# RETHINKING UNCERTAINTY AND RISK IN CONSUMER RESEARCH

By

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(Under the Direction of Marcus V. M. da Cunha Jr.)

## ABSTRACT

In this dissertation I provide a critical review of past literature on uncertainty and risk in consumer research, and discuss opportunities for new cross-paradigm research. In Chapter 2 I review past literature on the relationship between the mating mindset and risk-seeking behavior and posit an alternative explanation that consolidates inconsistencies across past findings. Chapter 3 reviews a past research that suggests uncertainty leads to overestimation in long-term consumer budgets. I provide evidence to show that construal level theory may be more adequate in explaining this over-budgeting phenomenon. In Chapter 4 I discuss the potential impact of uncertainty on consumers' cognitive capabilities, a relationship less considered in past literature. I show that while the feeling of uncertainty boosts one's ability to receive information, the newly received raw information may not be properly processed due to uncertainty-related anxiety.

INDEX WORDS: Risk, Uncertainty, Judgment and Decision Making, Mating Mindset, Omission Bias, Construal Level Theory, Reactive Approach Motivation

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# DECIDATION

To my parents, Ying Ye and Ping He, for their unconditional love and the life-long sacrifice for me,

To my love, Xiang-meng Ge, for her unwithering support and encouragement that sustained me through these challenging years of graduate school,

And to all the mentors and friends for believing in me

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TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... v

CHAPTER

1 INTRODUCTION AND LITERATURE REVIEW ..... 1

2 BEHAVIORAL ANOMALLY UNDER MATING MINDSET ..... 8

3 CONSTRUAL LEVEL, TEMPORAL DISTANCE AND BUDGET PLANNING ... 57

4 LEARNING AND RECOGNITION UNDER UNCERTAINTY ..... 75

5 CONCLUDING THOUGHTS AND FUTURE RESEARCH ..... 119

# CHAPTER 1

# INTRODUCTION AND LITERATURE REVIEW

Managing uncertainty and risk is essential to my economic life. Amos Tversky once said that the very concept of "decision" itself is a manifest of the fact that I have imperfect information regarding the consequences of my actions (Tversky and Fox 1995). While institutional decision makers such as investment banks may be capable to strive for optimal balance among risky options thanks to their knowledge in economics, individual consumers do not always follow the rules of rationality in situations of risk and uncertainty. The rising popularity of behavioral economics in the past half century testifies for the importance in understanding "bounded rationality", the notion that individuals deviate from the normative expectations of economics due to the influence from various psychological factors such as metacognition, emotions, and arousal. Following this tradition, this dissertation focuses on addressing how consumers, prone to various psychological biases, react to risk and uncertainty.

Before delving into the specific topics in this dissertation, it may be helpful to define the premises for the term "risk". Some behavioral researches have advanced to address specific domains of risk, such as financial risk, health/safety related risk, and social risk (for a review, see Weber, Blais, & Betz, 2002). However, this dissertation investigates the consumers' psychological response to risk in its general terms. In other words, I follow the convention in behavioral economics and refer to "risk" as the cognitive structure that reflects a set of options available to the decision maker which offer various pay-offs at different probabilities. My key interest in this dissertation is consumers' psychological response to the unknown probabilities associated with potential outcomes. In this sense, the terms "uncertainty" and "risk" may be used interchangeably in the remaining chapters of this dissertation.

I maintain that a firm grasp of the definition of the key construct is vital to consumer judgment and behavior. To this end, in Chapter 2 I review a series of past researches and explain how many of them misclassified their results under the categorization of "risk seeking behavior". To be specific, for a long time, it was believed that the activation of a mating mindset would lead individuals to engage in risk-seeking behavior. For example, it has been documented that individuals with a mating mindset are more likely to engage in conspicuous consumption, donation, and public helping, which are all costly of short term financial resources (e.g., Griskevicius et al., 2007). The validity of the relationship between mating mindset and risk-seeking behavior was recently criticized in a review, although the review did not provide a convincing explanation for the contrasting findings (Shanks et al. 2015). To reconcile past studies and the recent criticism, I propose that, instead of seeking risk, individuals with mating mindset tend to prefer options that differs from the status quo of affairs. This phenomenon is driven by the heightened focus on visibility, in other words the ability to differentiate oneself from the crowd, when one is in the mindset of attracting potential mating partners. Although in many daily instances the action-against-default behavior may be confounded with the risk-free options, I were able to parse out the difference between risk-seeking and action-against-default behaviors via a set of experiments. Once the default conditions of affair were controlled for, the risk factor no longer influenced individuals' decisions when a mating mindset was activated. According to this finding, for the use of sex appeals to work effectively in marketing practice, a default position must be clearly defined for the consumers as well as available options that represent a change from the default position.

In Chapter 3 I review past studies that address an issue related to temporal uncertainty. A recent study documented that consumers' budgets for future spending vary depending on the

length of the budget horizon. The longer the budget horizon is, the more likely a consumer overestimates the budget needs in comparison to his/her actual spending records (Ülkümen, Thomas, and Morwitz 2008). The authors of this study proposed that this phenomenon was driven by the fact that longer temporal distance covered by the budget period posed greater degree of uncertainty to the consumers, who then preempted for potential unforeseeable spending with over-sized budgets. In contest with this uncertainty-driven theoretical account, I proposed that the overbudgeting phenomenon can be explained by the construal level theory (CLT; Trope and Liberman 2003). According to CLT, the more psychologically distant an object is, the more likely individuals would focus on its desirability aspects as opposed to the feasibility aspects. Since I noticed that the original study predominantly used hedonic products as target products in experiments, I investigated whether the documented effect was a confound between intertemporal uncertainty and heightened interest in the hedonic quality of the products. A series of experiments confirmed my hypothesis that different levels of mental construal caused variation in consumers' budget estimations, and this effect was qualified by the nature of the expenditures. To be specific, consumers tend to overbudget for utilitarian spending over the short run and overbudget for hedonic spending over the long run. In comparison to the intertemporal uncertainty account, this new theoretical explanation based on CLT is more diagnostic of the complex nature of under/overbudgeting issue, and provides greater implication in protecting consumer welfare.

During the review of past literature on consumer response to uncertainty and risk, I also find that most studies revolve around the cognitive process antecedent to the arrival of a decision. Yet, it is worthwhile to ask whether the presence of uncertainty and risk would have consequential effects on the downstream psychological process. For example, it has been

proposed that the feeling of risk and uncertainty is associated with the formation of emotions such as fear and hopeful (Lerner and Keltner 2001). To this end, in Chapter 4 I explore the potential impact of uncertainty on consumers' cognitive capacity. According to the Reactive Approach Motivation (McGregor et al. 2010) account, the feeling of uncertainty induces a special type of anxiety, which leads to two downstream effects: 1) the individual's neurological receptors become more responsive, better at receiving raw input of information; 2) the processing capacity in the working memory is overloaded, reducing the individual's ability of semantic transformation (i.e., synthesizing and cross-referencing newly received information). As a result, I observed through a set experiments that probe items shown along with uncertainty priming procedure can be recognized better, but only if the recall cues were in the identical form as the original probes. This insight suggests that when advertising in high uncertainty situations such as competitive sports events, marketers should opt for simple, easy-to-remember messages that do no require much post-input processing.

In summary, this dissertation will provide a snippet of my research agenda in the near future. As I continue the research in consumer behavior revolving the topic of uncertainty and risk, I intend to do so by 1) examining past literature with academic scrutiny and mending drawbacks from previous studies, with examples seen in Chapter 2 and 3; and 2) expanding the boundaries of the risk and uncertainty literature by exploring the possibility of downstream effect such as cognitive responses seen in Chapter 4.

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# CHAPTER 2

# BEHAVIORAL ANOMALLY UNDER MATING MINDSET[1]

[1] He, Yang and Marcus da Cunha Jr. To be submitted to the *Journal of Consumer Research*

Mike, who is watching a football game at a sports bar, has to decide between two game-day combo offers: the standard combo that comes with a 12 ounce beer and a dozen Buffalo wings, or the jumbo combo that comes with a 12 ounce beer and 18 Buffalo wings. Would he be more likely to choose the jumbo combo despite the fair chances that he would not be able to finish so many chicken wings, if the order is to be taken by an attractive female staff?

The answer "yes" might seem almost too easy to reach, given the vast literature regarding consumer behavior under the influence of the mating mindset (e.g., Griskevicius et al. 2007; Durante et al. 2011; Sundie et al. 2011). A large collection of researches had generally agreed that once the mating mindset is activated, for example by being in the presence of an attractive member of the opposite sex, one is likely to become more tolerant of risks and engage in behaviors that s/he normally would not. However, this notion was challenged in a recent review (Shanks et al. 2015), which failed to find any conclusive connection between risk tolerance and the activation of the mating mindset through either meta-analysis or a series of replications of previously published studies.

To consolidate these opposing findings, I suggest that although the presence of an attractive waitress may not be enough to sway Mike's decision between two combo options, it may be effective in selling the additional wings if the deal was simply framed as an upgrade opportunity. To be specific, once the standard combo with 12 wings is established as the default offering, an opportunity to "upgrade" to a jumbo combo with additional 6 wings for a small surcharge would become appealing if Mike is served by an attractive waitress.

In the current research, I propose and test the hypothesis that individuals prefer the option that deviates from the default state of affairs if a mating mindset is activated. Diverging from the risk-reward paradigm, the proposed effect is grounded on the omission bias literature. I

demonstrate that the activation of mating mindset shifts an individual's focus from self-inflicted loss to missed opportunities as a potential cause of regret, and this shift of focus negates the well-documented omission bias. I also parse out the common confound between action-against-default behavior and risk-seeking behavior, the insight from which helps to reconcile the opposing findings from earlier researches such as Griskevicius et al. (2007) and the recent attempted replication by Shanks et al. (2015).

In the following sections, I first review the literature regarding omission bias, a well-documented phenomenon where individuals are reluctant to make changes to the default state of affairs. Next, I discuss the evolutionary advantage when individuals behave in a way that is opposite to the omission bias when a mating mindset is activated. I conclude the theoretical framework with a comparison between the omission bias account proposed in the current research and the previous interpretation in the risk-reward paradigm, in terms of their compatibility with past empirical results regarding consumer behavior under the mating mindset. I start the empirical section with an experiment that demonstrates the basic proposition that individuals' preferences under mating mindset is a function of the pre-determined default condition, rather than the specific risk factors associated with each option in the choice set. Experiment 2 replicates the finding from experiment 1 in the context of financial investment decisions and also examines the shifted focus of potential cause of future regret as the mediating factor offsetting the omission bias under mating mindset. Experiment 3 helps to bridge the conflicting results in the literature by showcasing the fact that individuals under mating mindset would use a fashion accessory only if the accessory is seen as non-conforming. Finally, in experiment 4, I provide an example of the marketing implication stemming from this research in purchase-related scenarios analogous to the one in the opening example. To be specific, I show

that the upselling technique, where the premium portion of a product offering is framed as an upgrade opportunity, is more effective than a direct side-by-side comparison between two product offerings when offering premium versions of products to consumers with a mating mindset.

## OMISSION BIAS

The omission bias refers to one's inflated preference for an option that does not require action given that all options bare equivalent risk (Spranca, Minsk, and Baron 1991; Anderson 2003). A typical example of the omission bias can be illustrated by the vaccination experiment (e.g., Ritov and Baron 1995). Participants in this experiment were presented with a scenario where children were exposed to a type of fatal flu while an inexpensive vaccine, which bore a very small chance of fatality itself, was available to the public to prevent the flu. In anticipation that fatality of natural causes (virus) was more bearable than that of man-made causes (vaccination), the majority of participants opted not to vaccinate their children (i.e., omission). Consistent with the omission bias, field studies also showed that individuals were reluctant to adjust pre-established investment portfolios years after they had started investing in them, even when they knew that there was virtually no cost associated with changing the portfolio composition (Samuelson and Zeckhauser 1988). The latter example is sometimes labeled "status quo bias", a phenomenon that refers to a heightened preference for the current state of affairs as opposed to taking an action that leads to a change in the current status quo (Samuelson and Zeckhauser 1988; Anderson 2003). Given that both phenomena are rooted in the idea of action avoidance (for a review, see Anderson 2003), I follow the tradition of treating the two biases as a

unitary phenomenon (Ritov and Baron 1992), and refer to the behaviors associated with this phenomenon as "action"/ "omission" in the remainder of this paper.

The extant literature in the omission bias generally agrees that the omission bias stems from the aversion to anticipated regret (Zeelenberg et al. 2002; Anderson 2003). Individuals feel greater levels of regret when unfortunate outcomes result from action than when identical outcomes result from omission. Compared to maintaining the status quo, actions require further justification, increase an individual's perception of responsibility for the outcome, and are often deemed abnormal. As a result, when an unfavorable outcome occurs, individuals are more likely to experience self-blame (Spranca et al. 1991; Zeelenberg et al. 2002; Baron and Ritov 2004; Zeelenberg and Pieters 2007). This association between heightened regret and omission bias is frequently replicated in the literature on counterfactual thinking (e.g. Gilovich and Medvec 1995; Zeelenberg and Pieters 2007). To illustrate, prior research has shown that consumers who are accustomed to repeated purchases are likely to experience regret when they switch to a different product (Inman and Zeelenberg 2002). In turn, when the decision makers expect to learn about the outcomes stemming from their actions, they tend to refrain from actions in order to preempt the potential regret (Ritov and Baron 1995; Zeelenberg 1999).

Although the omission effect is a robust and well-replicated phenomenon, there are factors such as presence of outcome knowledge (Ritov and Baron 1995; Inman and Zeelenberg 2002), passage of time (Gilovich and Medvec 1994), and history of an individual's previous decisions (Zeelenberg et al. 2002), that have been shown to moderate this effect. For instance, in consumption settings, consumers' regret usually results from recent purchases rather than purchase opportunities forgone, unless the purchase opportunity is a limited product offering. In the latter case, the non-purchase decision may be perceived as proactively forfeiting a limited

purchase opportunity, which signals one's own action and implies higher potential for regret than the purchase decision (Abendroth and Diehl 2006).

Relevant to this research is the observation that omission tends to be the default behavior once one encounters an opportunity to take an action that could lead to an undesirable outcome as a result of regret. As it is described in greater detail in the next section, this default behavior can signal a conforming behavior that may not allow one to stand out when a mating goal is active and one feels the need to engage in intrasexual competition for mating purposes. In the next section, I develop the rational for this hypothesis and describe its potential implications in the next section.

## INFLUENCE OF MATING MINDSETS

Prior research has documented that individuals under mating mindset often engage in abnormal behaviors, as a result of intrasexual competition (Buss 1988, 1994; Buss and Schmitt 1993). Evolutionary theories of behavior suggest that many of such behaviors are part of a strategy to stand out from the competition among members of the same sex, in order to attract and secure the ideal mating partner. An effective way to increase the visibility of an individual from his/her rivals is to differentiate oneself by engaging in nonconforming behavior (Griskevicius et al. 2006). In this light, men become more aggressive and willing to spend conspicuously (Griskevicius et al. 2007, 2009; Sundie et al. 2011) and women are more likely to wear revealing clothes (Durante et al. 2011) and engage in helping behavior (Griskevicius et al. 2007) when a dating mindset is activated. Such behaviors not only signal one's desirable quality (e.g., financial abundance, ability to provide care, etc.), but also provide individuals with

heightened visibility from the general population. Since behaviors such as conspicuous consumption and flamboyant donations are costly to the individual in terms of vital resources in the short run (e.g., money, time, and energy), they are not widely imitated by the population without an active mating mindset. In fact, research has shown that a behavioral trait can be desirable for someone with a mating mindset merely because it is non-conforming to the norm, without necessarily signaling other desirable qualities such as abundance of wealth. For example, in a picture rating task, male participants with an active mating mindset would deliberately vote in opposition to their peers' opinions (Griskevicius et al. 2006).

Oftentimes, the mating advantage of nonconformity come at the expense of an individual's short-term survival, such as conspicuous purchases, flamboyant donations, and help extended to people's offspring (Griskevicius et al. 2007). In order to sustain this differentiation strategy and cope with its potentially damaging aftermath, humans have developed corresponding cognitive processes. According to Error Management theory, certain biases and heuristics have survived evolution because they provide reproductive advantages (Haselton and Buss 2000; Haselton and Nettle 2006). In particular, error management theory suggests that in order to maximize the chance of conception, individuals become more tolerant of false-positive signals and more forgiving of errors in their approach decisions. Consistent with this prediction, it has been found that men often overestimate a women's sexual intent toward them. Echoing this notion, recent research shows that the mating mindset mitigates one's bias against losses in probability events (Li et al. 2012).

The notion that non-conforming behavior may be advantageous from a mating perspective provides a basis to make predictions about the conditions under which one would commit the omission bias versus violate it. Because omission is expected to be the standard

behavior of the majority of the population, under a mating mindset individuals become more inclined to take actions for the benefit of visibility relative to their mating competition. This change in behavior tendency is facilitated by a shift in the regret management process. As reviewed above, in contrast to individuals not under a mating mindset who are mostly concerned with avoiding false-positives in terms of signal detection, those with a mating mindset experience more regret over false-negatives because of the potential of missed opportunities.

## ACTION VERSUS RISK

At a first sight, it might be tempting to argue that the proposed effect that a mating mindset increases one's tendency to take actions aligns with the conventional wisdom that mating mindsets leads to risk-taking behaviors. After all, it is difficult to parse the difference between action-against-default and risk-taking behaviors in many real-life situations, given that most default conditions are relatively risk-free compared to the alternatives. Thus, in this section I examine the difference between action-taking and risk-taking.

First, existing evidence regarding the relationship between the mating mindset and risky behaviors is not conclusive. I have reviewed studies that show individuals under a mating mindset may be willing to engage in behaviors detrimental to their economic resources or social capital, which may be interpreted as risk-seeking behavior (e.g., Griskevicius et al. 2007; Durante et al. 2011; Sundie et al. 2011). However, there is also a stream of research showing that individuals under mating mindset become impatient (Kim & Zauberman, 2012; Van den Bergh, Dewitte, & Warlop, 2008; Wilson & Daly, 2004). As it is generally agreed that patience implies one's low tolerance for intertemporal risk given that events in the far future are less predictable

than in the near future (for a reviews, see Frederick, Loewenstein, and O'Donoghue 2008), these findings suggest that men actually become more risk-averse under dating mindsets, contradicting the idea that a mating mindset triggers risk-seeking behavior. Adding to the suspicion of this risky-behavior interpretation, a recent review questioned the validity of findings related to the effects of the mating mindset from previous studies (Shanks et al., 2015). In this review, which included both a meta-analysis on conspicuous consumption and public benevolent behaviors as expressions of risk-seeking tendencies, and a series of empirical replications failed to support for the notion that a mating mindset induces risk-seeking (Shanks et al., 2015).

My hypothesizing that the activation of mating mindset leads to action against the default option may help to reconcile these discrepancies found in the literature regarding the effect of mating mindset. On the one hand, instead of a function of tolerance for temporal risk, one's growing impatience under mating mindset can reflect a desire for immediate action, which is the rationale put forth in the original research regarding impatience by Van den Bergh and colleagues (2008). On the other hand, the unsuccessful replication of the effect of mating mindset on conspicuous consumption and benevolence behavior experiments (Shanks et al., 2015) could be a result of the dynamics of expected default behavior. If action-against-default, rather than risk-seeking, is indeed the unitary cause of various behavioral anomalies, the inconsistency in the empirical findings could result from the fact that that behavioral defaults were not explicitly specified in either the original studies or the attempted replications. To be specific, conspicuous purchases such as high-end cellphones and designer jeans might have been exceptional (non-default) when the original studies were conducted (Griskevicius et al. 2007) but these products may be more widely adopted nowadays, albeit still expensive. Considering that an individual under mating mindset is concerned about behaving against the default rather than

merely flaunting wealth, it is not surprising that the once sought-after symbols of exclusivity lost their appeal once they are widely adopted by a larger segment of the population.

