WHAT SATISFIES A CURIOUS MIND?
CURIOSITY PROMPTS NOVEL REWARD SEEKING

by

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Abstract

In this age of information overload, consumers are bombarded with various curiosity-inducing stimuli from newspapers, TV programs, movies, web banners, etc. Despite its ubiquity in the consumption world, curiosity has surprisingly received little attention in cognitive psychology and consumer behavior research (Kang et al. 2009; Menon and Soman 2002). In the limited research on state curiosity, most attention has been directed to its impact on people’s search for domain-specific information that closes the knowledge gap (Menon and Soman 2002; van Dijk and Zeelenberg 2007). However, as curiosity is also an appetitive state that possesses driving forces (Blumenberg 1983; Loewenstein 1994), it is possible that curiosity could motivate reward-seeking behaviors other than information seeking.

My dissertation investigates the impact of curiosity, a cognitive deprivation arising from the perception of a gap in knowledge (Loewenstein 1994), on consumers’ subsequent reward-seeking behaviors. I find that curiosity motivates people to seek rewards, particularly novel rewards, in other unrelated domains, such as physical domains (e.g., money, food) and social domains (e.g., social friendship, charitable donation). This effect occurs as a result of a general appetitive drive and an open mindset, which are both activated by exposure to curiosity cues. I further identify that information content moderates this effect; when people are curious about threatening information, the effect of curiosity on the spillover reward-seeking tendency is mitigated.

This research contributes to both the curiosity and the reward-seeking literature. While prior research has shown that curiosity motivates people to seek rewards in the
cognitive domain by searching for the missing information, I show that this general motivational dimension of curiosity can prompt people to engage in reward-seeking behaviors in other unrelated domains. Further, I add to the existing spillover reward-seeking studies by showing that such effect induced by curiosity is particularly pronounced for novel rewards. This research also contributes to the reward-seeking literature by exploring how the spillover reward-seeking effect extends to the intangible cognitive and social domains (e.g., cognitive deprivation, social rewards).
Preface

This dissertation is an original intellectual product of the author, Chen Wang. I am the primary author of the dissertation. I was responsible for conducting the literature review, developing the hypotheses, designing the experiments, collecting the data, analyzing the data and preparing the manuscript. Dr. Rui (Juliet) Zhu assisted in designing the experiments and providing intellectual contributions. Dr. Anirban Mukhopadhyay and Dr. JoAndrea (Joey) Hoegg assisted in providing intellectual contributions.

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I seem to be speechless to find the appropriate words to describe my gratitude to my family. So I dedicate my dissertation to them in the hope of sufficiently expressing my feelings.
Dedication

This dissertation is dedicated to my parents and grandparents.
Chapter 1: Introduction

Is your curiosity instantly piqued when you see a street billboard simply saying “innw? Text: 46691”? Do you become intrigued and try to guess what product is being advertised when you see a commercial showing a pack of dogs barking the Star Wars theme song? Are you eager to learn more about the latest smartphone when the teaser commercial features only an unpacked box and ends with “to be continued”? Do you keenly anticipate a movie when the movie trailer is only an image of the Mona Lisa with a voice-over saying “What if the world’s greatest works of art have the secret that could change the course of mankind forever”? In these advertisements for Doritos, Volkswagen, Samsung, and The Da Vinci Code, marketers use curiosity to engage consumers. They are also some examples of the numerous curiosity cues that consumers encounter on a daily basis. In this age of information overload, consumers are bombarded with curiosity-inducing stimuli from newspapers, TV programs, movies, web banners, etc.

Despite its ubiquity, curiosity has received surprisingly little attention in cognitive psychology and consumer behavior research (Kang et al. 2009; Menon and Soman 2002). Curiosity has been defined as “a form of cognitively induced deprivation that arises from the perception of a gap in knowledge or understanding” (Loewenstein 1994, 75). However, a large body of existing research on curiosity has examined curiosity as a personality trait (e.g., Kashdan 2009; Litman and Spielberger 2003). In the limited research on situational or state curiosity, most attention has been directed to its effects on people’s search for domain-specific information that closes the knowledge gap (Menon and Soman 2002; van Dijk and Zeelenberg 2007). Such domain-specific information can be considered a reward that satiates the curiosity-induced
cognitive deprivation (Kang et al. 2009). However, as curiosity is also an appetitive state that has its own driving forces (Blumenberg 1983; Loewenstein 1994), it is possible that curiosity could motivate reward-seeking behavior other than information seeking. This possibility has not been previously examined and is the focus of this research.

Over the past decade, neuroscience and behavioral science have made interesting discoveries about people’s reward-seeking behavior. They found that intangible cognitive rewards (e.g., information that satiates curiosity) and social rewards (e.g., interpersonal bonding), and tangible physical rewards (e.g., food, money) are processed similarly in the brain, and that this shared brain network leads to a spillover reward-seeking effect (Berridge and Kringelbach 2008; Lieberman and Eisenberger 2009). That is, deprivation in one domain motivates individuals to seek rewards in unrelated domains (Berger and Shiv 2011). For instance, food scarcity may motivate people to seek monetary rewards, and vice versa (Briers et al. 2006). Although these findings are intriguing, previous studies have focused on deprivation and satiation in the lower physical domain (e.g., food, money). We know little about the spillover effect in the higher domains. For example, might deprivation in the cognitive domain lead to reward-seeking behavior in the social domain? This research advances our understanding of curiosity and reward-seeking behavior by investigating whether, how, and why curiosity, a deprivation in the cognitive domain, motivates spillover reward seeking in other domains such as the social (e.g., interpersonal bonding) or physical (e.g., money, food) domains.

Given that curiosity is a cognitive deprivation (Loewenstein 1994) which resembles other types of deprivation that have been documented in the spillover reward-seeking effect (Lieberman and Eisenberger 2009), I propose that curiosity can lead to reward-seeking behavior in unrelated domains. I further suggest that curiosity, which elicits an open mindset, prompts
people to seek particularly novel (vs. familiar) unrelated rewards. Finally, I identify an important boundary condition that mitigates the reward-seeking propensity. Specifically, I find that when people are curious about threatening information, they no longer exhibit the reward-seeking tendency.

This research contributes to both curiosity and reward-seeking literature. Although previous studies have shown that curiosity motivates people to seek rewards in the cognitive domain by searching for the missing information, I show that this general motivational dimension of curiosity can prompt people to engage in reward-seeking behavior in other unrelated domains, such as physical (e.g., money, food) and social (e.g., social friendship, charitable donations) domains. Further, I add to the existing spillover reward-seeking studies by showing that such effect induced by curiosity is particularly pronounced for novel rewards. This research also contributes to the reward-seeking literature by exploring how the spillover reward-seeking effect extends to the intangible cognitive and social domains (e.g., cognitive deprivation, social rewards).

The rest of the dissertation is structured as follows. In Chapter 2, I provide the relevant conceptual background by reviewing literature in curiosity and reward-seeking behaviors, and develop my hypotheses based on the theorizing. In Chapter 3, I present Study 1, which establishes the basic effect of curiosity on the spillover reward-seeking behaviors. In Chapter 4, I present Study 2, which demonstrates that curiosity prompts people to seek particularly unrelated novel rewards. In Chapter 5, I present Study 3, which provides evidence on the process for the novelty preference. Specifically, it demonstrates that curiosity activates an open mindset, which subsequently leads to a preference for novelty. In Chapter 6, I present Study 4, which provides further process evidence for the reward-seeking mechanism. In particular, it demonstrates that
once the general appetitive drive induced by curiosity is satiated by even unrelated rewards, the subsequent reward-seeking tendency is mitigated. In Chapter 7, I present Study 5, which identifies an important moderator, namely, information content; when people are curious about threatening information, they no longer exhibit any reward-seeking tendencies. Finally, in Chapter 8, I end this dissertation with a conclusion section that summarizes the findings of these studies, discusses contributions of this research and future avenues for investigation, as well as offers relevant practical implications.
Chapter 2: Conceptual Background and Hypotheses Development

2.1 Curiosity as Cognitive Deprivation

The psychological research on curiosity historically underwent two major periods of intense examination. The first period took place in the 1950s and 1960s when researchers primarily examined curiosity’s psychological underpinnings. The most notable one was by Berlyne (1954) who realized that the conceptualization had been muddy in the literature and proposed a categorization of curiosity on two dimensions: perceptual versus epistemic curiosity, and specific versus diverersive curiosity. First, the perceptual – epistemic dimension applies to different organisms which could become curious. Perceptual curiosity refers to animals’ explorative behaviors induced by unfamiliar stimuli. For example, a large number of animal studies showed that rats would be more likely to explore the less familiar maze (e.g., Dember 1956; Kivy, Earl, and Walker 1956). Epistemic curiosity is used in the more advanced domain of epistemology and describes human’s desire for information and knowledge (Berlyne 1954). Second, the specific – diverersive dimension distinguishes the targets that the organism is curious about. Specific curiosity refers to the desire to know a particular piece of information, as exemplified by the motivation to search for the answer of a puzzle. Diversive curiosity, however, describes a more general sensation seeking such as a bored individual’s channel surfing on the television. The specific-diversive curiosity distinction, however, became a central focus of the second period. During the 1970s and 1980s, psychologists found that diverersive curiosity
appeared to be some distant construct such as boredom which was very different from our conventional understanding of curiosity (e.g., Boyle 1989; Day 1971). By contrast, specific curiosity is close to the true construct. For example, a factor analysis study (Olson and Camp 1984) on Day’s (1971) Ontario Test of Intrinsic Motivation (OTIM) found that the Diversive Curiosity subscale of the OTIM loaded on a factor along with Zuckerman’s (1971) sensation seeking scale, whereas the Specific Curiosity subscale loaded on a factor labeled as General Curiosity. Hence, given these two dimensions, *epistemic specific curiosity* is a more relevant concept to examine consumers’ curiosity, which is usually evoked by a specific consumption stimulus. For brevity, I will use curiosity in this research.

In the 1990s, Loewenstein (1994) advanced our understanding of the construct by integrating previous research and proposing a theoretical account of curiosity. In his seminal work, curiosity (i.e., epistemic specific curiosity) has been conceptualized as “a form of cognitively induced deprivation that arises from the perception of a gap in knowledge or understanding” (Loewenstein 1994, 75). In other words, the information gap that arises from what one currently knows and what one desires to know produces curiosity. For example, a perplexing advertisement, a brain teaser, or an incomplete story, all give rise to an information gap that arouses people’s curiosity about the missing information—the content of the advertisement, the solution to the brain teaser, or the ending of the story.

Of particular relevance to my research, Loewenstein’s information-gap perspective (1994) pointed to an important motivational dimension of curiosity. It suggested that curiosity is an appetitive drive. That is, the discrepancy between what one currently knows and what one wants to know will motivate individuals to engage in exploratory behavior (Carver and Scheier 1981, 1998). Psychologists have long considered curiosity as a drive like hunger and thirst. For
instance, Jones, Wilkinson, and Braden (1961, 135) suggested in their studies that “information deprivation functions as a drive variable in the same sense as the well-studied homeostatic drives of hunger, pain, and thirst”. Also, Kant described curiosity as an “appetite for knowledge” (Blumenberg 1983, 430), and Freud referred to curiosity as a “thirst for knowledge” (1915, 153). Feuerbach also suggested that analogous to physiological appetites, curiosity—the “unsatisfied knowledge drive”—produces painful feelings of deprivation (Blumenberg 1983, 445). Some more recent research also sheds light on this motivational dimension by suggesting that the desire to satisfy curiosity may even prompt people to seek out information that might induce regret (Caldwell and Burger 2009; van Dijk and Zeelenberg 2007) or have long-term harmful outcomes (Kruger and Evans 2009). In marketing, the motivational dimension of curiosity has been widely used in teaser advertising (Trehan and Maan 2012), as in the examples mentioned in the opening paragraph. Kover (1995) specifically noted that a teaser advertisement provides incomplete information that “entices another to seek to unravel or to trap the concealer into subsequent acts of discovery” (Perinbanayagam 1991, 156).

Furthermore, much as hunger motivates people to seek food reward, it is suggested that curiosity motivates people to seek the reward of the missing information, as a way to satiate the deprivation. According to the drive theories, the notion of drive is a homeostatic concept in which disequilibria or disruptions in needs produce driving forces that propel action to reestablish the equilibrium (Woodworth 1918). From this perspective, behaviors are motivated by drive reduction to meet certain primary or secondary needs that induce goals (Hull 1943; Lewin 1935; Spence 1956). This is also consistent with the classical motivational principle that individuals are motivated to approach pleasant, desired end states and avoid painful, undesired outcomes (Atkinson 1964; Higgins 1997). Therefore, curiosity, a cognitive deprivation
possessing driving forces, motivates people to search for the missing information as the cognitive reward to reduce the deprivation. Some recent research has lent support to this proposition. For example, in a recent fMRI brain-imaging experiment (Kang et al. 2009), participants read trivia questions on various topics during functional magnetic resonance imaging. The imaging results revealed that the reward circuitry was activated for those who were highly curious about the answers. In their follow-up experiment, the hypothesis that curiosity motivates reward-seeking behavior was further confirmed by behavioral results: participants who were more curious about the trivia questions were more likely to spend time or money to find out the answers.

