternative options (Dijksterhuis, 2004). The goal-mediated nature of the task purportedly produces the outcome, as unconscious thought is an automatic process initiated by relevant goal-states that activate habitually used processing systems (Aarts & Dijksterhuis, 2000). Thus, unconscious thought does not use rules by default, instead activating only the rules required to accomplish the goal.

In this way, the unconscious conforms to rules without using them (Dijksterhuis & Nordgren, 2006).

The Convergence-Versus-Divergence Principle

The convergence-versus-divergence principle states that conscious thought is focused and convergent, while “unconscious thought” is more divergent (Dijksterhuis & Nordgren, 2006). Proponents of UTT attribute the incubation effect, a phenomenon in which participants produce more creative responses to a problem after a period of time in which the participant is distracted, to the divergent properties of “unconscious thought,” and offer some additional evidence regarding its productive nature. The incubation effect occurs in participants performing the Remote Association Test (Smith & Blankenship, 1991). The Remote Association Test exposes participants to three words (e.g. arm, coal, peach) that can be combined with a fourth word (e.g. pit) so each forms a common word or phrase (e.g. armpit, coal pit, peach pit). Participants in the incubation condition, in which they performed a distraction task prior to answering, were significantly more likely to produce the correct fourth word than those asked to make an immediate decision. This result is due to *functional fixedness* present in the immediate choice condition that fades in the incubation condition, known as the forgetting-fixation hypothesis (Smith & Blankenship, 1989; Smith & Blankenship, 1991). Proponents of UTT view incubation effects as demonstrative of “unconscious thought,” and a number of experiments show how participants experiencing a distracted deliberation condition produce a greater number of novel answers in comparison to the conscious thought condition (Dijksterhuis & Meurs, 2006). In experiments examining the incubation effect, effect sizes are fairly small (.08), but with meta-analysis indicating an effect (Sio & Omerond, 2009). It is

never explained how the tasks presented in experiments explicitly attempting to explore UTT are functionally different from examinations of fixation, a known phenomenon. However, for proponents of UTT this confers upon “unconscious thought” the property of divergence, in comparison to the convergence seen in conscious thought.

Investigators have performed multiple replications and meta-analyses of Unconscious Thought Theory since the theory was published in 2006. Many of these replications have utilized the same stimuli as the work of Dijksterhuis et al., while others have made modifications to improve the strength of the conclusions that can be drawn or test individual principles of the theory.

Chapter 4: Replications and Meta-Analyses

The foundation of any good science is replication, and novel theories generated by social psychology are no exception. Daniel Kahneman's 2012 letter urging a "daisy-chain of replication" for social priming effects applies to all observable phenomena (D. Kahneman, personal communication, September 26, 2012) and Unconscious Thought Theory has been studied a number of times in an effort to replicate the original results. All replications used approximately the same methodology, with participants instructed to make a choice after viewing some information regarding their options. Information was presented in random order (e.g. Dijksterhuis et al., 2006), blocked per choice option (e.g., Ham, Van den Bos, & Van Doorn, 2009), or simultaneously (e.g., Newell, Wong, Cheung, & Rakow, 2009, Experiment 2), for a period of time. Some experiments asked participants to rate options rather than select amongst them (e.g., Lerouge, 2009). Following the information presentation participants make an immediate choice, engage in conscious thought, or engage in "unconscious thought." In the immediate choice condition, participants immediately rate or choose among the options available. In the conscious thought and "unconscious thought" conditions participants were given a period of time to either think carefully about their decision or performed a distraction task for the same period of time.

A meta-analysis of initial replications were not encouraging, with overall results indicating little to no effect of unconscious thought on normative decision making capacity (Acker, 2008). A larger meta-analysis examining 92 studies of Unconscious Thought Theory claimed to confirm the existence of the unconscious thought effect, though 66% of the variability in outcomes resulted from methodological differences

between the various studies (Strick, Dijksterhuis, Bos, Sjoerdsma, & van Baaren, 2011). This analysis noted that participants in a *configural* mindset, in which they are prepared to make an evaluation, are particularly sensitive to UTE. This is in contrast to participants in a *featural* mindset, in which participants identify positive or negative attributes rather than making evaluative judgments about the sum of those attributes (Strick et al., 2011). Thus the mindset, as dictated by the activated goal-states, results in the outcome. In contrast, a Bayesian meta-analysis was performed, in which a likelihood ratio (Bayes factor) was developed by comparing the probability of the data given the null against the probability of the data given a distribution of plausible alternate hypotheses (Newell & Rakow, 2011). This analysis clearly supported the null hypothesis, indicating no effect of “unconscious thought” on outcomes. These meta-analyses, in addition to a variety of other published works, highlight methodological and theoretical shortcomings in the original studies.