Furthermore, action and risk-taking behaviors involve different psychological processes. In the behavioral economics literature, an individual's risk tolerance is defined as the tradeoff between the variance in the payoff structure and the expected value of the uncertainty event (e.g., Kahneman and Tversky 1979; Tversky and Kahneman 1991; Benartzi and Thaler 1999; Garrett and Sobel 1999). A risk-seeking person is defined by his/her preference for a small probability of a large reward to a certain but smaller payoff, given that the expected value of the lotteries remain constant (for a review, see Weber, Blais, and Betz 2002). Unlike risk-seeking, the tendency to take action under a mating mindset does not concern tangible rewards. Instead, action-taking is merely a behavioral Nash Equilibrium resulting from the ecology of mating competition and living organisms have only developed corresponding psychological mechanisms in order to cope with the necessary cost required to secure the chance of conception (Smith and Bird 2000; Sosis 2000; Lotem, Fishman, and Stone 2003). This notion aligns with the findings from Li et al. (2012). In their experiments 1 and 2, whereas the priming of a mating mindset mitigated the loss-aversion in male participants, no significant increase in the desire to seek larger rewards was observed.

I provide further support for the proposition above through a series of experiments. In experiment 1 and 2, I manipulated the default status of options in choice sets independent of their latent risk factors, which are often confounded with one another otherwise, in the context of Blackjack card games and an investment decision scenario. Results from both experiments showed that the activation of mating mindset affected participants' preference for the default options but the mindset factor did not interact with the risk factors of the options. Experiment 3

demonstrated that young men's perception of exclusivity was a key factor driving their preference for the necktie and the pocket square under mating mindset. This result lent support to the argument that the conflicting results from the original studies of consumer behavior under mating mindset and the recent attempted replications may have merely stemmed from the products used in the experiments, which may have transitioned from novice items to daily commodities.

## EXPERIMENT 1

Experiment 1 was designed to showcase that individuals with an active mating mindset are more likely to take actions than those who do not have such mindset activated. Experiment 1 also demonstrates that participants react to the mating mindset by taking actions that deviate from the status quo rather than by choosing the riskier option.

### Participants

I recruited 213 participants of age 35 or younger from Amazon Mechanical Turk (114 female). I set this age limit to be consistent with the sampling population from recent publications regarding similar issues (e.g., Griskevicius et al. 2007; Wang and Griskevicius 2014; Durante and Arsena 2015). An automatic screening was set up online where participants filled out a simple screening questionnaire consisting of demographic questions such as time zone, education level, income, age group, and gender. Participants were aware that a screening procedure was in place but unaware of which variable combination determined their eligibility

for the main task. Only participants who self-identified as being member of the age group 18-25 or 26-35 were retained for the main experiment. Participants who did not fit the criteria were thanked, paid a small reward for participating in the pre-screening, and dismissed.

## Design and Procedure

The experiment used a 2 (mindset: control vs. mating) × 3 (default option: hit vs. stay vs. control) between-subject design. Participants were told that the survey consisted of multiple sections regarding consumer choices and preferences. Participants were randomly assigned to one of the mindset conditions and then played a series of Blackjack games where one of the three default settings in the input scheme was randomly assigned to each of the participants. Their decisions to "hit" or "stay" were recorded as the dependent variable.

*Mating mindset activation*. To activate the mating mindset, I used an established procedure (Griskevicius et al. 2006, 2007; Li et al. 2012) where participants were asked to imagine that they were single for the past three months and were about to go on a blind date that a friend had set up for them. For 30 seconds, they were asked to imagine a very desirable person to meet on the date. On the next screen, pictures of three attractive models of the sex opposite to that of the participant were shown and participants were asked to select the picture that best resembled the person they had imagined. I then asked participants a series of multiple-choice questions regarding their preferences related to a date such as dress code and conversation style.

Participants in the control group were given a similar assignment but were asked to imagine a vacation scenario with no obvious connection to dating or other romantic situations. They were asked to picture a very desirable vacation and choose one of three pictures of vacation

destinations that was the closest to the one they imagined. Participants then answered questions regarding their preferences related to vacations.

*Blackjack games*. The dependent measure was based on participants' decisions with respect to accepting the default option or taking action during a series of card games that followed the priming of neutral versus mating mindset. Participants were invited to play a simplified version of the card game Blackjack. Each participant was presented with 20 pairs of cards on the computer screen, one pair at a time, and asked to indicate whether they chose to add another card (i.e., "hit") or not (i.e., "stay") on each hand. The goal was to have the final sum of cards on each hand as high as possible but without exceeding 21 points. A hand of cards adding up to more than 21 points was considered a "bust" and yielded zero points. Ten pairs of cards, each adding up to 14,15 or 16 points, constituted the main decision task, given that even the most skilled Blackjack players face a dilemma to "hit" or "stay" in those situations (Galinsky et al. 2003; Baker and Maner 2008). To reduce suspicion, I added another 10 pairs of cards, each adding up to below 10 points or above 20 points, in which case the decision to "hit" or "stay" was straightforward. The order in which the 20 pairs of cards were presented was randomized. The third card in any "hit" decision was not revealed to participants in order to prevent any potential bias carried over to the subsequent decisions (Zeelenberg et al. 2002). All participants were given a passing score after all 20 hands were dealt and played, making them eligible for full participation regardless of their actual "hit" or "stay" decisions.

*Default conditions*. I recorded the number of "hit" decisions made by each participant for the main decision task where each initial pair of cards added up to 14-16. The default conditions were manipulated with different input methods on the computer screen. Approximately one third of the participants were randomly assigned to the condition where the default was set as "hit"

while for another third of the participants the default was set as "stay". For every pair of cards presented, participants in the hit-default (stay-default) condition were told that, by default, the system automatically assumed the decision was (not) to add another card and the text-input dialog box on the screen was pre-filled with the word "hit" ("stay"). To accept the default choice of "hit" ("stay"), participants had to simply hit the "Enter" key on their keyboard. To reverse the default choice and make the decision to "stay" ("hit"), participants had to delete the pre-filled word in the text-input dialogue box and type in the word "stay" ("hit") instead. The third group of participants, assigned to the control group, were not given a default choice and, for every pair of cards, participants were asked to indicate their hit/stay decision by selecting the radio button with their "hit" or "stay" decision as in most conventional online surveys (see appendix for sample screenshot).

*Manipulation check.* After completing the card games, participants reported how much they had experienced (a) romantic arousal, (b) sexual arousal, (c) a desire to have a romantic partner, and (d) a desire to have others attracted to them (Griskevicius et al. 2007). Responses were recorded on seven-point Likert scales ranging from "not at all" (1) to "very much" (7).

## Results and Discussion

*Manipulation check.* An ANOVA on the composite average score of the four manipulation check measures ($\alpha = .91$) confirmed that the priming procedure successfully produced different levels of mating mindset across the treatment and control groups ($M_{\text{mating mindset}} = 3.68$, $M_{\text{control}} = 2.71$; $F(1,209) = 16.17$, $p < .01$). No difference in mating mindsets was

observed across genders ($F(1,209) = .96$, *n.s.*), and the gender variable did not interact with the priming conditions either ($F(1,209) = 1.49$, *n.s.*).

*Risk-taking versus action*. I first tested for the prediction that participants' decisions under mating mindset were merely a function of the default condition, while the intrinsic risk factor associated with the "hit" or "stay" options did not affect one's decision making. I set the number of "hit" decisions made by participants as the dependent measure, and analyzed the data in a 2 (mindsets: mating vs. control) × 3 (default: "hit" vs. "stay" vs. none) × 2 (gender: males vs. female) three-way ANOVA. Results revealed a significant interaction between the mating mindset priming conditions and the default options given during the card games ($F(2,201) = 18.69$, $p < .01$, see figure 2.1) . In the condition where "hit" was set as the default option, participants who were primed with the dating scenario were less likely to "hit" compared to their counterparts who saw the vacation scenario ($M_{control\_mindset} = 7.90$, $M_{mating\_mindset} = 3.93$; $F(1,201) = 30.74$, $p < .01$), and the opposite was observed in the condition where "stay" was given as the default option ($M_{control\_mindset} = 4.24$, $M_{mating\_mindset} = 6.39$; $F(1,201) = 9.26$, $p < .01$). However, no significant difference was observed across the mindset priming conditions in the control condition of the default factor where participants were free to choose their card decisions without pre-defined default options ($M_{control\_mindset} = 7.32$, $M_{mating\_mindset} = 5.91$; $F(1,201) = 3.37$, *n.s.*). The gender variable neither produced a main effect nor interacted with other variables in the model. A re-specified model without the gender variable did not show meaningful changes in the results reported above. Overall, these results indicated that whereas a mating mindset induced action against the default behavior, the effect is unlikely unrelated to the risk-factors associated with each option, considering that no significant difference was observed in the control conditions of the default factor.

*Mating mindset and action against the default.* To test for the predicted action-against-default phenomenon under mating mindset, I focused the analysis only on participants who were assigned to the conditions where "hit" or "stay" was assigned as the default (150 participants). I re-coded the data as number of "actions" taken, defined as when participants chose to deviate from the assigned default option by erasing the assigned answer and retyping the alternate option. A 2 (mindset: mating vs. control) × 2 (default replicate: "hit" vs. "stay") ANOVA revealed that participants in the mating-mindset condition were indeed more likely to take action and deviate from the assigned default than their counterparts in the control-mindset condition ($M_{mating\_mindset} = 6.21$, $M_{control\_mindset} = 3.19$; $F(1,146) = 34.39$, $p < .01$). The default replicate factor did not interact with the mindset priming condition ($F(1,146) = 3.37$, *n.s.*).

Results from experiment 1 supported my hypothesis that a mating mindset leads to a higher likelihood of taking actions. Specifically, participants were more likely to take action and replace the default option when a mating mindset was activated relative to when this type of mindset was not activated. The results of experiment 1 also help to refute an alternative account that mating mindsets leads to risk-seeking behavior. If the priming of a mating mindset had triggered risk-seeking behavior, participants would have consistently preferred the "hit" option given that risk-seekers should be willing to bare the chance of a "bust" in exchange for the chance of a higher score on each hand. However, this phenomenon was not observed in experiment 1, as participants in the neutral condition did not show any bias toward or against the "hit" option when primed with the dating scenario. Therefore, the results in experiment 1 were consistent with the notion that one's preference for actions under the influence of a mating mindset should not be confused with risk-seeking behaviors. In fact, the effect of the mating mindset manipulation on participants' "hit" or "stay" decisions were only observed when a

default was pre-assigned, in which case participants consistently chose the options that deviated from the default.

## EXPERIMENT 2

Experiment 2 was designed with two goals in mind. First, I wanted to provide evidence that the shift of focus from regret over actions taken, which is the driver of the omission effect, to regret over opportunities forgone was indeed the underlying process for the reversal of omission bias under the mating mindset. Second, I sought to test the robustness of the findings from experiment 1 by testing my hypothesis in a different context of financial decision making context.

### Participants, Design, and Procedure

One hundred and eighty-seven participants of age 35 or younger were recruited from Amazon Mechanical Turk using the same screening process in experiment 1 (104 female). The experiment was a 2 (mindset: control vs. mating) × 2 (default: stocks vs. bonds) factorial design. The mediating variable, anticipated regret, was measured after the mindset priming task and before participants answered questions regarding their investment decisions. Mating mindset was manipulated between-subjects using the same procedure used in experiment 1.

*Financial decision making*. The financial decision making task was adapted from previous research related to omission bias (Samuelson and Zeckhauser 1988). Participants were given the following scenario:

"Pat recently received a sizable trust fund from her late grandfather. She contemplated between two viable investment options for the trust fund. On the one hand, US stocks gave an annual return between 5% and 9% in the past years; on the other hand, comparable corporate bonds usually guarantee an annual return of 7%."

The default investment option was manipulated between-subject. Approximately half of the participants were told that her grandfather kept the funds invested in stocks for the past 30 years whereas the remaining participants were told that her grandfather kept the funds invested in corporate bonds.

Next, participants were asked to consider the following two scenarios: In the no-action scenario participants were told that Pat left the trust fund in the same investment instrument her grandfather used to invest his money, but it turned out this decision yielded an annual return 2% lower than the forgone option in the next 5 years. In the action scenario, Pat switched the investment from the instrument her grandfather had used to invest the money to the other instrument available. Again, this investment decision yielded an annual return 2% lower than the original option in the next 5 years. Thus, in both scenarios, Pat's investment underperforms in comparison to the forgone option, with the only difference being the lower financial performance stemming from either inaction in the first scenario or action in the second scenario. Participants indicated which scenario would make Pat feel greater regret on a 100-point sliding scale ranging from "0 – definitely regret more in scenario A (no-action)" to "100 – definitely regret more in scenario B (action)". Following this measurement, participants were asked whether they would prefer stocks or corporate bonds if they had to maintain the entire trust fund in only one of the investment options.

Results and Discussion

As in experiment 1, I first analyzed propensity to risk-seeking given that stocks were manipulated to be, in line with the marketplace, a higher risk option. To this end, I regressed the participants' preference for investment, coded as a binary variable [chose stocks: yes (1) vs. no (0)], on the mating mindset factor and default investment factor using a binary logistic model. Results revealed an interaction between the mating mindset factor and default investment conditions (Wald $\chi^2(1) = 7.59$, $p < .01$, see figure 2.2). I observed omission bias from participants assigned to the control mindset condition (i.e., vacation scenario). Participants were more likely to keep the trust fund in stocks when the grandfather left the funds invested in stocks than when grandfather left the funds invested in corporate bonds ($M_{default\_stocks} = .51$, $M_{default\_bonds} = .11$; $\chi^2(1) = 17.00$, $p < .01$). Omission bias was mitigated for participants primed with the dating scenario ($M_{default\_stocks} = .30$, $M_{default\_bonds} = .27$; $\chi^2(1) = .09$, *n.s.*). Within the stocks-as-default condition, participants primed with the mating mindset were less likely to keep the investment in stocks compared to their counterparts not primed with mating mindsets ($M_{mating\ mindset} = .30$, $M_{control} = .51$; $\chi^2(1) = 3.95$, $p < .05$); within the bonds-as-default condition, participants primed with the mating mindset were more likely to reinvest the funds in stocks compared to their counterparts not primed with mating mindsets ($M_{mating\ mindset} = .27$, $M_{control} = .11$; $\chi^2(1) = 4.04$, $p < .05$).

When articulating the stock and bond conditions in experiment 2, I ensured that stocks were unambiguously riskier than bonds whereas the expected value of both instruments remained the same. If the activation of mating mindset had increased the participants' risk tolerance, I should have observed a systematic bias towards stocks. The fact that participants who received

the mating mindset priming did not show heightened interest in the stocks than their counter parts in the control condition suggested that the activation of mating mindset might not alter one's value function regarding risk and reward. Nonetheless, I showed that participants' investment decisions were more consistent with the prediction of the action-against-default paradigm, in that an individual primed with a mating mindset was more likely to reverse the course of action set as the default, regardless of the particular specification of that default condition.

*Mating mindset and action against the default*. To further investigate preference for action over inaction under mating mindset, I reran the analysis above after collapsing the data across the default instrument conditions (stocks vs. bonds) and recoding participants' decision into a new binary variable based on whether they took actions reverting the status quo of investment option as inherited [yes (1) vs. no (0)]. Overall, I observed that participants primed with the mating mindset were more likely to take an action that deviates from the default investment instrument than their counterparts in the control condition ($M_{\text{mating mindset}}$=.45, $M_{\text{control\_mindset}}$ = .30; $\chi^2(1) = 3.88$, $p < .05$). I note that the high interest rate I assigned to the bonds investment (7%) provide a stringent test to my hypothesis given that this alternative provides a disincentive to switch to a riskier alternative for which the upside is only 2% more. Consistent with this assumption, I observed that participants given bonds as the default instruments were less likely to take action when compared to those who were given stock as the default instrument in general ($M_{\text{default\_stocks}}$ = .72, $M_{\text{default\_bonds}}$ =.28; $\chi^2(1) = 13.38$, $p < .01$), which is not surprising given the fact that most investors hold a conservative sentiment regarding the stock market in the recent years. However, the factor of default instrument conditions did not interact with the effect of mating mindset driving action against the default (Wald $\chi^2(1) = .08$, *n.s.*).

*Mediation analysis*. Next, I examine anticipated regret as the mediating mechanism for the reported phenomenon. I collapsed the dependent variable across the default investment conditions into a new binary measure of whether the participant took action (i.e. chose the investment instrument different from the assigned default). Using bootstrapping mediation analysis procedure (Preacher and Hayes 2004, 2008; Zhao, Lynch Jr., and Chen 2010), I observed a total effect of the mating mindset on participants' likelihood to take actions [1,000 sample bootstrapping, c path, $\beta = .64$, SE = .31, $p < .05$, CI (.04, 1.24), see figure 2.3]. Specifically, participants primed with mating mindsets tended to regret unfavorable outcomes stemming from omission more than the same outcomes stemming from action [a path, $\beta = -11.02$, SE = 5.23, $t(185) = -2.11$, $p < .05$, CI (-21.34, -.70)]. In turn, higher anticipated regret over omission was associated with the increased likelihood taking action against the default investment options [b path, $\beta = -.01$, SE = .00, $p < .01$, CI (.-.02, -.01)]. Overall, the mediated effect of mating mindsets on action-taking via anticipated regret was statistically significant [ab path, $\beta = .15$, SE = .09, CI (.02, .39)]. After controlling for the mediated path, I no longer observed a statistically significant direct effect of mating mindsets on action-taking behavior [c' path, $\beta = .51$, SE = .32, *n.s.*, CI (-.11, 1.13)].

The results from experiment 2 confirmed that participants primed with mating mindset were likely to take action and reinvest into stocks or corporate bonds, depending only on the default investment options from the inheritance, even though stocks were generally considered to be a riskier financial instrument than bonds. More importantly, I showed that this increased likelihood of actions was driven by one's anticipated regret over omission.

## EXPERIMENT 3

The purpose of experiment 3 was to extend the potential contribution of my research by reconciling previous findings in the mating-mindset literature, specifically with regards to the relationship between sexual priming and risk-seeking behavior (e.g., Griskevicius et al. 2007) and a recent failed attempt to replicate such results by Shanks et al. (2015). Both the original experiments and the recent attempts of replication focused on identifying the impact of a mating mindset on the willingness to pay for conspicuous products (MP3 players, mobile phones, new cars, and vacations abroad). However, whereas evidence from the original experiments supported the hypothesis that the willingness to pay for conspicuous products were higher from participants primed with mating mindset (Griskevicius et al. 2007), the recent replications of the very same procedures did not find statistically significant results (Shanks et al. 2015). I propose that the contrast in findings between the two bodies of research could be related to the meaningfulness of the target products at the different points in time for the target participants (college students). For example, the conspicuous status of products such as MP3 players and mobile phones may be contextually dependent. In other words, such electronic devices may have signaled conspicuous consumption prior to 2010, but have arguably become commoditized nowadays. Also, although in the original studies the list of conspicuous products were chosen for the experiments based on their high prices alone (Griskevicius et al. 2007), the Merriam-Webster Dictionary defines "conspicuous" as "very easy to see or notice; attracting attention by being great or impressive", implying that that a product must also have the quality of exclusivity or non-conformity to be considered conspicuous. This definition reflects the core tenets of the action-against-default account proposed in my current research. If individuals' increased interest in conspicuous

products is indeed driven by the desire to distinguish themselves from the norm rather than the desire to signal wealth, it is not surprising that participants in the replication studies (Shanks et al. 2015) did not show higher willingness to pay for products such as mobile phones and MP3 players even when they were primed with mating mindset. Although still relatively expensive, such electronic devices may no longer enjoy the exclusive status as they might have had a decade ago, which would have been the key to its appeal to individuals primed with mating mindsets at the time.

