

ESSAYS ON CONSERVATION AND WASTE IN CONSUMPTION

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ACKNOWLEDGEMENTS

I used to be obsessed with poems and novels, and had seriously considered becoming a writer. After a series of random events, I started the Ph.D. program in marketing at Carnegie Mellon University in 2006. My life has changed ever since, in the most amazing way. *Einmal ist keinmal, says Tomas to himself...* And, sometimes, says me to myself... Completing the dissertation has helped me to confirm that all of this that has happened once has happened indeed, and beautifully.

There are a lot of people that I am grateful to. First and foremost, I am deeply indebted to my advisor, Joachim Vosgerau, for his patience, guidance, inspiration and friendship throughout the process. Thanks for always believing in me, even when I did not believe in myself. I am also extremely indebted to my dissertation co-chair Carey Morewedge for his invaluable encouragement, support, advices and insights.

I would also like to thank Ajay Kalra, Jeff Inman and Darron Billeter for spending extensive amount of time developing and discussing the topics with me. I feel honored to have had the opportunity to have worked with them on my dissertation essays. I am also grateful for the insightful comments and suggestions received from Baba Shiv, George Lowenstein, Karim Kassam, Jeff Galak, and Nitin Mehta. The work has also benefited from helpful suggestions from the faculty, Ph.D. students and alumni from the Center for Behavioral Decision Research at Carnegie Mellon University.

Finally, I would like to express my gratitude to my husband Jian Ni for his constant encouragement, love and support, my daughter Alexandra who has brought such joy into our lives and my parents for everything they have taught me.

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1. INTRODUCTION

Managing how resources can be conserved by reducing waste and making consumption more efficient has become an essential issue in maintaining the sustainability of our economy and society.

A wealth of consumer research has explored the factors that determine how much of a resource people consume, with important implications for how to reduce resource consumption. In many consumption contexts, however, waste arises primarily from consumer's overestimation of the amount of resources they will need—resource acquisition. I conceptualize waste in consumption as the difference between the amount of resources taken and the amount of resources required. For example, if a consumer takes four napkins in a fast-food restaurant but only uses three, she has wasted one napkin. This denotes a pure loss of resources, as the amount of resources taken is greater than the amount of resources consumed. Another form of waste in consumption consists of inefficient usage, which occurs when the amount of resources consumed is greater than the amount of resources required. For example, if other consumers on average use only two napkins, those who consistently use much more napkins waste resources through inefficient usage. Conservation can be achieved by both reducing pure loss in resources and reducing inefficiency in usage. My dissertation consists of two essays that provide a systematic investigation of the behavioral determinants of waste as well as contextual cues that trigger conservation behavior.

My first essay examines the interplay between resource abundance and conservation in consumption. The key question I ask is whether the perception of abundance vs. non-abundance

regarding one resource influences waste and conservation of unrelated resources. This question involves several issues: What is the interplay between resource abundance and conservation? Can cues indicating non-abundance of resources temporarily trigger conservation behavior? If so, can this conservation tendency persist into subsequent consumption of unrelated resources? Finally, what is the psychological mechanism responsible for this carry-over effect?

Consumers tend to seek convenience, which typically leads to greater acquisition of resources than is necessary (e.g., it's more convenient to take a lot of napkins at a restaurant rather than estimate the exact number one will need or take one and then walk back for more). Importantly, consumers can afford to do so only when resources are abundant. When resources are not abundant (non-abundance differs from scarcity in that it denotes the sufficient but non-excessive supply of resources), consumers need to carefully monitor their consumption to not deplete the resource. Therefore, I posit that cues indicating non-abundance of a resource can temporally prompt conservation behaviors. Importantly, the tendency to conserve can persist into subsequent consumption of unrelated resources. I demonstrate this carryover effect in a series of studies. For example, in one study participants are asked to evaluate the quality of a brand of cooking oil. They perceive the resource as less/more abundant when the same amount of the resource (1/3 cup of cooking oil) is provided in a large vs. small container. This perception of non-abundance/abundance subsequently increases/decreases participants' tendency to turn off the lights when leaving an empty room. In another study, I show that giving participants a chance to conserve before consumption (e.g., choosing which of two conservation charities to donate to) attenuates the impact of non-abundance cues on conservation, but similar actions unrelated to conservation do not attenuate the effect (e.g., choosing which of two education charities to donate to). These results demonstrate that the underlying mechanism is motivational rather than

priming of conservation-related concepts (e.g., Chartrand & Bargh 1996; Förster et al. 2007; Laran & Janiszewski, 2008; Sela & Shiv 2009).

My second essay examines how marketing cues (e.g., pictures and brand names) available in consumption contexts can curb consumption and help achieve conservation. Contrary to the common belief that marketing cues that highlight product effectiveness will generate positive influences on consumer demand, I argue that these cues can decrease usage amount per consumption occasion, thus leading to an increase in inter-purchase time and potentially hurting long-term product sales (i.e., signaling effectiveness is a “double-edged” sword). Building upon literature showing that consumption behaviors are largely constructive and guided by simple inferential rules and schemata (e.g., Bettman, Luce & Payne 1998; Prelec, Wernerfelt & Zettelmeyer 1997), I hypothesize that consumers often infer product effectiveness from marketing cues that are salient in the consumption context and then use perceived product effectiveness as an indicator for deciding how much they should consume. I predict that adding marketing cues that highlight the effectiveness of a product will lead consumers to perceive the product as more effective, and consequently reduce consumption volume, even when the actual product effectiveness remains unchanged. For example, I show that participants consume less insect repellent and toilet bowl cleaner when marketing cues indicate it is more effective. In support of the proposed inference-making account, I show that this negative impact of “effectiveness” marketing cues on consumption is attenuated when cue salience is low and when individuals’ need for cognition is high.

2. RESOURCE ABUNDANCE AND CONSERVATION IN CONSUMPTION

Managing conservation of resources has become an essential issue in maintaining the sustainability of our economy and society. Despite efforts to increase awareness of the importance of conservation, the rate of progress in reducing waste has been low. For example, Americans generated about 249.6 million tons of trash ¹ in 2008, almost triple compared to 50 years ago; likewise, the amount of trash generated per person per day has increased from 2.68 pounds in 1960 to 4.50 pounds in 2008 (United States Environmental Protection Agency 2009). From a firm's perspective too, considerable cost savings can be realized if employees waste fewer resources. For example, a recent report shows that 60 % of Ford's employees do not shut idle computers at the end of the working day costing the firm an additional \$1.2 million in power costs (Greener World Media 2010).

A rich body of research has explored factors that influence how much of an available resource people use in a given consumption context (e.g., Cheema and Soman 2008; Folkes, Martin and Gupta 1993; Geier, Rozin and Doros 2006; Goldstein, Cialdini and Griskevicius 2008; Hutton and McNeill 1981; Hutton et al. 1986; Sexton, Johnson and Konakayama 1987; Van Houwelingen and Van Raaij 1989; Wansink 1996; Wansink and Ittersum 2003). These findings provide important insights for reducing resource consumption. In many consumption contexts, however, waste arises primarily from consumer's over-acquisition of the amount of resources they will need.

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The U.S. Environmental Protection Agency (EPA) defines municipal solid waste (MSW) as the things we commonly use and then throw away. MSW typically includes packaging, food scraps, grass clippings, old sofas, computers, tires, refrigerators, etc., but does not include industrial, hazardous, or construction waste.

In this essay, we distinguish between the amount of resources consumers acquire to fulfill certain consumption purpose, the amount of resources they use in the course of action, and the amount of resources required to complete the given task. Examining these three elements in conjunction is important conceptually for understanding wasting behavior and how to influence conservation behavior.

We conceptualize waste in consumption as the difference between the amount of resources acquired and the amount of resources required for a consumption situation. We propose that waste in consumption has two instantiations. The first is pure loss of resources that occurs when the amount of resources acquired is greater than the amount of resources consumed. The second is inefficiency in usage that occurs when the amount of resources consumed is greater than the amount of resources required. For example, consider a consumer who takes four napkins in a fast food restaurant, uses only three of them and throws away one. This denotes a pure loss of one napkin as the number of napkins acquired is greater than the number of napkins consumed. Now consider a specific type of meal where most consumers on average use only two napkins, but some use much more. This constitutes inefficient usage as those who consistently use more napkins for the same meal waste resources because consumption is much more than required. Therefore, conservation can be achieved by both reducing pure loss of resources and reducing inefficiency in usage. Figure 1 represents a graphic illustration of our conceptualization.