In sum, curiosity, a cognitive deprivation, has a motivational dimension that could serve as an appetitive drive. Previous research has primarily suggested that curiosity motivates people to seek the missing information as an information reward. However, it is unclear whether curiosity can also motivate people to seek rewards in other unrelated domains, especially given that curiosity is an appetitive drive possessing motivational forces that could potentially propel people to approach rewards. This research seeks to fill this gap in the curiosity literature by investigating whether, how, and why curiosity could motivate individuals to seek rewards in other unrelated domains. I discuss this question in the next section.

2.2 Curiosity and the Spillover Reward-Seeking Effect

Eating when hungry, drinking when thirsty, and receiving money when poor are all activities that involve satiating a need or deprivation with rewards. A reward is “an object or
event that elicits approach and is worked for,” and has incentive-motivational value (Wise 2004). Over the past decade, neuroscientists have identified the brain reward circuitry that consists of the ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and the amygdale (Amyg; Breiter and Rosen 1999; Kringelbach 2004; O’Doherty, Deichmann, Critchley, and Dolan 2002; Wise 2002). This reward circuitry receives the neurotransmitter of dopamine and is activated in response to physically rewarding stimuli such as food, money, drugs, and sexual activity (Lieberman and Eisenberger 2009).

More strikingly, neuroscientists have recently shown that the intangible cognitive and social rewards activate the same brain reward circuitry as those tangible physical rewards (Berridge and Kringelbach 2008; Kringelbach and Berridge 2010; Lieberman and Eisenberger 2009; Sax and Haushofer 2008). For example, the information and knowledge to satisfy curiosity has been identified as cognitive rewards to satiate the cognitive deprivation of curiosity (Kang et al. 2009). Similarly, in the social rewards domain, interpersonal bonding that meets humans’ innate need to belong (Baumeister and Leary 1995) also activates the brain’s reward circuitry (Carter 2006; Sax and Haushofer 2008). For instance, Bartels and Zeki (2000; 2004) showed that the brain reward circuitry was activated when participants were viewing the pictures of their romantic partners or of their children. Further, charitable donation has been identified as another social reward. For instance, Moll et al. (2006) showed that making charitable donations actually activated the reward circuitry even more than obtaining the same amount of monetary reward. Taken together, emerging neuroscience evidence has consistently shown that rewards, ranging from the tangible physical rewards to the intangible cognitive or social rewards, systematically activate the same reward circuitry in the brain to process various forms of rewards (Sax and Haushofer 2008).
The shared nature of the brain reward circuitry has led some researchers to propose a spillover reward-seeking effect. Specifically, they have argued that deprivation in one domain enhances motivational impetus to seek out rewards in an unrelated domain (Berger and Shiv 2011; Wadhwa et al. 2008). This proposition has been tested in both behavioral and fMRI studies. For example, Briers et al. (2006) showed a reciprocal association between the deprivation and compensation of food and money. That is, hungry participants showed an enhanced desire for money, and participants who were deprived of money showed an increased desire for food. Also, Van den Bergh et al. (2008) demonstrated that men who were exposed to sexual cues displayed a heightened preference for immediate monetary rewards. Further, Knutson et al. (2008) provided neuroscience evidence that such enhanced desire for money by exposure to erotic pictures was mediated by activation in the brain reward circuitry. In sum, all this evidence has provided support for the spillover reward-seeking effect.

Although the findings of the spillover reward-seeking behavior are interesting, some questions still remain unanswered. First, previous studies have focused primarily on the deprivation that prompts the spillover reward seeking in the tangible physical domains (e.g., hunger). Thus, it is unclear whether deprivation in an intangible, higher cognitive domain (e.g., curiosity) also exhibits a similar spillover effect. Second, the satiation stimuli used in previous studies are also limited primarily to physical rewards (e.g., food, money), raising the question of whether the spillover effect could extend to intangible, higher reward domains, such as social bonding or charitable donations. If different types of rewards share the same brain reward circuitry, then it is reasonable to predict that the spillover reward-seeking behavior will also occur in higher cognitive and social domains. In fact, a recent paper by Berger and Shiv (2011) provided initial support for this idea. They found that hunger (a deprivation in the physical
domain) can activate the need for distinctiveness (a reward in the social domain), and vice versa. However, we still have little understanding on whether the spillover reward-seeking effect could take place between two intangible, higher domains (e.g., a cognitive deprivation and a social reward). The current research thus seeks to fill this gap in the reward-seeking literature by examining whether the spillover effect could be extended to higher cognitive or social domains.

Building on the existing research and the aforementioned logic, I propose that curiosity, because it is an appetitive drive, can similarly produce spillover reward-seeking behavior in domains other than the information domain, such as the tangible physical domain (e.g., money, food) or the intangible social domain (e.g., social friendship, charitable donation). To elaborate the effect more clearly, let me use an analogy to describe the role of curiosity. If a curious individual is considered as a vehicle, then the general appetitive drive arising from curiosity is the engine of the vehicle, providing the driving forces that impel the individual to seek out rewards in other unrelated domains. In fact, the analogy between motivation and engine is not new. Early in the 1970s, researchers already considered motivation as the “driving force” or the “energizer” behind behaviors (Bennett 1977; Madsen 1974). This analogy is particularly intriguing in the current context, because it not only highlights the motivational dimension of curiosity and its role in the spillover reward-seeking effect, but also has the potential to incorporate other characteristics that curiosity exhibits in the reward-seeking effect. In regard to these other characteristics, I will integrate them into this analogy in the next few sections.
Formally, my hypothesis about the impact of curiosity on the spillover reward-seeking behavior is as follows.

H1: Curiosity can motivate individuals to seek rewards in an unrelated domain.

2.3 Curiosity Prompts Novel Reward Seeking

I further suggest that, besides the general appetitive drive, curiosity has another characteristic that determines what kind of reward curious individuals are particularly looking for while seeking rewards. Specifically, I propose that curiosity motivates individuals to seek particularly novel (vs. familiar) rewards in other unrelated domains. This is expected to occur because curiosity elicits an open and explorative mindset, which will subsequently promote a preference for novelty. I discuss the explanations in the next few paragraphs.

First, I argue that curiosity may prompt people to engage in an open mindset. According to Loewenstein’s definition of curiosity (1994), when exposed to curiosity cues and presented with an information gap, individuals are motivated to obtain the missing information to reduce the feeling of deprivation. In their attempts to locate the missing information, individuals do not restrict themselves to familiar information but also take novel stimuli into account. Such enhanced receptivity to all sources should lead to an open mindset, a mental state that is receptive to new and unfamiliar things. Previous research on trait curiosity has also supported this possibility. It has been shown that people with higher trait curiosity have a greater tendency
to seek out novelty and challenges (Kashdan, Rose, and Fincham 2004; Kashdan and Steger 2007).

Next, I argue that such an open mindset elicited by curiosity will lead people to prefer novelty. Prior research on mindset has suggested that the salient cognitive characteristics evoked by environmental cues can promote consumers to choose subsequent choices with similar characteristics (Wood 2010). For example, Keinan and Kivetz (2011) found that a productivity mindset enhances the choices of collectable experiences. Also, Sassenberg and Moskowitz (2005) showed that a creative mindset reduces automatic stereotype activation. Building on these findings, I predict that an open mindset which encourages people to be more receptive to new and unfamiliar things will lead them to prefer novel options. In sum, I propose that curiosity prompts people to engage in an open mindset, which subsequently leads them to prefer novelty.

Built on hypothesis 1 which states that curiosity motivates individuals to seek rewards in other unrelated domains, I make my next hypothesis. I further propose that the general appetitive drive and the open mindset, both activated by curiosity, jointly determine that curiosity prompts individuals to seek particularly novel rewards in other unrelated domains. To elaborate the effect more clearly, let us consider the analogy I used earlier. If a curious individual is regarded as a vehicle, and the general appetitive drive arising from curiosity serves as the engine to impel the individual to seek out rewards, then the open mindset elicited by curiosity is the steering wheel that determines which direction (i.e., a preference for novelty) the vehicle is more likely to go.

Formally, I make hypothesis 2 as follows.

H2: Curiosity can motivate individuals to seek particularly novel rewards in an unrelated domain.
2.4 Curiosity about Threatening Information Mitigates the Reward-Seeking Effect

Based on my earlier theorizing, curiosity, because it is an appetitive drive, prompts people to engage in an approach orientation and motivates people to seek rewards in unrelated domains. However, is that always the case? If under certain circumstances curiosity elicits an avoidance, rather than an approach, orientation, would such an avoidance orientation mitigate the spillover reward-seeking effect? In this section, I seek to identify a contextual factor that could serve as a moderator of the reward-seeking effect.

People could be curious about anything in the surrounding environment. What if they are curious about something potentially threatening? Are they still likely to engage in an approach orientation and be motivated to seek rewards? I propose that when people are curious about potentially threatening information, they are more likely to engage in an avoidance orientation, which might subsequently refrain them from seeking any further reward. This argument has found consistent theoretical support from previous literature. Prior research has suggested that people usually try to avoid threatening information that may cause negative emotions (Nelsen and Shapiro 2009; Roth and Cohen 1986; Sweeny et al. 2010). When people are curious about potentially threatening information, they might refrain from approaching behavior and engage in an avoidance orientation to cope with the potential emotional consequences (Sweeny et al. 2010). For example, anecdotal evidence suggests that people sometimes avoid learning how much they weigh after the holiday season, or how they performed in a difficult test. Also, the medical research has provided converging evidence to support this argument. It has been consistently shown that people tend to avoid learning their risk of having a disease even when provided with
an opportunity. For instance, about 80% of men who were given the opportunity to learn their HIV status refused to obtain it (Lyter et al. 1987; Vargas 2001; Zapka et al. 1991). Similarly, a considerable percentage of people declined to learn their risk of getting cancer even when provided with an opportunity (Keogh et al. 2004; Lerman et al. 1996; Ropka et al. 2006).

Taken together, given that people who are curious about threatening information are likely to engage in avoidance motivation, I predict that such an avoidance orientation would carry over to their subsequent behavior and mitigate the spillover reward-seeking tendency. To explain the effect more clearly, let us consider the vehicle analogy again. When an individual is curious about threatening information, he (i.e., the vehicle) may detect the potential threat ahead. Although the engine might still be on as a result of being in a curious state, the brake of the vehicle is likely to put on as well, which will inhibit the vehicle from going forward and refrain him from seeking out any further reward.

Formally, the hypothesis can be stated as follows.

H3: Curiosity about threatening information (vs. non-threatening information) mitigates the reward-seeking effect.

In the next few chapters, I present a series of five studies that lend systematic support to my hypotheses, by demonstrating the basic effect, providing process evidence, and identifying the boundary condition.
Chapter 3: Study 1 – Curiosity Prompts Spillover Reward Seeking

Study 1 tested hypothesis 1 that curiosity motivates spillover reward-seeking behavior in other unrelated domains. The study was designed to demonstrate two key conditions for the effect to occur: 1) the target needs to be a reward (vs. penalty) for the effect to occur, and 2) the reward can be in another domain other than cognitive information. In other words, curiosity should not motivate individuals to approach a penalty, even if the penalty is in an unrelated domain. To test these, I employed a 2 curiosity (curious vs. incurious) x 2 target stimulus (reward vs. penalty) between-subjects design, and used a monetary reward (vs. penalty) in this study. I predicted that curiosity would prompt people to seek an unrelated monetary reward, but not a monetary penalty.

3.1 Method

I recruited 154 paid participants from an online panel (Amazon Mechanical Turk; $M_{\text{age}} = 33$ years, 62 females). Participants were first asked to complete an advertisement evaluation task, which served as my curiosity manipulation. The advertisement featured unbranded marketing campaign material for Freedom 55, a financial insurance company. The print advertisement lacked the information about the brand and the product, which was expected to induce curiosity among consumers and drive them to the company’s new website. In the advertisement, there was
an image of a young man playing drums in the mountain, with the advertisement copy “What
does your freedom look like? You tell us what. We’ll show you how,” a QR code, and a website
link (Figure 3.1). Participants were instructed to examine the advertisement carefully, guess what
the advertisement was about, and then write down their guess in the provided space. After this,
they completed a filler question on the extent to which they liked the advertisement using a 7-
point scale (1 = not at all, 7 = very much). To manipulate curiosity, those in the incurious
condition were then provided with explanations of what the advertisement was about, which
filled the information gap in their mind. By contrast, those in the curious condition were not
provided with such information and were directed to move onto the next task, which leave their
information gap open.