In experiment 3, I pit these two key aspects of conspicuous consumption, exclusivity and signal of wealth, against each other. I predict that, perceived product exclusivity, which is a proxy for the deviation from the default of conforming attires, would be more appealing to participants with a mating mindset than those who are not primed with a mating mindset.

## Participants, Design, and Procedure

Following the prescription of Griskevicius et al. (2007) stating that the phenomenon of conspicuous consumption under a mating mindset pertains to male consumers, I recruited 107 male participants at the age of 35 or younger from Amazon Mechanical Turk using the same screening process in experiment 1. The experiment was a two-cell (mindset: control vs. mating) between-subject design with the same mindset priming procedure used in experiment 1. I used the likelihoods of wearing a necktie and a pocket square as fashion accessories as repeated measures factor. I also measured perceived uniqueness and expensiveness of both products as potential moderators.

*Male fashion accessories*. After the mating mindset priming procedures, all participants were asked to imagine that they were invited to a friend's end-of-year office party, where the dress code was business casual. Participants were told that a sports coat was expected at the party, with accessories of a necktie or a pocket square being an option for consideration. The non-essential fashion accessories, the necktie and pocket square, served as conspicuous products. The necktie and pocket square were each rated on perceived exclusivity of the accessory (1 = "very conforming", 7 = "very unique") and the extent to which participants agreed that the accessory made the entire outfit appear more expensive (1 = "Do not agree at all", 7 = "Very much agree"). Following these ratings, participants indicated how likely they were to wear each accessory to the office party using a Likert scale ranging from (1 = "Very unlikely", 7 = "Very likely"), which was the dependent measure in the experiment.

## Results and Discussion

Since experiment 3 used repeated dependent measures of usage likelihood (necktie and pocket square), I used a random-effect panel data analysis to analyze the data to account for any potential threat of carry-over effects. First I tested for the moderating effect of perceived product exclusivity on the relationship between mating mindset and conspicuous product choice. The mindset factor was used as a cross-sectional variable whereas the product-specific perceived exclusivity and the interaction term between mindset condition and exclusivity were used as within-subject variables. The analysis results are shown in Table 2.1a. The results showed an interaction effect between the mindset condition and the perceived product exclusivity on the likelihood to use each accessory ($z(210) = 2.30$, $p < .05$). To provide a qualitative interpretation

of this interaction, I conducted separate floodlight analyses using the likelihood of using of each accessory, necktie or pocket square, as the dependent measure (Hayes and Matthes 2009; Spiller et al. 2013). These analyses revealed that there was an interaction effect between the mindset condition and perceived exclusivity on the use of the necktie ($t(103) = 2.05$, $p < .05$) and pocket square ($t(103) = 2.70$, $p = .01$). Participants who were primed with a mating mindset would be less likely to wear a fashion accessory compared to their counterparts in the control condition as the perception of conformity of the accessory increased (for neck tie, exclusivity score less than 3.61, $\beta_{JN} = -.65$, SE = .33, $p$=.05, see figure 2.4a; for pocket square, for neck tie, exclusivity score less than 4.66, $\beta_{JN} = -.61$, SE = .31, $p$=.05, see figure 2.4b). These results are consistent with the prediction that the products that conform to the norm lose their appeal to individuals primed with the mating mindset.

I also tested for the effect of signal of wealth from wearing a necktie and pocket square. Participants somewhat agreed that both the necktie and pocket square would make the entire outfit more expensive (in comparison to "neither agree nor disagree" (4): $M_{tie} = 4.55$, $t(106) = 3.99$, $p < .01$; $M_{square} = 4.82$, $t(106) = 5.66$, $p < .01$). However, the panel data analysis showed that the perceived signal of wealth did not interact with the effect of mating mindset on the use of fashion accessories ($z(210) = -.53$, *n.s.*, see table 2.1b).

Overall, the results of experiment 3 showed that an individual's preference for conspicuous products may indeed be altered as a function of the mating mindset priming. Consistent with my hypothesizing, individuals with a mating mindset tended to prefer product options that deviate from the norm. In this regard, I argue that the preference for conspicuous products should stem from the products' perceived exclusivity rather than the price level alone. Therefore, the results from both Griskevicius et al. (2007) and Shanks et al. (2015) could both be

valid empirical findings, with the contrast between them stemming from the shifting dynamics of the target products used in the experiments. As mobile phones and MP3 players became popular commodities since the publication of Griskevicius et al. (2007), they lost their exclusivity status and the inherent conspicuous appeal to participants primed with a mating mindset.

## EXPERIMENT 4

In experiment 4, I sought to test the potential substantive implication of my findings by applying to more realistic consumption scenarios. Based on my theorizing, I propose that consumers primed with a mating mindset may be more willing to buy premium versions of products when the add-on items (e.g., drink and fries added to an order of hamburger) and premium features (e.g., heated leather seats and premium sound system on a car) offered as upgrade options, in comparison to the traditional direct comparison tactic where the baseline versions and premium versions are presented side-by-side. This is expected because such upgrade opportunities resemble non-conforming actions that differ from the baseline product offerings. Premium products and product bundles are often presented along with baseline product offerings in hope that a contrasting effect would accentuate the appeal of the additional features/products (for a review, see Cunha and Shulman 2011). Research has shown that the direct comparison, where a premium product/product bundle and the baseline product are presented simultaneously, may not be the most effective selling tactic owing to the activation of conflicting processing goal at the moment of choice (Cunha and Shulman 2011). However, when a consumer is primed with a mating mindset, s/he may become more susceptible to upselling, a tactic where the baseline product is presented first and the premium/bundle offering is provided

later as an upgrade option. The early entry of the baseline product is often established as the default representation in consumers' memory and judgment (Robinson and Fornell 1985; Carpenter and Nakamoto 1989; Kardes and Kalyanaram 1992; Kardes et al. 1993), whereas the upgrade option represents an action that deviates from the default. According to the theory I put forward, consumers with a mating mindset activated should be more inclined to purchase the offering of add-on products as upgrades than they would in the direct comparison situation. I tested this hypothesis in experiment 4.

## Pretest

To support my assumption that the upselling scenario (US), relative to the direct comparison (DC) scenario, is more likely to capture a situation in which the baseline offering represents a default from which the upgrade opportunity would deviate, I recruited 134 participants with the same demographic composition of experiments 1 and 2 (18-35 years old, 54 female) for a pretest.

Participants were randomly assigned to either the DC condition or the US condition in a car purchase scenario. A listing for the standard trim package of a car offering indicated that it included "Standard 2015 Comfort Drive Features", along with basic information such as engine specifications and gas mileage. In the DC condition, the premium luxury package was presented next to the standard model on the same screen with the same basic information, but in addition to "Standard 2015 Comfort Drive Features", it also included premium features of "Keyless Entry/Start", "Backup Camera", "Premium Sound System" and "Leather Interior and Seating". In the US condition, the premium package was presented on a separate screen after the one with

the standard package and listed only with the exclusive premium features. After the information regarding the different trims of cars, participants in both conditions read the same information regarding two potential customers: Pat, who decided to purchase the baseline package, and Chris, who chose to purchase the premium package. Participants then indicated how much they agreed with the following statement on a 7-point Likert scale: "In comparison to Chris, Pat is more likely to be the kind of person who accepts things in life the way they are." A one-way ANOVA revealed that participants in the US condition were indeed more likely to agree that Pat, the person who chose the baseline version, would accept things in life as is, compared to those in the DC condition ($M_{US}$ = 5.44, $M_{DC}$ = 4.89; $t(1,132) = -2.35$, $p = .05$).

## Participants, Design, and Procedure

For the main task, I recruited 265 participants of age of 35 or younger from Amazon Mechanical Turk using the same screening process in experiment 1 (129 female). The experiment was a 2 (mindset: control vs. mating) × 2 (selling tactic: direct comparison vs. upselling) factorial design. The mating mindset factor was manipulated between-subject using the same procedure used in experiment 1.

*Selling product upgrades*. Similar to the pretest, participants were randomly assigned to either the DC condition or the US condition. The hypothetical purchase scenarios consisted of both a choice between a standard trim package and a premium trim package of a full-size sedan as in the pretest, and a choice between a two-course meal and a three-course meal, a replicate used to test whether the effect can also be observed for purchases that imply lower financial risks relative to the car purchase scenario.

In the car purchase scenario, information regarding different versions of car trims were identical to those of the pretest. The only change was that, rather than reading about the decisions by hypothetical customers Pat and Chris, participants were asked to imagine themselves shopping for a car. In the DC condition, participants were asked "Considering both packages are reasonably priced, which package would you be more inclined to purchase?" In the US condition, participants were asked "Considering both packages are reasonably priced, would you be inclined to upgrade from the standard package to the premium package?" In both conditions, choice between baseline or premium package served as the dependent variable.

In the dinner scenario, participants in the DC condition were given a hypothetical restaurant menu listed with options for "Entrée", "Side" and "Dessert". Participants were given two combo options: "Dinner Combo for $12, including one entrée and one side dish of your choice" and "Dinner Combo with Dessert for $16, including one entrée, one side dish and one dessert item of your choice". Participants first chose their desired combo option, then selected desired menu items for each course of the meal, for example "cheese burger for the entrée" and "fried for the side dish". In the US condition, participants were first presented with a menu with only item for "Entrée" and "Side Dish", and identified desired items for this "Dinner Combo for $12 with one entrée and side dish". On the next screen, participants were presented with a separate dessert menu and were asked if they would like to upgrade the dinner combo to include a dessert item for an addition $4. In both conditions, whether the participant ordered dessert served as the dependent variable.

## Results and Discussion

Given that the dependent variables from experiment 4 consisted of repeated binary choices, I analyzed the data using a Generalized Estimating Equation model with a binomial logistic link. This analysis treated the within-subject repeated choices as cross sectional panel data and allowed for more efficient and unbiased estimation of coefficients while accounting for the effect of prior choice (i.e., carry-over effects) via an autoregressive working correlation matrix (Liang and Zeger 1986; Ballinger 2004; Ge, Häubl, and Elrod 2012). The analysis revealed an interaction effect between participants' mindset and the selling tactics on product choices (Wald $\chi^2(1) = 8.17$, $p < .01$, see figure 2.5). In the DC condition, no significant difference in terms of choice proportions was observed across participants primed with a mating mindset and their counterparts with a neutral mindset ($M_{\text{mating\_mindset}} = .46$, $M_{\text{control}} = .53$; $\chi^2(1) = 1.18$, *n.s.*). In the US condition, however, participants primed with a mating mindset were more likely to choose product upgrades compared to their counterparts in the control condition ($M_{\text{mating\_mindset}} = .61$, $M_{\text{control}} = .42$; $\chi^2(1) = 8.92$, $p < .01$). The same pattern of interaction was also observed for each consumption scenario (car: Wald $\chi^2(1) = 4.51$, $p < .05$; dinner combos: Wald $\chi^2(1) = 5.28$, $p < .05$).

Overall, the results in experiment 4 showed that activating a mating mindset did not necessarily make product bundles that include premium features or add-on items more attractive to potential buyers when the option did not include an action element as it was the case for direct comparison. However, presenting the added premium features and products as upgrade options, as in the upselling case, made it a viable tactic because it took advantage of participants' inclination to take actions under the mating mindset.

# GENERAL CONCLUSION AND DISCUSSION

As I reviewed earlier, the proposition that the mating mindset leads to risk-seeking behavior lacks theoretical grounding and is met with growing inconsistency in empirical results. In the current research, I attempt to reconcile past empirical findings by providing a different interpretation of the reported phenomena. To be specific, I proposed and showed that individuals display increased preference for options that deviate from an a-priori default position once a mating mindset is activated, but this change of behavior was not necessarily related to the risk factors associated with the options. My current action-against-default account provides a parsimonious explanation that accommodates a wide range of empirical findings including impatience (Van den Bergh et al. 2008), conspicuous purchases, and public helping behavior (Greskivicius et al. 2007), and also accounts for the recent criticism about the sex-leads-to-risk paradigm. Although in many real-life cases a action-against-default situation and risk-seeking behavior situation may be confounded, I were able parse these two behaviors out this in experiment 1 and 2. This finding is important to my understanding of consumer behavior under the influence of the mating mindset, especially considering the recent criticism about a series of work in this paradigm (Shanks et al. 2015). I emphasize that the key to the influence of a mating mindset on consumer behavior is the presence of an a-priori default condition rather than the intrinsic property of risk and reward associated with the options. This proposition may help to bridge the conflicting findings between these previous studies regarding regarding the effect of mating mindset priming (e.g. Griskevicius et al. 2007) and the recent failed replication (Shanks et al. 2015). Results from experiment 3 showed that individuals with an active mating mindset prefer conspicuous products only if such products signal a exclusive status, a finding consistent

with the action-against-default account I put forward. The fact that products such as the MP3 players have lost their uniqueness and non-conformity properties since the publication of the orginal studies (e.g., Greskivicius et al. 2007) may have contributed to the failure of the recent attempted replication of the effect of mating mindsets on consumer behavior by Shanks et al. (2015).

My research also contributes to the literature of omission bias in important ways. As seen in the results from experiment 2, the action-against-default effect is driven by the anticipated regret over forgone opportunities, which contrasts with the finding in the omission bias literature that, under non-mating mindsets, individuals expect greater regret from taking actions. Previous consumer behavior research on the omission bias has mainly focused on post-behavior evaluation such as the findings that under the circumstances where action, instead of omission, seems justifiable, consumers experience less post-hoc regret over their actions (Inman and Zeelenberg 2002; Abendroth and Diehl 2006). In contrast to the studies related to post-hoc evaluations, I complement the extant literature by examining a series of psychological processes that predict dispositional behavior tendencies and this prediction was validated across scenarios of card games, financial decision making, fashion accessories for a social occasion, and product upgrade purchases. I demonstrated that individuals primed with a mating mindset alter their behavior only relative to the status quo and that this behavior is orthognal to the risk factors or possible payoffs underlying each potential course of action. This finding provides a direct implication for upselling tactics, as experiment 4 demonstrates.

In addition to making contributions to the literature on the influence of mating mindsets on consumer behavior, the insights from my research are also relevant to real-world marketing applications. The use of sex appeals in advertising may not be as effective in encouraging

product acquisition only by increasing consumers' risk tolerance as many have previously thought. Alternatively, my findings suggest that the activation of a mating mindset would affect an individual's behavior only if there exists a default condition from which individuals can deviate, as demonstrated in experiment 4 when the upselling of product upgrade was more effective than direct comparison because upgrades are perceived as more action laden than direct comparison.

## Limitations

A limitation of the current research lies in the fact that I did not examine participants' current relationship status. It is reasonable to suspect that individuals in long term relationships or marriages would be less affected by the mating mindset manipulation and subsequently produce a less pronounced response in the decision making process. Nonetheless, the manipulation check in experiment 1 showed that after random assignment, the priming procedure produced a difference in the level of mating mindset between the groups as intended. Also, robust results were observed across all experiments despite the fact that heterogeneity in participants' relationship status affects the power of the data negatively, if at all. Previous studies also lend support to the notion that both single and in-relationship individuals may produce similar response under the influence of a mating mindset (for an example, compare Durante et al. 2011, Wang, and Griskevicius 2014). However, I realize that the relationship status may also affect whether individuals are invested in long-term or short-term mating goals (Buss and Schmitt 1993). As the experiments in the current research only focused on one-time decisions in

pulse events, I are curious whether the phenomenon would also sustain in long-term consumer behavior such as product subscription and renewal decisions.

Finally, another limitation of the current research is that unlike the first three experiments, I used slightly different dependent measures in experiment 4 across the moderator conditions as an attempt to mimic realism. Participants in the DC condition were asked questions in a fashion similar to "would you choose product A or B?" while their counterparts in the US condition were asked "would you like to add C onto the base offering of A?" As much as I were cautious to maintain the products offered across conditions equivalent to one another, in that the aggregate of A and C was identical to the offering of B, it could still be argued that the observed advantage of upselling tactic was a simple result of framing rather than the mating mindset. To address this concern, I draw attention to the difference between participants' decisions within each condition of sales tactic. I observed that within the DC condition, participants' preference for product B, the premium version remained virtually unchanged regardless of whether a mating mindset was primed. However, within the US condition, participants with mating mindset showed more interest in the premium upgrades than their counterparts with neutral mindset priming. The simple main effect observed only within the US condition but not within the DC condition helped to rule out the potential threat of a demand effect caused by the slight wording difference between the moderator conditions. Nonetheless, I invite future researches to confirm this point with potential data from real-world transactions and at a larger scale.

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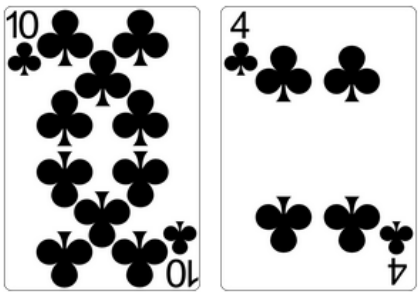
# APPENDIX: SAMPLE SCREENSHOT FROM EXPERIMENT 1

For this hand, you have:




What is your decision?