[Insert Figure 1 about here]

The focus of this essay is to examine whether cues indicating non-abundance versus abundance of one resource could prompt conservation behaviors in subsequent consumption situations even when different types of resource are being acquired and utilized. This question involves several interrelated essential issues. What is the interplay between resource abundance and conservation? Can cues indicating non-abundance of a particular resource change people's general perception about resource abundance? If so, can this perceptual change activate the tendency to conserve and therefore affect subsequent acquisition and consumption of unrelated resources? Finally, will giving people a chance to conserve before taking resources for subsequent consumption attenuate or exacerbate the impact of non-abundance cues on conservation?

The remainder of the essay is organized as follows. We review the relevant literature and the basis for our predictions about the interplay between resource abundance and conservation in consumption. Next, we report five studies that provide support for the proposed effect and underlying mechanisms. We conclude with implications of our findings.

2.1 THEORY DEVELOPMENT

Conservation and environmental issues is a textbook case of a “wicked problem” (Rittel and Webber 1973) as the problems are complex and ambiguous. Given the crucial role conservation plays in today's economy and its impact on the sustainability of our society, researchers across several disciplines have investigated the effectiveness of direct interventions on conservation behaviors (see Kazdin 2009 for a complete review), such as educating the public about environmental problems or possible solutions (e.g., Leiserowitz 2006; Nickerson 2003;

Singhal et al. 2003; Winett and Kagel 1984), providing feedback information (e.g., Hutton et al. 1986; Sexton, Johnson and Konakayama 1987; Van Houwelingen and Van Raaij 1989) , and employing various incentives and disincentives (e.g., Clayton and Myers 2009; Costello, Gaines and Lynham 2008; Hutton and McNeill 1981; Pitts and Wittenbach 1981). More recently, in several interesting studies, messages manipulating social norms have been found to increase conservation in domains such as reusing hotel towels and conserving energy in the home (Goldstein, Cialdini and Griskevicius 2008; Nolan et al. 2008). The influences of individual characteristics such altruism (e.g., Heberlein 1972; Hopper and Nielsen 1991; Griskevicius, Tybur and Van den Bergh 2010), values (e.g., Egri and Herman 2000; Ingelhart 1990; Hunecke et al. 2001), and risk perceptions (e.g., Bohm, Nerb and Spada 2001) on environmental orientations have also received attention.

In spite of this rich body of literature, why people do not conserve enough when consuming a resource continues to remain an open and intriguing question. Several findings have demonstrated that perceptions of the amount of resources available – both the actual quantity and contextual cues that bias perceptions of the supply amount influence how much of a resource people consume. For example, Folkes, Martin and Gupta (1993) show that the amount consumers indicated they would use generally decreased as the supply decreased. Wansink (1996) finds that small package sizes decreased usage volume because people perceived the unit cost as higher. Wansink and van Ittersum (2003) also shows perceptions of quantity can be influenced by shape of the container: an elongated glass reduced pouring and consumption volume because people perceive that the elongated glass as having a higher capacity. Additionally, smaller serving sizes have been shown to activate consumption norms and in turn regulate consumption. Geier, Rozin and Doros (2006) demonstrate that participants consumed

substantially fewer candies when they were offered in small rather than large portions.

Furthermore, Cheema and Soman (2008) show that partitioning an aggregate quantity into smaller units reduced the consumption quantity of chocolate and lottery tickets.

While the extant research provides interesting insights into how consumption depends on cues that affect perceptions of supply level and have important implications for reducing inefficiency in usage, the impact of supply cues on resource acquisition and pure loss (i.e., the difference between the amount acquired and consumed) remains an important area to be explored. Additionally, the level of specificity examined in existing literature is very domain specific. To elaborate, cues such as the shape of the juice glass are shown to influence juice consumption (Wansink and van Ittersum 2003). An intriguing question is whether cues suggesting a lower level of availability of a particular resource not only influence perceptions of the cue-specific resource but also impact the cognitive accessibility of the general notion of abundance. If indeed cues indicating a limited supply of a resource evoke a broad sense of non-abundance, it suggests that consumption of unrelated resources is also likely to decrease. Such a finding is conceptually important and also suggests that a very different approach can be used to influence conservation behaviors. Such approaches can operate at an unconscious level and may be very effective as they are indirect.

The key question we investigate is whether cues indicating non-abundance vs. abundance of one resource in a prior context also extend more broadly and reduce over-acquisition and waste in subsequent consumption contexts even when different types of resources are used. To address this issue, we need to first examine the interaction between resource abundance and conservation.

2.1.1 Resource Abundance and Conservation

We conceptualize abundance to be an excessive supply of resources whereas non-abundance is sufficient but non-excessive supply of resources. Non-abundance differs from scarcity in the sense that scarcity refers to insufficient supply of resources. We focus on situations where the supply is always sufficient but simply differs in terms of excessiveness.

Consumers are innately convenience seekers, which is essentially a tendency to save or simplify work and also to add to one's ease or comfort. The tendency to seek convenience typically leads to greater acquisition of resources than is necessary. For example, at a fast food restaurant, it is more convenient to take excessive number of paper napkins, cutlery and condiments rather than allow for the possibility of running short and walking back for more. Thus taking more napkins eliminates the cognitive effort of estimating the quantity required as well as the physical effort of replenishing the resource. In a similar vein, it is more convenient to leave the lights on when leaving a room rather than turning off the lights, as the latter requires an additional action. In addition to seeking convenience, over-acquisition could also occur because people are greedy, or simply enjoy the sense of entitlement.

Importantly, consumers can afford to seek convenience, satisfy other personal motives and waste in the course of consumption only when resources are abundant. When resources are not abundant, consumers need to carefully monitor their consumption so as to not deplete the resource. Therefore, we would expect that perceiving resources as limited can temporally prompt conservation behaviors. This argument is consistent with the sociological perspective of “abundance psychology”, which suggests that in late-modern and industrialized society, as the means of mass production become mastered, abundance becomes more taken-for-granted and

scarcity is therefore supplanted by abundance, leading to highlighted consumerism (Côté 1993, 1996; Riesman 1950).

2.1.2 Abundance Cues and Conservation of Unrelated Resources

Broadly building upon evidence suggesting that environmental cues in a prior context can influence decision-making in subsequent unrelated contexts by affecting mental representation and accessibility of different knowledge structure (e.g., Bargh et al., 2001; Dijksterhuis, Chartrand and Aarts 2007; Förster, Liberman and Friedman 2007; Kay et al. 2004; Neely, 1977; Srull and Wyer, 1979), we posit that cues indicating one particular resource as non-abundant can reduce the cognitive accessibility of the general construct of abundance and trigger the tendency to conserve. Further, the conservation tendency activated by non-abundance cues can persist into subsequent consumption even when different resources are utilized. Formally, we hypothesize that non-abundance cues about resource “A” can reduce both pure loss (i.e., the difference between the amount of resource acquired and consumed) and inefficiency in usage (i.e., the difference between the amount of resources consumed and required) of resource “B”.

There are several different reasons why non-abundance cues in a prior context could prompt conservation behaviors in subsequent consumption. First, cues highlighting non-abundance of a resource may lead people to waste fewer resources in subsequent unrelated consumption by passively activating a conservation goal (e.g., Förster, Liberman and Friedman 2007; Laran and Janiszewski 2008). Second, non-abundance cues presented in a prior task could prime conservation-related concepts and therefore increase the likelihood of conserving behaviors in subsequent context (e.g., Bargh and Barndollar 1996; Bargh, Chen and Burrows

1996). Third, it is possible that prior cues indicating non-abundance can prime frugality-related traits and therefore lead participants to act more frugally in subsequent consumption contexts (e.g., Kay et al. 2004; Dijksterhuis, Chartrand and Aarts 2007).

Moreover, we hypothesize that the effect of non-abundances cues on conservation will disappear when people get a chance to conserve before taking resources. We argue this is the case because the conservation tendency activated by non-abundance cues can only temporarily dominate convenience seeking and other personal motives that lead to increased waste in consumption, as the latter factors are more innate and are further highlighted by the abundance of modern societies. Once people get a chance to engage in any conserving behavior (e.g., donating to an environmental cause), conserving resources becomes less of a local and direct concern whereas satisfying motives such as seeking convenience reemerges as individuals' primary propensity. Our explanation is consistent with recent findings by Mazar and Zhong (2010) showing that consumption is closely connected to social and ethical behavioral broadly across domains. For example, they demonstrate that people react less altruistically and are more likely to cheat and steal after purchasing green products as compared to conventional products.