Chapter 5: Methodological Problems with Studies of Unconscious Thought Theory

Original research identifying and exploring Unconscious Thought Theory exposed participants to attributes (e.g. “Apartment ____ is fairly large”) surveyed to not have an extreme valence (Dijksterhuis, 2004, p. 589). Valence, however, is not the only attribute variable that requires consideration, as participants in the survey indicated that certain attributes were more important than others: specifically, cost and size (p. 589). Thus, attributes used were of unequal weight, and the relative weighting of these attributes has not been validated cross-culturally. Contexts surrounding housing availability and preference vary tremendously even between participants, so it stands to reason that individual preferences are likely to dictate the system of weights attached to attributes. Replications using the original experimental materials avoided re-surveying sample populations to cross-validate claims of normative objectivity, instead using the same type of post-hoc decision analysis in the original work. As a result, replication or nonreplication of effects could simply be due to geographic trends in preference, rather than actually reflecting something about UTT. This prevents the comparison of causal explanations, and complicates the meta-analytic process. Analysis of participant choice within the original work and replications determined individuals did differentiate between the “best” and “worst” options according to a simple accounting of good/bad attribute ratio (Dijksterhuis, 2004); group mean preference paired with experimenter-derived normative quality, however, is a poor way to measure the best decision among a set of alternatives. To combat this, participants in a more recent replication weighed attributes in importance prior viewing attributions (Newell et al., 2009). All participants, regardless of condition, selected choices that conformed to their weighted attribute ratings,

producing a null effect. In addition to using flawed stimulus materials, the effect size of the Unconscious Thought Effect has not been compared within a single sample population across different types of evaluative objects.

One unexplored aspect of UTT is whether or not the same sample has similar effect sizes across stimuli-types. Although investigators have used different stimulus materials in some of the replications, the analysis of these replications have not measured the effect size of the UTE within the same subject pool. Given that proponents of UTT attribute 2/3 of the variability in replication outcomes to methodological differences between the studies (Strick et. al., 2011), holding a subject pool and methodology constant across stimulus-types could ferret out any potential interactions or confounds. No differences in effect size across stimulus-types are expected if the process was functioning identically irrespective of stimuli-type, but this premise has never been tested. As it turns out, there are many untested testable corollaries generated by UTT that have largely gone ignored by proponents of the theory. This includes comparing effects attributed to UTE and those attributed to competing theories.

Studies of UTT are unable to differentiate between the “Unconscious Thought Effect” and competing theories of cognition and perception that had been previously developed to explain automatic processes. Using the example of the convergence-versus-divergence principle, the ability to generate novel responses after performing a distraction task has been explored by researchers studying insight and creativity, and occurs in approximately 75% of experiments examining incubation (Dodds, Ward, & Smith, 2003). This has been termed the *incubation effect*, and is known to increase in response to how long incubation lasts and is more potent when during incubation a low-cognitive-demand

task is performed (Sio & Ormerod, 2009). Although proponents of Unconscious Thought Theory have acknowledged that other theories explain such phenomena, they posit an alternative without detailing why the competing theory is insufficient. This is in contrast to modern models of incubation effects, such as the forgetting-fixation hypothesis (Smith & Blankenship, 1989) and the returning-act hypothesis (Segal, 2004), both of which avoid assuming unseen mental activity while accounting for observed results. The issue of importance here is that studies of UTT in no way differentiate between competing explanations incubation effects, while other work within the domain of creativity has.

One final issue with the methodology employed by proponents of Unconscious Thought Theory is in the reporting of statistical significance. Even in landmark studies, there was no statistically significant difference between the “conscious thought” and “unconscious thought” conditions (Dijksterhuis, 2004, Experiments 1 and 2), all three conditions (Dijksterhuis, 2004, Experiment 3), goal-dependent and non-goal dependent conditions (Bos et al., 2008), and polarization and non-polarization conditions (Dijksterhuis, 2004, Experiment 4). Significant correlations are often not significantly different from one another (Dijksterhuis, 2004, Experiment 3), findings that are then referred to in passing in follow-up work without sufficient explanation (Dijksterhuis & Nordgren, 2006, p. 100). In fact, proponents go so far as to quote the different “correct choice” percentages without reporting the lack of statistical difference between the correlations (Dijksterhuis & Nordgren, 2006, p. 97). This sort of ideological run-around creates the appearance of intentional obfuscation, especially when investigators claim the inability to replicate original results is due to subtle differences in experimental methodology.