Change the text in the box below by entering "**hit**" to add another card,

or simply press the Enter key on your keyboard to move on.

stay

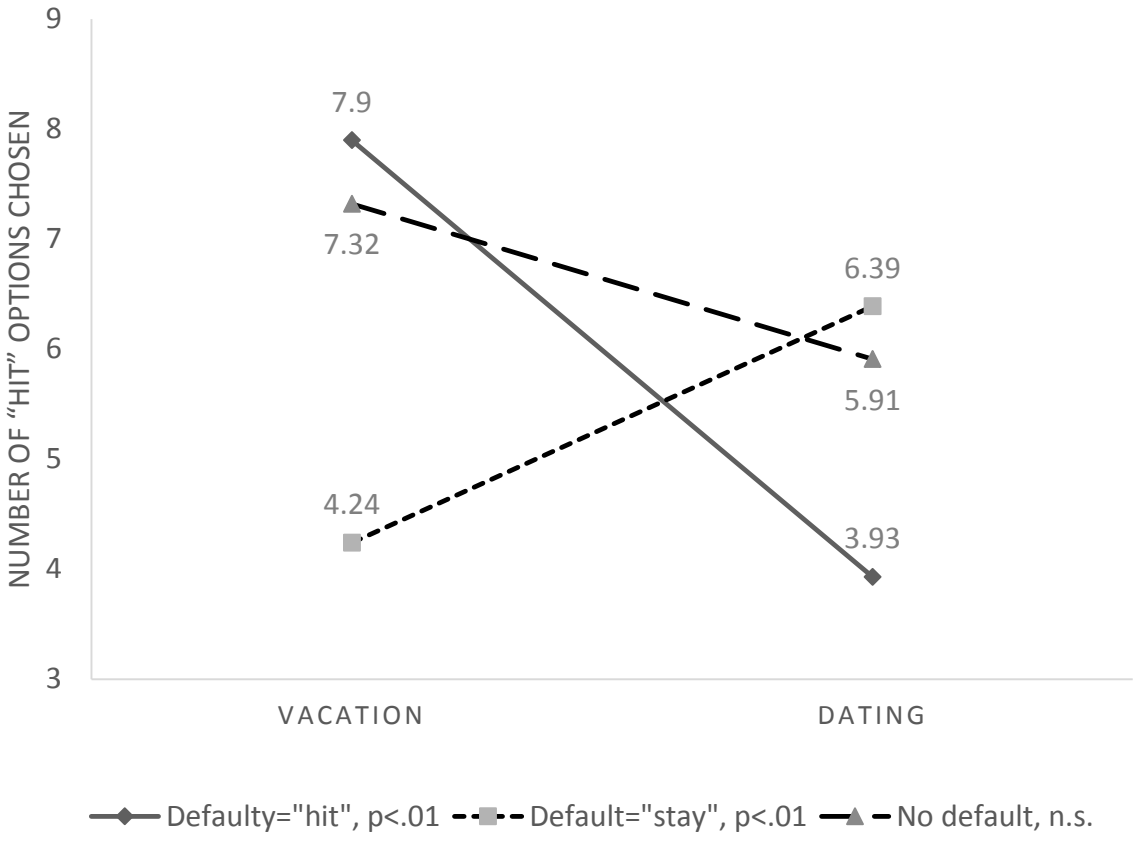

9
8
7
6
5
4
3
NUMBER OF "HIT" OPTIONS CHOSEN
7.9
7.32
6.39
5.91
4.24
3.93
VACATION
DATING
Defaulty="hit", p<.01
Default="stay", p<.01
No default, n.s.

Figure 2.1

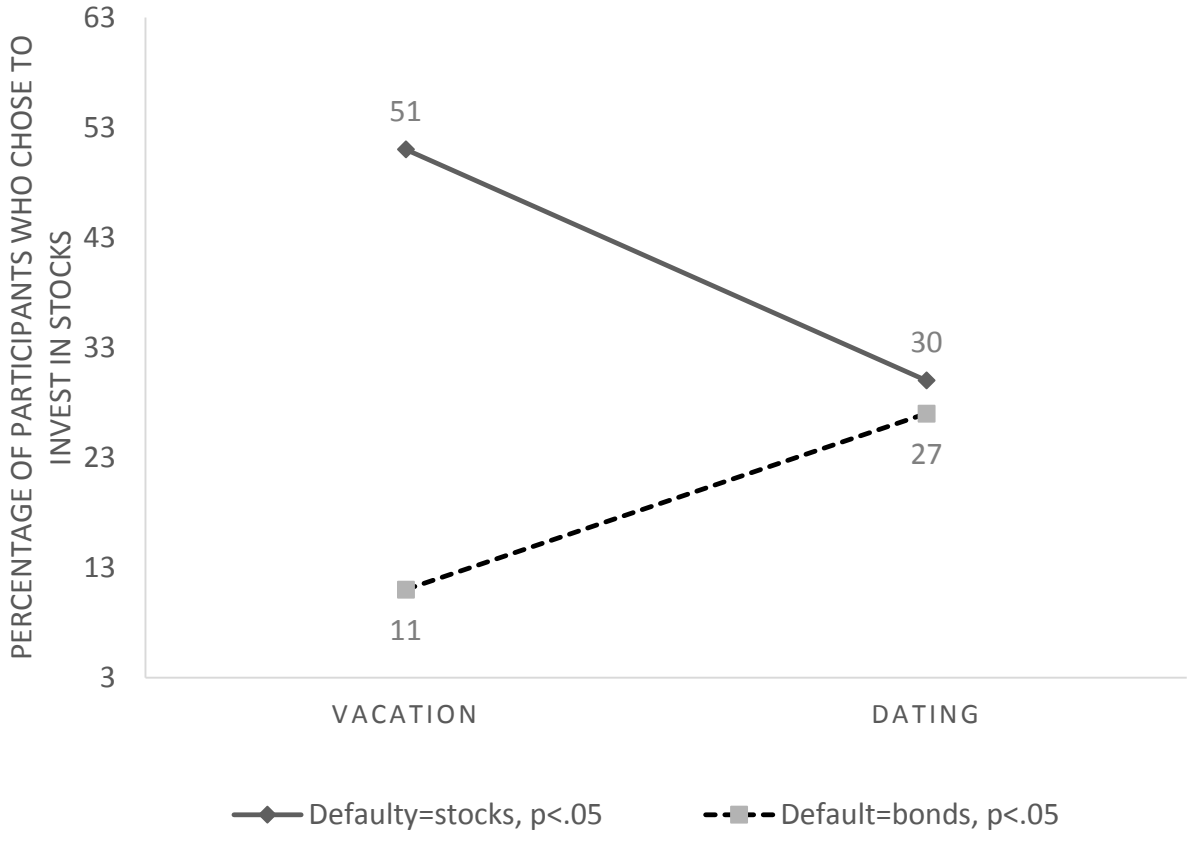

PERCENTAGE OF PARTICIPANTS WHO CHOSE TO INVEST IN STOCKS
63
53
43
33
23
13
3
51
30
27
11
VACATION
DATING
Defaulty=stocks, p<.05
Default=bonds, p<.05

Figure 2.2

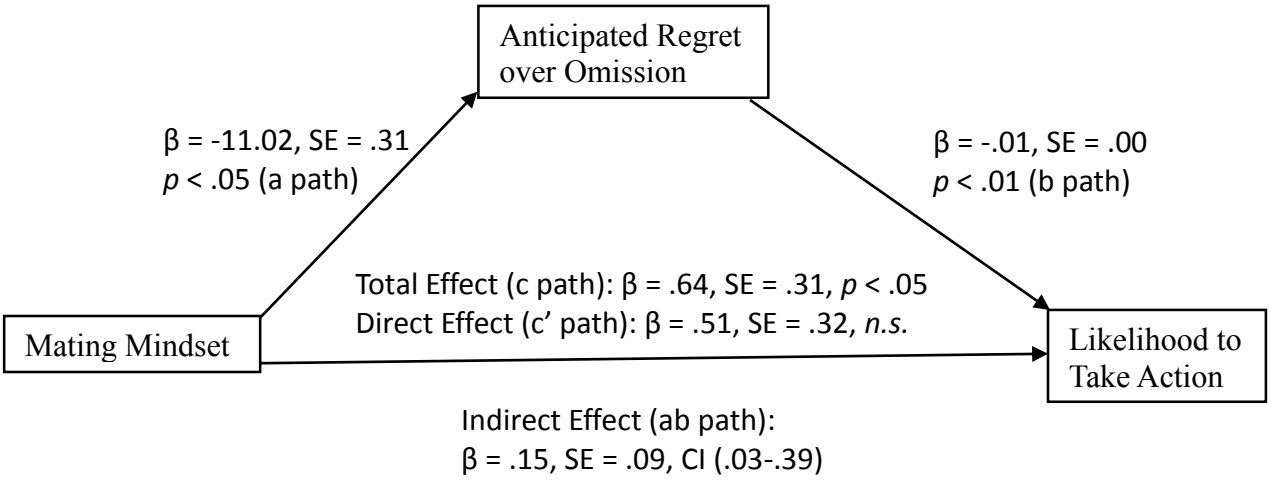

Anticipated Regret over Omission
β = -11.02, SE = .31
p < .05 (a path)
β = -.01, SE = .00
p < .01 (b path)
Total Effect (c path): β = .64, SE = .31, p < .05
Direct Effect (c' path): β = .51, SE = .32, n.s.
Mating Mindset
Likelihood to Take Action
Indirect Effect (ab path):
β = .15, SE = .09, CI (.03-.39)

Figure 2.3

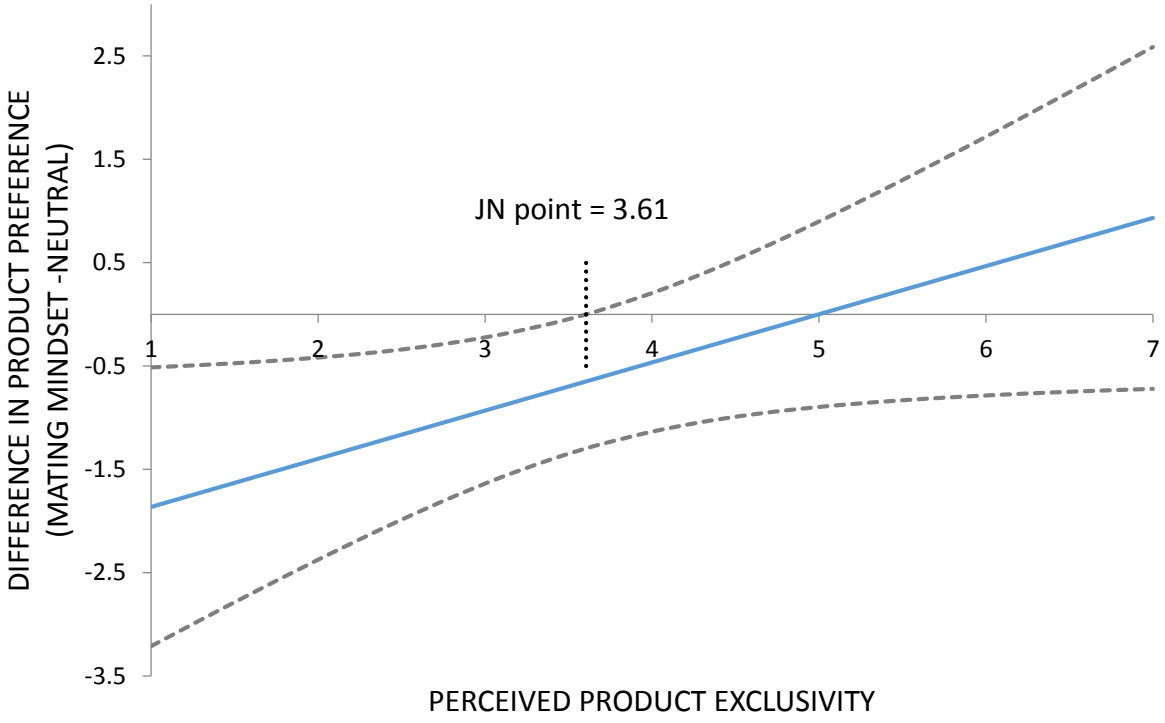

DIFFERENCE IN PRODUCT PREFERENCE
(MATING MINDSET -NEUTRAL)
2.5
1.5
0.5
-0.5
-1.5
-2.5
-3.5
JN point = 3.61
1
2
3
4
5
6
7
PERCEIVED PRODUCT EXCLUSIVITY

Figure 2.4a

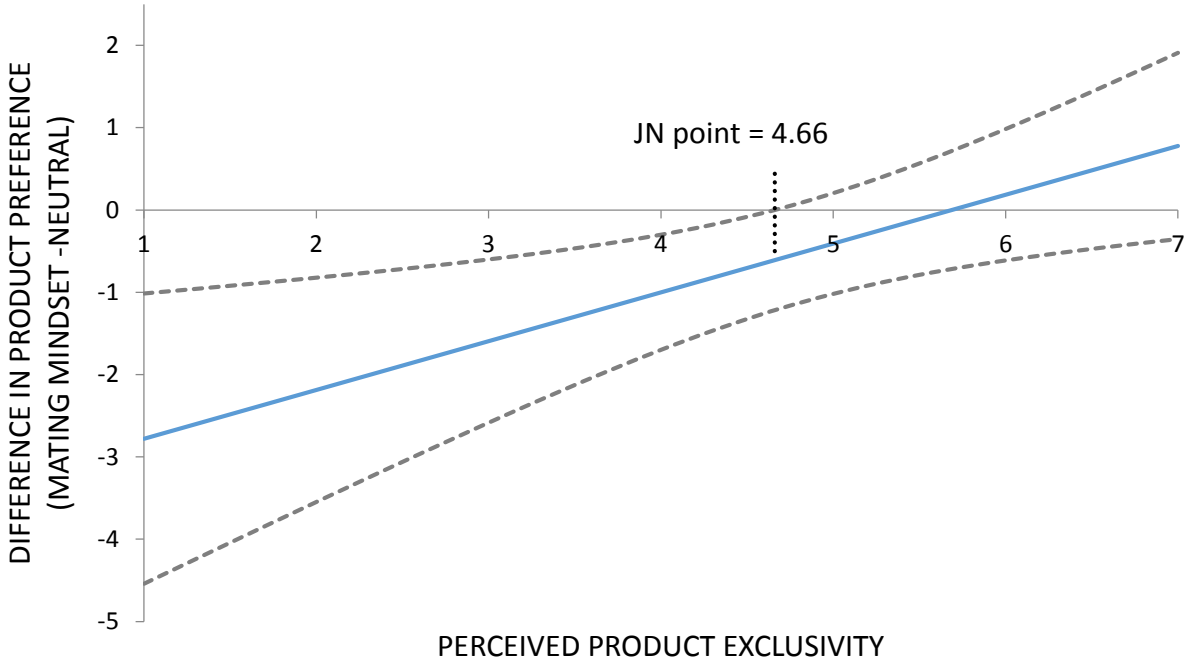

DIFFERENCE IN PRODUCT PREFERENCE
(MATING MINDSET -NEUTRAL)
2
1
0
-1
-2
-3
-4
-5
JN point = 4.66
1
2
3
4
5
6
7
PERCEIVED PRODUCT EXCLUSIVITY

Figure 2.4b

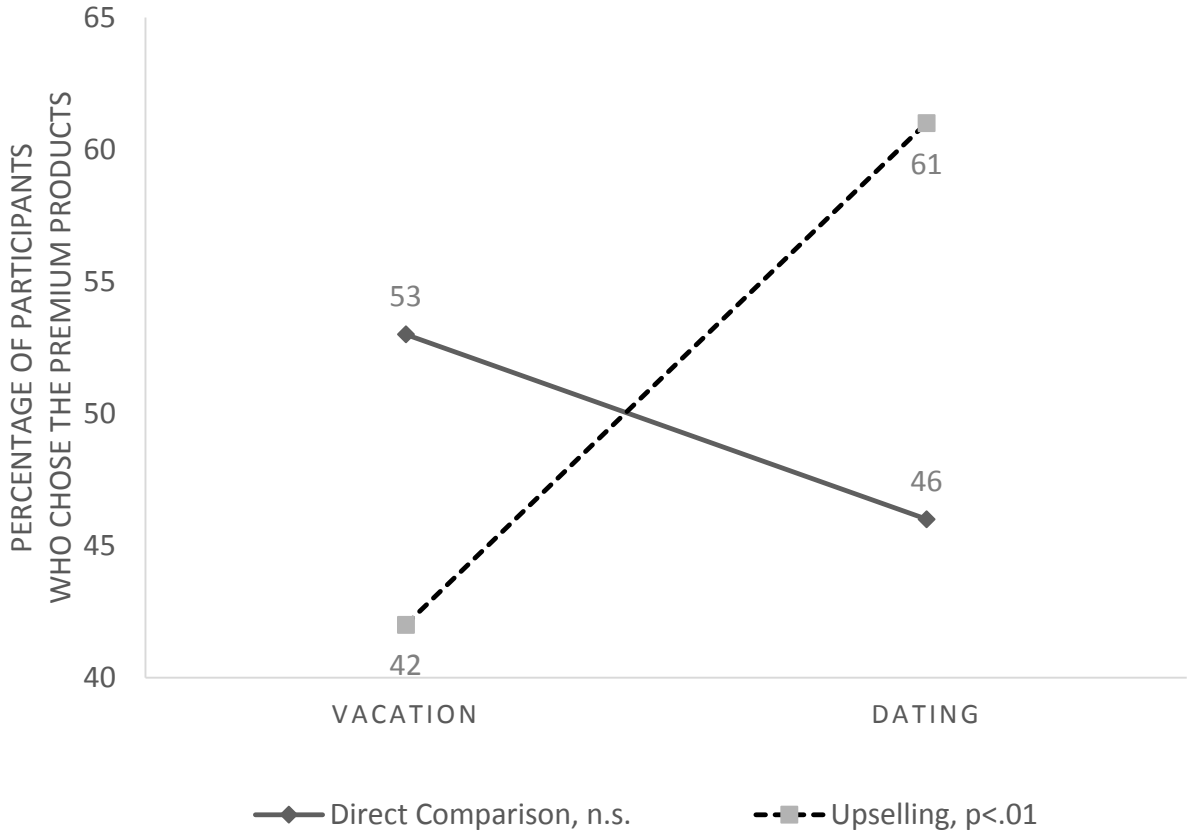

65
60
55
50
45
40
PERCENTAGE OF PARTICIPANTS WHO CHOSE THE PREMIUM PRODUCTS
53
46
42
61
VACATION
DATING
Direct Comparison, n.s.
Upselling, p<.01

Figure 2.5

Table 2.1a

| | β | Std. Error | *z* | *P* |
|---|---|---|---|---|
| (Intercept) | 6.77 | .51 | 13.36 | .00 |
| Mindset | -2.08 | .68 | -3.07 | .00 |
| Exclusivity | -.56 | .11 | -5.30 | .00 |
| Mindset × Exclusivity | .34 | .14 | 2.30 | .02 |
| | | | | |
| | | | Wald $\chi^2(3) = 36.82$ | $p = .00$ |

Table 2.1b

| | β | Std. Error | *z* | *P* |
|---|---|---|---|---|
| (Intercept) | 4.37 | .62 | 7.01 | .00 |
| Mindset | -.07 | .89 | -.08 | .94 |
| Wealth | -.02 | .12 | -.16 | .87 |
| Mindset × Wealth | -.10 | .18 | -.53 | .59 |
| | | | | |
| | | | Wald $\chi^2(3) = 4.21$ | $p = .24$ |

# CHAPTER 3

# CONSTRUAL LEVEL, TEMPORAL DISTANCE AND BUDGET PLANNING[2]

[2] He, Yang and Marcus da Cunha Jr. To be submitted to the *Journal of Consumer Psychology*

Budgeting is an issue critical to consumer wellbeing, especially during the past years of slow economic growth and dwindling personal savings. A recent survey reported that 67% of Americans would not be able to pay for a $500 surprise bill with savings (Steiner 2016). Many of them reported that they would respond to an unexpected bill by reducing spending on other things.

While abundant research exists in the consumer behavior literature regarding the topic of budgeting, most focus on budget execution, the process where an individual carries out a budget plan once it is set. In comparison, less research is seen with regards to the planning phase of a consumption budget, where consumers forecast their consumption needs and allocate money in advance. I contend that more research regarding budget planning is necessary, given that planning is equally important as, if not more than, the budget execution in achieving financial responsibility. Planning precedes execution in time and establishes the goal for the execution phase. As seen in earlier research, although actual spending may deviate from the budget goal, consumers usually diligently strive to fulfill the consumption quota they had previously determined (Larson and Hamilton 2012). This finding echoes the general notion of the Endowment Effect (Thaler 1985, 1999), in that once the money is written off at the budget planning phase, a new reference point is established for the commitment in purchases and consumptions, with unfulfilled spending quota resulting in adverse feelings. Therefore, accurate estimation of one's future consumption is the first step to the better management of spending. In addition, how consumers estimate their future consumptions may have immediate impact on their product choices. For example, one's estimation of annual mileage driven is a critical variable in deciding whether it is advisable to pay the price premium for a hybrid-powered

automobile in comparison to a cheaper version with conventional fuel. The estimated annual mileage is also used to decide various financing options for the automobile.