Our prediction is consistent with the aforementioned motivation account explaining that cues highlighting non-abundance of a resource may lead people to waste fewer resources in subsequent unrelated consumption by passively activating a conservation goal. It is important to note that only the goal activation account predicts that giving people a chance to conserve would attenuate the effect of non-abundance cues on conservation as an unique characteristic about goal activation is that once the activated goal is satisfied, individuals will no-longer engage in goal-consistent behaviors (e.g., Förster, Liberman and Friedman 2007; Laran and Janiszewski 2008). However, both the conceptual priming and trait priming accounts predict that giving people a

chance to conserve exacerbate the proposed effect, as engaging in a conservation action would have made conservation-related concepts or traits even more accessible and salient.

To summarize, our theoretical approach integrates amounts of resources acquired, resources consumed, and resources required to empirically explore the interplay between resource abundance and conservation in consumption. Our key thesis is that cues indicating non-abundance of a resource can activate the tendency to conserve, which can persist into subsequent consumption and reduce waste of unrelated resources. In a series of five experiments, we first demonstrate the proposed phenomenon, showing that non-abundance cues regarding one resource can reduce pure loss (Experiment 1) and inefficiency in usage (Experiment 2) regarding different types of resource in subsequent consumption. Next, we test whether manipulating perceived non-abundance while holding the actual abundance level constant is sufficient to trigger conservation behaviors across consumption domains (Experiment 3). In the last two experiments, we test the underlying mechanisms that are responsible for the proposed behavioral effect. Experiment 4 examines whether cues indicating non-abundance regarding one particular resource can reduce the cognitive accessibility of the general construct of abundance. Finally, in Experiment 5 we test whether giving people a chance to conserve attenuates the effect of non-abundance cues on conservation. In doing so, we also test the motivational account against other theoretical accounts based on conceptual or trait activations.

2.2 METHODOLOGY

Given the main objective of our experiments is to test the interplay between resource abundance on conservation, it is key that we concentrate on only one of the reasons why people

waste so that we can keep the underlying motive consistent across studies. In the current essay, we focus on convenience seeking, as this is a factor that is very important and intuitively appealing. We set up all the experiments such that seeking convenience conflicts with conserving behaviors. In these scenarios, we test how cues of resource abundance influence waste and conservation in subsequent consumption. To validate that seeking convenience indeed is one important reason why people do not conserve, we ran a preliminary study to establish the linkage between convenience and waste.

To do so, we manipulate convenience by altering the physical distance at which the resource is located. We anticipate that more resources will be wasted when it is more inconvenient to take/ replenish a resource. Thirty-two participants recruited from the paid participant pool at a northeastern university received \$2 for participating in a food evaluation study. Participants were seated in isolated computer cubicles so that they could not see other respondents. They were told that the purpose of the study was to elicit perceptions of the taste combination of three different flavors of chips with ketchup. Every participant was provided with a bowl with three chips each of a different flavor, a full bottle of ketchup (32 oz., squeezable bottle) and a small sampling plate. They were asked to squeeze the ketchup into the small plate and then taste the chip-ketchup combinations. Ratings of each taste were obtained on a 7-point scale anchored by “I dislike the taste- I like the taste.” For some participants, the ketchup bottle and small plate were placed on their own desk. Others were asked to go to the desk next to them to pour the ketchup and return to their original seat with the plate. The rest of the participants were asked to go to the room located on their right to pour the ketchup and then

return to their original seat.² The amount of ketchup that participants left in the small plate after finishing the taste test served as our main dependent variable.

We found a significant effect of ketchup location on the amount of ketchup wasted ($F(2, 29) = 3.52, p < .05$). Specifically, participants wasted significantly less ketchup when the ketchup bottle was put on the same desk ($M_{\text{same desk}} = 1.82$ grams) than when it was located on the next desk ($M_{\text{next desk}} = 4.12$ grams; $F(1, 30) = 4.53, p < .05$) or next room ($M_{\text{next room}} = 4.29$ grams; $F(1, 30) = 5.73, p < .05$). While the deviation from convenience led people to waste more ketchup, the degree to which it was inconvenient to take and renew resources (i.e., going to next desk vs. next room) did not produce a significant effect on the amount of waste ($F(1, 30) = .02, p = .89$).

These results confirm that seeking convenience leads to increased waste in consumption. In all experiments, we will set up the consumption contexts in such a way that seeking convenience conflicts with conserving so that we can keep the underlying motive why people waste consistent across studies when examining the interplay between resource abundance and conservation. Next, in five experiments, we test our main thesis, that is, cues indicating non-abundance of one resource can trigger conservation behaviors regarding an unrelated resource. We begin by reporting the results of two experiments that demonstrate the proposed effect for pure loss of resources and inefficiency in usage respectively. We subsequently present three additional experiments that demonstrate the robustness of the effect, further discriminating among different theoretical accounts for the effect.

2.3 EXPERIMENT 1: RESOURCE CUES AND PURE LOSS IN RESOURCES

² In the next desk and next room conditions, we didn't explicitly provide instructions regarding whether participants should leave the ketchup bottle in the original place or whether they can go back to get more ketchup. In all sessions, none of our participants took the ketchup bottle away from their original place (i.e., none of them took the bottle to their own seat) and none of them went back to the next desk or next room to pour more ketchup.

In this experiment we examine whether non-abundance cues regarding resource A can reduce pure loss of resource B. To do so, we measure the amount of resources acquired, resources consumed and the difference between the two. We predict that cues indicating non-abundance vs. abundance of one resource in a prior unrelated task can reduce pure loss of a different type resource in subsequent consumption. Reduction in pure loss which is the difference between resources acquired and resources consumed can occur in different ways. For example, resources acquired may increase while consumption is unaffected. Alternatively, resources consumption may increase while acquisition remains unaffected. We test which of these possibilities occur.

2.3.1 Method

Participants. Sixty undergraduate students took part in two supposedly unrelated studies in exchange for extra course credit.

Procedure. Participants were told that they would take part in two unrelated studies. The first study was a figure drawing task, which randomly assigned participants to one of two conditions: abundance or non-abundance. Participants were seated in cubicles so that they could not see other respondents. They were instructed to trace an unbroken line between the boundaries that were formed by two, same shaped figures with one figure placed in the interior of the other similar figure. They were given four sets of shapes and instructed to try to keep the line in the middle of each set of the shapes. In the abundance condition, a stack of regular sized (7.5")

sharpened pencils were placed in the front of the participants. In the non-abundance manipulation, participants were provided with one small pencil stub of a length of 2.5".

After completing the figure drawing task, all participants moved to a “food evaluation study.” They were told that the researchers were interested in their opinions on the taste of new low calorie snacks. Participants were asked to sample three new varieties of 100-calorie snacks. Participants were told to rinse their mouth well with water before beginning each tasting to avoid taste contamination. A full jug of water (1 gallon) and a 16.oz cup were placed on an adjacent desk to their right. This made it inconvenient to get the water and to replenish it. Before beginning the sampling, participants were asked to go to the next desk, fill water in the cup and then return to their original seat. As instructed, participants rinsed their mouth with water before sampling each snack. Evaluations of the snacks were elicited using a 7-point scale after finishing each sample (1 = “I dislike the taste of the snack”, 7 = “I like the taste of the snack”).

After the food evaluation task, participants were asked to complete a feedback sheet, which asked them to rate whether the figure drawing task was easy (1=very easy; 11=very difficult); how expensive they thought the new snacks would be as compared to Lays potato chips (1 = “less expensive than Lays”, 11 = “more expensive than Lays”); and whether they had sufficient water to rinse (1 = “it was not enough”; 11 = “it was enough”). At the end of the session, participants were quizzed about the objective of the study and then were debriefed, thanked and dismissed. None of the participants correctly guessed the true purpose of the experiment. One participant who failed to follow instructions and did not take water was excluded from the analysis.

Measures. The key dependent measures are the amount of water that participants took from the water jug, the amount of water that participants consumed for rinsing and the amount of

water that participants left in the cup after completing the task. The weight of the water jugs was measured before and immediately after each lab session. The amount of water that participants took was calculated by taking the difference in the before and after measures for each water jug. The amount of the water that participant left in the cup was determined by taking the difference in the before and after weights of each cup. Finally, we calculated the amount of water that participants consumed by taking the amount of water poured from the jug minus the amount of water left in the cup.