Chapter 6: Theoretical Critiques of Unconscious Thought Theory

Although the conscious-unconscious distinction is one with historical roots, some modern theories of judgment and decision-making dichotomize mental processes by modeling affect and cognition as dual processes in which affect has primacy (Zajonc, 1998), while other models dichotomize reasoning processes into rule-based and associative, with the former being controlled and the latter automatic (Sloman, 1996). That said, any dichotomization must be viewed as purely metaphorical, as the distinctions drawn between processes is largely artificial. This theory effectively uses attention to bifurcate the conscious and unconscious mind, a paradigm that has largely fallen out of favor among experts in the field (e.g. Shiffrin, 1997, in Gonzalez-Vallejo et al., 2008). Encapsulating the fuzzy dichotomy between conscious and unconscious via attention is the cocktail-party problem, in which one can be in a large crowd of individuals and be oblivious to the conversations of others yet immediately attend when one hears an important or relevant piece of information, such as one's own name (Cherry, 1953). This demonstrates that nonattended stimuli can be processed consciously, preventing hard distinctions from being drawn between unconscious and conscious processing. As the unconscious-conscious principle clearly delineates two modes of thought (conscious and unconscious), it leaves no room for continuum or parallel processing models that developed within the cognitive literature (Gonzalez-Vallejo, et al., 2008). This principle is not the only one that reflects an extremely narrow and dated reading of the literature.

The capacity principle also appears at first glance to be based on an old understanding of research into information processing that relies upon strong conscious/unconscious delineation. Proponents of UTT very quickly move between a

recitation of Miller's research, which initially defined the 7 ± 2 capacity rule for working memory in reference to chunks, rather than information units, to a calculation of total information processing capacity in terms of bits (Dijksterhuis & Nordgren, 2006, pp. 96-97). They derive this calculation from seemingly nowhere, and footnote it so it is not "taken too literally." Literature contained within the forgetting-fixation hypothesis is then used to bolster this principle without in any way referencing the explanation originally used to explain the observations in the original research (e.g. Wilson & Schooler, 1991, in Dijksterhuis & Nordgren, 2006, p. 97). Instead, an alternate hypothesis is put forward without explaining any sort of difference. Ignoring the implications of prior research seems to be a recurring theme within the work of UTT theorists, and reflects analysis the weighting principle.

The weighting principle has similar issues ignoring the implications of research conducted previously. First, a number of experiments used as evidence for the weighting principle presuppose a natural system of weights that is "interfered with" by conscious thought (Dijksterhuis & Nordgren, 2006, pp. 99-100). They never experimentally validate the natural system of weights, and on its face this presents an *a priori* assumption on the part of the theorist. To avoid relying on this assumption, certain methodologies allow participants to express their idiosyncratic weighting system by explicitly rating the importance of various attributes. They selected choices that conformed to their attribute weights irrespective of decision-method (Dijksterhuis, 2004, Experiment 3; Newell et al., 2009). If anything, observing UTE could simply be the result of a particular set of preferences contained within the sample population using a particular set of stimuli.

When subjective systems of weighting are controlled for, any Unconscious Thought Effect completely disappears.

The bottom-up-versus-top-down principle deals with the unconscious mind's ability to engage in schematized thinking. Proponents of UTT claim that, over time, unconscious processes slowly integrate information to form an "objective" holistic judgment (Dijksterhuis & Nordgren, 2006, p. 98). This is in contrast to the conscious mind's much faster schema-guided top-down system of processing. Top-down processing is discussed as equivalent to schema-guided processing, bottom-up to aschematic processing. However, similar to the unconscious-conscious distinction, systems of processing typically use both top-down and bottom-up processes to complete an action. Categorization, by its nature a system of schematization, uses both top-down and bottom-up systems to go about processing information (Barsalou, 1992). This is the case with the vast majority of cognitions; top-down and bottom-up processes converge to form a judgment, and use both process types constantly. Strict delineations between the two process types do not exist, creating questions about the assumption underlying the principle. A corollary of the bottom-up-versus-top-down principle is that those in the unconscious thought condition would produce more polarized views, and an experiment looking for polarization affirms this prediction (see Dijksterhuis, 2004, Experiment 4 in Dijksterhuis & Nordgren, 2006, p. 100) even though null results were obtained (Dijksterhuis, 2004, p. 594). Given that participants across a number of experiments produce more polarized evaluations of stimulus objects after engaging in conscious thought, rather than performing a distraction task, this is expected (Chaiken & Yates, 1985; Lassiter, Apple & Straw, 1996; Tesser, Martin & Mendolia, 1995). Due to the vast

quantity of empirically supported theoretical research that directly contradicts this principle, this principle is likely not a replicable effect.