One research that explicitly explores the process of budget planning is the work by Ülkümen et al. (2008), where they found that consumers tend to overbudget in comparison to their actual spending as the budget horizon extends. In the current research, I expand the work by Ülkümen et al. (2008) and investigate the nature of consumer overbudgeting. I propose that the extent of consumer overbudgeting differs across consumption categories and over different budget horizons, with larger degrees of overbudgeting coming from hedonic consumptions than utilitarian consumptions in the longrun. I propose that this phenomenon can be accounted for by Construal Level Theory (Liberman and Trope 1998; Trope and Liberman 2003).

## THEORETICAL FRAMEWORK

### Previous Literature in Mental Accounting and Budgeting

Early theoretical discussions in the mental accounting and budgeting literature (Thaler 1985, 1999; Prelec and Loewenstein 1998) established my foundational understanding in the subject such as the concept of opening and closing the accounts, infungibility of fund allocation amongst spending categories, and effects of time on budget consumption. Later I have seen empirical inquiries by consumer behavior researchers to provide further insights in how consumers enforce their budget policies. For example it has been shown that one's motivation, specifically the effects of escalation of commitment, is a considerable force that decides the outcome of consumer budget keeping (Heath & Soll, 1996; Heath, 1995). It has also been shown

that the cognitive representation of budget categories, namely the specificity of each consumption category, would also affect consumers' ability to keep consumption under pre-determined limits (Cheema and Soman 2006; Sussman and Alter 2012). Relating to the literature in self-control, other researches have conceptualized budget consumption as a contest between consumers' will and desire (Stilley, Inman, and Wakefield 2010; Soster, Gershoff, and Bearden 2014).

In reviewing the literature, I have noticed that the majority of research on consumer budgeting has focused on the execution phase, answering the question how consumers carry out a budget plan once it is set. Less explored is how consumers estimate their future expenditures over a certain period and set the budget accordingly. One exception in this regard is seen in the work by Ülkümen and colleagues (Ülkümen, Thomas, and Morwitz 2008). They found that, as a result of reduced confidence in the accuracy of estimated consumption, consumers were more likely to overbudget for their spending over a longer period of time in comparison to a shorter budget period. The current research aims to complement the existing literature and further my understanding in the process where consumers estimate their future consumption and set budgets.

## Construal Level and Consumption Focus

Ülkümen et al. (2008) attribute the overbudgeting phenomenon to a cognitive bias. They suggest one's confidence in his/her spending estimation should decrease as the estimation horizon expands and therefore the individual is more likely to make upward adjustments to the initial estimation. This theorezation echoes a prediction by Construal Level Theory (CLT; Trope

and Liberman 2010), which states that because distant future is constructed abstractly in one's mind, categorization tend to become broader and more inclusive. Meanwhile, there are reasons to believe the budgeting activity involves more than the cognitive process alone. Many previous studies, as mentioned earlier, have found that mental budgeting is also affected by affective and motivational factors. that the feeling of uncertainty can be experienced as either fear or hope (Lerner, Ye, Valdesolo, & Kassam., 2015). Why individuals who are uncertain of their future spending only engage in upward adjustment (i.e., fearful that they may overspend), but not downward adjustment (i.e., hopeful that they would underspend), was not communicated clearly in the original research.

To answer this question I start with a review of the basic premises of CLT (Trope and Liberman 2003, 2010). Trope and Liberman posit that people can only experience events at the current moment, while objects in the past or future are experienced as constructed mental projections. Mental representation of future events and objects are constructed at different levels of abstraction. Central to CLT is the claim that the more distant the projected object is, the more abstraction and less contextual detail is included in the mental construction process. It is important to note that the abstraction process, while omitting the less relevant details, transcends the mental representation to become less ambiguous, more coherent, and more prototypical than representations at a lower level. As a result of this process, higher level construals focus on the abstract and superordinate goals of actions, in comparison to the lower level construals which emphasizes the concrete means and methods to achieve the goals (Trope and Liberman 2010). Extending the core propositions of CLT, Liberman and Trope (1998) found that sicne the focus on the end state of one's action is a feature of the higher level construal, an individual would be more concerned with the desiability of an action, in contrast to the fact that s/he would be more

concerned with the feasibility of an action with a lower level construal when the individual focuses on the means required to achieve the end state. Since the construal level is often determined by the temporal distance of the action, I propose that the difference in construal levels is an alternative explanation to the previously documented effect of under-/overbudgeting at different budget horizons. To be specific, I notice that studies reported by Ülkümen et al. (2008) mainly asked participants to estimate spendings on food and entertainment (partying), which are activities heavily related to the purpose of having fun. According to the prediction of CLT, as the budget horizon extends, participants would pay more attention to the desirability aspect of the activities, and in turn an increase in estimated spending was observed. This prediction coincides with the findings from an earlier study, where participants were more likely to precommit to indulgence expenditures in the future but preferred cash rewards for the current moment (Kivetz and Simonson 2002). However, not all consumptions are for hedonic purposes. Many consumptions are utilitarian, as they provide a means to help achieve an end goal while giving little hedonic value such as "fun" or "enjoyment" per se (Hirschman and Holbrook 1982; Voss, Spangenberg, and Grohmann 2003). Such utilitarian consumptions obviously would not appeal to individuals if their attention gradually shifts away from the feasibility and towards desirability as the construal level rises. Thus, instead of an increase in budget as the budgeting horizon expands, I should expect to observe the estimated spending decrease.

In sum, I hypothesize that the degree of under-/overbudgeting biases at different budgeting horizons is moderated by the type of consumptions under budget. As the budgeting horizon expands, the budget increase should only be observed in hedonic consumptions but not in utilitarian consumptions. I develop a series of experiments to confirm this hypothesis and

showcase its implication in real sales situations. By doing so, I seek to augment the previous understanding of consumer budget planning by introducing consumption type as a qualifier.

## EXPERIMENT 1

The purpose of experiment 1 was to replicate the general findings from Ülkümen et al. (2008) but explicate the difference in the effect size between consumption types as hypothesized. Again, as I noticed that the overbudgeting phenomenon reported in the previous research was recorded in consumption categories with large hedonic utilities, I investigate whether this effect can be extended to other types of consumption as well.

### Participants, Design, and Procedure

Experiment 1 was a 2 (budget horizon: month vs. year, between-subject) × 2 (consumption type: hedonic vs. utilitarian, within-subject) mixed design. Forty-nine participants were recruited from Amazon Mechanical Turk for the online study. Participants were first given detailed definitions of two categories of consumptions, entertainment and transportation, which served as proxy for hedonic and utilitarian consumptions, respectively. Examples for each category were also given. For entertainment consumptions, examples included fine dining, sports events, and media (movie and video game) rentals; examples for transportation expenses included fuel cost, public transit fare, and taxi fare. After reading the description and examples for both consumption categories, participants provided estimation for the total amount they would be spending in each category, for either the next month or the next year, depending on

random assignment of the budget horizon condition. Next, all participants finished an unrelated filler task before recalling their actual spending in the past week. The purpose of the filler task was to prevent the potential threat of presentation bias where participants' recall of actual spending would gravitate towards the future spending they had estimated earlier. During the final task of consumption recall, participants estimated (1) the number of times and (2) total dollar amount of their purchases in both entertainment and transportation consumption categories during the past seven days.

## Analysis, Results, and Discussion

I calculated the dependent measures as $/underbudgeting = \frac{\left(\frac{7}{n}\right) estimated\ spending}{spending\ recall} - 1$ , where *n* equaled 30 or 365 days, depending on the budget horizon assignment. When participants estimated an amount that is larger (smaller) than their actual spending in a given category, this percentage measure would have a positive (negative) value, indicating over-/ underbudgeting. I used a repeated measures ANOVA to analyze the data. Results were consistent with the general finding from Ülkümen et al. (2008). Overall, participants in the yearly budget horizon condition estimated higher spending ($M$ = 0.13) than in their counterparts who were in the monthly budget horizon condition ($M$ = -0.26; $F(1,47) = 4.48$, $p < 0.05$. However, this main effect was qualified by a statistically significant interaction between consumption type and budget horizon ($F(1,47) = 6.66$, $p < 0.05$, see figure 3.1). As hypothesized, budget estimation for hedonic consumptions was more sensitive to the change in budget horizon than the budget for utilitarian consumptions. For hedonic consumptions, participants in the yearly condition estimated a higher spending ($M$ = 0.62) than those in the monthly condition ($M$=-0.23; $F(1,47)$ =

6.22, $p<0.05$). In contrast, the difference between estimations was not statistically significant across budget horizon conditions when budgeting involved utilitarian consumptions ($M_{yearly}$ =-0.36 vs. $M_{monthly}$ = -0.28; $F(1,47)=0.49$, n.s).

The results from experiment 1 confirms the prediction of my hypothesis, that overbudgeting, as a function of the budgeting horizon, is moderated by the consumption type. While this result is consistent with the findings from earlier research, it also reveals two important insights. First, I recognize that the overbudgeting phenomenon may be more pronounced for hedonic consumptions and less observable for utilitarian consumptions. Second, and more imporantly, while the explanation of cognitive error given by Ülkümen et al. (2008) is consistent with the general phenomenon of overbudgeting, it does not account for the interaction effect between budget horizon and consumption type. In contrast, the CLT is more appropriate to explain the psychological mechanism behind the interaction.

## EXPERIMENT 2

The purpose of experiment 2 was to provide further evidence that the change in budget estimation indeed stems from the change in construal level as the budgeting horizon expands. As discussed earlier, while the cognitive efficiency explanation can account for the general effect of overbudgeting, it does not explain the difference in effect size across different consumption types. To explicate the difference between the two theoretical accounts, I directly manipulated the construal levels while holding the budget horizon constant in experiment 2.

## Participants, Design, and Procedure

Experiment 2 was a 2 (construal level: low vs. high, between-subject) × 2 (consumption type: hedonic vs. utilitarian, within-subject) mixed design. Forty-three participants were recruited from Amazon Mechanical Turk. Upon arriving at the online survey page, participants were first given a construal level priming task adapted from previous research (Freitas, Gollwitzer, and Trope 2004). Participants in the low-construal condition were asked to think of the detailed steps they would take to clean the housing space they currently live in, while participants in the high-construal condition were asked to think of the transcending reasons they have for cleaning their living space (see Appendix for example). Immediately after the construal level priming tasks, all participants completed the Behavior Identification Form (BIF) scale, which has been used as a reliable check for construal level (Vallacher and Wegner 1989; Williams, Stein, and Galguera 2014). Next, all participants provided budget estimation for the next month and reported actual spending in the past two weeks in both hedonic and utilitarian consumptions, in the identical procedure used in experiment 1.

## Analysis, Results, and Discussion

Comparing the response in the BIF showed that the construal level priming task successfully produced a difference in the mental construal between the treatment groups ($M_{high\ \_construal}$ = 6.14 vs. $M_{low\ \_construal}$ = 4.29; $F(1,41)=4.18$, $p=0.05$). Next, a repeated measures ANOVA was used to analyze the effects of construal level and consumption category on the budget estimation. The dependent measure, under/over-budgeting was calculated using the same

formula as in the analysis of experiment 1. From the results, I did not observe a significant effect of construal level manipulation on the budget estimation ($F_{(1,41)} = .11$, $p > 0.10$). However, there was an interaction between the construal level and consumption categories ($F(1,41)=4.11$, $p < 0.05$, see figure 3.2). The budget estimation for hedonic consumptions from participants in the high construal condition ($M = -0.30$) were higher than that from the participants in the low construal condition ($M = -0.54$; $F_{(1,41)} = 3.24$, $p < 0.10$). But this difference was not observed the utilitarian consumptions ($M_{high\ \_construal} = -0.40$ vs. $M_{low\ \_construal} = -0.23$; $F_{(1,41)}=1.07$, *n.s*).

In experiment 2, the budget horizon was held consistent across experimental conditions. Yet I still observed that hedonic and utilitarian consumption estimations vary at different magnitude as a function of the construal level. This interaction supports the proposition that construal level is a driver that leads to overbudgeting in hedonic consumptions, a process that is different from the previous literature.

## GENERAL DISCUSSION

In this research, I have examined consumer budget estimation as a function of budget horizon and the consumption category. As discussed at the beginning of this report, although extant literature exist regarding the issue of consumer budgeting, the vast majority focus on the issue of budget keeping and budget execution. I contend that the budgeting planning phase is as important as, if not more than, the execution phase to consumer welfare. I replicated the general findings from earlier research that overbudgeting is more likely to happen as the budget horizon expands. But more importantly, I augment earlier research by by demontrating that degree of

overbudget in the long run is not uniform across various consumption categories. Consumptions that are hedonic in nature are more likely to receive overbudget in the long run than consumption that are utilitarian in nature. My empirical results confirm that this moderation effect by consumption type is driven by the difference in construal level experienced by consumers forecasting over different budget horizons.

Consumers often face situations where they have to estimate their usage of a product in the future, such as the type of meal plan to purchase at a college dining service, or the annual mileage to be underwritten on a new car lease agreement. I believe that a same person would produce considerably different estimations for his/her product usage by focusing on different aspects of the product and choosing different time span as their budgeting horizon. The findings from the current research can also shed light on how retailers may reduce the stockpiling problem, where consumers take advantage of sales events and buy merchandise in large sums saved for later use.

## APPENDIX: CONSTRUAL LEVEL PRIMING PROCEDURE

| High Level Construal | Low Level Construal |
|---|---|
| What is a reason that you would clean up your living space (house/ apartment/ etc.)? | What is a method that you would use to clean up your living space (house/ apartment/ etc.)? |
| Why do you desire the goal above? | How would you achieve the activity above? |
| Why do you desire the goal above? | How would you achieve the activity above? |
| Why do you desire the goal above? | How would you achieve the activity above? |

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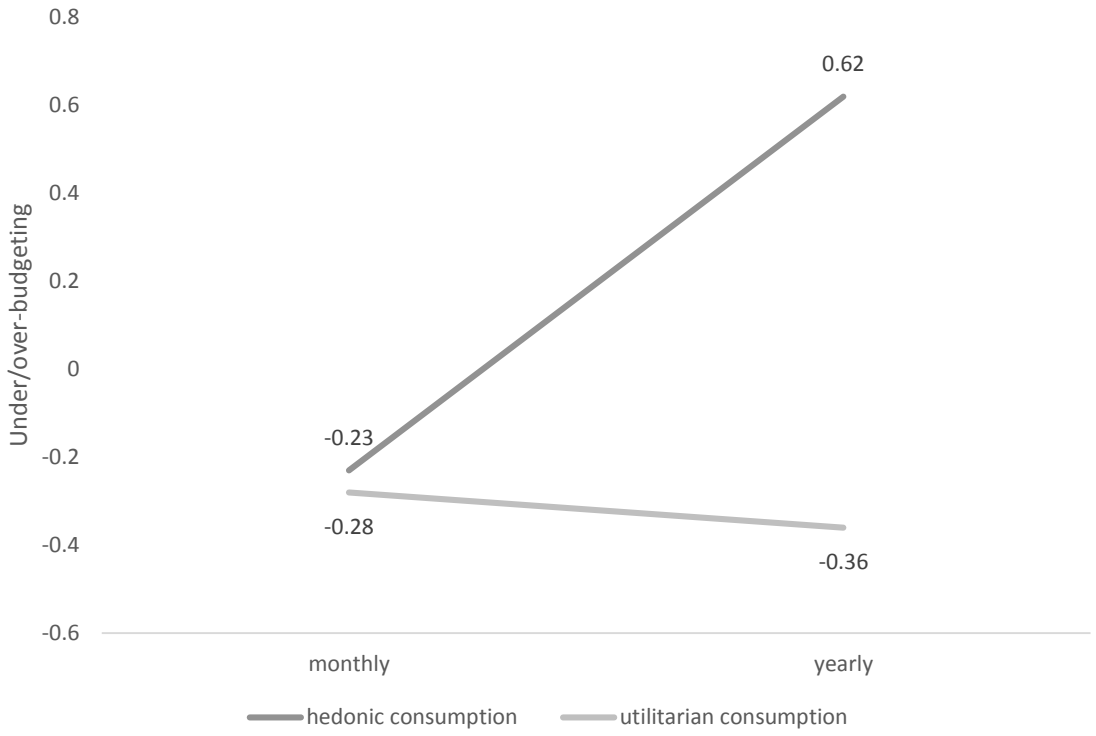
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Under/over-budgeting
0.62
-0.23
-0.28
-0.36
monthly
yearly
hedonic consumption
utilitarian consumption

Figure 3.1

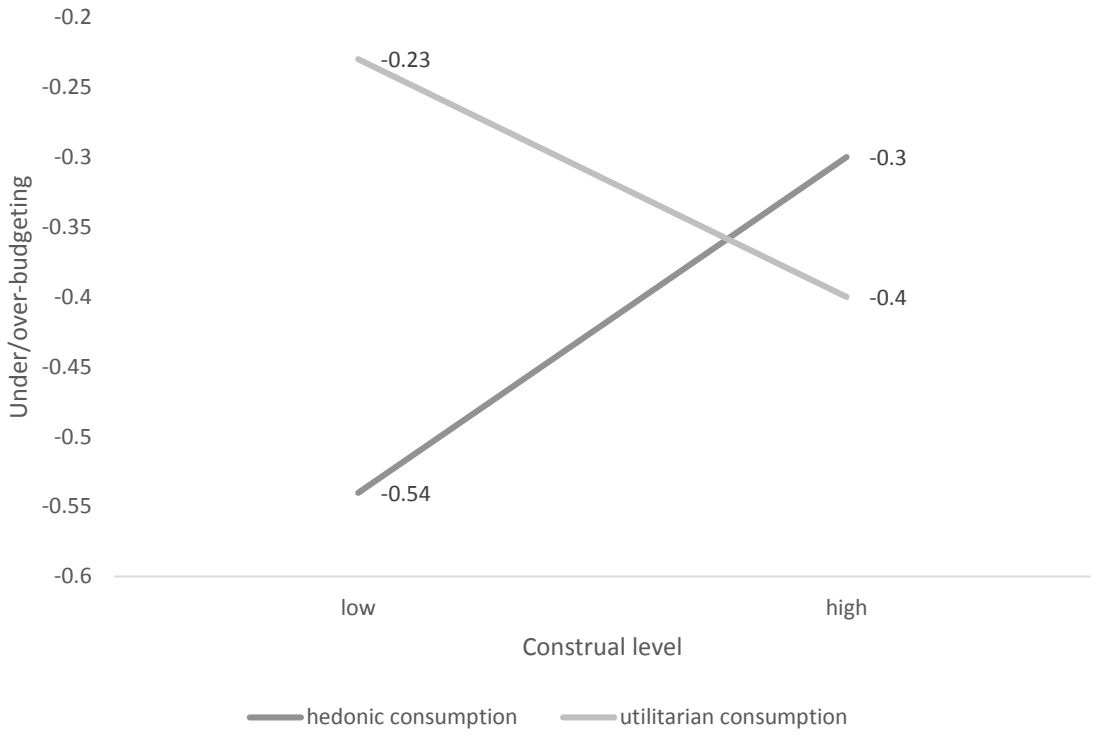
-0.2
-0.25
-0.3
-0.35
-0.4
-0.45
-0.5
-0.55
-0.6
Under/over-budgeting
-0.23
-0.3
-0.4
-0.54
low
high
Construal level
hedonic consumption
utilitarian consumption

Figure 3.2

# CHAPTER 4

# LEARNING AND RECOGNITION UNDER UNCERTAINTY[3]

[3] He, Yang and Marcus da Cunha Jr. To be submitted to the *Journal of Consumer Research*

Marketing information aimed at persuading consumers is often presented within contexts that trigger uncertainty. For instance, such a context can include situations in which uncertainty about an outcome takes place, such as when a consumer watches a very close championship game involving his favorite team, the final round of a talent competition on TV featuring a singer with whom the spectator has made an emotional connection, or the world series of poker featuring one's favorite player. These examples portray situations in which high levels of anxiety may arise as a result of contextual uncertainty while consumers are exposed to marketing information such as brand logos on the players' cleats or sideline banners, brand logos on the cups of the judges in a singing competition, or information about brands sponsoring the poker tournament. Would the anxiety caused by uncertainty influence how consumers process incidental exposure to marketing information?