2.3.2 Results and Discussion

Amount of Pure Loss of Water. To test whether non-abundance cues presented in a prior task can reduce pure loss of a different resource in subsequent consumption, we first conducted a one-way ANOVA (Resource cue: abundance vs. non-abundance) on the amount of water that participants left in the cup after the task. As expected, we found a significant effect of resource cue on the amount of water wasted ($F(1, 57) = 5.18, p < .05$; see Figure 2). Specifically, participants in the non-abundance condition (pencil stub: $M_{\text{non-abundance cue}} = 1.21 \text{ oz.}$) wasted significantly less water than participants in the abundant condition (stack of pencils: $M_{\text{abundance cue}} = 2.37 \text{ oz.}$).

Amount of Water Acquired & Consumed. To examine whether this reduction in pure loss of resources is driven by the decrease in the amount of resources acquired or the increase in the amount of resources consumed, we ran two separate ANOVA's on the amount of water poured from the jug and amount of water consumed respectively. We found a marginal significant effect of resource cue on the amount of water acquired ($F(1, 57) = 2.83, p < .10$); there was no

significant effect of resource cue on the amount of water consumed ($F(1, 57) = .12, p = .73$; see Figure 2). That is, participants in the non-abundant condition poured less water from the jug than participants in the abundance condition ($M_{\text{abundance cue}} = 7.11 \text{ oz.}$ vs. $M_{\text{non-abundance cue}} = 6.18 \text{ oz.}$). However, participants used about the same amount of water for rinsing ($M_{\text{abundance cue}} = 4.74 \text{ oz.}$ vs. $M_{\text{non-abundance cue}} = 4.97 \text{ oz.}$).

[Insert Figure 2 about here]

Evaluations. There were no significant differences in the perceived difficulty of the figure drawing task. The task was rated as equally easy in both conditions ($M_{\text{abundance cue}} = 1.97$ vs. $M_{\text{non-abundance cue}} = 1.93$; $F(1, 57) = .01, p = .92$). Participants also perceived the snacks to be equally expensive in both conditions ($M_{\text{abundance cue}} = 7.16$ vs. $M_{\text{non-abundance cue}} = 7.19$; $F(1, 57) = .004, p = .95$). Finally, participants indicated that they had adequate amount of water to rinse their mouth in both conditions ($M_{\text{abundance cue}} = 10.50$ vs. $M_{\text{non-abundance cue}} = 10.48$; $F(1, 57) = .002, p = .96$). These results suggest that the differences found in the amount of water wasted and acquired cannot be explained by alternative explanations such as task difficulty or scarcity.

Experiment 1 provides support for the proposed carry-over effect of non-abundance cues on conservation by demonstrating that naturally occurring environmental cues highlighting non-abundance of a resource (e.g., a pencil stub) presented in a prior context can lead to reduction of pure loss of a different resource (water). Importantly, we demonstrate that non-abundance cues reduced pure loss of resources because participants decreased the amount of resources acquired, not because they increased the amount of resources consumed. Thus, the use of the non-abundance cue overcomes convenience seeking and over-acquisition. In the next experiment, we

examine whether non-abundance cues can also reduce inefficiency in usage, the other instantiation of waste in consumption.

2.4 EXPERIMENT 2: RESOURCE CUES AND INEFFICIENCY IN USAGE

The objective of Experiment 2 is to provide further support for our main thesis that cues suggesting non-abundance of a resource can temporarily prompt conservation behaviors and reduce waste in subsequent consumption. More specifically, in this experiment we examine whether a cue of non-abundance impacts usage efficiency.

2.4.1 Method

Participants. Ninety-five college students from a northeastern university took part in two supposedly unrelated studies in exchange for extra course credit.

Procedure. Participants were told that they would take part in two unrelated studies. The first study was a drink sampling task, which randomly assigned participants to one of two conditions: abundance or non-abundance. In both conditions, participants were asked to sample and evaluate a new type of flavored Vitamin water. After being seated in isolated cubicles, participants were asked to wait for the sample. The experimenter went to each subject's cubicle with an unopened full bottle of the drink and a sampling cup and poured about 10 milliliters of the drink into the cup. In the non-abundance condition, the experimenter took the drink bottle away leaving only the sampling cup on the participants' desk. In the abundance condition, after pouring, the experimenter left both the sampling cup and the full bottle on the participants'

desk³. Participants were asked to evaluate the drink on a 7-point scale (1 = “I did not like the taste”, 7 = “I like the taste”). In a third control condition, participants did not sample the drink but responded to unrelated filler questions that took the same amount of time as the sampling task.

Next, all participants proceeded to a “wrapping box” task. Participants were told that the researchers were interested in how people wrap packages. Each participant was provided with a parcel box with dimensions of 11-5/16" x 8-3/4" x 2-1/2", a roll of wrapping paper (width = 17.5") of approximately equal length, a pop-up tape strip dispenser and scissors. The width of the paper was selected so that it was wide enough to cover the box from any starting point (length or breadth). Therefore, length of paper used is a good measure of the efficiency of resource usage. After finishing wrapping the box, participants in the abundance and non-abundance conditions indicated their purchase intentions for the drink sampled in the first study on a 7-point scale (1 = “I would not buy the drink”, 7 = “I would buy the drink”). Finally, all participants were quizzed about the purpose of the study. No one correctly guessed the objective.

Measures. The length of paper that participants used to wrap the box served as our main dependent variable. The length of the paper rolls was measured before and right after each lab session. As the dimension of the parcel box was the same for each participant, relatively speaking, more wrapping paper used is an indicator of more inefficiency and waste of resources.

2.4.2 Results and Discussion

³ None of the participants drank from the bottle directly. Several of them asked whether they can take the drink with them in the abundance condition, and the experimenter allowed them to do so.

Length of Wrapping Paper Used. One participant who took more than three standard deviations from the mean was excluded from the analysis, leaving a total of ninety-four usable subjects. Across all conditions, participants on average used 28.02" of wrapping paper. We hypothesize that cueing non-abundance in a prior task can subsequently increase the efficiency in usage and reduce wastage on an unrelated resource. As expected, we found a significant effect of resource cue on the amount of paper acquired ($F(2, 91) = 3.71, p < .05$; see Figure 3). In the non-abundance condition, participants took significantly less wrapping paper after the drink bottle was taken away in the prior sampling task than participants in the abundance condition where the bottle was left on their desk ($M_{\text{abundance cue}} = 28.65''$ vs. $M_{\text{non-abundance cue}} = 26.82''$; $F(1, 92) = 5.62, p < .05$). As compared to the non-abundance condition, participants in the control condition where there was no sampling task, also significantly utilized more resources ($M_{\text{control}} = 28.63''$; $F(1, 92) = 5.50, p < .05$). No significant difference was found between the abundance and control conditions. ($F(1, 92) = .001, p = .97$).

Drink Evaluations. It could be argued that the difference in wrapping paper usage amount was driven by attitudes towards the drink rather than the abundance manipulation. To rule out this alternative explanation, we examine the evaluations of the drink. Participants in the control condition were not included in this analyses as they did not complete the sampling task. Two separate ANOVA's (resource cue: abundance, non-abundance) reveal no significant difference in evaluation of the taste of drink and purchase intention. Participants in both conditions perceived the drink as equally tasty ($M_{\text{abundance cue}} = 4.77$ vs. $M_{\text{non-abundance cue}} = 4.78$; $F(1, 61) = .00, p = .98$), and had similar purchase intentions ($M_{\text{abundance cue}} = 4.29$ vs. $M_{\text{non-abundance cue}} = 3.91$; $F(1, 61) = .49, p = .49$).

[Insert Figure 3 about here]

The results of Experiment 2 support our key prediction that cueing non-abundance vs. abundance of a resource (in this case, flavored water) can temporarily prompt conservation behaviors and curb waste in subsequent unrelated consumption domains (in this case, reducing the inefficiency in usage of wrapping paper). It is important to note that the lack of difference between the abundance and control conditions may signify that by default, participants in our participation pool perceive resources as abundant rather than non-abundant.

A question that naturally arises from this perspective is that if consumers generally perceive resources as abundant, what is the practical importance of studying the impact of resource cues on conservation? While by default consumers might perceive resource as abundant, we argue (and show) that there are subtle naturally occurring environmental and contextual cues that can automatically activate the tendency to conserve and curb waste in consumption.

In the next experiment, we extend the findings from Experiments 1 and 2 in two ways. First, in the first two experiments, abundance was manipulated by altering the real amount of resource availability. In Experiment 3, perception of abundance is manipulated rather than actual abundance.