The rule principle claims activated goal-states determine whether or not rules are conformed to or not, drawing a distinction between conforming to and actively following rules (Dijksterhuis & Nordgren, 2006, p. 101). This doesn't explain why other rule-based thought cannot occur when relevant goal-states are activated and rules need to be used (e.g. arithmetic). In different works, UTT proponents state that arithmetic rules cannot be used, citing research examining the effect of distraction tasks on ability to solve arithmetic problems (e.g. Betsch et al., 2001 in Dijksterhuis & Nordgren, 2006). To test this principle, participants were exposed to stimulus digits paired with a subliminally presented instruction to add or subtract (Ric & Muller, 2012). Participants were able to identify digits that corresponded to the subliminal instructions significantly faster than those in the control condition, in which no instruction was provided. In direct contradiction to the rule principle, automatic processes can use proposition-based reasoning. Moreover, the corollaries of the rule principle are not consistent with the experimental methodology employed by proponents of UTT. Studies in which participants are demonstrated to be unable to encode negated attributions are used to demonstrate the inability of unconscious thought to follow rules more generally with the "not" modifying acting as a rule (Deutsch et al., 2006). In these experiments, participants simply encode negated terms as non-negated versions of the same terms, flipping the valence of the attribution. The absence of this effect in the UTT paradigm is explained away with the statement that the unconscious can process negated attributions as long as they are encoded properly, and proper encoding requires the setting of a relevant goal-

state prior to stimulus exposure or prior to unconscious thought itself. Unfortunately, this claim is wildly divergent from results arrived at in the studies used to support it, as participants in both the goal-directed and non-goal-directed conditions performed with equal efficacy on the decision task (e.g. Bos, Dijksterhuis, & van Baaren, 2008). The rule principle simply doesn't make sense, nor is it supported by a comprehensive view of the relevant literature and studies. In contrast, the convergence-versus-divergence principle is a phenomena supported by the literature, but again the causal explanation varies wildly from established precedent.

The convergence-versus-divergence principle, similar to the capacity principle, is based on a dated understanding of research, this time in the domain of decision-making and judgment. Experiments studying functional fixedness have demonstrated the effect of distraction on creative output, describing the precise phenomenon attributed to the power of unconscious thought. Fixation is defined as something that blocks the successful completion of cognitive operations, in this case the generation of novel output or insight (Smith, 2003). When individuals are faced with a problem, they will engage a solution strategy that is determined to be appropriate for the task at hand. Over time individuals become habituated to certain types of problems that are paired with certain types of strategies; to conserve resources and act in an efficient and timely manner, preexisting processes attenuated to past experiences are employed. These preexisting processes can be referred to as a *mental set*, and they contain within them a number of implicit assumptions regarding the nature of the problem at hand (Smith, 2003). As mental sets are attenuated to particular problem types, activating an inappropriate mental set will result in inappropriate solution strategies. Because the selection of a mental set

and the judgments regarding its contextual appropriateness are entirely implicit rather than explicit, fixation on a particular strategy can be difficult to explicitly identify and correct for. A distraction task, however, can break the fixation and allow for an alternative solution strategy to be used (Dodds & Smith, 1999; Smith & Blankenship, 1991; Smith & Vela, 1991). Instead of relying on unproven constructs like “unconscious thought,” however, the divergence observed in tests of UTT is simple the result of a mental set shift occurring as a result of the distraction task. Rather than something actively happening (unconscious thought) something is no longer happening (fixation). The scope of the current study hopes to eliminate some of the methodological problems and inconsistencies within explorations of Unconscious Thought Theory.

Chapter 7: Scope of Current Study

Study 1 measures the extremity of the valence of the attributions used in Study 2. Participants will be making decisions based on different sets of stimuli, so if the effect of the decision-making condition is to be examined the stimuli must be treated by participants as functionally identical. Study 2 seeks to replicate and extend the effects observed in the Unconscious Thought Theory paradigm while improving experimental methodology and correcting for potential confounds to internal validity. In opposition to most previous replications, normative judgments of “worst,” “average,” and “best” derived from positive/negative attribute ratios have been abandoned in favor of judgments based on subjective attribute importance provided by participants. Whether individuals are choosing among apartments, cars, or roommates, there can be no objective system of weights that account for the variety of preferences that exist. It is easy to see how various attributes, e.g. the amount of space, could vary wildly in importance depending on the personal or geographical history of the participant. An individual who grew up in a rural area could very well be motivated by space concerns to the exclusion of others while a poor individual could be motivated first by cost, and this sort of variability in preference prevents strong conclusions about UTT from being drawn. In an effort to prevent this from confounding results, participants will engage in a weighting exercise prior to stimulus exposure similar to a well-conducted replication (Newell et al., 2009, Experiment 2). Summed rankings reflect a personal system of weights, and choice outcomes in a number of object-type and decision-method conditions can be directly compared to stated preferences.