Next, participants completed an ostensibly unrelated decision-making task, which served
as my key dependent measure to assess their motivation to seek a monetary reward vs. a penalty.
In the task, participants were asked to imagine that they either won a $20 lottery ticket (reward
condition) or had to pay a $20 parking ticket (penalty condition). The ticket could be claimed
(paid) at any time within the next 60 days with no change in the ticket value. Participants were
asked to indicate, on a 100-unit slider between 0 day and 100 days, the number of days from
today that they would wait before claiming the lottery prize or paying the parking ticket,
depending on the condition. This dependent measure was selected because previous studies have
shown that waiting time is a measure of an individual’s motivation to approach the target
(Aharon et al. 2001; Van den Bergh et al. 2008). If curiosity indeed elicits a reward-seeking
tendency, curious people should select a shorter waiting time for the monetary reward than
incurious people. However, such a difference should not exist for the monetary penalty, if the
target needs to be a reward for the curiosity effect to occur.
In the final stage of the study, participants completed a curiosity manipulation check by indicating their curiosity level using two items adapted from Kang et al. (2009; i.e., How curious are you now about the advertisement content? How eagerly do you want to know what the advertisement is about now?). The reward manipulation was checked by asking participants to indicate how rewarding it is, and how desirable it is, to receive a $20 lottery prize (vs. parking ticket). Participants’ level of involvement was measured on four items (i.e., How well were you able to concentrate on the experimental task? How much effort did you spend in completing this study? How involved were you in completing the study? How interesting do you think this study was?). All of the items were assessed on a 7-point scale (1 = not at all, 7 = very much). Finally, suspicion probe and demographic information were recorded.

3.2 Results and Discussion

Twelve participants did not finish the survey and were excluded from the data analysis. Manipulation checks confirmed the effectiveness of my manipulations. For the curiosity manipulation, the two curiosity items were averaged to create a curiosity index ($r = .84$). The results revealed that participants who were not provided with explanations of the advertisement were indeed more curious than those who were provided with the explanations ($Ms = 5.03$ vs. 3.89, $t(140) = 4.05, p < .001$). For the reward manipulation, the two items were averaged to create a reward index ($r = .96$). As expected, the lottery ticket was considered more rewarding than the parking ticket ($Ms = 5.46$ vs. 1.24, $t(140) = 23.04, p < .001$).
The dependent measure (i.e., the number of days that participants indicated they would wait before receiving the reward vs. the penalty) was skewed, so I used its square root to test my main hypothesis (Howell 1982; the untransformed means are reported for ease of interpretation). I first found a main effect of the target stimulus, such that people generally waited less time to claim the lottery prize than to pay the parking ticket ($M_s = 3.99$ vs. $21.41$, $F(1,138) = 51.34$, $p < .001$). This is expected as people generally approach rewards (vs. penalties). Further, a two-way ANOVA revealed a significant interaction between curiosity and target stimulus ($F(1,138) = 5.65$, $p < .05$; Table 3.1, Figure 3.2). Specifically, curious participants waited less time than incurious participants to claim the lottery prize ($M_s = 2.34$ vs. $5.58$, $t(138) = 3.22$, $p < .005$). However, both groups waited an equivalently long time to pay for the parking ticket ($M_s = 22.76$ vs. $19.94$, $t(138) = 1.19$, $p > .20$).

Additionally, to examine whether my manipulations altered participants’ involvement, I created an involvement index by averaging the four items ($\alpha = .71$). I did not find any treatment effects ($ps > .30$). Thus, involvement could not explain the effect of curiosity on spillover reward-seeking behavior. Note that I also measured involvement in studies 3 and 4, but again found no treatment effects. To save space, I do not report this measure in later studies. Finally, no one correctly guessed the true purpose of the study.

The results of study 1 provided support for my hypothesis 1 that incidental exposure to curiosity cues enhances people’s motivation to seek rewards in an unrelated domain. Moreover, I found that curiosity cues do not enhance motivation to approach penalties, even the penalties are in other unrelated domains. This indicated that the target stimuli need to be rewards for the effect to occur. Therefore, in my subsequent studies I focused on rewarding stimuli. In the next study, I further tested whether curiosity motivated individuals to seek particularly novel rewards in other
unrelated domains. I also included a control condition to test whether it was indeed the curiosity condition that drove the effect.
Chapter 4: Study 2 – Curiosity Prompts Novel Reward Seeking

Study 2 tested hypothesis 2 by demonstrating that incidental exposure to curiosity cues encourages people to seek particularly novel rewards in an unrelated domain. A food reward was adopted in this study. I conducted a field study using a one-factor design with three between-subjects conditions (curious vs. incurious vs. control).

4.1 Method

The study was conducted at a subway station in the downtown area of Vancouver. One hundred and forty-six passengers (79 females, 2 not indicated) waiting at the subway station participated in the study. The procedure to manipulate curiosity was the same as that in Study 1, which was shown to be effective. Passengers were approached individually. They were directed to look at an advertisement displayed in the waiting area and asked to guess what it was about. The advertisement was another version of the advertisement used in Study 1. In this version, there was an image of a woman and a young girl boating on the river, with the advertisement copy “What does your freedom look like? You tell us what. We’ll show you how,” a QR code, and a website link (Figure 4.1). Again, the advertisement served as my curiosity manipulation. Specifically, participants in the curious condition were not provided with any explanations of
what the advertisement was about, whereas those in the incurious condition were provided with explanations. In the control condition, participants were not given this task.

After the curiosity manipulation, all participants were asked to do a short product evaluation survey. In the survey, they were asked to indicate their attitudes (i.e., “To what extent do you like the following products, at this moment in time?” on a 7-point scale from 1 = not at all to 7 = very much) towards six food products from three categories, with one familiar and one novel products within each category. Specifically, the products were strawberry vs. cheddar cheese ice cream, lemonade vs. bacon flavored soda, and cheese vs. donut burger. Half of the participants were presented with the three familiar products first, and the other half were presented with the three novel products first. Afterwards, they were asked to choose between two types of almond snacks, namely Munchies® Roasted Salted Almonds (a familiar snack) and Munchies® Lime & Chili Almonds (a novel snack), as a thank-you gift. My dependent measures were consumers’ evaluations of familiar vs. novel food products in the survey, and their choice of a familiar vs. novel almond snack. Because the time interval between the trains was only 2-3 minutes, I kept the procedure short and recorded only gender as the demographic information at the end.

The products used in the study were selected based on a pretest with 56 participants from an online panel. Participants were asked to rate on a 7-point scale (1 = not at all, 7 = very much) the novelty of items on a list of products. As expected, the results indicated that cheddar cheese ice cream (M = 5.14), bacon flavored soda (M = 5.11), donut burgers (M = 4.80), and lime & chili almonds (M = 4.30) were considered more novel than strawberry ice cream (M = 2.48; t(55) = 5.83, p < .001), lemonade soda (M = 2.89; t(55) = 5.11, p < .001), cheese burgers (M = 2.48;
\[ t(55) = 6.06, \ p < .001 \], and roasted salted almonds \( (M = 2.27; \ t(55) = 5.28, \ p < .001) \), respectively.

### 4.2 Results and Discussion

Five participants were excluded from the analysis. Among them, two did not finish the survey due to train arrivals, two did not want the almonds at the end, and one did not fully understand the study procedure due to language difficulties.

For the remaining 141 participants, the choice measure generated a pattern consistent with my hypothesis. Specifically, participants in the curious condition (58.30%) were more likely to choose the novel food reward (i.e., Munchies® Lime & Chili Almonds) over the familiar food reward (i.e., Munchies® Roasted Salted Almonds), compared to participants in either the incurious condition (35.40%) or the control condition (37.80%; \( \chi^2(2) = 6.15, \ p < .05 \); Table 4.1, Figure 4.2). There was no difference between the choices of the incurious and the control conditions (\( \chi^2(1) = .06, \ p > .80 \)). These results indicated that the reward-seeking effect was driven by curiosity, rather than incuriosity (i.e., curiosity satiation).

In contrast to the choice results, the product evaluation measure did not produce the anticipated effect. For each of the three novel-familiar pairs, I ran a 3 (curious, incurious, control) x 2 (familiar vs. novel product) mixed ANOVA with the second factor being a within-subject variable. The results revealed no interaction effect (\( ps > .29 \)), but did have a significant main effect of the product type (\( ps < .001 \)). All of the participants, regardless of curiosity
condition, rated the familiar products more favorably than the novel products. In retrospect, this finding was very reasonable, and it suggested that although curiosity may prompt people to take the action to try novel products, it does not necessarily change people’s usual preferences for the products before they could try them.

To explore whether there was any gender effect, I also included gender as an independent variable in the analysis of both the almond choice measure and the product evaluation measure. However, gender did not produce any main or interaction effect ($p > .22$).

The results from this study thus supported hypothesis 2 by showing that curiosity prompts people to seek particularly novel (vs. familiar) rewards in other unrelated domains. By including a control condition, I was able to demonstrate that the effect was driven by curiosity rather than incuriosity. Thus, in subsequent studies, I dropped the control condition and only focused on the curious and incurious conditions. In the third study, I replicated this study’s findings in a lab setting and further explored the underlying mechanism that open-mindedness drives the effect of curiosity on people’s preference for novelty.
Chapter 5: Study 3 – Curiosity Elicits An Open Mindset

Having established the basic effect, I next sought to demonstrate the process through which curiosity enhances a preference for novelty. I posited that curiosity elicits an open mindset, which promotes people to prefer a novel option to a familiar option. Therefore, in this experiment, I directly examined the mediating role of an open mindset by using a lexical decision task (Meyer and Schvaneveldt 1971), in which I measured the accessibility of open-minded concepts through participants’ reaction time towards these words. In particular, participants were asked to respond to open-mindedness related words as quickly as possible after the curiosity manipulation, while their reaction time to each word was recorded. The underlying rationale of this method is that if curiosity indeed activated an open mindset, curious participants should access the open-minded concepts more easily than the incurious participants. Thus, I predicted that curious participants would respond to the open-minded words faster than the incurious participants.

To test the mediating role of an open mindset, I used a 2 curiosity (curious vs. incurious) x 3 word type (open-minded vs. neutral vs. non-word) mixed design, with the second factor being within-subjects. The accessibility of the open-minded concepts was measured by using the lexical decision task. The same almond snacks used in Study 2 were employed again as the food reward. I predicted that curious (vs. incurious) people would respond to the open-minded words faster, and would be more likely to choose the novel almond. Further, the reaction time of the open-minded words would mediate the effect of curiosity on participants’ choice between novel and familiar almonds.
5.1 Method

Ninety-four undergraduate students (62 females) participated in the experiment for course credit. Curiosity was manipulated in a different manner in this study. Participants first worked on a video evaluation task, which was in fact my curiosity manipulation. The video was adopted from a reality TV show named “What Would You Do?”. In this 8-minute video, real customers’ responses towards an ethical scenario were recorded using hidden cameras. In the scenario used in the TV show, a customer portrayed by a hired actress passed her lotto ticket to a store clerk, who was also a hired actor, and asked him to check if she had won the lottery while she went to grab a bottle of wine. When the clerk entered the lotto number into the register, a loud jingle immediately played indicating that the customer was a winner and the screen flashed “INSTANT WINNER, $20.00.” However, when the woman returned, the clerk lied to her, saying “No, sorry, not a winner.” The TV show then recorded the responses from real customers who had witnessed the scene. I selected this video as the stimulus, because it had enough storyline to induce curiosity but not enough emotional content to cause any affective responses. To manipulate curiosity, I divided the video into two parts. The first part ended right before a real customer was about to respond by displaying a caption “What will happen next” on the screen; this break was intended to elicit the viewer’s curiosity about the in-store customer’s response. Hence, in the curious condition, participants watched only the first part of the video and were told that the second part would be played later. In the incurious condition, participants watched both parts of the video.
Next, I measured participants’ semantic activation of an open mindset using a lexical decision task, under the cover story that the task aimed to understand consumers’ attentions to different information. Participants were told that they would be presented with a list of letter strings on the computer screen, and their task was to identify, as quickly and accurately as possible, whether the letter string was a word or a non-word (press “A” for words, “L” for non-words). The procedure of the lexical decision task was similar with that used in previous research (Bargh and Chartrand 2000; Fishbach, Friedman, and Kruglanski 2003; Kruglanski et al. 2002). Specifically, at the beginning of each trial, a “+” sign that served as a fixation point appeared at the center of the screen for one second. Participants were asked to focus their attention on this fixation point to start. The fixation point was followed by the appearance of the target letter string. Each response was then followed by a 300-millisecond interval, after which the next trial began. Participants first went through 10 practice trials to familiarize the procedure, and then went through 40 experimental trials. Of the 40 experimental targets, 10 strings were related to an open mindset (i.e., novel, liberal, creative, imagination, embrace, receptive, curious, innovative, free, open-minded), 10 strings were neutral words (i.e., spoon, notebook, printer, breakfast, folder, pillow, function, operate, document, describe), and 20 strings were non-words (i.e., asdfitc, ozlesdf, sadflwct, xoelskgf, socskld, pwekfd, zemfskg, dlemslc, ncoensg, yvcleois, rsozke, tkpoe, wpocxd, qoxost, locsitkj, zidesd, hkglsc, glsaoz, rslgicsdf, jakoxkad). These 40 trials were presented to participants in a random order. The ten open-minded words were chosen as the stimuli based on a pretest, in which thirty eight participants from the same subject pool were asked to write down words that were related to an open mindset. These words were ranked on the top of the list.
Upon finishing both the curiosity manipulation and the lexical decision task, participants were asked to take a 2-minute break, during which time they were provided with almond snacks and were asked to choose between a can of novel almonds (i.e., lime & chili almonds) and a can of familiar almonds (i.e., roasted salted almonds). Their choice served as my dependent measure.