Furthermore, in Experiments 1 and 2, convenience seeking conflicts with conservation because it is inconvenient to acquire or consume fewer resources than necessary. In Experiment 3, convenience conflicts with conservation in a different manner. It requires participants to take an extra action to stop acquiring resources when they no longer need them. More specifically, we

measure the percentage of participants leaving an empty room leaving lights on vs. turning off lights.

2.5 EXPERIMENT 3: PERCEIVED ABUNDANCE VS. NON-ABUNDANCE

The main objective of Experiment is to test whether the perception of abundance vs. non-abundance is sufficient to prompt conservation in subsequent consumption. Specifically, we provided participants the same amount of resource in either a large or a small container. We predict that providing the resource in a large vs. small container would lead participants to perceive the resource as less abundant and thus generate conservation actions in a later unrelated context. The key dependent variable is whether participants shut the light off when leaving an empty room. Note that in this consumption context, each additional unit of acquisition after participants leaving the room results into pure loss of energy, as participants no longer consume it.

2.5.1 Method

Participants. Eighty-six participants recruited from two large research participant pools at a northwestern university participated in a short product evaluation study for either \$2 or extra course credit, in addition to the chance to win a \$20 lottery drawing.

Procedure. Participants signed up for a short product evaluation study where they were required to evaluate the quality of a new brand of cooking oil. The experimental sessions were held individually: each session lasted about 5 minutes with a break of 10 minutes between

sessions. Participants were randomly assigned to either the abundance or non-abundance condition. In both conditions, participants were provided with the same amount of cooking oil, that is, 1/3 cup. Whereas in the non-abundance condition 1/3 cup of cooking oil was provided in a large 4-cup measuring cup, in the abundance condition, the same amount of oil was provided in a small 1-cup measuring cup. Participants were asked to rate the color, texture and smell of the cooking oil on a 7-point scale anchored by “dislike- like”. At the end of the survey, they were asked to indicate whether they had enough cooking oil to make a judgment (1 = “It was not enough”, 7 = “It was enough”).

After completing the oil evaluation task, participants were asked to go to the adjacent room (located on the right) to enter into a drawing for \$20. As there was only one participant per session, the experimenter walked each of them individually to the next room, which was always empty with the door closed. . The experimenter first unlocked the door by entering a code. The experimenter did not enter the room but indicated to the participants that the light switch was on the wall near the door and the instruction sheet for the lottery drawing was on the computer desk. The experimenter then left leaving the participant alone in the room. Participants had to switch on the lights themselves in order to read the instruction sheet. The drawing required participants to pick a number from 1 to 1000 and write it on the instruction sheet. Participants were told that the number closest to the drawn number would win the \$ 20 lottery. After deciding on the number, participants were instructed to place the instruction sheet with the number into the envelope provided, leave the envelope on the desk, and close the door when they left the room.

Measures. The dependent measure was whether the participant switched the lights off when leaving the room.

2.5.2 Results and Discussion

Manipulation Check. To test whether providing the same amount of resource (1/3 cup of cooking oil) in a large vs. small measuring cup indeed changed participants' perception of resource abundance, we compared participants' responses to the question whether they had enough cooking oil to make a judgment across the two experimental conditions. One participant didn't respond to this question, leaving a total of eighty-five usable participants. We found a significant effect of container size ($F(1, 83) = 7.42, p < .01$). Participants perceived the same amount of cooking oil as less abundant when it was provided in the large measuring cup as compared to the small measuring cup ($M_{\text{large measuring cup}} = 5.86$ vs. $M_{\text{small measuring cup}} = 6.63$). Nevertheless, in both conditions, participants indicated that the amount of oil provided was sufficient to make a judgment (t-tests against the scale midpoint 4: p 's $< .001$). There was no significant difference in participants' evaluation of the color, texture or smell of the cooking oil (all p 's $> .20$).

Percentage Turning Lights Off. Our main prediction is that non-abundance cues prompt the tendency to conserve and therefore will increase the propensity to switch the lights off. As expected, there was a significant effect of abundance cue on the percentage of participants turning lights off ($\chi^2(1) = 4.01, p < .05$; see Figure 4). In the abundance condition, only 47.7% switched the lights off whereas in the non-abundance condition, 69.0% switched the lights off.

[Insert Figure 4 about here]

The results of experiment 3 demonstrate that the perception of abundance vs. non-abundance is sufficient to prompt conservation in subsequent consumption. Further, when the cooking oil was provided in the bigger vs. smaller cup, participants still indicated that they had sufficient amount of resources. These findings suggest the deviation from abundance (i.e., non-abundance, denoting the sufficient but non-excessive supply of resources) rather than scarcity (i.e., denoting insufficient supply) is adequate to prompt conservation behaviors (in this case, taking an extra action to turn off lights when leaving a room).

In three experiments we have demonstrated the proposed phenomenon that cues indicating non-abundance of a resource can prompt conservation behaviors in subsequent consumption, even when different types of resources are utilized. We show that non-abundance cues lead to both reduction in losses and more efficiency in usage. We also find that this proposed effect occurs even when non-abundance is perceived rather than real. In the next two experiments we test the underlying mechanisms that are responsible for the observed effect. Experiment 4 examines whether cues indicating non-abundance regarding one particular resource can reduce the cognitive accessibility of the general construct of abundance. Finally, in Experiment 5 we study whether giving people a chance to conserve attenuate the effect of non-abundance cues on conservation. We also test against various activation processes underlying the focal phenomenon, including the motivation-based goal activation account and other semantic-based activation accounts.

2.6 EXPERIMENT 4: RESOURCE CUES AND GENERAL PERCEPTION OF ABUNDANCE

Experiment 4 tests whether cues indicating non-abundance vs. abundance of a particular resource in a prior unrelated task can reduce the accessibility of cognitive representation of the general construct of abundance. We first exposed participants to either non-abundance or abundance cues in a sampling task. We then measured the accessibility of cognitive representations of the notion of abundance employing a lexical decision task that requires participants to determine whether certain letter strings are words or not (Bargh and Chartrand 2000; Fazio 1990; Laran and Janiszewski 2009). If cueing is successful, we expect that participants who are exposed to the non-abundance cue will respond slower to abundance-related words than participants initially exposed to the abundance cue.

2.6. 1 Method

Participants. Thirty-one participants took part in two supposedly unrelated studies in exchange for extra course credit.

Procedure. The first task was a drink sampling task, which randomly assigned participants to either the abundance or non-abundance condition. The procedures were similar to those used in the Experiment 2. In both conditions, participants were asked to sample and evaluate a new drink. The experimenter went to each subject's cubicle with a full bottle of the drink and a sampling cup and poured about 10 milliliter of drink into the cup. In the abundance condition, the experimenter left both the sampling cup and the bottle on participant's desk while in the non-abundance condition, the experimenter took away the bottle.

After evaluating the drink, all participants completed an ostensibly unrelated lexical decision task on a computer. Participants were told that the purpose of the study was to test their attentional capability in a task involving how quickly they could identify whether certain letter strings are words

or non-words. Participants were told to look at the middle of the computer screen, where they would see letter strings that were either words (e.g., ORANGE) or non-words (e.g., HPPLE). Their task was to, as quickly and as accurately as possible, press “1” if the letter string was a word or “0” if the letter string was not a word. Participants first completed a trial run consisting of 10 word and non-word letter strings; then proceeded to the main task where three types of letter strings were presented one at a time, including 10 abundance-related words (e.g., ABUNDANCE, EXCESSIVE), 10 neutral words unrelated to abundance (e.g., FOOTNOTE, MESSAGE), and 30 non-words (e.g., SUBSKRIBE, BAFTERY). The dependent measure was the latency for recognition of each word.

2.6. 2 Results and Discussion

After removing all incorrect answers, we performed a natural log transformation of response times for words correctly identified. Times that exceeded three standard deviations from their cell mean were eliminated from the analysis (Bargh and Chartrand 2000; Fazio 1990; Laran and Janiszewski 2009). We then averaged the response times to generate one score for the abundance and neutral words for each participant.