The primary issue of importance is in determining whether or not the protocol implemented is sufficiently similar to an insight problem to benefit from incubation effects. Predicted outcomes are derived from research on incubation effects (Sio & Omerond, 2009). It is predicted that those in the “unconscious thought” condition will be more likely than the conscious thought or immediate decision conditions to select an option that conforms to their system of weights. Fixation ought to occur in the conscious thought condition thus reducing the quality of judgment, with the immediate choice condition faring worst due to reliance on the most recent attributions. A distraction task allows decay to occur, and thus prevents fixation from constraining evaluative capacity. Because these effects are expected to be robust to object-type, no interaction is predicted between the object being evaluated and the decision method being used. Meta-analysis of incubation effects research produced a mean effect size of .08, and thus sets the basis for the prediction of the effect size in this study. Alternatively, if the protocol is not sufficiently similar to an insight problem, null effects will be obtained. This would mirror results observed elsewhere (Dijksterhuis, 2004, Experiment 3; Newell, et al., 2009, Experiment 2).

Chapter 8: Study 1

Method

Participants

A total of 39 participants were used to validate the stimulus items to be used in Study 2. Participants were gathered from general psychology courses at the University of Central Oklahoma and received partial course credit for completing the experiment.

Materials and Procedure

The experiment was hosted online using Qualtrics, an online survey software developed for the social sciences (Qualtrics, Provo, UT), and participants signed up for the experiment using Sona System. Participants were informed that they would be viewing a series of statements about different objects, and that they would be asked to rate how positive or negative the statement is on a 1-10 scale, with 1 being extremely negative and 10 being extremely positive. Participants viewed 24 attributions in counterbalanced blocks of 12 for 3 different object categories, rating the extremity of valence on a 1-10 Likert-type scale. All attributions rated by participants can be found in Appendices A-B.

Results and Discussion

Because Study 2 will be using three different sets of stimuli pertaining to different types of objects to determine the effect of different decision-making conditions on participant choice, it must be ensured that participants view the relative importance and valence of each set of attributions equally. If the stimuli are to be used interchangeably, they must largely be treated as functionally identical. Object category (apartment, car, or

roommate) was used as the categorical independent variable. Attribution ratings were summed for each object category generating a continuous dependent variable. A one-way analysis of variance (ANOVA) was run, and the assumption of homogeneity of variance was met. It was found that stimulus condition had a marginally significant effect on summed participant ratings, $F(2, 109) = 3.05, p = .051, \text{partial } \eta\text{-squared} = .053$. Pairwise comparisons demonstrated the summed rating for statements about apartments ($M = 128.24, SD = 10.40$) was significantly lower than the summed rating for statements about potential roommates ($M = 134.05, SD = 10.55$). This is, in a way, expected, as evaluations regarding other individuals are likely to be slightly more forgiving than evaluations of mere objects or potential living quarters. There were no other significant differences. While these results are not perfect, the relatively small effect size (accounting for ~5.3% of variance) and the overall lack of statistical significance in the model indicate that the stimulus items can be treated as functionally identical.

Chapter 9: Study 2

Method

Participants

A total of 57 participants were gathered from general psychology courses at the University of Central Oklahoma and received partial course credit for completing the experiment. A total of 4 participants with incomplete weightings were excluded from the second analysis but not the first.

Materials and Procedure

The experiment was hosted online using Qualtrics, an online survey software developed for the social sciences (Qualtrics, Provo, UT), and participants signed up for the experiment using Sona System. Prior to being exposed to the stimulus, participants will rank the importance of various attributes in relation to a decision among a number of object-alternatives. The sum of the positive attributes for a particular object-alternative will be used to rank the relative desirability of each object-alternative that is presented. The dependent variable is a dichotomous variable derived from an analysis of whether participants within a decision condition selected an object-alternative that conformed to the participant's personal weighing system. An additional analysis will be used to determine the relative probability of participants selecting the "normatively better option," the same analysis performed in a variety of studies examining UTT (Dijksterhuis 2004, Dijksterhuis et al., 2006).

After the attribute importance ranking task, participants began the immediate choice condition paired with the apartment object-type, and were randomly exposed to 48 stimulus items containing attributions for each of the object-alternatives. Participants

were told they will see attributes of four apartments and will need to form an impression to make a choice later. The apartments were labeled with atypical characters as opposed to numbers or letters to avoid any potential order effects. Apartments were described using positive and negative phrases (e.g., “above average size,” “no dishwasher”). Positive and negative attributes of each apartment will be presented to participants one at a time for four seconds each, with 48 attributes randomly presented in total. Participants in the original studies were expected to select among apartments with a ratio of good/bad attributions of 3/9, 6/6, or 9/3, with a higher good/bad ratio indicating a “normatively better choice” (Dijksterhuis, 2004). Objections have been raised questioning the existence of truly normative standards of assessment, and to correct for this participants will instead be comparing the likelihood of a particular choice to how well it conforms to the weighting system identified at the beginning of the experiment. After being exposed to the attributions participants were immediately asked to make a selection among the apartments.