Finally, participants completed manipulation checks. First, I measured their curiosity level by asking two questions similar to those in study 1 (i.e., How curious are you now about the ending of the story in the TV show? How eagerly do you want to know the ending of the story in the TV show now?). Then, I measured their ratings on the novelty of the almond snack (i.e., To what extend do you think the lime chili almond / roasted salted almond is a novel product?). All of the items were scored on a 7-point scale (1 = not at all, 7 = very much). Demographic information and a suspicion probe were recorded at the end.

5.2 Results and Discussion

Manipulation checks. The results of the curiosity manipulation check confirmed that the curiosity manipulation was successful. Specifically, the average of the two items assessing the curiosity level ($r = .93$) showed that those in the curious conditions were indeed more curious than those in the incurious conditions ($M_s = 5.27$ vs. $3.98$, $t(92) = 4.09$, $p < .0001$). Also, the results of the novelty check confirmed that the lime chili almond was indeed more novel than the roasted salted almond to the participants ($M_s = 4.87$ vs. $2.91$, $t(93) = 7.91$, $p < .0001$). In addition, no one correctly guessed the true purpose of the study.
Almond choice. The major dependent variable, namely the almond choice measure, generated a pattern consistent with my hypothesis. As expected, those in the curious condition (62.50%) were more likely to choose the novel almonds (i.e., lime & chili almonds) over the familiar almonds (i.e., roasted salted almonds), compared to those in the incurious condition (39.13%; $\chi^2(1) = 5.13, p < .05$; Table 5.1, Figure 5.1), replicating result in the previous study.

Accessibility of open-mindedness. To analyze the reaction time data of the lexical decision task, I first removed all incorrect responses of identifying words as non-words. The error rate was 3.75%, which was comparable with those similar studies in the literature. Then I performed a natural log transformation on the correct individual reaction times (Bargh and Chartrand 2000; Fazio 1990; Fishbach et al. 2003; the actual reaction times, instead of the log-transformed data, are reported for the ease of interpretation). For each participant, I averaged the reaction times for each word type (Laran 2010). As expected, a 2 curiosity (curious vs. incurious) x 3 word type (open-minded vs. neutral vs. non-word) mixed ANOVA revealed a significant two-way interaction between curiosity and word type ($F(2, 91) = 3.72, p < .05$; Table 5.1, Figure 5.2). Consistent with my prediction, participants in the curious condition ($M = 632$ milliseconds) responded to the open-minded words faster than participants in the incurious condition ($M = 688$ milliseconds; $F(1, 92) = 6.99, p < .05$). However, no such difference occurred for the neutral words ($Ms = 668$ vs. 674 milliseconds; $F(1, 92) = .10, p > .70$) or the non-words ($Ms = 690$ vs. 674 milliseconds; $F(1, 92) = .69, p < .40$). These results indicated that curiosity enabled participants to respond to the open-minded words faster and indeed enhanced the accessibility of the open-minded concepts.

Mediation of an open mindset. Most importantly, I examined the mediating role of an open mindset on the effect of curiosity on almond choice. Using the SPSS macro PROCESS
developed by Hayes (2013), I used the bootstrapping approach to assess the mediation, with the curiosity condition as the independent variable, the almond choice as the dependent variable, and the reaction time for the open-minded words as the mediator. The 95% bias-corrected bootstrap confidence interval was obtained using 10000 bootstrap samples. In line with my theory, the bootstrapping results demonstrated that the 95% confidence interval did not include zero (.0421, .7459), indicating a significant overall indirect effect and significant mediation from this model. Specifically, it underscored the notion that the semantic activation of an open mindset mediated the effect of curiosity on the almond choice.

The results of Study 3 thus fulfilled two purposes. First, it replicated the findings of Study 2 and demonstrated support for hypothesis 2 in a controlled laboratory setting. Second, and more importantly, it provided crucial evidence for the mechanism on why curiosity leads people to seek particularly novel rewards. According to the result, it demonstrated that curiosity elicits an open mindset which subsequently promotes a preference for novelty. In the next study, I aimed to find further process evidence that the general appetitive drive of curiosity was driving the reward-seeking tendency. Also, I sought to extend the rewarding stimuli to the social reward domain.
Chapter 6: Study 4 – Satiating the General Appetitive Drive

Study 4 was designed to provide more process evidence for my theory. Earlier I posited that curiosity possesses a general appetitive drive that motivates people to approach any rewards, especially novel rewards. If this appetitive drive is satiated by a reward beforehand, regardless of whether the reward is related to the missing information or not, people should have little motivation to seek out additional rewards. In this case, the spillover reward-seeking effect should be mitigated. In other words, I predicted that when curious individuals receive a reward beforehand, their subsequent spillover reward-seeking tendency should be diminished. I tested this prediction in the current study.

Also, in this study, I extended my investigation of reward-seeking behavior from the physical domain (i.e., money and food in earlier studies) to the social domain (i.e., social friendship). Research has suggested that interpersonal friendship is a social reward that satisfies human’s innate need to belong (Baumeister and Leary 1995). For example, in the social psychology research, it has been well-documented that the socially excluded individuals are motivated to seek out interpersonal bonding and affiliation to meet such social need (Maner et al. 2007; Mead et al. 2011). Further, neuroscience research has provided more direct evidence that interpersonal bonding is indeed a social reward that can also activate the brain reward circuitry (Carter 2006; Sax and Haushofer 2008). In that sense, it would be interesting to test whether curiosity’s spillover reward-seeking effect could be extended to the social friendship reward.

To fulfill the purposes above, this study used a 3 satiation (none vs. information vs. food) x 2 social friendship reward (familiar vs. novel) between-subjects design. I anticipated that
curious individuals would be more likely to seek novel social friendship than individuals who were satiated with either the missing information reward or a food reward. I also expected no difference between the latter two groups in their motivation to seek the social reward. Moreover, I attempted to rule out alternative explanations by assessing additional measures such as mood, arousal level, and the need for cognitive closure (NFCC).

6.1 Method

One hundred and thirty-two undergraduate students (83 females) participated in the experiment for course credit. Satiation was manipulated by using the same two-part video from the previous study. Specifically, in the no-satiation (i.e., curious) condition, participants watched only the first part of the video and were told that the second part would be played later. In the information-satiation (i.e., incurious) condition, participants watched both parts of the video. In the food-satiation condition, participants watched only the first part and were then given a Kit-Kat chocolate bar as a thank-you gift for their participation (Berger and Shiv 2011). None of the participants consumed the chocolate bar during the experiment. The participants in the no- and information-satiation conditions also received the chocolate bar, but only at the very end of the study. All of the participants then completed the Brief Mood Introspection Scale (BMIS; Mayer and Gaschke 1988) to measure their affective responses at that moment.

Next, participants’ motivation to seek social friendship was assessed. They completed a questionnaire on a fictitious student service that measured their interest in making friends with
others (Maner et al. 2007). Specifically, participants read that the student center was planning to establish a new student service, called University of British Columbia Connect (UBC Connect; for the familiar condition) or Simon Fraser University Connect (SFU Connect; for the novel condition). The goal of this student service was to facilitate social networking among students at UBC (i.e., the participants’ own university) or with students at SFU (i.e., another local university). If implemented, UBC (vs. SFU) Connect would establish a social network website and would regularly organize social events such as concerts and game nights to help students make friends with other students at UBC (vs. SFU). After reading the paragraph, participants responded to four statements assessing their interest in making friends via this student service [e.g., “I have a great desire to join UBC (vs. SFU) Connect and attend their social events.”]. Participants indicated their interest on an 11-point scale (1 = strongly disagree, 11 = strongly agree).

Next, participants completed some other measures. The satiation manipulation was first checked by asking participants to indicate whether they had watched the video ending and whether they received a chocolate bar in the middle of the experiment. The participants’ curiosity level was assessed with the same two items as those used in study 3. The reward familiarity manipulation was checked by asking participants to respond to two items (i.e., “To what extent do you think UBC (SFU) is a familiar environment for you to make friends?” and “To what extent do you think making friends at UBC (SFU) is a familiar experience to you?”). Then they completed the Need for Cognitive Closure (NFCC) scale (Webster and Kruglanski 1994). Next, participants in the no- and food-satiation conditions watched the second part of the video and received a chocolate bar as a thank-you gift. Finally, to maintain the cover story, all of the participants evaluated the video clip. All of the scales except the NFCC scale used a 7-point
scale (1 = not at all, 7 = very much), and the NFCC was measured on a 6-point scale (1= strongly disagree, 6 = strongly agree). Demographic information and a suspicion probe were recorded at the end of the study.

6.2 Results and Discussion

Manipulation checks. Manipulation checks confirmed the effectiveness of my manipulations. All of the participants correctly indicated, according to their condition, whether they watched the video ending and whether they received a chocolate bar in the middle of the experiment. Also, participants’ curiosity level, obtained by averaging the two curiosity items ($r = .87$), revealed a main effect of satiation ($F(2,129) = 22.48, p < .001$). As expected, those with information satiation ($M = 3.69$) were much less curious than those with no satiation ($M = 5.73$; $t(129) = 6.53, p < .001$), or those with food satiation ($M = 5.20$; $t(129) = 4.69, p < .001$). The curiosity level of the latter two conditions were comparably high ($t(129) = 1.69, p = .09$), suggesting that those with food satiation still desired the specific information as those with no satiation. I also averaged the two items that were used to check the familiarity manipulation ($r = .84$). As anticipated, participants considered making friends at their own university (i.e., UBC; $M = 4.67$) as a more familiar experience than making friends at another local university (i.e., SFU; $M = 3.48$; $t(130) = 4.68, p < .001$).

Interest in seeking friendship. To analyze my dependent measure, I created an index of participants’ desire to establish friendship with UBC (vs. SFU) students by averaging the ratings
of the four statements ($\alpha = .90$). As predicted, I found a main effect of satiation ($F(2, 129) = 6.54$, $p < .005$), such that those with no satiation (i.e., curious participants) were more interested in seeking social friendship ($M = 6.93$) than those with information satiation (i.e., incurious participants; $M = 5.58$; $t(129) = 3.16, p < .005$) or those with food satiation ($M = 5.64$; $t(129) = 3.03, p < .005$). No difference occurred between the latter two conditions ($t(129) = .12, p > .90$). These results indicated that food satiation mitigated the spillover reward-seeking propensity in the same way as the information satiation, which demonstrated that it was the general appetitive drive of curiosity produced the spillover reward-seeking effect. Further, a two-way ANOVA revealed a significant interaction between satiation and reward type ($F(2, 126) = 3.12, p < .05$; Table 6.1, Figure 6.1). Specifically, those with no-satiation (i.e., curious participants) were more interested in seeking novel friendship than familiar friendship ($Ms = 7.64$ vs. 6.16; $t(126) = 2.57, p < .05$), which replicated the previous results. In contrast, those with information satiation (i.e., incurious participants; $Ms = 5.39$ vs. 5.77; $t(126) = .62, p > .50$) and those with food satiation ($Ms = 5.50$ vs. 5.76; $t(126) = .43, p > .60$) showed equal interest in novel and familiar friendship.