A 2 (Resource cue: abundance vs. non-abundance, between-subjects) X 2 (Word type: abundance words vs. neutral words, within-subjects) ANOVA revealed a significant two-way interaction of resource cue and word type ($F(1, 29) = 6.26, p < .05$; see Figure 5). As predicted, participants in the non-abundance condition (where the drink bottle was taken away in the sampling task) were significantly slower to respond to the abundance-related words than participants in the abundance condition where the drink bottle was left on their desk ($\text{LnMean}_{\text{abundance words, abundance cue}} = 6.55 \text{ ms}$ vs. $\text{LnMean}_{\text{abundance words, non-abundance cue}} = 6.66 \text{ ms}$; $F(1, 29) = 19.87, p < .001$). There was no significant differences in the response times for neutral words across

conditions ($\text{LnMean}_{\text{neutral words, abundance cue}} = 6.53 \text{ ms}$ vs. $\text{LnMean}_{\text{neutral words, non-abundance cue}} = 6.58 \text{ ms}$; $F(1, 29) = .92, p = .35$). These results suggest that using subtle cues to manipulate abundance such as taking away the drink bottle as compared to leaving it on the desk does influence participants' perception of resource abundance. In particular, cuing non-abundance of a resource makes the general construct of abundance less accessible.

[Insert Figure 5 about here]

In the next study, we examine whether the effect of non-abundance cues on conservation exacerbates or attenuates when people get a chance to conserve before taking resources for subsequent consumption. This test not only allows us to identify an important moderator for our finding but also helps test again multiple underlying activation process, such as passive activation of a conservation goal, priming of conservation-related concepts and priming of frugality-related traits (e.g., Chartrand and Bargh 1996; Förster, Liberman and Friedman 2007; Laran and Janiszewski, 2008; Sela and Shiv 2009).

2.7 EXPERIMENT 5: ACTIVATION PROCESS

Experiment 5 examines whether giving participants a chance to conserve (e.g., donating to a conservation charity) before taking resources for subsequent consumption moderates the influence on non-abundance cues on conservation. We predict that the effect of non-abundance cues on conservation will be attenuated when people get a chance to conserve before taking resources. We explain that the conservation tendency activated by non-abundance cues can only

temporarily dominate convenience seeking and other personal motives because the latter factors are more innate and are further highlighted by the abundance of modern societies. If given an opportunity to engage in a conserving behavior after being exposed to non-abundance cues, we anticipate that individuals will return to seeking convenience and satisfying other personal motives in subsequent consumption.

The current study also allows us to discriminate against different theoretical accounts that could be responsible for the effect of non-abundance cues on conservation. Specifically, only the motivational goal-activation account predicts giving people a chance to conserve would attenuate the proposed effect of non-abundance cues on conservation as an unique characteristic about goal activation is that once the activated goal is satisfied, participants will no-longer engage in goal-consistent behaviors (e.g., Förster, Liberman and Friedman 2007; Laran and Janiszewski 2008). However, the non-motivational accounts of priming conservation-related concepts and traits predict the opposite pattern, as engaging in a conservation action would have made conservation-related concepts and traits even more accessible and salient.

2.7.1 Method

Participants. One hundred and eighty-seven undergraduate students took part in several supposedly unrelated studies in exchange for extra course credit.

Procedure. The experiment employed a 2 (Resource cue: abundance vs. non-abundance) x 2 (Charity type: conservation cause vs. non-conservation cause) between-subjects design. Participants were asked to complete several ostensibly separate studies. The first study was a figure drawing task. The procedures were identical to those in Experiment 2. That is, we

provided participants with either a pencil stub (non-abundance condition) or a stack of regular pencils (abundance condition) and asked them to draw a line between four sets of same-shaped, different-sized figures. After completing the figure drawing task, participants were asked to indicate whether the task were easy on a 7-point scale anchored by “very easy-very difficult”.

Next, participants were told that before moving to the next study, the experimenters wanted their vote on which charity to donate to. More specifically, they were told that one of the experimenters’ colleagues at a southwestern University was planning to donate money to two charities and that \$1 would be donated for each participant⁴. Half participants were asked to choose between two environmental charities that primarily focused on conservation issues, that is, “Conservation International” and “Conservation Fund”. They were given the following descriptions, “Conservation International is committed to helping societies adopt a more sustainable approach to development- one that considers and values nature at every turn” and “Here at the Conservation Fund we’re committed to protecting America’s working landscapes- the forests, farms and ranches that define our horizon- and history.” The other half of the participants were asked to choose between two education charities - “Institute of International Education” and the “The Children’s Scholarship Fund”. The descriptions were “The Institute of International Education is among the world’s largest and most experienced international education and training organizations” and “The Children’s Scholarship Fund gives low-income children four-year partial scholarship to private school”.

After indicating which charity they preferred, all participants moved to a product evaluation task, which asked them to evaluate the color and smell of a new detergent. Participants were given a full bottle of detergent and a clear crystal sampling cup. They were asked to pour some detergent into the cup to make the evaluation. The evaluations were elicited

⁴ We donated a total of \$187 to the charities on behalf of the students who participated in Experiment 4.

using two 7-point scales anchored by “I dislike the color-I like the color” and “I dislike the smell-I like the smell”. Finally, all participants were quizzed about the purpose of the study, which no one correctly guessed.

Measures. The weight of detergent that participants poured into the crystal cup served as our main dependent variable. The weight was determined by taking the difference in cup weight between the before and after measurements. Since the cup was crystal, participants only need a minimal amount in order to make the evaluations. Relatively speaking, the more they poured into the cup, the more inefficient they were in terms of resource utilization.

2.7.2 Results and Discussion

Amount of Detergent Poured. One participant insisted on using his own pen for the figure drawing task while two participants poured the detergent into the cap rather than the crystal cup provided. We excluded these participants from our analyses, leaving a total of one-hundred and eighty-four participants. Across all the four conditions, participants on average poured 28.34 grams of detergent. As the distribution of the amount of detergent poured were highly skewed (skewness statistic = 1.65; SE = .18), we performed a natural log transformation of detergent weights for further analysis.

A 2 (Resource cue: abundance vs. non-abundance) X 2 (Charity type: conservation vs. non-conservation) ANOVA revealed a significant two-way interaction of resource cue and charity type ($F(1, 180) = 3.19, p < .05$) as well as a marginal main effect of charity type ($F(1, 180) = 2.64, p = .11$; see Figure 6). Consistent with our earlier findings, in the education charity condition where participants chose between two educational causes, we replicated the carry-over effect of non-

abundance cues on conservation: that is, participants in the non-abundance condition poured significantly less detergent ($\text{LnMean}_{\text{education charities, non-abundance}} = 2.72$ grams) than those in the abundance condition ($\text{LnMean}_{\text{education charities, abundance}} = 3.10$ grams; $F(1, 180) = 4.37, p < .05$). As hypothesized, in the environmental charity conditions where participants were given an opportunity to conserve, the impact of non-abundance cues on conservation was attenuated: there was no difference in the amount of detergent poured between the abundance and non-abundance conditions ($\text{LnMean}_{\text{conservation charities, non-abundance}} = 3.20$ grams vs. $\text{LnMean}_{\text{conservation charities, abundance}} = 3.05$ grams; $F(1, 180) = .68, p = .41$).

[Insert Figure 6 about here]

Evaluations. As before, there were no significant differences in participants' rating of the difficulty of the figure drawing task. No matter whether they used a pencil stub or a regular pencil to draw the lines, participants indicated the task as equally easy ($M_{\text{abundance cue}} = 1.61$ vs. $M_{\text{non-abundance cue}} = 1.44$; $F(1, 181) = 2.07, p = .15$). Additionally, there was no significant interaction of resource cue * Charity type on participants' evaluation of the color and smell of the detergent (p 's $> .72$).

In addition to identifying an important moderator for our findings showing that giving participants a chance to conserve before taking resources attenuates the proposed effect of non-abundance cues on conservation, Experiment 5 allows us to test against multiple underlying mechanisms, including the motivation goal activation account and the non-motivational accounts of conceptual priming and trait priming.

As discussed earlier, the goal activation account predicts that giving participants a chance to conserve (e.g., choosing which of two environmental charities to donate to) would attenuate the influence of non-abundance cues on conservation, as once the activated goal is satisfied, participants will no-longer engage in goal-consistent behaviors. However, both the conceptual priming and trait priming accounts would not predict the observed attenuation, as choosing which of two environmental charities to donate to would have made conservation-related concepts and traits even more accessible and salient. The findings of experiments provide empirical evidence that the underlying mechanism responsible for the observed effect is motivational, rather than priming of conservation-related concepts or frugality-related traits.