Following the immediate choice condition, participants experienced the conscious-deliberation condition paired with the car stimulus items. Participants randomly viewed a total of 48 attributions for 4 seconds each regarding a number of vehicles (e.g. “Hatsdun has good gas mileage,” “Dasuki has no cupholders”). After exposure participants were given three minutes to “very carefully think” about each of the four cars. The time remaining was displayed on the computer screen with no other items; after the required time had elapsed participants selected the car they considered best.

In the “unconscious thought” condition, participants were told to form an impression of a potential roommate and then randomly viewed 48 stimulus items for 4 seconds each regarding a that person (e.g. “Roommate A has interesting friends,” “Roommate D sometimes leaves dirty dishes in the sink.” After exposure, participants performed a neutrally valenced sentence unscramble task (Vess, 2012, Appendix F) for 3 minutes. Participants were presented with a series of 5 words out-of-order, and were instructed to use 4 of those 5 words to form a sentence. After participants worked on the task for three minutes, they were asked to determine which of the roommates they preferred. All attributions for each choice alternative are listed in Appendices C-E.

Results

Two sets of results were analyzed to determine whether the independent variable decision-condition (immediate, conscious thought, unconscious thought) had a significant impact on participant selection. In an attempt to replicate the original results (Dijksterhuis, 2004), decisions were analyzed to determine whether or not participants selected previously identified “normatively better options.” These were options with the greatest “good attribution” to “bad attribution” ratio. A dependent variable called “match” was created, and if participants selected the “normatively best option” it was coded as a 1, whereas if they selected any other option it was coded as a 0. An ANOVA revealed a marginally significant effect of condition on decision, $F(2, 164) = 2.42, p = .091$, partial eta-squared = .029, observed power = .48. Upon performing Tukey pairwise analyses, a marginally significant difference was identified between the conscious thought and unconscious thought condition, $p = .075$, with those in the unconscious

thought condition slightly more likely to select the experimenter-selected option ($M = .60$, $SD = .49$) than those in the conscious thought ($M = .39$, $SD = .49$) condition.

In the second set of analyses, participant decisions were compared not to the experimenter selected “normatively better option,” but rather took into account the system of personal weights identified in the first part of the experimental procedure. Weighted values were either added or subtracted from an “object index” that represented the relative desirability of each option. In each category the object indexes were compared to one another, with highest object index indicated the best alternative for each participant. A new variable, “pref_match” was created as the dependent variable. If a participant selected an option that coincided with the highest object index value, “pref_match” was coded as a 1. If they selected any other option it was coded as a 0. A 3x1 ANOVA was run, and once individual preferences were taken into account the relationship between decision condition and the outcome non-significant, $F(2, 158) = .97$, $p = .38$, observed power = .22. Participants in the conscious thought condition were more likely to select options that coincided with their pre-stated weighting schemes ($M = .63$, $SD = .49$) than either the immediate choice condition ($M = .51$, $SD = .50$) or the unconscious thought condition ($M = .52$, $SD = .50$), but the differences were not statistically significant.

Discussion

The analyses above are revealing, precisely mirroring the foundational work in UTT while considerably reducing its significance. If participants’ individual weighting schemes are ignored, they are marginally more likely to select the experimenter-identified “best option” in the “unconscious thought” condition than they were in the conscious

thought condition. This is in line with the original experiments identifying and exploring UTT – differences specifically between those two conditions with a small effect size (Dijksterhuis, 2004; Dijksterhuis & Nordgren, 2006). This, however, is not evidence for a “natural” system of normative judgment. While there was variation between conditions, that variation was statistically insignificant and only serves to indicate mean preferences differ among the general population, a set of “normative” preferences that cannot account for the decisions individuals make.

Upon taking into account individualized weighting schemes, all significance in favor of the unconscious thought effect disappears. This is also in line with research testing UTT after controlling for individual systems of weighting (Newell et al., 2009). Moreover, by keeping the participants consistent between conditions there is compelling data from Study 2 to suggest a potential benefit to purposeful conscious thought in evaluating options, though the extent of the effect would need to be further explored in future studies. Regardless, effect sizes will likely be small enough to state simply that people, for the most part, make choices that are largely consistent with their stated preferences. If given more time to evaluate the options they are given, participants may be more likely to make a decision that aligns with the option that best suits them. While neither a surprising nor groundbreaking discovery, the result is intuitive, and does not require the acceptance of a number of hypothetical constructs underlying UTT, such as: clearly delineated dual-process models of cognition, a “hidden unconscious” akin to an iceberg, “naturalistic systems of weighting,” an attentional “spotlight,” or any other theoretical abstractions that don’t actually reflect true human functioning. There is no

homunculus pulling the levers, there are no clockwork gnomes inputting perceptual data into a grand computational device.