Consumer researchers have long been interested in how uncertain contexts may influence the way consumers respond to marketing materials, both from a resource allocation standpoint and from an affective-response standpoint. For instance, uncertainty has been shown to influence the extent to which information is processed systematically or peripherally as a result of allocation of cognitive resources (Chaiken 1980). Researchers investigating the role of felt uncertainty on affective responses have found that the feeling of uncertainty magnifies/polarizes positive affective responses, possibly owing to heightened attentional and emotional engagement (Bar-Anan, Wilson, and Gilbert 2009). In addition, as a result of postponed emotional adaptation, the sense of uncertainty has been shown to help to extend positive moods (Wilson et al. 2005). Applied to a marketing context, these findings imply that uncertainty could lead to greater liking of an ad or a product that elicits positive emotions.

Whereas the findings regarding the potential positive link between uncertainty and attitudinal/behavioral outcomes have been plentiful in the past few decades, there has been a somewhat limited focus on how uncertainty affects the cognitive system, especially with respect to the encoding and recall of incidental exposures to marketing stimuli. Specifically, it is not clear what role uncertainty plays when the focus of attention is fixated on the source of uncertainty while marketing information is peripheral to this source, much like the scenarios presented above. In this research, I investigate how contextual uncertainty affects consumers' ability to properly recall incidental exposures to peripheral marketing stimuli.

I propose that the answer to this question is a function of two counteracting forces triggered by uncertainty-induced anxiety. Based on the Reactive Approach Motivation (RAM, McGregor et al. 2010), I propose that, to insulate themselves from uncertainty-induced anxiety, individuals engage in tunnel vision of an alternative goal, much like the way animals engage in behaviors such as running and licking to distract them from the source of anxiety, even though such behaviors have no obvious instrumental link to the source of anxiety. In this process, individuals experience heightened responsivity to external stimuli (Aston-Jones et al. 1994; Usher et al. 1999; Critchley, Mathias, and Dolan 2001; Eysenck et al. 2007; McGregor et al. 2010; Hirsh, Mar, and Peterson 2012). This palliative tunnel vision results in an enhanced perception of peripheral information unrelated to the source of anxiety, such as in the case of exposure to brand information during an event in which the outcome is uncertain. Meanwhile, as much as individuals may become better at processing peripheral information as a result of anxious uncertainty, their ability to process such information in a more meaningful way may be hindered because the heightened anxiety overloads the cognitive system, as it will be detailed in the theory section of this manuscript. Thus, the extent to which uncertainty enhances (as opposed

to hinders) the processing of peripheral marketing information depends on the interaction between these two counteracting forces.

My research contributes to the literature on consumer behavior by expanding the understanding of the effect of uncertainty on information processing beyond what has been proposed by elaboration-based models such as the Elaboration Likelihood Model (ELM) (Petty and Cacioppo 1986) and the Heuristic-Systematic Model (HSM, Chaiken 1980). To illustrate, the HSM suggests that uncertainty motivates people to systematically process relevant information as a way to reduce the experienced uncertainty. As a result, the HSM predicts that one should decrease the allocation of cognitive resources to process peripheral cues, such as a brand logo, given that these cues are irrelevant to solving experienced uncertainty, leading to the weakened recall for brand information. My research is distinct from elaboration-based models in two important ways. First, I propose and show the counter-intuitive effect that uncertainty may actually enhance the processing of such peripheral information, and this result is explained by the RAM account rather than by increased task involvement or elaboration. Second, I propose information modality (visuospatial versus phonological) as a moderator of this effect, such that one would observe the effect when the encoded information and the recall cues are of the same modality, but not when recall cues are presented in a modality (e.g., phonological brand name) that differs from that of the encoded information (e.g., visual-spatial brand logo). This is expected, because anxiety, a byproduct of felt uncertainty, poses constraints on the available cognitive resources, which are necessary for the integration of cross-modality information.

## THEORETICAL BACKGROUND

With the exception of research in affect management, which predicts that individuals may prefer uncertainty over certainty for affect management purposes (e.g., Wilson et al. 2005; Bar-Anan et al. 2009; Lee and Qiu 2009; Shen, Fishbach, and Hsee 2015), the large majority of studies in decision optimization support the claim that individuals tend to be averse to uncertainty (e.g., van den Bos 2001; Konstantinidis and Shanks 2014), because uncertainty makes the outcomes of events less foreseeable or controllable. This gap between desired and actual control over the outcome of events triggered by uncertainty creates an aversive state of deprivation that motivates people to obtain additional information in order to decrease uncertainty and improve their decision making (Loewenstein 1994; Goodie and Young 2007). To illustrate, in consumption settings, uncertainty surrounding the choice among alternative product offerings has been shown to drive consumers to exert greater effort in searching information about the offerings (Weitzman 1979; Moorthy, Ratchford, and Talukdar 1997; Diehl and Zauberman 2005). The heightened motivation to solve uncertainty may also result in improved cognitive performance, as evidenced in blurred-picture recall experiments by Berlyne and Normore (1972). In the information-learning phase of these experiments, the experimenters showed participants in the treatment group blurred versions of pictures followed by the clear versions of the same pictures, whereas participants in the control group saw the clear versions twice. Participants in the treatment group performed better than their counterparts in the control group.

Although there is mounting evidence supporting the notion that uncertainty enhances the processing of information, this predicted relationship is limited to information that is

instrumental in reducing uncertainty. Uncertainty-driven motivation posits that consumers should selectively focus on information central to resolving uncertainty when uncertainty arises. The HSM model (Chaiken 1980), for example, suggests that, when motivation to process is heightened by risk, individuals apply greater scrutiny in differentiating between central and peripheral information. They allocate more attention to the central cues in the messages, as these cues are deemed more diagnostic in resolving the gap between actual and desired states of uncertainty (Chaiken 1980). Thus, when facing uncertainty, consumers should become more devoted to identifying and processing cues that are more likely to reduce uncertainty.

The majority of the literature on uncertainty, however, is agnostic with respect to predictions about situations in which consumers are exposed to marketing messages that are irrelevant to resolve uncertainty. For example, product or brand placements are often deliberately peripheral to the focal issue that may trigger feelings of uncertainty in order to prevent persuasion reactance. Based on the predictions from models such as the HSM, one should expect that non-focal placement of marketing information should not lead to systematic processing, as such information (i.e., peripheral brand logos) is unrelated to the reduction of uncertainty (Chaiken 1980; Petty, Cacioppo, and Schumann 1983; Petty and Cacioppo 1986). In contrast with this prediction, in the next section I propose an account that suggests that uncertainty may indeed enhance the processing of such peripheral information.

## Cognitive Representation under Uncertainty

Living organisms are inclined to produce effective responses when external challenges arise. However, in the presence of uncertainty, the ability to produce such effective responses is

limited because the organism faces not one, but multiple simultaneously possible challenges, each with an unknown probability (Swanson 2012). Thus, the presence of uncertainty results in the concurrent activation of competing interpretive frameworks and response tendencies. However, the organism has to suppress the urge to act on any of the response tendencies and withhold action until the uncertainty starts to resolve. The duality between response tendencies and behavioral suppression produces entropy, the amount of energy within a system that cannot be used to perform tasks, which is experienced as anxiety (McGregor et al. 2010; Hirsh et al. 2012). The level of anxiety experienced is proportional to the entropy induced by uncertainty which, in turn, is a function of the shape of distributions across plausible outcomes within uncertainty. Flatter distributions, those in which no outcome is clearly more likely than the others, produce greater anxiety. This framework is supported by evidence from neurophysiology. It has been documented that uncertainty is associated with the activities in the Behavioral Inhibition System (BIS), the part of anterior cingulate cortex responsible for the feeling of anxiety. When activated, the BIS suppresses behavior but increases attention to novel features of the environment (Gray 1982; Gray and McNaughton 2000).

To cope with anxiety, organisms often engage in compulsive displacement behavior. For instance, in the face of anxiety, animals often engage in behaviors such as running, licking, and biting, even though such behaviors have no apparent instrumental link to the eliciting anxiety (Rapoport, Ryland, and Kriete 1992; Uchiumi et al. 2008). Similarly, it has been found that humans also engage in displacement behaviors to cope with anxiety triggered by uncertainty. According to the RAM account (McGregor et al. 2010), individuals may fixate on cues unrelated to the source of anxiety solely for palliative reasons when facing uncertainty. The new focus insulates the individual from the eliciting uncertainty, which in turn makes the anxiety less

bothersome. This motivated tunnel vision also shields the negative effect of dissonance caused by the goal-irrelevant information. In a series of experiments, when participants were primed to experience uncertainty in their academic performance and relationship status, they displayed heightened approach tendency towards various irrelevant personal projects as compared to the control group participants who did not experience uncertainty (McGregor et al. 2010). This tendency to engage in distractive tunnel vision under uncertainty is also supported by neurological evidence. When experiencing uncertainty-related anxiety, the BIS releases noradrenaline, which causes target neurons to better respond to inputs, increasing cell functions of receiving excitatory inputs and decreasing the functions of receiving inhibitory inputs (Gray 1982; Gray and McNaughton 2000). As a consequence, individuals become better at responding to all external stimuli at the expense of the reduced ability to differentiate between relevant information from noises (Hirsh et al. 2012).

The discussion above provides a basis on which to make predictions about the processing of incidental product/brand information when the context triggers uncertainty-induced anxiety. If individuals fixate on unrelated cues for palliative reasons when uncertainty arises, the processing of marketing-related information may be enhanced, because this information does not relate to the rise of uncertainty. As a consequence, recall for incidental exposure to marketing cues may be enhanced when uncertainty arises.

H1: Recall performance for incidental brand information will be higher when such information is presented under higher levels uncertainty than when it is presented under lower levels of uncertainty.

## The Moderating Role of Information Modality

Whereas the RAM account predicts that individuals become more responsive towards distractive information under uncertainty, there are also reasons to believe that they are not as efficient at integrating the newly acquired information with the existing memory network. The working memory account suggests that uncertainty may pose constraints on one's ability to process and maintain newly received information (Baddeley 1992; Repovs and Baddeley 2006). This notion can be illustrated by cross-modality recall studies. Research on this topic has found that modality crossover, such as when information is presented in both visual/graphic modality and text/phonological modality, enhances performance. But this enhancement is attenuated when the individual's available cognitive resources are restricted (Allen et al. 2015).

Individuals process newly received information at various levels of depth, which in turn leads to the retention of different features of the stimuli in the memory network. At the shallowest level of processing, an individual merely maintains an impression of the occasion during which he or she is exposed to the information, whereas at deeper levels of processing, information is abstracted and associated with other nodes in the memory network. For example, in a classic word-association task, participants primed with shallower processing could only retain information about the typefaces of the probes encountered earlier; participants with an intermediate level of processing, however, were able to answer questions about the rhymes of the probe words given. Only participants who were allowed to deeply process information could extract the meaning of the probe words shown earlier and assign those words to appropriate categories through lexical association (Craik and Tulving 1975).

A large part of semantic transformation invoked by deeper levels of processing takes place in the episodic buffer, which is temporary storage for singular information from various sensors such as vision and hearing. The successful manipulation and processing of information in the episodic buffer depends on the availability of attentional resources (Baddeley 2000, 2012; Repovs and Baddeley 2006). Relevant to this research is evidence showing that the maintenance and processing of information with multiple modality-specific features is more resource demanding than single-modality information, and the episodic buffer can only afford to maintain up to three cross-modality information units at a time (Langerock, Vergauwe, and Barrouillet 2014). As a result of its dependency on resources, this process of reflecting, modifying, and manipulating information is disrupted under cognitive load.

Take the "visual bootstrapping" experiments as an example. In these experiments, participants were shown a series of digits on a keypad in a format similar to that of an ATM or telephone dialer, and those in the treatment condition were also asked to perform a working memory load task in which they repeatedly vocalized the brand name "Coca-Cola" at a high rate. When later asked to verbally recall the digits they learned through visual encoding (watching the keypad dialing), participants in the control group performed better than their counterparts in the treatment group. The authors reasoned that the visual presentation improved the verbal recall, but the effect was attenuated in the treatment condition because participants in this condition had their working memory preoccupied during encoding (Allen et al. 2015). Recall the claim that uncertainty often causes anxiety. Research has found that anxiety, either as a personality trait or as situational manipulation, has negative effects on the processing efficiency of the working memory, likely due to its disruption to the functions of the central executive (Eysenck and Calvo 1992; Ashcraft and Kirk 2001; Eysenck et al. 2007). For example, anxious participants take a

longer time to solve math problems than non-anxious participants. Since anxiety is a significant byproduct of uncertainty, I hypothesize that people may not be able to integrate different forms of information efficiently under anxiety, as uncertainty-driven anxiety overloads the episodic buffer, which is an essential part of the working memory in charge of integrating information from a variety of domain- (modality-) specific sensors.

Thus, although Hypothesis 1 predicts improved recall for peripheral marketing information encoded under uncertainty, I also predict that this enhanced recall may be hindered by the debilitating effect of uncertainty on one's ability to integrate pieces of information that vary in modality, owing to the taxing effect that uncertainty exerts on the episodic buffer. Thus, I propose that the hypothesized positive effect of uncertainty on recall is conditional on one's ability to process cross-modality information. When uncertainty overloads the cognitive system, the positive effect of uncertainty on the recall of incidental exposure to marketing information should be tampered. However, when this overload is offset by enhancing one's ability to process cross-modality information, the detrimental effect of uncertainty should decrease, and the positive relationship between uncertainty and recall predicted by hypothesis 1 should be observed. Thus:

H2: The enhanced performance in recall of information encoded under uncertainty is conditional on one's ability to process cross-modality information to an extent that the enhancement in encoding offsets the detrimental effect of uncertainty-induced cognitive overload.

I tested hypotheses 1 and 2 in four experiments. I used well-known consumer package products and hotel franchise brand names across the experiments as stimuli. I reason that, since the participants are likely to possess tacit awareness of these brands, not a significant amount of

cognitive resources may be required for integrating cross-modality information across the exposure and recall phases of the experiments. Only when uncertainty-related anxiety induces shallower processing, in which case participants should only be able to remember the incident of information exposure, which is dependent on episodic details, instead the actual information, the inconsistency in modality between target information and recall cues would hinder recall performance.

Experiment 1 showed that participants were able to recall information presented in uncertain contexts better than that presented in certain contexts. However, this result was observed only when the modality of the encoded information and recall cues was the same. In the remaining experiments, I test the proposed mechanism underlying the moderating role of modality consistency on recall under uncertainty by increasing participants' ability to process cross modality information. Experiment 2 showed that cognitive readiness training prior to the exposure to brand logos reduces the requirement for cognitive resources in cross-modality integration, enhancing the recall of brands to which participants were exposed under higher uncertainty. In experiments 3 and 4, I showed that salient tacit knowledge helped to mitigate the negative effect caused by limited cognitive resources, again enhancing recall for brands encountered under high-uncertainty contexts.

## EXPERIMENT 1

The goal of experiment 1 was to provide preliminary evidence in support of hypotheses 1 and 2. To test the hypothesis that uncertainty may lead to improved recall (hypothesis 1), I presented brand logos across multiple hands of a simulated blackjack card game. The cards dealt

were manipulated such that half of the hands dealt elicited higher uncertainty, whereas the other half elicited low uncertainty. On every hand of cards dealt, participants were exposed to a brand logo disguised as a sponsor of the game. To test hypothesis 2, I manipulated the modality of the cue used in the recall task, such that some participants saw recall cues in the form of visual cues, whereas others saw recall cues in the form of phonological cues.

## Participants and Design

Forty-five undergraduate business students (23 females, $M_{age}$=20.40) from a major university in the United States participated in this experiment in exchange for course credit. The design was a 2 (uncertainty level: low vs. high) × 2 (modality consistency: yes vs. no) mixed design. Uncertainty was manipulated within subjects, whereas information modality was manipulated between subjects.

I manipulated uncertainty levels using a procedure adapted from previous research investigating the role of uncertainty on information processing (Critchley et al. 2001; Galinsky, Gruenfeld, and Magee 2003; Baker and Maner 2008). Participants were invited to play a simplified version of the card game blackjack. Each participant was presented with 20 pairs of cards on the computer screen, one pair at a time, and was asked to indicate whether he or she chose to add another card (i.e., hit) or take no further action (i.e., stay) on each hand. The goal was to have the final sum of cards on each hand be as high as possible without exceeding 21 points. A hand with cards adding up to more than 21 points was considered a "bust" and yielded 0 points. High-uncertainty hands consisted of 10 pairs of cards, with each pair adding up to 14, 15, or 16 points, given that even the most skilled blackjack players face a dilemma to either hit or

stay in those situations (Galinsky et al. 2003; Baker and Maner 2008). Low-uncertainty hands of cards consisted of 10 pairs of cards with each pair adding up to below 10 points or above 20 points, in which case the decision to "hit" (adding another card) or "stay" (not adding another card) were straightforward. If the participant chose to "hit", the added card was not shown to the participant in order to prevent sequential decision bias for the rest of the card game. After all 20 hands were dealt and played, participants were given a passing score, making them eligible for full participation credit, regardless of outcomes of their hit or stay decision.

Pretest 1

Thirty-nine participants (19 females, $M_{age}$=20.33) from the same population of the main experiment were recruited for a pretest of the uncertainty manipulation. After completing the 20 hands of Blackjack, but before receiving their passing score, one of the high-uncertainty hands and one of the low-uncertainty hands dealt during the game (main task) were randomly selected and presented on the screen one more time, one at a time. Participants were then asked to rate how certain they had felt that they had made the right decision regarding that hand earlier, on a seven-point Likert scale ranging from 1- "not certain at all" to 7- "very certain". A paired-sample *t* test revealed that participants' felt uncertainty followed the expected pattern based on the hands of cards dealt ($M_{\text{low\_uncertainty}}$=6.36, $M_{\text{high\_uncertainty}}$=3.97; $t(38)$=8.01, $p$<.01).