The results of Experiment 5 also help rule out the alternative explanation of demand effect arguing that the differences found in subsequent consumption in our previous studies are simply driven by the fact that non-abundance cues presented in the prior task made participants to believe that the experimenter have only limited resources for running studies and they should therefore take less of the experimenter's resource in the following consumption task. However, this explanation cannot explain the interaction of resource cue and charity type. As the simple action of choosing between two environmental vs. education charities should not change participants' judgment about how many resources the experimenter has and therefore, we should have observed that in the education charity conditions, participants also poured less detergent out after being provided with a pencil stub rather than a stack of pencils in the figure drawing task. Additionally, one could argue non-abundances cues presented in the prior unrelated task can activate certain social norm such as taking only limited amount of resource in the laboratory. Again, this social-norm based explanation predicts that we would observe the same carry-over

effect in the education charity and environmental charity conditions, which is inconsistent with the interaction pattern found in Experiment 5.

2.8 DISCUSSION

Our objective was to investigate the impact of resource abundance, a crucial factor in determining resource utilization, on conservation and waste in consumption. While resource abundance allows people to acquire more resources than necessary in consumption; perceiving resources as limited prompts conservation behavior. We build upon prior findings that show environmental cues in a prior unrelated context can influence subsequent decision-making. We propose that cues indicating non-abundance vs. abundance of a particular resource can decrease cognitive accessibility of the broad construct of abundance and activate a general tendency to conserve. This, in turn, can persist into subsequent consumption and reduce waste even when different resources are utilized. In five experiments, we find support for the proposed effects and the theoretical underpinnings. We demonstrate the proposed carry-over effects of non-abundance cues on conservation across different scenarios including reducing pure loss of resources and inefficiency in usage, across different resource domains such as paper, water and energy, and through different types of manipulations such as varying actual or perceived amount of resources provided.

The first two experiments were designed to demonstrate the proposed phenomenon for both instantiations of waste in consumption. Experiment 1 shows that non-abundance cues presented in an irrelevant prior task can reduce pure loss of an unrelated resource: those participants previously exposed to a pencil stub rather than a stack of pencils subsequently took

and wasted relatively less water in a following snack sampling study. Experiment 2 extends the impact of non-abundance vs. abundance cues to another instantiation of waste in consumption, inefficiency in usage. The results show that simply taking away or leaving a drink bottle on participant's desk in a drink sampling reduced the amount of wrapping paper participants used in a later wrapping box task.

Experiment 3 extends findings from the first two studies by showing that perceived non-abundance is sufficient to prompt conservation behaviors across resource domains. We find that providing the same amount of resources (1/3 cup of cooking oil) in a large vs. small cup was sufficient to change the perception of abundance and led people to subsequently take a proactive action to conserve energy (turning lights off when leaving an empty room).

In the last two experiments, we test the underlying mechanisms that are responsible for the proposed behavioral effect. Experiment 4 shows that cues indicating non-abundance regarding one particular resource can reduce the cognitive accessibility of the general construct of abundance. After being exposed to a non-abundance cue vs. an abundance cue in a prior sampling task, participants reacted to abundance-related words slower while their reaction time to neutral words didn't differ. Finally, in Experiment 5 we study whether giving people a chance to conserve attenuates the effect of non-abundance cues on conservation. We find that allocating \$1 donation between two conservation charities (i.e., having a chance to conserve before consumption) attenuates the impact of non-abundance cues on conservation whereas allocating \$1 donation between two education charities (i.e., engaging in similar actions unrelated to conservation) do not attenuate the effect. These results demonstrate that the underlying mechanism is motivational rather than priming of conservation-related concepts or frugality-related traits.

This essay offers several theoretical contributions. While extant consumer behavior literature has primarily focused on consumption, our theoretical approach also incorporates resource acquisition – which is crucial to understanding wasting behavior. We conceptualize waste in consumption as the difference between resources acquired and required, and classify it further into pure loss of resources (the difference between resources acquired and consumed) and inefficiency in usage (the difference between resources consumed and required).

While a rich body of literature has examined the linkage between resource supply and consumption, the level of specificity examined in existing literature is domain specific. For example, researchers have shown that both actual resource supply and contextual cues that bias perceived supply amount can produce significant influences on how much of the same resource people consume (e.g., Cheema and Soman 2008; Folkes, Martin and Gupta 1993; Geier, Rozin and Doros 2006; Wansink 1996; Wansink and van Ittersum 2003). The current research extends existing literature by demonstrating that cues suggesting a lower level of availability of a particular resource not only influence perceptions of the cue-specific resource but also impact the cognitive accessibility of the general notion of abundance and therefore trigger conservation behaviors regarding an unrelated resources.

We find preliminary evidence that participants acquire and waste about the same amount of resources in the abundance and control conditions (Experiment 2). These results suggest that our participants seem to naturally perceive resources as abundance rather than non-abundant, which is consistent with the sociology literature arguing that people in modern and industrialized society have moved away a scarcity mindset and instead take abundance as granted (Côté 1993, 1996; Riesman 1950). Additionally, we find that when we manipulated the perception of abundance vs. non-abundance by providing the same amount of resource in a small vs. big

container, participants indicated that they had enough resources even in the non-abundance condition, which clearly demonstrates that it is the deviation from abundance (sufficient but not excessive supply of resource) rather than scarcity (insufficient supply of resources) that is adequate to activate conservation tendency.

Furthermore, we find that the activation of a conservation goal is only temporary. Once people get a chance to engage in any conserving behavior before acquiring resources for subsequent consumption, conserving resources become less of a local and direct concern and seeking convenience and satisfying other personal motives reemerge as individuals' primary propensity. These results are consistent with recent literature on "green licensing" showing that purchasing green products can produce unintended effects licensing people to act unethically in subsequent tasks (Mazar and Zhong 2010).

Our findings suggest that a very different approach can be used to influence conservation behaviors. Existing literature on conservation-related topics have center attention upon the effectiveness of direct interventions on conservation behaviors, such as providing information, feedbacks and incentives (e.g., Clayton and Myers 2009; Costello, Gaines and Lynham 2008; Goldstein, Cialdini and Griskevicius 2008; Leiserowitz 2006; Nickerson 2003 Nolan et al. 2008). Our approaches can operate at an unconscious level and may be very effective as they are indirect. Participants in our experiments were not aware of the influences of non-abundance cues on their acquisition and consumption behaviors. In all our studies, participants were quizzed about the purpose the experiments at the end of the lab sessions, and none of them correctly guessed our hypotheses.

We all know that it's very difficult to change people's attitude; even if we can successfully do so, these attitudinal changes may not necessary translate into behavioral changes.

For example, Geller (1981) finds that the positive attitudes and behavioral intentions regarding energy conservation reported by attendees of an energy-conservation workshop produced little impact on their actual energy-conservation behaviors at home. In their review of interventions studies aimed at household energy conservation, Abrahamse et al. (2005) conclude that information tends to result in higher knowledge level but not necessarily in energy-savings. In this research, we show that non-abundance cues, on the other hand, can directly change people's conservation behaviors without attempts to convince or persuade them.

Our findings also offer implications for marketing practitioners and employers. From a cost standpoint, costs can be curtailed if employees waste fewer resources and also if customers waste fewer resources that they are not paying for (e.g., condiments, napkins cutlery in fast food restaurants). The finding that non-abundance can be cued in unrelated domains is particularly useful. Thus, managers should consider cueing non-abundance in attributes that are relatively unimportant for consumers or those that do not impact quality perceptions.

The findings open up some future questions for investigation. What type of cues can evoke non-abundance is a natural extension to our research questions. In all our manipulations, the non-abundance cue was embedded in tasks that participants were required to actively engage in. Whether more subtle and irrelevant cues available in the environment can be equally effective is important from a managerial perspective.

In the current research we examined situations where people are not paying for the focal resources. These resemble several common consumption scenarios where cost and price are not involved or salient at the point of consumption. For example, house-hold energy and water bills are often paid monthly rather than daily. Whether non-abundance cues can lead to conservation

where consumers are aware of the costs can also be a fruitful area of inquiry (e.g., lunch buffet, car self-cleaning).

On one hand, price serves as a stimulus to think (Wathieu and Bertini 2007) and deliberation may highlight the unused utility involved in pure loss and inefficiency and thus lead to aversion to waste (Arkes 1996). On the other hand, a small fine can actually decrease the likelihood of people engaging in behaviors that benefit the group or society however hurt personal interests, as the small price provides people an excuse not to engage in such behaviors (Gneezy and Rustichini 1998). So it's possible that a small price may well provide justifications for consumers to take more than necessary as they won't mind paying a small amount of money. Further research is needed to gain insights into how cost interacts with resource abundance and conservation in consumption.