**Arousal, mood, and NFCC.** I next examined the arousal level and affective responses of the participants. Prior research has suggested that curiosity could increase arousal level (Berlyne 1955, 1960). In my data I did not find a main effect of satiation on the arousal-calm subscale score of the BMIS score ($F(2, 129) = 1.77, p = .17$), although the means were directionally consistent with the literature. Specifically, the arousal level in the no-satiation condition ($M = 2.26$) was marginally higher than that in the information-satiation condition ($M = 2.12$; $t(129) = 1.86, p = .07$), and comparable to that in the food-satiation condition ($M = 2.17$; $t(129) = 1.10, p = .27$). I further examined whether the arousal level mediated the effect of satiation on reward seeking. Using the SPSS macro PROCESS developed by Hayes (2013), I found that the 95%
bias-corrected bootstrap confidence interval using 10000 bootstrap samples contained zero (-.0393, .2104). Hence, arousal level could not account for the reward-seeking effect observed in this study. Next, I analyzed the mood data. Although my analysis of the pleasant-unpleasant BMIS subscale score did not reveal a significant main effect of satiation ($F(2, 129) = 1.71$, $p = .19$), those with food satiation ($M = 2.86$) were directionally happier than those with information satiation ($M = 2.72$; $t(129) = 1.52$, $p = .13$), or those with no satiation ($M = 2.71$; $t(129) = 1.69$, $p = .09$), with no difference between the latter two conditions ($t(129) = .12$, $p = .91$). This is perhaps because the unexpected chocolate reward produced a positive mood. I also examined whether mood mediated the effect of satiation on reward seeking, but did not find any effect (95% C.I. = [-.0675, .1006]). In short, although the patterns of arousal and mood were directionally consistent with previous research or my manipulation, I did not find any evidence that the effect of satiation on reward-seeking behavior was driven by arousal level or mood.

I also tested whether the need for cognitive closure (NFCC) contributed to the effect. My analysis of the NFCC score did not find any treatment effect (all $F$s < 1). Also, when I included the NFCC score as an independent variable, I did not find it moderated any effect (all $F$s < 1).

Taken together, this study demonstrated that a general appetitive drive evoked by curiosity drove the observed spillover reward-seeking effect. Once the general appetitive drive was satiated by either the information reward or a food reward, the subsequent reward-seeking tendency was mitigated. Also, it provided evidence that the spillover reward-seeking effect elicited by curiosity could also be extended to the social reward domain, in particular, to the social friendship reward. Further, arousal level, mood, and the need for cognitive closure could
not explain the observed effects. In the next study, I aimed to identify a boundary condition for the observed reward-seeking effect.
Chapter 7: Study 5 – The Moderating Role of Threatening Information

The final study sought to test hypothesis 3 by identifying a contextual factor as a moderator of the reward-seeking effect. Specifically, I expected that those who were curious about threatening information would exhibit a reduced reward-seeking tendency, compared to those who were curious about non-threatening information.

Also, this study aimed to replicate the effect with another social reward, namely, charitable donation. Existing research in both social psychology and neuroscience has provided converging evidence that charitable donation is also a social reward that meets human’s innate social need to belong. In social psychology research, it has been consistently shown that prosocial spending has more rewarding value than personal spending (Aknin et al. 2013). For example, in one of their studies, Dunn and her colleagues (2008) asked their participants to spend a cash windfall either on themselves or on a charity. They found that those who spent the money on a charitable donation experienced more happy feelings than those who spent the money on themselves. Further, neuroscience research has provided more direct evidence that charitable donation is indeed a social reward. For example, Harbaugh and his colleagues (2007) found that charitable donations, either mandatory or voluntary, could activate the brain reward circuitry. It has even been shown that making a charitable donation actually activates the brain reward circuitry more than receiving the same amount of money for oneself (Moll et al. 2006). Hence, there is considerable evidence suggesting that charitable donation is indeed a social reward that could also activate the brain reward circuitry. In that sense, it would be interesting to
examine whether the spillover reward-seeking effect of curiosity could be extended to the donation reward.

To test the predictions above, I used a 3 information type (threatening vs. non-threatening vs. control) x 2 charity (familiar vs. novel) mixed design with the second factor being a within-subject variable. I first predicted that those who were curious about non-threatening information would be more likely to make donations than the control condition baseline, whereas those who were curious about threatening information would be less likely to make donations than the baseline, demonstrating support for hypothesis 3. Further, I anticipated that those who were curious about non-threatening information would show higher willingness-to-donate to a novel charity than a familiar charity, replicating the previous effect suggested by hypothesis 2. By contrast, those who were curious about threatening information would exhibit equally low willingness-to-donate regardless of the charity type, due to their overall diminished motivation to seek rewards.

7.1 Method

Sixty-two undergraduate students (38 females, 1 not indicated) participated in the experiment for course credit. Following previous research (Keogh et al. 2004; Lerman et al. 1996; Ropka et al. 2006; Sweeny et al. 2010), I manipulated information threat in the health domain. Participants in the threatening and non-threatening conditions first read a paragraph on increasing awareness of heart disease risks among college students. The paragraph said that heart
disease is the number one killer of men and women in North America, but college students are not well-informed about the risks and may be ignoring the threat of heart disease. The paragraph also cited scientific research that suggested that lifestyle habits (e.g., alcohol consumption, physical activities, stress levels, etc.) during college years can significantly affect the probability of having heart disease in later life. This procedure was designed to make the current context more relevant to the participants.

After reading the paragraph, participants were asked to complete a health questionnaire which was adapted from Siteman Cancer Center at Washington University School of Medicine (http://yourdiseaseisk.r.wustl.edu/). The questionnaire estimated participants’ risk of getting heart disease based on their responses to over 20 questions about age, lifestyle, eating habits, family medical history, etc. To manipulate the information threat, I framed the purpose of the questionnaire differently in the two conditions. In the non-threatening condition, participants were told that the purpose of the questionnaire was to provide them with a personalized plan to prevent heart disease in later life. In contrast, in the threatening condition, participants were told that the questionnaire was to estimate their risk of getting heart disease in later life. After they completed the questionnaire, participants were told that the survey results could not be provided right away due to the complicated algorithm needed for analysis. This procedure meant to induce participants’ curiosity about the results. Participants in the control condition did not complete the health questionnaire, but started the experiment with the next task.

In the next task, participants were asked to do an ostensibly unrelated willingness-to-donate task. Specifically, they were sequentially presented with two charities on the computer screen. UNICEF was selected as a familiar charity, whereas a fictitious charity, Children Awaiting Schools, was selected as a novel charity. I included a short description of each charity,
and the presentation order of the charities was randomized. For each charity, participants were asked to indicate their willingness to donate at that moment with two items (i.e., “How likely are you to donate to this organization, at this moment in time?” “To what extent are you willing to donate to this organization, at this moment in time?”). Both items used a 7-point scale (1 = not at all, 7 = very much).

After this task, participants in all three conditions completed the manipulation checks by rating their familiarity with each charity. Participants in the threatening and non-threatening conditions were also asked to indicate how threatening it was to learn about the health questionnaire results. Two items were used (i.e., “To what extent do you think it’s threatening to learn / How frightening do you think it is to know about the risk of getting heart disease [vs. the personalized plan to prevent heart disease] in your later life?”) to assess the perceived threat. The participants’ curiosity level was also assessed with the two items similar to those used in the previous studies. All of the items were measured on a 7-point scale (1 = not at all; 7 = very much). Demographic information and suspicion probe were recorded at the end.

7.2 Results and Discussion

Manipulation checks confirmed that the Children Awaiting School charity was less familiar to the participants than UNICEF charity (\(M_s = 2.29\) vs. \(5.26\); \(t(61) =11.93, p < .001\)). The analysis of the information threat checks \((r = .78)\) also confirmed that learning about future heart disease risk was more threatening than a personalized plan to prevent heart disease \((M_s =\)
4.39 vs. 2.27; \( t(39) = 4.82, p < .001 \). The results for the analysis of curiosity level \( (r = .82) \) revealed that participants in the threatening and non-threatening conditions were equally curious about the questionnaire result \( (M_s = 4.74 \text{ vs.} 5.23; \ t(39) = .93, p > .35) \). In addition, no one expressed any suspicion about the true purpose of the different tasks.

To analyze the dependent measure, I created a donation index by averaging the two willingness-to-donate items for each charity \( (r_s = .84, .70) \). The results first revealed a significant main effect of information type \( (F(2,59) = 14.02, p < .001) \), such that those who were curious about non-threatening information \( (M = 5.00) \) were more likely to donate than those in the control condition \( (M = 3.96; \ t(59) = 2.74, p < .01) \), or those in the threatening information condition \( (M = 2.95, \ t(59) = 5.29, p < .01) \). The donation likelihood in the latter two conditions was also significantly different \( (t(59) = 2.59, p < .05) \). This main effect supported hypothesis 3 that although curiosity about non-threatening information enhances individuals’ reward-seeking tendency, curiosity about threatening information constrains such behavior. Further, I observed an anticipated two-way interaction between the information type and the charity type \( (F(2, 59) = 4.04, p < .05; \text{Table 7.1, Figure 7.1}) \). Specifically, those curious about non-threatening information were more likely to donate to the novel charity than the familiar charity \( (M_s = 5.27 \text{ vs.} 4.73; \ F(1, 59) = 4.54, p < .05) \), which replicated the previous results. In contrast, the willingness to donate, among those curious about threatening information, was comparably low regardless of the novelty of the charities \( (M_{\text{novel}} = 2.84; M_{\text{familiar}} = 3.05; \ F(1, 59) = .58, p > .44) \).

In the control condition, people were marginally less likely to donate to the novel than the familiar charity \( (M_s = 3.74 \text{ vs.} 4.19; \ F(1, 59) = 2.98, p = .09) \).

This study demonstrated support for hypothesis 3 by identifying a boundary condition on the effect of curiosity on the spillover reward-seeking behavior. Specifically, when people were
curious about threatening information, they refrained from seeking any further rewards. Further, it replicated the previously observed effect by adopting another social reward, namely, charitable donation. In particular, when people were curious about non-threatening information, they were more likely to seek novel rewards (i.e., donating to novel charities) than familiar rewards (i.e., donating to familiar charities). However, due to the diminished reward-seeking motivation, those who were curious about threatening information showed equally low reward-seeking tendency (i.e., low willingness to donate), regardless of the reward type.
Chapter 8: Conclusion

In the last chapter of this dissertation, I summarize the results of the studies presented in previous chapters, and discuss how these findings advance and contribute to our understanding of consumer curiosity and reward-seeking behaviors. Also, I discuss some of the limitations of the current research and suggest a number of future research directions. Finally, I offer some practical implications from my findings as well as my concluding comments.

8.1 Summary of Results

This research investigates the effect of curiosity, a cognitive deprivation, on subsequent reward-seeking behavior in other unrelated domains. I propose that exposure to curiosity cues prompts people to seek rewards, particularly novel rewards, in various unrelated domains, including physical (e.g., money, food) and social (e.g., social friendship, charitable donation) domains. Such novel reward-seeking effect occurs as a result of a general appetitive drive and an open mindset, both activated by exposure to curiosity cues. Further, the spillover reward-seeking tendency is mitigated when people are curious about threatening information.

A series of five studies provide systematic support for my hypotheses. Study 1 documents the main effect of curiosity on the spillover reward-seeking behavior. Study 2 builds upon Study 1 by demonstrating that curiosity motivates people to seek particularly novel rewards in other
unrelated domains. The next two studies shed light on the underlying processes of the curiosity effect. Specifically, Study 3 shows that curious individuals are likely to be in an open mindset, and thus prefer novel options such as novel rewards. Study 4 emphasizes the appetitive dimension of curiosity by showing that when the appetitive drive has been satiated by either the missing information reward or a food reward, these individuals no longer have the motivation to seek any further rewards. Finally, Study 5 identifies an important moderator of the above effect, namely, the content of information. When people are curious about threatening information, they are likely to adopt an avoidance motivation, and thus refrain from seeking any further rewards.

8.2 Contributions

This dissertation makes theoretical contributions to both the curiosity and the reward-seeking literature. First, it adds to our understanding of curiosity. Although curiosity is a ubiquitous concept in our daily environment, it has received surprisingly little attention in cognitive psychology and consumer behavior research (Kang et al. 2009; Menon and Soman 2002). This research advances our knowledge of curiosity by investigating whether, how, and why curiosity affects subsequent reward-seeking behaviors in a consumption context. In particular, within the limited existing research on curiosity, it mostly shows that curiosity motivates people to seek rewards in the cognitive domain by searching for the missing information. Hence, it is unclear whether curiosity could also motivate individuals to seek other rewards, especially given that curiosity is an appetitive state that has its own driving forces (Blumemberg 1983;
Loewenstein 1994). This research fills this gap by showing that this general motivational dimension of curiosity can prompt people to engage in reward-seeking behavior even in other unrelated domains, such as physical (e.g., money, food) and social (e.g., social friendship, charitable donations) domains. In addition, I show that this spillover reward-seeking tendency is more pronounced for novel rewards, and I offer process evidence for why this occurs. Finally, I find that curiosity does not always promote reward-seeking behavior. Specifically, when people are curious about threatening information, they avoid seeking any further rewards.

Second, this research also contributes to the reward seeking literature. Previous studies on the spillover reward-seeking behaviors have primarily examined deprivation and satiation in the physical domains (e.g., food, money). Therefore, we know little about whether deprivation in a higher cognitive domain (e.g., curiosity) or satiation in a higher social domain (e.g., social friendship, charitable donation) could also exhibit a similar spillover reward-seeking effect. This work thus adds to the extant line of research by showing that the spillover reward-seeking effect can also be extended to intangible, higher cognitive and social domains (e.g., cognitive deprivation, social rewards).