Pretest 2

To confirm that the blackjack game manipulation was appropriate to create a state of anxiety, I conducted a second separate pretest. As discussed earlier, anxiety is an organism's response to the presence of a threat, such as uncertainty, and detachment from such threats reduces anxiety (Kalisch et al. 2005; Eippert et al. 2007). Post-hoc measurement of anxiety following the within-subject design as in Pretest 1 is not an ideal solution, because a participant's anxiety from high-uncertainty hands of cards would have been offset by the equal number of low-uncertainty hands at the end of the series of card games. Instead, I randomly assigned participants into either a high-uncertainty or a low-uncertainty group. In the high- (low-) uncertainty group, a participant plays 20 hands of Blackjack games as in Pretest 1, with the only difference being that a majority (14 out of 20) of these hands of cards were high- (low-) uncertainty cards, with the remaining hands of cards being low- (high-) uncertainty hands. In this case, the cumulative effect of uncertainty might not be completely offset by the low- (high-) uncertainty cards. I used a subset of five questions from the State-Trait Anxiety Index (Speilberger 2010) to capture participants' situational anxiety after playing the card games. A composite average score of the five ratings, each recorded on a 7-point Likert scale, was used as dependent variables (Cronbach's Alpha=.89). Sixty participants were recruited from Amazon Mechanic Turk to participate in this pretest (37 females, $M_{age}$= 37). The results showed higher levels of anxiety when the proportion of high-uncertainty hands of cards was high than when it was low ($M_{low\_uncertainty}$=1.73, $M_{high\_uncertainty}$=2.76; $t(58)$=-3.12, $p$<.01).

## Procedure

Participants in the main experiment played the simulated game of blackjack on a computer in the behavioral lab. On each of the hands dealt, one of 10 Proctor and Gamble product brand logos was presented as a sponsor brand on the top of the screen above each hand of cards (See Appendix 1 for a sample screenshot). The presentation of the logos constituted the incidental exposure to marketing information that would later be tested in the recall task. Logos were randomly assigned to be paired with either high-uncertainty hands of cards or low-uncertainty hands of cards. Each logo was presented twice during the manipulation sequence, always paired with its pre-assigned pair of cards. After making decisions with respect to hitting or staying for each of the 20 hands of cards (10 low-uncertainty and 10 high-uncertainty hands), participants completed a recall task. In this task, participants performed an old-new signal detection task (Stanislaw and Todorov 1999; Mercurio and Forehand 2011; Shapiro and Nielsen 2013) in which the 10 target brands that were paired with the hands of cards during the blackjack game and 10 new filler brands were shown one at a time. In the modality-consistent condition, participants saw the brands in the form of logos as presented during the blackjack task. In the modality-inconsistent condition, participants saw the brands in the form of the brand names spelled out in Times New Roman font. Participants were asked to indicate whether they recalled being exposed to each of the 10 target brands and the 10 filler brands, one at a time. Recall performance was determined based on the discriminability score ($d' = Z_{\text{correct hit}} - Z_{\text{false alarm}}$), which served as the dependent measure of the study. The *d'* statistic assesses the relative rate of the correct recall of target brands (hit rate) relative to the incorrect recall of filler brands (false

alarm rate). A higher *d'* value indicates increased ability to correctly recall the target stimuli rather than random guessing.

## Results

An ANOVA on the *d'* scores showed a statistically significant interaction between the uncertainty and information-modality factors ($F(1,43)=6.33$, $p<.05$, see figure 4.1). Participants in the same-modality condition showed higher recall performance for brands that were paired with high-uncertainty hands of blackjack than for brands that were paired with low-uncertainty hands of blackjack ($M_{low\_uncertainty}=.50$, $M_{high\_uncertainty}=.90$; $F(1,43)=5.64$, $p<.05$). This difference in recall performance across levels of uncertainty was not observed in the cross-modality condition ($M_{low\_uncertainty}=.60$, $M_{high\_uncertainty}=.38$; $F(1,43)=1.50$, $p>.10$).

## Discussion

The results of experiment 1 supported hypothesis 1 in the same-modality condition where participants better recalled the brand names presented within a high-uncertainty context than brand names presented within a low-uncertainty context. In support of hypothesis 2, this effect was mitigated when the recall cue did not match the modality of the presentation of the brands during the blackjack exposure phase of the experiment.

I recognize that one potential shortcoming in experiment 1 relates to the use of varying modalities in the recall task. It might be tempting to argue that the reported difference between the modality groups is simply a result of a weaker recall cue signal when the modality at retrieval

(recall task) did not match the modality at encoding. However, if this were true, I should have observed a main effect of cue-modality consistency rather than the interaction reported above. In fact, this simple main effect was not observed ($M_{consistent}$=.70, $M_{inconsistent}$ =.49; $F(1,43)$=.44, $p$>.50). The advantage of having recall cues in the same modality with encoded information was only pronounced in the high uncertainty condition. When comparing the two modality conditions' brand recall, both encoded under low uncertainty, the measures were almost identical ($M_{consistent}$=.50, $M_{inconsistent}$ =.60; $F(1,43)$<1, $p$>.10). Nonetheless, I bore the potential confound in mind when I designed the next experiments and addressed the issue by using the same modalities across encoding and retrieval tasks. This allows me to show that that the null effect in recall performance in the cross-modality recall condition is indeed related to the reduced processing efficiency under uncertainty. I address this issue in Experiment 2.

## EXPERIMENT 2

The goal of experiment 2 is to provide further evidence for the proposed moderation of the effect of uncertainty-induced anxiety on information processing and its contingency on information modality. Recall that I propose that anxiety induced by uncertainty hinders one's ability to integrate information of different modalities in the working memory, thus decreasing the benefits associated with greater in-depth processing of peripheral information. A large body of literature has shown that repeated practice of a task increases an individual's cognitive readiness and lowers the cognitive costs associated with performing similar tasks at a later time (e.g., Waszak, Hommel, and Allport 2005; Liefooghe et al. 2008). Thus, if participants are trained to become more proficient in performing cross-modality tasks prior to the recall test, they

should overcome the resource deficiency that led to the lack of differences in recall across uncertainty level in experiment 1. Thus, relative to participants who do not perform the unrelated cross-modality task prior to the blackjack game, participants who do perform this task prior to the exposure to the blackjack game should better recall brands that were paired with the high-uncertainty hands of blackjack than the ones that were paired with the low-uncertainty hands of Blackjack, replicating the results of the same-modality condition of experiment 1.

## Participants and Design

Fifty undergraduate business students (25 females, $M_{age}$=20.48) from the same population of experiment 1 participated in the experiment in a computer lab in exchange for course credit. The design was a 2 (uncertainty level: low vs. high; within-subject) × 2 (cross-modality practice: yes vs. no; between-subject) mixed factorial.

## Procedure

Experiment 2 replicated the cross-modality condition of experiment 1. The key difference was that approximately half of the participants performed an unrelated cross-modality task prior to the main task. At the beginning of the experiment, participants in this condition were shown images of famous landmarks of a number of cities in the U.S. (the Space Needle in Seattle and the Arc of St. Louis, etc.) and were asked to type the name of the corresponding city. This task served as a practice of cross-modality information retrieval (visual vs. phonological). Participants in the control group read a short magazine article as a filler task. After performing

these initial tasks, all participants played the blackjack game featuring the P&G's brands' logos disguised as a sponsor as in experiment 1. Participants then performed the same recall task used in the cross-modality condition of experiment 1, in which all 20 brands (10 target brands and 10 filler brands) were presented in plain text format.

Results

An ANOVA on the *d'* scores showed a statistically significant interaction between the uncertainty and the practice factors ($F(1,48)=4.43$, $p<.05$, see Figure 2.2). Variations in the level of uncertainty during the card games did not produce a difference in the recall performance when participants in the control condition were cued with brands of a different modality ($M_{low\_uncertainty}=.31$, $M_{high\_uncertainty}=.15$; $F(1,48)<1$, *n.s.*). This result replicates that of the cross-modality condition in Experiment 1. However, participants who participated in the cross-modality practice task showed improved recall for brand names when brands were learned under high uncertainty better than those learned under low uncertainty ($M_{low\_uncertainty}=.04$, $M_{high\_uncertainty}=.44$; $F(1,48)=4.50$, $p<.05$). This finding replicates that of the same-modality treatment condition in experiment 1. It suggests that the cognitive readiness practice task mitigated the negative effect of cross modality presentation in recall performance under uncertainty.

Discussion

Experiments 1 and 2 provide evidence that uncertainty may indeed influence consumers' learning of brand information as a function of information modality. Experiment 2, in particular, provided evidence that the limitation caused by cross-modality recall cue may be a result of processing efficiency.

Hypothesis 2 states that processing resources is critical in cross-modality recall performance. Whereas experiment 2 shows that cognitive readiness improves one's processing efficiency, another potential remedy to the restricted processing resources under uncertainty is by invoking tacit knowledge. If individuals possess strong inherent knowledge of the object prior to exposure to the object, a lesser amount of cognitive resources should be required in cross-modality processing, thus enhancing the recall of brands to which participants were exposed under higher uncertainty. Experiments 3 and 4 were designed to test this prediction while providing enhanced external validity to the results of experiments 1 and 2.

## EXPERIMENT 3

In experiment 3, I test whether semantic associations in tactic knowledge could alleviate the burden of processing triggered by uncertainty and, in turn, lead to the enhanced ability to recall brands that participants were exposed to under higher-levels of uncertainty. Support for this prediction is provided by research in cognitive psychology. For example, in an extension of the visual bootstrapping experiment discussed earlier, children from age groups 6 and 9 and a group of young adults were shown a series of digits in a visual presentation as if they were dialed

in on a telephone keypad and, later, in a recall test, children at the age of 6 were not able to reproduce the digit series as well as those in the other age groups. No difference was observed between 9-year-old children and young adults. The authors argued that the lower performance by the 6-year-old children was a result of their lack of representation of the telephone keypad layout in their long-term memory (Darling et al. 2014). In another version of the visual bootstrapping experiment, participants were shown series of digits dialed on a conventional telephone keypad or on a novel keypad. The novel keypad resembled the 3×3+1 grid of the telephone keypad, but the positions of the digits were scrambled. Participants who saw the novel keypad were able to recall the digits dialed as well as participants who saw the traditional keypads only after a training period of repeated trials (Darling et al. 2012).

Following this reasoning, I expect that making the pre-existing semantic association of brands more accessible should decrease the difficulty of at-the-moment information processing caused by a shortage of working memory resources. Hypothesis 2 predicts that, under high uncertainty, participants with high-load tunnel vision may not efficiently process the impression of the brand as a result of the taxing cognitive load triggered by uncertainty. Priming the activation of associations should help to mitigate the negative effect caused by uncertainty-related anxiety and, in turn, improve recall performance for brand information learned under high uncertainty.

## Participants and Design

Seventy-three participants were recruited online for experiment 3. Four participants did not finish the task in the allotted time and were removed from the analysis. Thus, the final

sample included 69 participants (33 females, $M_{age}$=24.39). The design was a 2 (uncertainty level: low vs. high; within-subject) × 2 (product concept salience: low vs. high; between-subject) mixed factorial. The design replicated that of experiment 2; the only difference is that, rather than providing a cognitive readiness practice task before the card game, I manipulated the salience of the product categories for target brands. In the high-salience condition, I labeled the sponsor logo with the corresponding product category. For example, instead of being exposed to the logo of *Head and Shoulders* by itself, the text "shampoo" was presented as well (see Appendix 2). Since all brands used for the recall test are popular consumer packaged goods (CPG) from P&G, merely mentioning the product category should help spread the activation of associations for the brand.

Results

An ANOVA on the *d'* scores showed a statistically significant interaction with the manipulation of brand product salience ($F(1,47)=6.69$, $p<.05$, Figure 4.3). As predicted, when the product category was made salient, recall performance was higher for brands that were paired with high-uncertainty hands of cards than for brands that were paired with low-uncertainty hands of cards ($M_{low\_uncertainty}=.02$, $M_{high\_uncertainty}=.53$; $F(1,67)=11.38$, $p<.01$). The same was not observed when the product category was not made salient ($M_{low\_uncertainty}=.42$, $M_{high\_uncertainty}=.37$; $F(1,67) < 1$, *n.s.*).

Discussion

Experiment 3 provides evidence that the salience of product-concept information enhances processing efficiency under uncertainty which, in turn, enhances recall performance in a cross-modality recall task. One potential shortcoming of Experiment 3, however, is that participants in the treatment group received additional cues during encoding, and the improved recall performance was merely a manifestation of increased probability of spread activation. Yet, I observe no main effect of the product category cue ($M_{\text{no cue}}$=.40, $M_{\text{cue}}$=.28; $F(1,67) < 1$, *n.s.*), and the effect is only observed in the high-uncertainty condition reported above. Nonetheless, I address this issue in experiment 4 by directly measuring product category knowledge.

## EXPERIMENT 4

Experiment 4 was designed to provide further support for the findings in experiment 3 and to enhance the external validity of my results. Rather than manipulating product-category salience, Experiment 4 measured participants' product-category familiarity. As discussed earlier, participants who have greater familiarity with a product category should require a lesser amount of cognitive resources when processing related information and, as a result, the effect of uncertainty on recall performance should be more pronounced for such consumers.

## Participants, Design, and Procedure

One hundred and twenty-six online participants were recruited from the Amazon Mechanical Turks for monetary compensation. Given the lower level of experimental control for this sample relative to the student samples used in the previous experiments, I only analyzed the data for participants who made at least 90% of correct stay/hit choices based on the low uncertainty hands, where the optimal decisions were unambiguous. Based on this criterion, 115 participants (91% of the original sample; 59 females, $M_{age}$=36.4) were retained for the analysis.

The experiment was a 2 (uncertainty levels: low vs. high) × product category expertise (individual difference measured continuous variable) design. Uncertainty levels were manipulated within subjects as in the previous experiments. In order to obtain larger variance in terms of product category familiarity/expertise, I used hotel and motel brands as marketing information instead of than CPG brands. Product-category familiarity was measured using a set of self-reported questions adopted from previously published studies (Alba and Hutchinson 1987; Mitchell and Dacin 1996). An averaged indicator of these ratings (Cronbach's alpha = .87) served as the category-familiarity measure.

## Results and Discussion

Since the proposed product-category familiarity moderator is a continuous variable, I adopted the floodlight analysis approach (Hayes and Matthes 2009; Spiller et al. 2013) to examine the interaction. I computed the difference between the *d'* statistics (DV= $d'_{high\_uncertainty}$ - $d'_{low\_uncertainty}$) and regressed it on the product category familiarity score ($M$ = 3.52, SD = 1.28,

min = 1.00, max = 6.67). I observed a significant and positive effect of the product category familiarity ($t(113)=2.17$, $p < .05$, Figure 4.4). I used the Johnson-Neyman technique to decompose this effect. This analysis revealed that individuals familiar with the product category (familiarity score greater than 4.59, $DV_{JN}=.21$, SE=.11, $p=.05$) showed better recall performance for brands learned under higher uncertainty than for brands learned under lower uncertainty. The positive effect of uncertainty on recall was not observed for individuals who were less familiar with the product category (expertise score less than 4.59). This result was consistent with the prediction that individuals who are more familiar with the product category can circumvent the working memory deficiency and better recall marketing information under higher levels of uncertainty, even if the encoding cues and the recall cues were presented in different modalities.

## GENERAL DISCUSSION

Standard approaches to studying the role of uncertainty on decision making have focused on understanding how uncertainty as a source of contextual influence biases consumers' judgments, decisions, and behaviors (e.g., Ariely 2000; Chernev 2006; Shen, Fishbach, and Hsee 2014). In this research, I expand the breadth of the understanding of the effect of uncertainty to the domain of memory. Specifically, I propose, and show in four experiments, that uncertainty-induced anxiety creates two counteracting effects that can enhance or hinder the processing of incidental marketing information. In this process, I propose a theory that predicts that anxiety shifts the focus of information processing away from the source of anxiety, enhancing the processing of peripheral information, as it was the case of brand logos in a game of Blackjack. However, anxiety can also be cognitively taxing, which may hinder the ability of one to thoroughly process

information, leading to decreased recall. Thus, the extent to which uncertainty may improve recall depends on the net result of these two counteracting effects.

In support of this theory, in Experiment 1 I demonstrated that the peripheral information acquired under uncertainty was more likely to be recalled in a later test. However, as much as participants' processing of information improved under uncertainty, they might not have become equally as effective at the semantic transformation process where the raw information from the incidental exposure is integrated into the network of associations in the memory as a result of the constraint imposed by limited cognitive capacity. Consistent with the predicted mechanism, I observed that the recall of marketing information to which participants were exposed under uncertainty varied significantly as a result of the (in)consistency between the modalities of the encoded information and the recall cue. Experiments 2, 3, and 4 focused on illustrating the underlying mechanism that produced such differences in recall performance while enhancing the external validity of my results. Since I propose that constrained cognitive capacity under uncertainty may weaken recall performance in the cross-modality condition of experiment 1, in experiment 2 I introduced an experimental condition under which cognitive readiness was activated through a training task, which should reduce the need for cognitive resources during the exposure to the brand logos. The unrelated cross-modality cognitive readiness task that involved recalling city names from pictures of landmarks enhanced participants' recall performance for information learned under higher uncertainty, even when the modalities of the brand logos and brand recall cues varied in modality. In consumer settings, my theory predicts that increasing the salience of a product concept reduces the workload of information integration at the time of encoding, which in turn mitigates the negative effect of the cognitive resource

constraint on the processing of information. The results from Experiments 3 and 4 confirm this proposition.

My research contributes to the literature on consumer behavior by extending the understanding of the effect of uncertainty on information processing stemming from resource-based models such as the Elaboration Likelihood Model (ELM) (Petty and Cacioppo 1986) and the Heuristic-Systematic Model (HSM, Chaiken 1980). My findings distinctively contribute to this stream of research in two ways. First, I investigate information that is incidentally presented but irrelevant to the reduction of the felt uncertainty. I propose, and empirically demonstrate, the counter-intuitive effect that uncertainty may help enhance consumer encoding of such peripheral information and that this result is explained by the palliative tunnel vision account proposed by RAM, rather than by increased task involvement or elaboration likelihood. I also propose information modality (visual-spatial versus phonological) as a moderator of this effect such that one would observe the effect when the encoded information and the recall cues are of the same modality but not when the recall cue is presented in a different modality (e.g., phonological brand name) than that of the encoded information (e.g., visual-spatial brand logo). When the recall cue's modality does not match that of the encoded information, additional processing resources are required for the associative process. Yet, such resources may be constrained as a result of uncertainty-related anxiety.

Although the data was consistently supportive of the hypotheses I put forward, I noticed an interesting pattern in Experiments 2 and 3 that might provide an avenue for further investigation. When testing for information recall across different modalities, the provision of cognitive readiness training reduced participants' performance in the low-uncertainty conditions; albeit this was not a statistically significant effect. Similarly, when uncertainty was low, participants who

were given hints of the product category during encoding performed worse than those who were not given hints of the product category. Although not reaching statistical significance, these results are consistent with predictions from resource-based models. With cognitive readiness training or additional category priming, it is not likely that participants in the treatment groups would find the brand logos novel or informative. As a result, attention may remain focused on the main task (blackjack) instead of shifting towards peripheral information, as the HSM model predicts. This may explain the decreased ability to later recall such information; however, it gives me some level of confidence that these issues are related to the effect of uncertainty on information processing and that my results are novel relative to the established literature.