These results cast tremendous doubt on the claims made by proponents of UTT, as they are attempting to describe a phenomenon that doesn't exist. As a science, psychology ought to put to bed the dichotomy between the "conscious" and "unconscious mind," as though the functioning of an intact human mind is somehow separable in that sense. It is not some divisible construct, actively in motion, with attention bifurcating the line between different aspects of daily experience. Although the unconscious-conscious dichotomy has been expanded in the automaticity literature to align more with a continuum model, any attempt to utilize a metaphorical "attentional spotlight" as the primary driver of subjective experience – implying that there is a measure of unseen "movement" occurring under the surface via some sort of secondary processor separable from experience, cannot explain the human behavior and decision-making.

Research produced by UTT proponents also attempts to demonstrate the increased degree of satisfaction experienced by individuals who make a decision after a period of distraction rather than having engaged in conscious thought (Dijksterhuis et al., 2006). Here, proponents of UTT are conflating feelings of satisfaction with actual satisfaction generated by the quality of the choice. Carefully evaluating choices requires an exploration of both the positive and negative aspects of any option, and any carefully considered decision that is made would be based in part on knowingly subjective appraisals of those aspects. Given that most people are aware of their own subjectivity and fallibility to degree (at least insofar as they recognize their preferences don't generalize to the entire human race), doubt is injected into the decision-making process,

and this doubt manifests as a lower level of sureness or satisfaction in the decision that is made. Although thorough assessment of various pros and cons may result in more strife over the short-term, long-term satisfaction with a decision should intuitively be the result of measured evaluation and appraisal of alternatives and how those alternatives eventually segue into outcomes. In a sense, proponents of UTT are advocating for a modified chosen version of the Dunning-Krueger effect; keep yourself ignorant to the actual consequences of your decision, and you will probably be happier with it due to your lack of awareness of alternatives. Put simply, advocates of UTT are unknowingly trying to prove that ignorance is bliss.

Future studies could include a much larger sample size in order to parse out even the smallest of effects. Given how the data was trending once individual weightings were taken into account, additional experimentation would likely reveal a more beneficial effect to conscious thought in the act of evaluative decision-making. Moreover, due to the lack of control over the participants' immediate ecosystem in online experiments, control for environmental variables was extremely limited. Although this likely did not significantly affect outcomes, future research ought to take place in a more controlled environment. However, given the overall lack of veridicality of the UTT paradigm additional exploration should only serve to further invalidate the model.

Limitations include the small and homogenous sample size of students, and a lack of local variability in preferences. If the study were done in other areas of the country that would more realistically reflect different preference profiles, such as in a more rural environment rather than a suburban one, outcomes in the initial analysis could be different. Regardless, it highly intuitive to believe that most of the time, in most places,

people make decisions that align with what they want – not what is necessarily best, or most effective, or anything else.

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Appendix A

Positive Apartment Attributes	Negative Apartment Attributes
Rent is cheaper than comparable apartments	Rent is more expensive than comparable apartments
Short walk to places you frequent	Long drive to places you frequent
Above average size	Average in size
Heating bill is average	Heating bill is high
Has air conditioning	No air conditioning
Has a dishwasher	No dishwasher
Attractive interior and exterior	Okay looking interior and exterior
New	Old
Quiet	Somewhat noisy
Free high speed Internet	High speed Internet not included
Reserved parking space next to building	Parking available on street only
Landlord is friendly	Landlord is unfriendly

Positive Car Attributes	Negative Car Attributes
The Hatsdun has good mileage	The Nabusi has poor mileage
The Hatsdun has good handling	The Nabusi has poor handling
The Hatsdun has a large trunk	The Nabusi has a small trunk
The Hatsdun is new	The Nabusi is old
The Hatsdun is available in many different colors	The Nabusi is available in many different colors
For the Hatsdun service is excellent	For the Nabusi service is poor
The Hatsdun has plenty of leg room	The Nabusi has little leg room
With the Hatsdun it is easy to shift gears	With the Nabusi it is difficult to shift gears
The Hatsdun has cupholders	The Nabusi has no cupholders
The Hatsdun has a sunroof	The Nabusi has no sunroof
The Hatsdun is relatively good for the environment	The Nabusi is not very good for the environment
The Hatsdun has a good sound system	The Nabusi has a poor sound system

Appendix B

Positive Roommate Attributions	Negative Roommate Attributions
Has good grades in school	Has low grades in school
Has a variety of interests	Does not have a variety of interests
Is a good cook	Is not a good cook
Has nice friends	Has friends that are somewhat boring
Takes care of his/her appearance	Does not take care of his/her appearance
Has a good income	Does not have a good income
Has similar tastes to you	Does not have similar tastes to you
Is fun to be with	Is not fun to be with
Is a relaxed and easygoing person	Is a bit uptight
Has sense of humor	Does not have a sense of humor
Does not leave dirty dishes in the sink	Sometimes leaves dirty dishes in the sink
Plays pleasant music while at home	Plays unpleasant music while at home