8.3 Limitations and Future Research

It is appropriate to acknowledge the limitations of the current research, and to further suggest avenues for future investigations. One limitation of the present research is that the major independent variable is dichotomous, namely, curiosity vs. incuriosity. However, curiosity also
has intensity (Loewenstein 1994), which is a continuous variable. For example, an individual may be highly curious about the winner of a sporting event, but may have little curiosity about a brain teaser. Therefore, it would be interesting to examine how curiosity intensity affects the spillover reward-seeking effect. Given that the documented spillover reward-seeking effect is driven by the general appetitive drive of curiosity, it is reasonable to predict that curiosity intensity will positively impact the reward-seeking tendency. That is, high curiosity intensity may lead to stronger reward-seeking propensity than low curiosity intensity. Also, it is possible that the range of curiosity intensity for the spillover reward-seeking effect to occur has certain boundaries. For example, extremely weak curiosity might be too subtle to cause any reward-seeking effect. Or extremely strong curiosity might not lead to spillover but only domain-specific reward-seeking behavior, due to the excessive cognitive deprivation. Therefore, future research can further investigate how curiosity intensity influences the spillover reward-seeking effect, and even quantify the valid range of the intensity for the effect to occur.

Another limitation of the current research is that the reward-seeking measures took place immediately after the exposure to the curiosity cues in all of my experiments. What would happen if there was a delay? Hence, it would be interesting to study how time delay might affect the curiosity effect found in this research. It is possible that the feeling of deprivation induced by curiosity would intensify over time and thus lead to even greater spillover reward-seeking behavior. It is also likely that the desire to know would diminish after a delay and thus reduce the subsequent reward-seeking tendency. Future research can thus be directed to investigate the impact of time delay on the documented curiosity effect.

Further, it would be interesting to examine how individual differences might moderate the observed effect of curiosity on spillover reward-seeking behavior. For example, openness to
experience, one of the Big Five personality traits (Costa and McCrae 1992; McCrae 1996; McCrae and Costa 1997) could potentially moderate the effect. This personality trait distinguishes individuals who prefer novelty and variety from individuals who prefer familiarity and routine (Digman 1990; John 1990). Therefore, I expect that those who are high on openness to experience to be immune to the curiosity effect. That is, they are very likely to choose a novel option, regardless of their curiosity state. By contrast, I predict that those who are low on openness to experience would replicate the curiosity effect reported in this research.

Also, all the reported studies in this research are behavioral experiments. Since the theoretical development is partially based on the neuroscience findings, it might be worthwhile to find more empirical evidence from brain-imaging results for the current research. Prior work has provided fMRI evidence for some relevant spillover reward-seeking effect. For instance, Knutson et al. (2008), using brain-imaging techniques, found that the enhanced desire for money after exposure to erotic pictures was mediated by activation in the brain reward circuitry. Similarly, it might be more compelling to have fMRI evidence to support the reward-seeking mechanism documented in the present research.

Finally, given that there has been very little academic attention directed to curiosity in the consumption context, future investigations could expand the current stream of research by examining whether curiosity can influence behaviors other than reward seeking. For example, if curiosity indeed prompts an open mindset, it might encourage creative cognition and behavior, or reduce stereotype activation. These and other questions merit further examinations.
8.4 Implications and Conclusion

This research offers a number of practical implications. First, it suggests effective approaches for marketing managers who want to introduce a new food product to the market. A teaser advertisement could be displayed next to a new food product that has been recently introduced to the market, so that curiosity produced by the advertisement would encourage store customers to choose the novel food product. For example, Kraft Miracle Whip introduced a new Smokin’ Bacon Ranch early this year. In order to encourage consumers to purchase and try the new product, the marketing manager of Kraft could set up a teaser advertisement from Kraft’s other product line (e.g., rice cracker) and display it next to the new Smokin’ Bacon Ranch. This is in fact a win-win strategy: while promoting the product in the teaser advertisement, Kraft is also encouraging consumers to purchase its new ranch dressing by using curiosity from the teaser advertisement.

My findings also provide some insights into how curiosity may help those new organizations or communities recruit members efficiently. For example, for the newly-established organizations or communities that need more enrollments, instead of investing heavily on building brand image or establishing word of mouth, they might consider involving curiosity in their reach-out materials. For instance, they could use some puzzling advertisements or brain teasers to evoke curiosity, which will subsequently prompt people to join the group as a way to seek social rewards.

Moreover, this research offers important implications for charitable institutions, particularly those that are less known and struggling with limited donation rates. Those less-
known charities usually invest vastly in public relations to build awareness in order to promote fundraising. However, my findings suggest an innovative and cost-effective approach of involving curiosity to enhance fundraising. For example, fundraisers can arouse potential donors’ curiosity first by incorporating brain teasers on their website or by displaying perplexing teaser advertisements in their public booth. As a result, the evoked curiosity would enhance reward seeking by facilitating donating likelihood and ultimately donation rates.

Finally, according to my findings, practitioners also need to be cautious while using such curiosity strategies. Specifically, the information content which is designed in the teaser advertisement or the brain teaser should not be threatening to the target consumers. Otherwise, the information threat might backfire on the organization and refrain consumers from seeking any additional rewards.

In conclusion, this dissertation provides insights into the effect of curiosity on consumers’ reward-seeking behaviors. Through five empirical studies, I find that curiosity, a cognitive deprivation, motivates people to seek rewards, particularly novel rewards, in other unrelated domains, such as physical domains (e.g., money, food) and social domains (e.g., social friendship, charitable donation). I am hopeful that this work, motivated by my “curiosity about curiosity”, will arouse more curiosity in this domain and inspire more fascinating investigations in the future.
**Tables and Figures**

**TABLE 3.1 STUDY 1 RESULTS SUMMARY**

<table>
<thead>
<tr>
<th></th>
<th>Curious</th>
<th>Incurious</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reward (lottery)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.34</td>
<td>5.58</td>
</tr>
<tr>
<td><strong>Penalty (parking ticket)</strong></td>
<td>22.76</td>
<td>19.94</td>
</tr>
</tbody>
</table>

$N = 142$; 43.7% female, 56.3% male

**TABLE 4.1 STUDY 2 RESULTS SUMMARY**

<table>
<thead>
<tr>
<th>% Choosing Novel Almonds over Familiar Almonds</th>
<th>Curious</th>
<th>Incurious</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58.30%</td>
<td>35.40%</td>
<td>37.80%</td>
</tr>
</tbody>
</table>

$N = 141$; 53.9% female, 44.7% male, 1.4% not indicated

**TABLE 5.1 STUDY 3 RESULTS SUMMARY**

<table>
<thead>
<tr>
<th>% Choosing Novel Almonds over Familiar Almonds</th>
<th>Curious</th>
<th>Incurious</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>62.50%</td>
<td>39.13%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reaction Time (ms)</th>
<th>Curious</th>
<th>Incurious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-minded words</td>
<td>$M$</td>
<td>$M$</td>
</tr>
<tr>
<td>Neutral words</td>
<td>632</td>
<td>688</td>
</tr>
<tr>
<td>Non-words</td>
<td>668</td>
<td>674</td>
</tr>
<tr>
<td></td>
<td>690</td>
<td>674</td>
</tr>
</tbody>
</table>

$N = 94$; 66.0% female, 34.0% male
### TABLE 6.1 STUDY 4 RESULTS SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>No Satiation (Curious)</th>
<th>Info Satiation (Incurious)</th>
<th>Food Satiation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Familiar Reward</strong></td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
</tr>
<tr>
<td></td>
<td>6.16 (2.00)</td>
<td>5.77 (2.06)</td>
<td>5.76 (2.11)</td>
</tr>
<tr>
<td><strong>Novel Reward</strong></td>
<td>7.64 (1.93)</td>
<td>5.39 (1.81)</td>
<td>5.50 (2.02)</td>
</tr>
</tbody>
</table>

$N = 132$; 62.9% female, 37.1% male

### TABLE 7.1 STUDY 5 RESULTS SUMMARY

<table>
<thead>
<tr>
<th></th>
<th>Non-threatening Info</th>
<th>Threatening Info</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Familiar Charity</strong></td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
<td>$M (SD)$</td>
</tr>
<tr>
<td></td>
<td>4.73 (1.18)</td>
<td>3.05 (1.77)</td>
<td>4.19 (1.15)</td>
</tr>
<tr>
<td><strong>Novel Charity</strong></td>
<td>5.27 (1.17)</td>
<td>2.84 (1.63)</td>
<td>3.74 (1.32)</td>
</tr>
</tbody>
</table>

$N = 62$; 61.3% female, 37.1% male, 1.6% not indicated
FIGURE 3.1 STUDY 1 ADVERTISEMENT
FIGURE 3.2 STUDY 1 RESULTS

Number of Days from Today One Would Wait
Before Receiving the Reward vs. Penalty

- Reward (lottery): Incurious: 5.58, Curious: 2.34
- Penalty (parking ticket): Incurious: 19.94, Curious: 22.76
What does your freedom look like?

You tell us what. We’ll show you how. tellusyourfreedom.ca
FIGURE 4.2 STUDY 2 ALMOND CHOICE

Percent Choosing Novel Almonds over Familiar Almonds

<table>
<thead>
<tr>
<th>Group</th>
<th>Percent Choosing Novel Almonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curious</td>
<td>58.30%</td>
</tr>
<tr>
<td>Incurious</td>
<td>35.40%</td>
</tr>
<tr>
<td>Control</td>
<td>37.80%</td>
</tr>
</tbody>
</table>
FIGURE 5.1 STUDY 3 ALMOND CHOICE

Percent Choosing Novel Almonds over Familiar Almonds

Curious: 62.50%
Incurious: 39.13%

FIGURE 5.2 STUDY 3 LEXICAL DECISION TASK RESULT

Lexical Decision Task RT (ms)

Curious:
- Open-minded: 632 ms
- Neutral: 668 ms
- Non-word: 690 ms

Incurious:
- Open-minded: 688 ms
- Neutral: 674 ms
- Non-word: 674 ms
FIGURE 6.1 STUDY 4 RESULTS

![Bar chart showing interest in seeking novel vs. familiar friendship.](image)

**Reward Type**
- Familiar
- Novel

**Interest in Seeking Novel vs. Familiar Friendship**

<table>
<thead>
<tr>
<th>Satiation</th>
<th>None (Curious)</th>
<th>Info (Incurious)</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.16</td>
<td>5.77</td>
<td>5.76</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>5.39</td>
<td>5.5</td>
</tr>
</tbody>
</table>

FIGURE 7.1 STUDY 5 RESULTS

![Bar chart showing willingness to donate.](image)

**Charity**
- Familiar
- Novel

**Willingness To Donate**

<table>
<thead>
<tr>
<th>Info Type</th>
<th>Non-threatening</th>
<th>Control</th>
<th>Threatening</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.73</td>
<td>4.19</td>
<td>3.05</td>
</tr>
<tr>
<td></td>
<td>5.27</td>
<td>3.74</td>
<td>2.84</td>
</tr>
</tbody>
</table>
References


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Costa, Paul T. and Robert R. McCrae (1992), Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual, Odessa, FL: Psychological Assessment Resources.


Appendix A: Study 1 Experimental Surveys

A.1 Survey for Curious, Reward Condition

Task 1: Ad Evaluation
Please see the printed ad above. There is no information about the brand and the product in the ad. Please examine the ad carefully and take a guess on what the ad is about.

(Please don’t search on the internet for any assistance. We are only interested in your honest answers. Thank you!)

What do you think this ad is all about?
Write down any of your guess/thought about this ad in the space below.

How much do you like this ad?
1  2  3  4  5  6  7
Not at all                               Very much
Task 2: Decision Making

Suppose that you bought a lottery ticket and you learnt that you have won $20. You can claim the prize within 60 days, and there is no change in the winning prize if you claim it any time within the 60 days.

How soon would you like to claim your lottery prize?

__________________________________________________________________ (slider)

0 day from today ................................................................................................. 100 days from today
Task 3: Follow-up Questions

Recall the ad you evaluated at the beginning.

1. How curious are you now about the answer of the ad content?
   1  2  3  4  5  6  7
   Not at all  Very much

2. How eagerly do you want to know what the ad is about now?
   1  2  3  4  5  6  7
   Not at all  Very much

Please answer the following questions:

1. To what extent do you think receiving a $20 lottery prize is rewarding?
   1  2  3  4  5  6  7
   Not at all  Very much

2. To what extent do you think receiving a $20 lottery prize is a desirable experience?
   1  2  3  4  5  6  7
   Not at all  Very much
Task 4: About You

1. How well were you able to concentrate on the experimental task?
   1  2  3  4  5  6  7
   Not at all                               Very much

2. How much effort did you spend in completing this study?
   1  2  3  4  5  6  7
   Not at all                               Very much

3. How involved were you in completing the study?
   1  2  3  4  5  6  7
   Not at all                               Very much

4. How interesting do you think this study was?
   1  2  3  4  5  6  7
   Not at all                               Very much

What do you think is the purpose of this study?