It might be tempting to reason that the phenomenon documented in this manuscript can be explained alternatively by the effect of arousal, since oftentimes uncertainty and arousal take place simultaneously, and the dispositions of these two psychological states are not always distinguishable. In particular, arousal is known to both boost one's sensitivity to stimuli and pose limitations on cognitive capacity. However, the distinction lies in that uncertainty exclusively subscribes to the prediction of RAM, in which an individual better responds to distractive information due to psychological entropy. Uncertainty-induced anxiety reflects the experience of indecision among simultaneously active approach responses, while arousal heightens singular approach tendency and increases an individual's attentional focus on the main task instead of peripherals (Gray and McNaughton 2000; Hirsh et al. 2012). In other cases, anxiety may arise in absence of clear evidence of arousal. For instance, prior research has shown that consumers experience anxiety merely because they have to choose from larger assortments (Iyengar and Lepper 2000; Chernev 2003). Therefore, I argue that the effect discussed in this manuscript, which addresses the processing of peripheral information in particular, is reserved for anxious

uncertainty and not for arousal. Moreover, I believe that the alternative account based on arousal is ruled out empirically in this research. Research has shown that arousal is often long-lasting, and its effect can carry over across tasks (Menon and Kahn 2002). Alternatively, as noted earlier, anxiety is a stimulus-dependent reaction, in that anxiety reduces rapidly upon the detachment from the eliciting entity (Kalisch et al. 2005; Eippert et al. 2007). Recall that the uncertainty conditions were manipulated within-subjects across all experiments using a randomized series of blackjack cards. If the high-uncertainty cards indeed created any arousal other than the uncertainty-dependent anxiety, the arousal should have been be carried over to the next hands of cards, which would wash out any within-subject results. Nonetheless, I invite future research on this subject in broader contexts.

## Substantive Implications

Marketers compete for air time for live content such as live sports or game shows, because consumers are less likely to skip through ads when watching time-shifted content. Oftentimes, this live programming invokes felt uncertainty due to consumers' engagement and anticipation of the event outcomes. My research shows that uncertainty may enhance the effectiveness of advertising when it comes to brand recall. Under uncertainty, consumers may be more likely to pay attention to marketing information, even if such information is not directly related to the reduction of uncertainty and, in turn, have enhanced memory towards brands to which they are exposed when experiencing uncertainty. Moreover, my research suggests that the degree to which marketers may reap the benefits stemming from contextual uncertainty depends on the formatting of the message and the brand's characteristics. As the available cognitive

resources play a critical role in the correctly recalling brand information, experiment 2 demonstrates that heightened cognitive readiness may help facilitate the process. Therefore, I recommend that marketers present simple and familiar content within uncertainty-laden environments, instead of complex rhetoric, which requires additional cognitive resources to decipher. Similarly, experiments 3 and 4 show that preexisting familiarity with the advertised brand may help alleviate the constraint on cognitive resources posted by uncertainty-related anxiety. For this reason, I predict that marketing information regarding well-established brands should leave a stronger imprint on consumers' memory than that of newly introduced brands.

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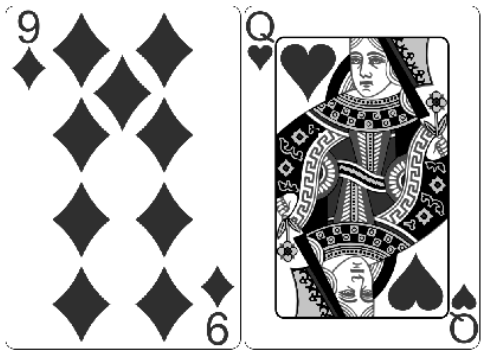
# APPENDIX 1: SCREENSHOT OF THE CARD GAMES

This study is made possible by

DURACELL

For this hand, you have:



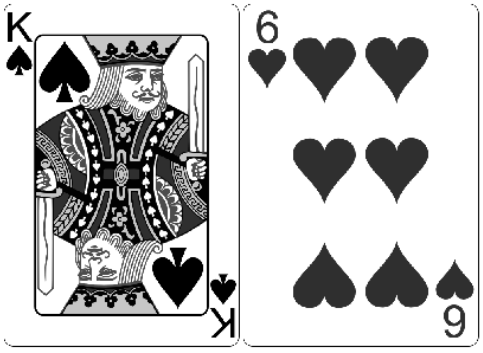
Would you like to add another card?

- Yes
- No

This study is made possible by

Cascade

For this hand, you have:



Would you like to add another card?

- Yes
- No

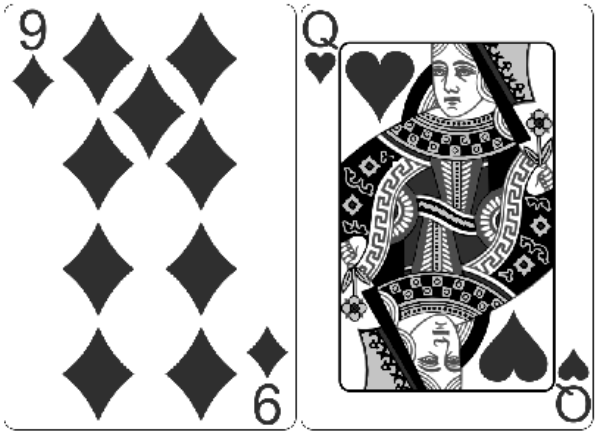
# APPENDIX 2: PRODUCT CATEGORY HINT

This study is made possible by

DURACELL

battery

For this hand, you have:




Would you like to add another card?

- Yes
- No

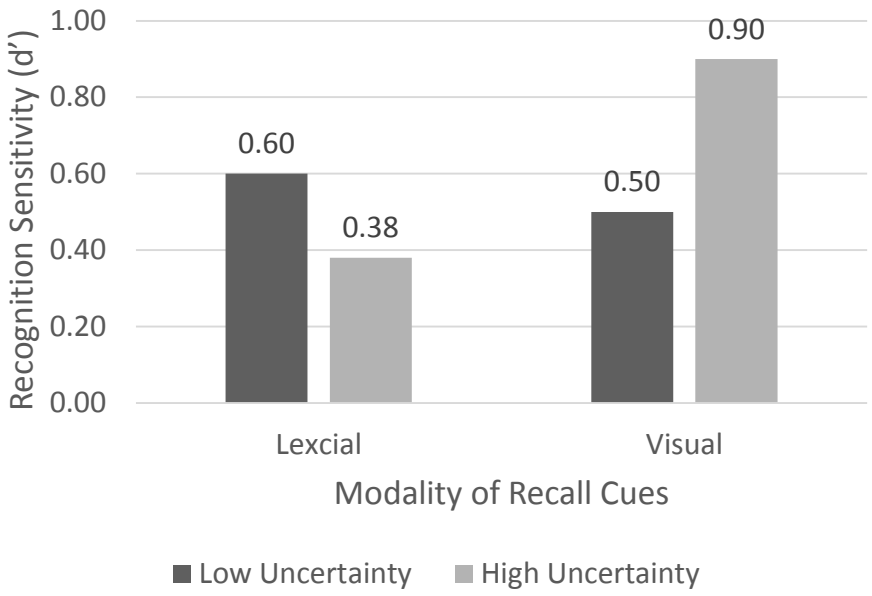

1.00
0.80
0.60
0.40
0.20
0.00
Recognition Sensitivity (d')
0.60
0.38
0.50
0.90
Lexcial
Visual
Modality of Recall Cues
Low Uncertainty
High Uncertainty

Figure 4.1

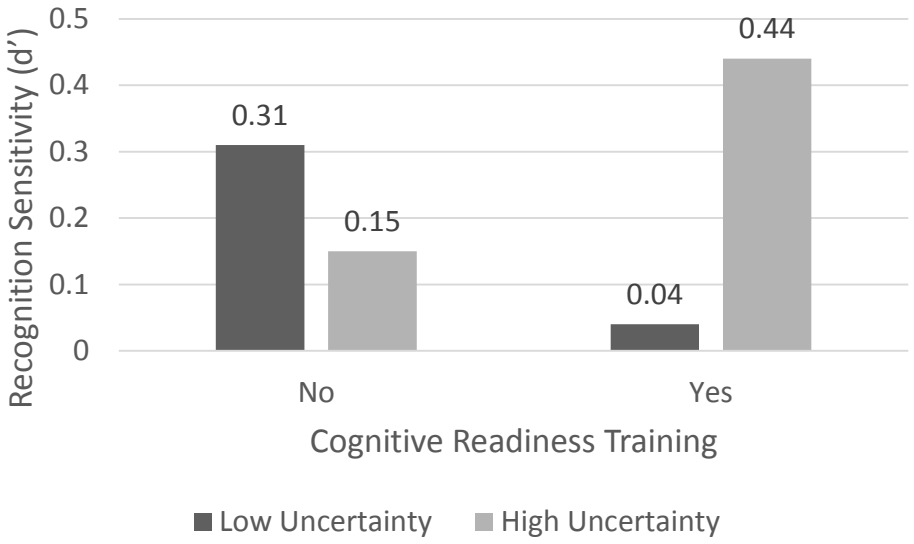

0.5
0.4
0.3
0.2
0.1
0
Recognition Sensitivity (d')
0.31
0.15
0.04
0.44
No
Yes
Cognitive Readiness Training
Low Uncertainty
High Uncertainty

Figure 4.2

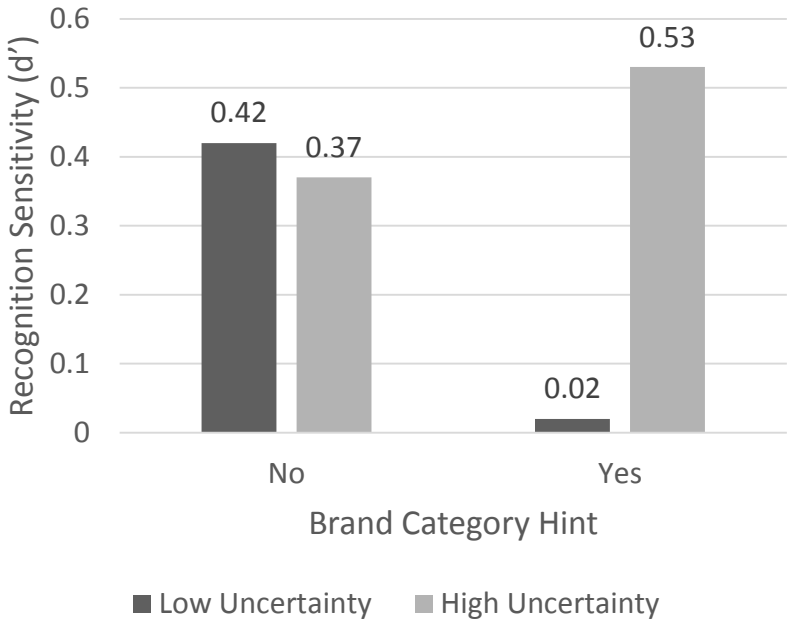

0.6
0.5
0.4
0.3
0.2
0.1
0
Recognition Sensitivity (d')
0.42
0.37
0.02
0.53
No
Yes
Brand Category Hint
Low Uncertainty
High Uncertainty

Figure 4.3

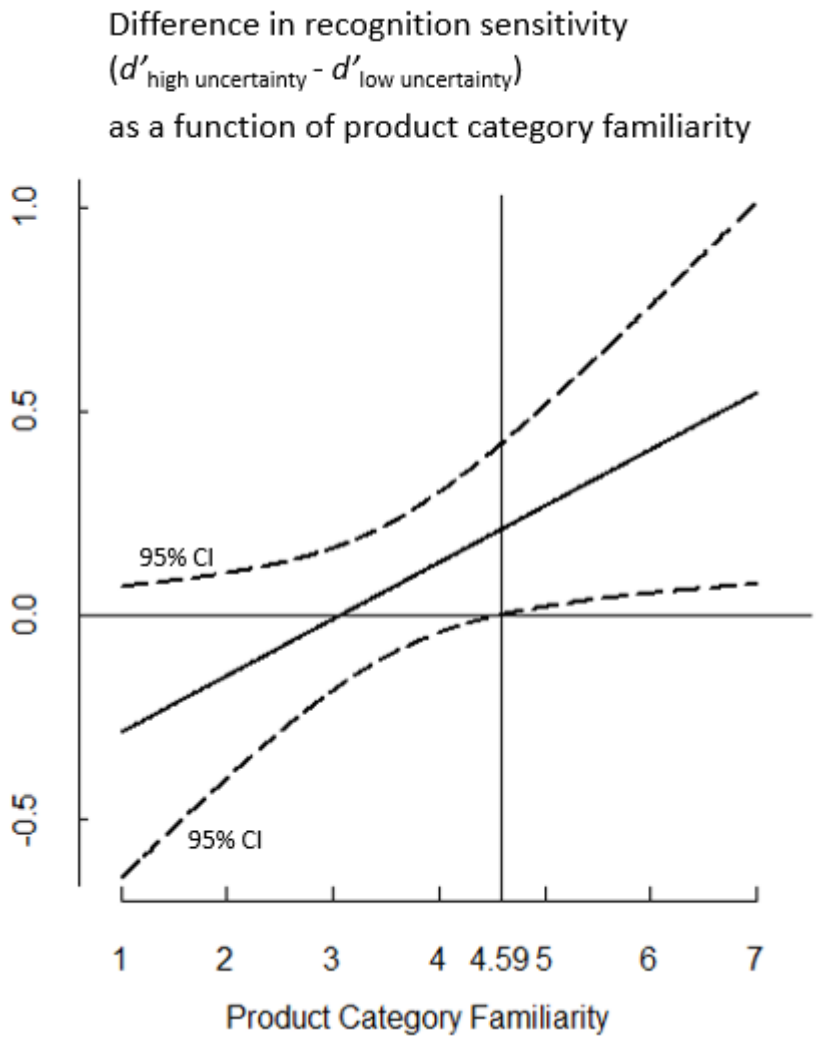

Difference in recognition sensitivity
($d'_{high\ uncertainty}$ - $d'_{low\ uncertainty}$)
as a function of product category familiarity
1.0
0.5
0.0
-0.5
95% CI
95% CI
1
2
3
4
4.59
5
6
7
Product Category Familiarity

Figure 4

# CHAPTER 5

# CONCLUDING THOUGHTS AND FUTURE RESEARCH

The rising popularity of behavioral economics in the past half a century attests to its importance to academics, and business practitioners, and consumers alike. The integration of psychological factors into the discussion of economic decisions have greatly enriched my understanding in this matter. The fact that behavioral economics research accommodates both the normative, analytical thinking of classical microeconomics and the positive, experiential thinking of psychology makes it interesting to academic researchers and impactful to marketing practitioners. But this integration between two vastly different parent scientific disciplines, economics and psychology, may bring forth challenges as well. At times miscommunications happen because researchers in one discipline borrow constructs from the other discipline at their face value without much scrutiny given to the theoretical definitions. A good example is the treatment of the terms "uncertainty" and "risk". Scholars with heavy economic influence tend to treat "risk" simply as a set of potential payoffs each associated with given uncertainty, and often times the terms "risk" and "uncertainty" are used as synonyms (for example, see Tversky & Fox, 1995). Meanwhile, psychologists usually treat the two terms distinctively: "risk" as an external factor, such as "health risk", "financial risk", and "social risk" (Weber, Blais, & Betz, 2002), but "uncertainty" as an internal experience or response, either in cognitive or emotional forms (Han, Lerner, & Keltner, 2007). Taking the constructs such as risk and uncertainty at their face value without clear examination of the definition in its theoretical context may lead to misinterpretation of previous research and in turn unverifiable misleading conclusions.

Chapter 2 shows an example where the simplified treatment of the construct "risk" results in misleading results. In this case, the mating motive leads individuals to engage in irrational behaviors, which are often associated with aversive feelings. I suspect that simply labeling such irrational behavior as "risky" was one of the causes for the debate between the recent review

(Shanks et al., 2015) and previous studies (Durante, Griskevicius, Hill, Perilloux, & Li, 2011; Griskevicius et al., 2007; Sundie et al., 2011). As seen in chapter 2, after controlling for the default conditions given to participants, the risk factors underlying the options did not interact with the mating mindset's influence on participants' decision making. In other words, individuals do behave differently under the influence of a mating mindset than they would otherwise, but this behavioral anomaly is not associated with risk. I provide an alternative explanation that individuals with a mating mindset opt to deviate from the default/status-quo in order to increase their chance of being detected by potential mates. This finding is important to marketing practices. As the use of sex appeals are subject to much controversy in the US nowadays, I point out that such tactics may not be as effective as they were previously thought to be. To successfully alter consumer decision making using sex appeals, marketers have to establish a clear baseline/ default from which individuals with a mating motive can make a visible rebellion.

Chapter 3 reports another potential case of confounding effect involving the interpretation of the term "uncertainty". While I agree with the previous finding that consumers may overestimate their budget in the long run, the cause for this phenomenon given in the original proposition is not as convincing (Ülkümen, Thomas, & Morwitz, 2008). The previous study attributed the overbudgeting phenomenon to the fact that consumers are less certain about their behaviors in the distant future than in the near future, and argued that the overestimation is to preempt any future shortage of funds. However, after reviewing the literature on the affective representation of uncertainty, I notice that the feeling of uncertainty can be experienced as either fear or hope (Lerner, Ye, Valdesolo, & Kassam., 2015). Why individuals who are uncertain of their future spending only engage in upward adjustment (i.e., fearful that they may overspend), but not downward adjustment (i.e., hopeful that they would underspend), was not communicated

clearly in the original research. Alternatively, I show that the budget variation could be a result of the different construal levels associated with different budget horizons. When making plans over a longer horizon, individuals tend to be at a higher level of construal, which focuses on the desirability aspect of the consumptions. In turn, I show that the long-run overbudgeting phenomenon observed in previous studies could be merely a coincidence since the previous authors happened to use all hedonic products as target products and these products become more appealing in the long run due to the high construal level effect. In fact, I show that overbudgeting can also happen within short-run budget horizon, an effect in contrast to the previous study. This reversed phenomenon happens when individuals budget for utilitarian consumptions, since individuals at a lower level of construal tend to focus on feasibility.

Whereas reviewing past literature from parent disciplines such as economics and psychology helps to prevent committing to misguided conclusions, as illustrated in chapter 2 and 3, I am also intrigued in the opportunities to expand the understandings in the topic of risk and uncertainty. To this end, in chapter 4 I provide a snippet of the research I plan to conduct in the coming years. Specifically, in that chapter I investigate how the presence of uncertainty alters one's cognitive response, and particularly the ability to encode and later recognize new information. Complementing the Reactive Approach Motivation theory (McGregor, Nash, Mann, & Phills, 2010), results suggest that the special type of anxiety that accompanies uncertainty interferes with individuals' learning ability. While their neural receptors become more excited and better at receiving raw information at the presence of uncertainty, the cognitive process of semantic transformation is blocked, leading to decreased integration of information across modalities. This finding suggest that marketers should use simple, easy-to-process messages during high-tension events like sports games in order to achieve maximum effectiveness.

Continuing the inquisition set out in chapter 4, in the coming years, I also expand the scope of my research from cognitive functions to metacognition. There are reasons to believe, instead of storing specific information about the uncertainty and pay-off structure of underlying the uncertainty, my mind captures and stores the concept of uncertainty based on metacognitive information. In other words, how confident I feel retrospectively about past judgments and decisions may serve as a good proxy for the uncertainty and risks involved in those situations at the moment. Then, what errors and irrationalities, if at all, are present during the metacognitive process? For example, it is possible that unrelated events may affect one's confidence in a product's ability to function as expected after the purchase, and then retrospectively alter the recollection of the uncertainty involved with the activity of choosing itself. I believe answering such questions will be helpful to manage repeated purchases, and will be committed to uncovering the answers in the near future.

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