Appendix C

Apartment ○	Apartment +
Rent is cheaper than comparable apartments	Rent is more expensive than comparable apartments
Short walk to places you frequent	Long drive to places you frequent
Average size	Above average in size
Heating bill is average	Heating bill is high
No air conditioning	Has air conditioning
Has a dishwasher	No dishwasher
Attractive interior and exterior	Okay looking interior and exterior
New	Old
Quiet	Somewhat noisy
Free high speed Internet	High speed Internet not included
Reserved parking space next to building	Parking available on street only
Landlord is unfriendly	Landlord is friendly

Apartment ◆	Apartment ■
Rent is cheaper than comparable apartments	Rent is more expensive than comparable apartments
Long drive to places you frequent	Short walk to places you frequent
Above average in size	Average size
Heating bill is high	Heating bill is average
Has air conditioning	No air conditioning
Has a dishwasher	No dishwasher
Attractive interior and exterior	Okay looking interior and exterior
Old	New
Somewhat noisy	Quiet
High speed Internet not included	Free high speed Internet included
Parking available on street only	Reserved parking space next to building
Landlord is friendly	Landlord is unfriendly

Appendix D

Hatsdun	Kaiwa
The Hatsdun has good mileage	The Kaiwa has good mileage
The Hatsdun has good handling	The Kaiwa has poor handling
The Hatsdun has a large trunk	The Kaiwa has a large trunk
The Hatsdun is new	The Kaiwa is old
The Hatsdun is available in many different colors	The Kaiwa is available in many different colors
For the Hatsdun service is excellent	For the Kaiwa service is excellent
The Hatsdun has little leg room	The Kaiwa has plenty of leg room
With the Hatsdun it is difficult to shift gears	With the Kaiwa it is easy to shift gears
The Hatsdun has cupholders	The Kaiwa has no cupholders
The Hatsdun has a sunroof	The Kaiwa has no sunroof
The Hatsdun is relatively good for the environment	The Kaiwa is fairly good for the environment
The Hatsdun has a poor sound system	The Kaiwa has a poor sound system

Dasuka	Nabusi
The Dasuka has poor mileage	The Nabusi has poor mileage
The Dasuka has good handling	The Nabusi has poor handling
The Dasuka has a small trunk	The Nabusi has a small trunk
The Dasuka is new	The Nabusi is old
The Dasuka is available in very few colors	The Nabusi is available in many different colors
For the Dasuka service is poor	For the Nabusi service is poor
The Dasuka has little leg room	The Nabusi has plenty of leg room
With the Dasuka it is easy to shift gears	With the Nabusi it is difficult to shift gears
The Dasuka has cupholders	The Nabusi has no cupholders
The Dasuka has a sunroof	The Nabusi has a sunroof
The Dasuka is not very good for the environment	The Nabusi is not very good for the environment
The Dasuka has a good sound system	The Nabusi has a poor sound system

Appendix E

Roommate ○	Roommate □
Has good grades in school	Has good grades in school
Does not have a variety of interests	Has a variety of interests
Is a good cook	Is not a good cook
Has nice friends	Has nice friends
Takes care of his/her appearance	Does not take care of his/her appearance
Has a good income	Has a good income
Does not have similar tastes to you	Does not have similar tastes to you
Is fun to be with	Is not fun to be with
Is a relaxed and easygoing person	Is a bit uptight
Does not have sense of humor	Has a sense of humor
Sometimes leaves dirty dishes in the sink	Sometimes leaves dirty dishes in the sink
Plays pleasant music while at home	Plays pleasant music while at home

Roommate ◆	Roommate ■
Has low grades in school	Has good grades in school
Has a variety of interests	Does not have a variety of interests
Is not a good cook	Is a good cook
Has friends that are somewhat boring	Has friends that are somewhat boring
Does not take care of his/her appearance	Takes care of his/her appearance
Does not have a good income	Does not have a good income
Has similar interests to you	Has similar tastes to you
Is not fun to be with	Is fun to be with
Is a bit uptight	Is a relaxed and easy-going person
Has a sense of humor	Does not have a sense of humor
Does not leave dirty dishes in the sink	Does not leave dirty dishes in the sink
Plays unpleasant music while at home	Plays unpleasant music while at home

Appendix F

Instructions: Please construct a grammatically correct sentence using **only four** of the five words you are given.

- 1. ranch likes the he headed _____
- 2. shampoo uses flag green she _____
- 3. turtle laptop walks the slowly _____
- 4. carpet Judy cleans the stumped _____
- 5. judged performance sticks he their _____
- 6. bulbs plants lamps have light _____
- 7. chirped loudly robin the phone _____
- 8. plant water gravy needs the _____
- 9. staples the paper she relaxed _____
- 10. the hat big is wooded _____
- 11. window cracked is the televisions _____
- 12. carpet vacuumed he pan the _____
- 13. green the grass is pusher _____