____________________________________________________________________

Your Gender: __________
Your Age: _______________ Language spoken at home:_____________
Your Ethnicity: ____________ Are you an exchange student? ___Y  ___N
A.2 Survey for Incurious, Penalty Condition

Task 1: Ad Evaluation
Please see the printed ad above. There is no information about the brand and the product in the ad. Please examine the ad carefully and take a guess on what the ad is about.

(Please don’t search on the internet for any assistance. We are only interested in your honest answers. Thank you!)

What do you think this ad is all about?
Write down any of your guess/thought about this ad in the space below.

How much do you like this ad?

1  2  3  4  5  6  7
Not at all

Very much

This ad is from a Canadian financial insurance company, Freedom 55. The underlying meaning of this ad is that you can reach your own definition of freedom by using their financial services. They initiated this unbranded marketing campaign to drive consumers to visit their new website, and to establish a new brand image with the unbranded ad.
Task 2: Decision Making

Suppose that you had a parking violation and you need to pay a $20 parking ticket. You can pay the parking ticket within 60 days, and there is no penalty involved if you pay the ticket any time within the 60 days.

How soon would you like to pay your parking ticket?

0 day from today

100 days from today
Task 3: Follow-up Questions

Recall the ad you evaluated at the beginning.

1. How curious are you now about the answer of the ad content?
   1  2  3  4  5  6  7
   Not at all                                                                     Very much

2. How eagerly do you want to know what the ad is about now?
   1  2  3  4  5  6  7
   Not at all                                                                     Very much

Please answer the following questions:

1. To what extent do you think receiving a $20 parking ticket is rewarding?
   1  2  3  4  5  6  7
   Not at all                                                                     Very much

2. To what extent do you think receiving a $20 parking ticket is a desirable experience?
   1  2  3  4  5  6  7
   Not at all                                                                     Very much
Task 4: About You

1. How well were you able to concentrate on the experimental task?
   1  2  3  4  5  6  7
   Not at all                                                                 Very much

2. How much effort did you spend in completing this study?
   1  2  3  4  5  6  7
   Not at all                                                                 Very much

3. How involved were you in completing the study?
   1  2  3  4  5  6  7
   Not at all                                                                 Very much

4. How interesting do you think this study was?
   1  2  3  4  5  6  7
   Not at all                                                                 Very much

What do you think is the purpose of this study?

______________________________________________________________________

Your Gender: ___________

Your Age: _____________ Language spoken at home: _____________

Your Ethnicity: ___________ Are you an exchange student? ___Y  ___N
Appendix B: Study 2 Experimental Survey

We are interested in your evaluations of some products. Please indicate your attitudes towards these products based on the question below.

**To what extent do you like the following products, at this moment in time?**
Please circle the corresponding numbers.

<table>
<thead>
<tr>
<th>Product</th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheddar Cheese Ice Cream</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Bacon Flavored Soda</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Donut Burger</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Strawberry Ice Cream</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Lemonade Soda</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Cheese Burger</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Your Gender:   Female   Male

THANK YOU FOR YOUR PARTICIPATION!
Appendix C: Study 3 Video Screenshots

[Two images are shown. The upper image shows two people standing behind a counter with a computer screen displaying a conversation. The lower image shows a close-up of the computer screen with the text "INSTANT WINNER $20.00".
WHAT WILL HAPPEN NEXT?
Appendix D: Study 4 Experimental Surveys

D.1 Survey for Novel Friendship Condition

Task 1: Watching a TV Show

You will watch a short video of a TV show called “What Would You Do”. This TV show usually presents real-life ethical scenarios and capture people’s response using hidden cameras. Please watch the show carefully. You will be asked to give us your evaluations afterwards.

( Participants were instructed to watch corresponding video clips based on the curiosity conditions.)
## Task 2: Your Feelings

Instructions:  
Please choose the response on the scale below that indicates how well each adjective or phrase describes your present mood at this moment.

<table>
<thead>
<tr>
<th>Adjective</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lively</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Happy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Caring</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Gloomy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Drowsy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Grouchy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Peppy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Calm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Loving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Fed up</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Task 3: Judgment Making

The student center at UBC is considering establishing a new student social service – SFU Connect – to increase social network with SFU students. The primary goal of this service is to connect UBC students with SFU students and facilitate the friendship between the two universities. If implemented, SFU Connect will establish a social network website and regularly organize social events (such as concerts, game nights) at SFU to help UBC students make more friends at SFU.

Please respond to the following statements assessing your interest in meeting people via SFU Connect if it’s implemented.

1. I have a great desire to join SFU Connect and attend their social events.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree
   Strongly Agree

2. I’m not interested at all in joining SFU Connect and attending their social events.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree
   Strongly Agree

3. I would love to make more SFU friends via SFU Connect.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree
   Strongly Agree

4. SFU Connect is a student service that I would definitely try.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree
   Strongly Agree
**Task 4: Follow-up Questions**

Recall the TV show you watched at the beginning.

Have you watched the story ending?

_________ Y  _________ N

How curious are you now about the ending of the story in the TV show?

1  2  3  4  5  6  7  
Not at all  Very much

How eagerly do you want to know the ending of the story in the TV show now?

1  2  3  4  5  6  7  
Not at all  Very much

Did you receive a Kit-Kat chocolate bar in the middle of the experiment?

_________ Y  _________ N

To what extent do you think SFU is a familiar environment for you to make friends?

1  2  3  4  5  6  7  
Not at all  Very much

To what extent do you think making friends at SFU is a familiar experience to you?

1  2  3  4  5  6  7  
Not at all  Very much
Task 5: Attitude and Experience

Instructions:
Read each of the following statements and decide how much you agree with each according to your beliefs and experiences. Please respond according to the following scale.

1...........strongly disagree
2....moderately disagree
3...........slightly disagree
4...............slightly agree
5...........moderately agree
6..............strongly agree

1. I think that having clear rules and order at work is essential for success.
2. Even after I've made up my mind about something, I am always eager to consider a different opinion.
3. I don't like situations that are uncertain.
4. I dislike questions which could be answered in many different ways.
5. I like to have friends who are unpredictable.
6. I find that a well ordered life with regular hours suits my temperament.
7. I enjoy the uncertainty of going into a new situation without knowing what might happen.
8. When dining out, I like to go to places where I have been before so that I know what to expect.
9. I feel uncomfortable when I don't understand the reason why an event occurred in my life.
10. I feel irritated when one person disagrees with what everyone else in a group believes.
11. I hate to change my plans at the last minute.
12. I would describe myself as indecisive.
13. When I go shopping, I have difficulty deciding exactly what it is I want.
14. When faced with a problem I usually see the one best solution very quickly
15. When I am confused about an important issue, I feel very upset.
16. I tend to put off making important decisions until the last possible moment.
17. I usually make important decisions quickly and confidently.
18. I have never been late for an appointment or work.
19. I think it is fun to change my plans at the last moment.
20. My personal space is usually messy and disorganized.
21. In most social conflicts, I can easily see which side is right and which is wrong.
22. I have never known someone I did not like.
23. I tend to struggle with most decisions.
24. I believe orderliness and organization are among the most important characteristics of a good student.
25. When considering most conflict situations, I can usually see how both sides could be right.
26. I don't like to be with people who are capable of unexpected actions.
27. I prefer to socialize with familiar friends because I know what to expect from them.
28. I think that I would learn best in a class that lacks clearly stated objectives and requirements.
29. When thinking about a problem, I consider as many different opinions on the issue as possible.
30. I don't like to go into a situation without knowing what I can expect from it.
31. I like to know what people are thinking all the time.
32. I dislike it when a person's statement could mean many different things.
33. It's annoying to listen to someone who cannot seem to make up his or her mind.
34. I find that establishing a consistent routine enables me to enjoy life more.
35. I enjoy having a clear and structured mode of life.
36. I prefer interacting with people whose opinions are very different from my own.
37. I like to have a plan for everything and a place for everything.
38. I feel uncomfortable when someone's meaning or intention is unclear to me.
39. I believe that one should never engage in leisure activities.
40. When trying to solve a problem I often see so many possible options that it's confusing.
41. I always see many possible solutions to problems I face.
42. I'd rather know bad news than stay in a state of uncertainty.
43. I feel that there is no such thing as an honest mistake.
44. I do not usually consult many different options before forming my own view.
45. I dislike unpredictable situations.
46. I have never hurt another person's feelings.
47. I dislike the routine aspects of my work (studies).
Task 6: About You

Recall the TV show you watched early on. How much do you like the TV show?
1  2  3  4  5  6  7
Not at all                                                              Very much

How well were you able to concentrate on the experimental task?
1  2  3  4  5  6  7
Not at all                                                              Very much

How much effort did you spend in completing this study?
1  2  3  4  5  6  7
Not at all                                                              Very much

How involved were you in completing the study?
1  2  3  4  5  6  7
Not at all                                                              Very much

How interesting do you think this study was?
1  2  3  4  5  6  7
Not at all                                                              Very much

What do you think is the purpose of this study?
_____________________________________________________________________

Your Gender: __________
Your Age: _____________                           Language spoken at home:_____________
Your Ethnicity: ______________                   Are you an exchange student? ___Y ___N
D.2 Survey for Familiar Friendship Condition

Task 1: Watching a TV Show

You will watch a short video of a TV show called “What Would You Do”. This TV show usually presents real-life ethical scenarios and capture people’s response using hidden cameras. Please watch the show carefully. You will be asked to give us your evaluations afterwards.

(Participants were instructed to watch corresponding video clips based on the curiosity conditions.)
Task 2: Your Feelings

Instructions:
Please choose the response on the scale below that indicates how well each adjective or phrase describes your present mood at this moment.

<table>
<thead>
<tr>
<th></th>
<th>definitely do not feel</th>
<th>do not feel</th>
<th>slightly feel</th>
<th>definitely feel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lively</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Happy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Sad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Tired</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Caring</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Gloomy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Drowsy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Grouchy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Peppy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Calm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Loving</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Fed up</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Active</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Task 3: Judgment Making

The student center at UBC is considering establishing a new student social service – UBC Connect – to increase social network among UBC students. The primary goal of this service is to connect UBC students and facilitate the friendship within the university. If implemented, UBC Connect will establish a social network website and regularly organize social events (such as concerts, game nights) on campus to help UBC students make more friends within the university.

Please respond to the following statements assessing your interest in meeting people via UBC Connect if it’s implemented.

1. I have a great desire to join UBC Connect and attend their social events.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree Strongly Agree

2. I’m not interested at all in joining UBC Connect and attending their social events.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree Strongly Agree

3. I would love to make more UBC friends via UBC Connect.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree Strongly Agree

4. UBC Connect is a student service that I would definitely try.
   1 2 3 4 5 6 7 8 9 10 11
   Strongly Disagree Strongly Agree
Task 4: Follow-up Questions

Recall the TV show you watched at the beginning.

Have you watched the story ending?

_________Y   _________N

How curious are you now about the ending of the story in the TV show?

1   2   3   4   5   6   7
Not at all   Very much

How eagerly do you want to know the ending of the story in the TV show now?

1   2   3   4   5   6   7
Not at all   Very much

Did you receive a Kit-Kat chocolate bar in the middle of the experiment?

_________Y   _________N

To what extent do you think UBC is a familiar environment for you to make friends?

1   2   3   4   5   6   7
Not at all   Very much

To what extent do you think making friends at UBC is a familiar experience to you?

1   2   3   4   5   6   7
Not at all   Very much
Task 5: Attitude and Experience

Instructions:
Read each of the following statements and decide how much you agree with each according to your beliefs and experiences. Please respond according to the following scale.

1...........strongly disagree
2.........moderately disagree
3.............slightly disagree
4..............slightly agree
5...........moderately agree
6..............strongly agree

1. I think that having clear rules and order at work is essential for success.
2. Even after I've made up my mind about something, I am always eager to consider a different opinion.
3. I don't like situations that are uncertain.
4. I dislike questions which could be answered in many different ways.
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8. When dining out, I like to go to places where I have been before so that I know what to expect.
9. I feel uncomfortable when I don't understand the reason why an event occurred in my life.
10. I feel irritated when one person disagrees with what everyone else in a group believes.
11. I hate to change my plans at the last minute.
12. I would describe myself as indecisive.
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14. When faced with a problem I usually see the one best solution very quickly.
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19. I think it is fun to change my plans at the last moment.
20. My personal space is usually messy and disorganized.
21. In most social conflicts, I can easily see which side is right and which is wrong.
22. I have never known someone I did not like.
23. I tend to struggle with most decisions.
24. I believe orderliness and organization are among the most important characteristics of a good student.
25. When considering most conflict situations, I can usually see how both sides could be right.
26. I don't like to be with people who are capable of unexpected actions.
27. I prefer to socialize with familiar friends because I know what to expect from them.
28. I think that I would learn best in a class that lacks clearly stated objectives and requirements.
29. When thinking about a problem, I consider as many different opinions on the issue as possible.
30. I don't like to go into a situation without knowing what I can expect from it.
31. I like to know what people are thinking all the time.
32. I dislike it when a person's statement could mean many different things.
33. It's annoying to listen to someone who cannot seem to make up his or her mind.
34. I find that establishing a consistent routine enables me to enjoy life more.
35. I enjoy having a clear and structured mode of life.
36. I prefer interacting with people whose opinions are very different from my own.
37. I like to have a plan for everything and a place for everything.
38. I feel uncomfortable when someone's meaning or intention is unclear to me.
39. I believe that one should never engage in leisure activities.
40. When trying to solve a problem I often see so many possible options that it's confusing.
41. I always see many possible solutions to problems I face.
42. I'd rather know bad news than stay in a state of uncertainty.
43. I feel that there is no such thing as an honest mistake.
44. I do not usually consult many different options before forming my own view.
45. I dislike unpredictable situations.
46. I have never hurt another person's feelings.
47. I dislike the routine aspects of my work (studies).
**Task 6: About You**

Recall the TV show you watched early on. How much do you like the TV show?
1 2 3 4 5 6 7
Not at all Very much

How well were you able to concentrate on the experimental task?
1 2 3 4 5 6 7
Not at all Very much

How much effort did you spend in completing this study?
1 2 3 4 5 6 7
Not at all Very much

How involved were you in completing the study?
1 2 3 4 5 6 7
Not at all Very much

How interesting do you think this study was?
1 2 3 4 5 6 7
Not at all Very much

What do you think is the purpose of this study?

____________________________________________________________________

Your Gender: __________
Your Age: _____________
Your Ethnicity: ______________
Language spoken at home: __________
Are you an exchange student? ___Y  ___N
Appendix E: Study 5 Experimental Surveys

E.1 Survey for Threatening Information Condition

Task 1: Questionnaire on Your Health

Heart disease is the #1 killer of men and women in North America. However, new scientific research finds that college students are not well-informed and may be ignoring the threat of heart disease. According to the study, researchers suggest that although serious heart disease is rare among college students, their lifestyle habits during college years can be significantly impactful on their heart disease risk in their later life. These risk factors include tobacco use, alcohol consumption, physical activities, nutrition, stress levels, etc., which can be tragic or beneficial for their future life. Also, another recent study from the American Heart Association reveals that college students who drink excessively may double their risk of heart disease in later life. Therefore, it calls for increased awareness and education about heart disease among college students.

In this survey, we are trying to provide you with more information about the heart disease. In what follows, you will complete a questionnaire developed by the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. The purpose of this questionnaire is to **estimate your risk of getting heart disease in your later life**, based on your current health background and lifestyle.
Questionnaire:

1. What is your sex?
   Male     Female

2. Enter your age: _______

3. Have you ever had a heart attack or been told that you have heart disease?
   Yes     No

4. What is your height?  __________cm

5. What is your weight?  __________kg
   Note: Height isn't a risk factor for heart disease. But a healthy weight range varies based on height.

6. Have you ever been told that you have high blood pressure (hypertension) or have you ever been given blood pressure medication?
   Yes
   No

7. Have you ever been told that you have diabetes or a problem with high blood sugar?
   Yes
   No

8. Have you ever been told that your total cholesterol level is high?
   Yes
   No

9. What is your total cholesterol level?
   159 or lower
   160-199
   200-239
   240-279
   280 or higher
   Don't know

10. What is your HDL cholesterol?
    39 or lower
    40 or higher
    Don't know

11. Do you usually eat fish two or more times per week?
    Yes
    No
12. Do you eat 5 or more servings of fruit and vegetables per day? A serving is one medium apple, banana or orange, 1 cup of raw leafy vegetable (like spinach or lettuce), ½ cup of cooked beans or peas, ½ cup of chopped, cooked or canned fruit/vegetable or ¾ cup of fruit/vegetable juice.
   Yes
   No

13. Do you eat 3 or more servings of whole grains per day (wheat bread, whole grain pasta, brown rice, oatmeal, whole grain breakfast cereal, bran or popcorn)? A serving is one slice of bread, 1 ounce of breakfast cereal or ½ cup of cooked cereal, pasta or rice.
   Yes
   No

14. Do you usually eat 3 servings of nuts per week? A serving is 1 ounce, which is about one airline packet of nuts or one tablespoon of peanut butter.
   Yes
   No

15. Do you usually eat butter, lard, red meat, cheese or whole milk 2 or more times per day?
   Yes
   No

16. Do you eat stick margarine, vegetable shortening, store-bought baked goods (cookies, cakes, pies) or deep-fried fast foods on most days?
   Yes
   No

17. Do you eat oil-based salad dressing or use liquid vegetable oil for cooking on most days?
   Yes
   No

18. How many servings of alcohol do you have on a typical day? One serving is a can of beer, a glass of wine or a shot of hard liquor.
   0
   1
   2
   3 or more

19. Do you take a multivitamin or a B complex supplement on most days?
   Yes
   No

20. Do you smoke cigarettes?
   Yes
   No, I never smoked cigarettes
I used to smoke cigarettes, but I quit

21. Are you exposed to smoke from other people's cigarettes or cigars?
   Almost never
   Occasionally
   Regularly

22. Do you walk (or do other moderate activity) for at least 30 minutes on most days, or at least 3 hours per week?
   Yes
   No

23. Has anyone in your immediate family (mother, father, sister, brother) had a heart attack?
   Yes
   No

Your input has been recorded!
Due to the complicated algorithm, the result cannot be provided to you now. It will be provided to you next week via email.
Task 2: Willingness to Donate

Many non-profit organizations seek donations from individuals like you. Below is a list of such organizations. We would like you to consider each organization and indicate, at this moment in time, your likelihood of donating to this organization.

1. **UNICEF**
   The mission of UNICEF (United Nations Children's Fund) is to provide long-term humanitarian and developmental assistance to children and mothers in developing countries.

   How likely are you to donate to this organization, at this moment in time?
   
   1      2     3     4    5   6       7
   Not at all                                                                                                             Very much

   To what extent are you willing to donate to this organization, at this moment in time?
   
   1      2     3     4    5   6       7
   Not at all                                                                                                             Very much

2. **Children Awaiting Schools**
   The mission of Children Awaiting Schools is to support children in impoverished countries to obtain education and to improve educational facilities in these poor regions.

   How likely are you to donate to this organization, at this moment in time?
   
   1      2     3     4    5   6       7
   Not at all                                                                                                             Very much

   To what extent are you willing to donate to this organization, at this moment in time?
   
   1      2     3     4    5   6       7
   Not at all                                                                                                             Very much
**Task 3: About You**

Recall the health questionnaire you had early on.

1. How curious are you now about the questionnaire result?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. How eagerly do you want to know the questionnaire result?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. To what extent do you think it’s threatening to learn the risk of getting heart disease in your later life?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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4. How frightening do you think it is to know about the risk of getting heart disease in your later life?
   
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What do you think is the purpose of this study?

______________________________________________________________________

Your Gender: __________

Your Age: _____________ Language spoken at home: ______________

Your Ethnicity: __________ Are you an exchange student? ___Y ___N
E.2 Survey for Non-Threatening Information Condition

Task 1: Questionnaire on Your Health

Heart disease is the #1 killer of men and women in North America. However, new scientific research finds that college students are not well-informed and may be ignoring the threat of heart disease. According to the study, researchers suggest that although serious heart disease is rare among college students, their lifestyle habits during college years can be significantly impactful on their heart disease risk in their later life. These risk factors include tobacco use, alcohol consumption, physical activities, nutrition, stress levels, etc., which can be tragic or beneficial for their future life. Also, another recent study from the American Heart Association reveals that college students who drink excessively may double their risk of heart disease in later life. Therefore, it calls for increased awareness and education about heart disease among college students.

In this survey, we are trying to provide you with more information about the heart disease. In what follows, you will complete a questionnaire developed by the Alvin J. Siteman Cancer Center at Barnes-Jewish Hospital and Washington University School of Medicine. The purpose of this questionnaire is to provide you with a personalized plan to prevent heart disease in your later life, based on your current health background and lifestyle.
Questionnaire:

1. What is your sex?
   Male    Female

2. Enter your age: _______

3. Have you ever had a heart attack or been told that you have heart disease?
   Yes   No

4. What is your height?  __________ cm

5. What is your weight?  __________ kg
   Note: Height isn't a risk factor for heart disease. But a healthy weight range varies based on height.

6. Have you ever been told that you have high blood pressure (hypertension) or have you ever been given blood pressure medication?
   Yes   No

7. Have you ever been told that you have diabetes or a problem with high blood sugar?
   Yes   No

8. Have you ever been told that your total cholesterol level is high?
   Yes   No

9. What is your total cholesterol level?
   159 or lower
   160-199
   200-239
   240-279
   280 or higher
   Don't know

10. What is your HDL cholesterol?
    39 or lower
    41 or higher
    Don't know

11. Do you usually eat fish two or more times per week?
    Yes   No
12. Do you eat 5 or more servings of fruit and vegetables per day? A serving is one medium apple, banana or orange, 1 cup of raw leafy vegetable (like spinach or lettuce), \( \frac{1}{2} \) cup of cooked beans or peas, \( \frac{1}{2} \) cup of chopped, cooked or canned fruit/vegetable or \( \frac{3}{4} \) cup of fruit/vegetable juice.
   Yes
   No

13. Do you eat 3 or more servings of whole grains per day (wheat bread, whole grain pasta, brown rice, oatmeal, whole grain breakfast cereal, bran or popcorn)? A serving is one slice of bread, 1 ounce of breakfast cereal or \( \frac{1}{2} \) cup of cooked cereal, pasta or rice.
   Yes
   No

14. Do you usually eat 3 servings of nuts per week? A serving is 1 ounce, which is about one airline packet of nuts or one tablespoon of peanut butter.
   Yes
   No

15. Do you usually eat butter, lard, red meat, cheese or whole milk 2 or more times per day?
   Yes
   No

16. Do you eat stick margarine, vegetable shortening, store-bought baked goods (cookies, cakes, pies) or deep-fried fast foods on most days?
   Yes
   No

17. Do you eat oil-based salad dressing or use liquid vegetable oil for cooking on most days?
   Yes
   No

18. How many servings of alcohol do you have on a typical day? One serving is a can of beer, a glass of wine or a shot of hard liquor.
   4
   5
   6
   7 or more

19. Do you take a multivitamin or a B complex supplement on most days?
   Yes
   No

20. Do you smoke cigarettes?
   Yes
   No, I never smoked cigarettes
I used to smoke cigarettes, but I quit

21. Are you exposed to smoke from other people's cigarettes or cigars?
   Almost never
   Occasionally
   Regularly

22. Do you walk (or do other moderate activity) for at least 30 minutes on most days, or at least 3 hours per week?
   Yes
   No

23. Has anyone in your immediate family (mother, father, sister, brother) had a heart attack?
   Yes
   No

Your input has been recorded!
Due to the complicated algorithm, the result will be provided to you next week via email.
Task 2: Willingness to Donate

Many non-profit organizations seek donations from individuals like you. Below is a list of such organizations. We would like you to consider each organization and indicate, at this moment in time, your likelihood of donating to this organization.

1. UNICEF
   The mission of UNICEF (United Nations Children's Fund) is to provide long-term humanitarian and developmental assistance to children and mothers in developing countries.

   How likely are you to donate to this organization, at this moment in time?
   1  2  3  4  5  6  7
   Not at all                          Very much

   To what extent are you willing to donate to this organization, at this moment in time?
   1  2  3  4  5  6  7
   Not at all                          Very much

2. Children Awaiting Schools
   The mission of Children Awaiting Schools is to support children in impoverished countries to obtain education and to improve educational facilities in these poor regions.

   How likely are you to donate to this organization, at this moment in time?
   1  2  3  4  5  6  7
   Not at all                          Very much

   To what extent are you willing to donate to this organization, at this moment in time?
   1  2  3  4  5  6  7
   Not at all                          Very much
Task 3: About You

Recall the health questionnaire you took early on.

1. How curious are you now about the health questionnaire result?
   1 2 3 4 5 6 7
   Not at all                                    Very much

2. How eagerly do you want to know the health questionnaire result?
   1 2 3 4 5 6 7
   Not at all                                    Very much

3. To what extent do you think it’s threatening to learn the personalized plan to prevent heart disease in your later life?
   1 2 3 4 5 6 7
   Not at all                                    Very much

4. How frightening do you think it is to know about the personalized plan to prevent heart disease in your later life?
   1 2 3 4 5 6 7
   Not at all                                    Very much
Please rate your familiarity of these non-profit organizations:

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Are you an exchange student? ___Y ___N