3. THE “DOUBLE-EDGED SWORD” OF SIGNALING EFFECTIVENESS: WHEN SALIENT CUES CURB POST-PURCHASE CONSUMPTION

Marketers often employ cues in advertising or packaging to signal the effectiveness of their products, presumably in the belief that they produce a positive impact on consumer demand. For example, the close-up of a smiling face with great teeth has been widely used in the packaging of teeth whitening products, such as Colgate[®] Visible White Toothpaste and Ionic[®] White Gel. Similarly, the picture of a dead bug is often seen on bottles of Raid[®] Ant and Roach Killer and Lifesystems[®] Expedition Insect Repellent. In a similar vein, phrases that highlight a product's efficacy are extensively included in the labeling of household cleaning brands, such as RESOLVE[®] Spot & Stain Carpet Cleaner, and VANISH[®] Drops-in Blue Toilet Bowl Cleaner.

Prior research suggests that these marketing cues may produce a beneficial effect on consumer preference by enhancing recall of brand names, facilitating retrieval of attribute information, and forming favorable attitudes towards the featured product (e.g., Carpenter, Glazer and Nakamoto 1994; Geath and Heath 1987; Miniard et al. 1991; Mitchell 1986; Unnava and Burnkrant 1991). However, the influence of signaling effectiveness on post-purchase consumption remains an uninvestigated question. For example, imagine you are offered information about a new teeth whitening rinse. In one situation, you are provided with only product descriptions, while in the other situation you are provided with the same descriptions plus the picture of a smiling face with great teeth. Will signaling product effectiveness by adding the picture of the smiling face affect the amount of rinse you consume on a single occasion? If so, will this effect be an increase or a decrease in single-use consumption?

The results of a survey conducted with 60 respondents at a shopping center suggest that people's intuition is that the impact of efficacy cues on consumer preference will translate into higher post-purchase consumption. Specifically, respondents in our survey were asked whether adding the picture of a smiling face with great teeth to product descriptions of a new teeth whitening rinse would (1) not change how much rinse they consume on a single occasion, (2) lead them to use less rinse on a single occasion, or (3) lead them to use more rinse on a single occasion. Of the survey respondents, approximately 1/3 said either no effect (18.3%) or less product usage (16.7%), while about 2/3 (65%) of the respondents indicated that adding the picture of a smiling face with great teeth would lead them to use more rinse on a single occasion.⁵

⁵ This result is consistent with the audience vote when we have presented this research at conferences and in seminars.

However, contrary to this common intuition, we argue that signaling effectiveness is a “double-edged sword”; while effectiveness cues like the picture of a smiling face may increase initial purchase, they can curb post-purchase consumption. Building on research showing that everyday consumption behaviors are largely constructive and guided by simple inferential rules and schema rather than deliberate thoughts and stable preferences (e.g., Bettman, Luce, and Payne 1998; Prelec, Wernerfelt and Zettelmeyer 1997), we propose that consumers often infer product effectiveness from marketing cues that are salient in the consumption context (e.g., pictures and brand names) and then use perceived product effectiveness as a guide for deciding how much they should consume. More specifically, based on literature suggesting that inference making processes often result in the construction of meaning beyond the information explicitly given (Harris 1981), we predict that the addition of a salient cue that highlights the effectiveness of the featured product will lead consumers to perceive the product as more effective (even when the actual product effectiveness remains unchanged) and consequently reduce product usage per occasion.

In addition to investigating the impact of signaling effectiveness on post-purchase consumption, our research empirically tests the widely held belief that signaling effectiveness will increase the likelihood of initial purchase (e.g., Dawar and Parker 1994; Milgrom and Roberts 1986). Our results reveal that while reducing product usage, effectiveness cues do not necessarily increase product choice. By drawing attention to the potential effect of signaling effectiveness on reducing long-term product sales, the current research stresses the importance of seeking cues that can stimulate both initial purchase and post-purchase consumption.

The remainder of the essay is organized as follows. We first review the relevant literature and the basis for our predictions about the impact of effectiveness cues on post-purchase

consumption and the moderating roles of cue salience and individual's need for cognition. Next, we report a series of studies that provide support for the proposed effects and test the underlying mechanisms. We conclude with theoretical and practical implications of the findings.

3.1 CONCEPTUAL BACKGROUND

Research in judgment and decision making consistently demonstrates that due to limited processing capacity, consumers are frequently uncertain about their own preferences and the value of product offerings (e.g., Bettman, Luce, and Payne 1998; Slovic 1995), and that they often make inferences and construct meanings based on information available in the local decision context (Kardes, Posavac and Cronley 2004). Further, consumers infer their own preferences from choice sets that carry information about other consumer's preferences (Prelec, Wernerfelt and Zettelmeyer 1997) and product lines that reveal payoff-relevant information (Kamenica 2008). Consumers have also been found to infer the value of unfamiliar products in a bundle based on the value of familiar items (Leszczyc, Pracejus and Shen 2007) and to infer the importance of product offerings simply by relying on whether they are offered both individually and in bundles (Hamilton and Koukova 2008).

Given the crucial role consumption plays in the economy and its impact on the natural environment, researchers have begun to examine the role of inference making in the domain of consumption. In particular, researchers have focused on investigating how inferences about supply influence the amount a consumer will use on a single occasion. For example, Wansink (1996) reports that large package size accelerated usage volume because they were inferred as having lower unit cost, and Wansink and van Ittersum (2003) find that the elongation of a glass

reduced pouring and consumption volume because people infer that the elongated glass has increased capacity. Additionally, smaller serving sizes have been shown to activate inferences about consumption norms and in turn regulate consumption of candies (Geier, Rozin and Doros 2006), chocolate and lottery tickets (Cheema and Soman 2008). Further evidence suggests that the effect of smaller sized food on self-regulation reverses for restrained eaters (Scott, Nowlis, Mandel, and Morales 2008) and when self-regulation concerns are activated (Coelho do Vale, Pieters, and Zeelenberg 2008).

In spite of the growing literature on the effects of supply on product usage, judgment about product effectiveness, arguably “the most important influence on usage” (Folkes, Martin and Gupta 1993, p467), has been largely neglected. Since marketing cues such as pictures and brand names that are salient in consumption contexts can simply suggest effectiveness of the featured products without actually changing product ingredients (e.g., adding the picture of a smiling face with great teeth to a whitening product’s packaging), it is important to understand the interplay between salient cues, perceived product effectiveness, and product usage.

In the present research, we explore the impact of efficacy cues on post-purchase consumption. Building on those prior findings suggesting that consumption behaviors are often constructive and subject to influences of immediate contextual cues, we argue that consumers are often uncertain about how much to consume and that they infer usage amount based on cues that are salient in the consumption context. That is, consumers infer product effectiveness from salient marketing cues and then use inferred product effectiveness as an indicator for how much they should consume. Because inference making often leads to extra meaning than what is explicitly provided in the decision context (e.g., Dick, Chakravarti and Biehal 1990; Kardes, Posavac and Cronley 2004), we theorize that while actual product effectiveness remains

constant, the addition of a marketing cue highlighting that the product is effective (e.g., using a brand name that brings to light the sought-after end state) will enhance consumers' perception about the product's effectiveness. Since a more effective product should require a smaller amount to accomplish the same objective, we propose that effectiveness cues will reduce usage amount.

Broniarczyk and Alba (1994) find that inference making is often based on consumers' intuitive beliefs, while Feldman and Lynch (1998) argue that information will serve as a basis for inferences only when it is accessible (). If the influence of effectiveness cues on consumption arises mainly from inference making, then consumers should be less susceptible to the influences of effectiveness cues that are not salient in the consumption context. For example, whereas pictures and brand names on packaging are very likely to draw consumers' attention, verbal descriptions of effectiveness such as "in a highly effective waterproof formulation" or "clinically proven to be effective for fast teeth whitening" are less likely to be noticed and therefore should be less likely to serve as the basis for inferring product effectiveness. Therefore, we argue that the influence of effectiveness cues on usage will be attenuated when cue salience is low (e.g., verbal descriptions printed in plain rather than bold font on packaging).

Additionally, previous research suggests that people are less likely to rely on information to make inferences when they perceive the given information as non-diagnostic (Feldman and Lynch 1998). Cues such as pictures and brand names are often non-diagnostic efficacy signals that are not reliable predictors of actual product effectiveness. For example, imagine two identical product descriptions differentiated by one factor – one of the items in the product description is in bold text. Obviously, a line of bolded text in a product description is not a diagnostic indicator of product effectiveness. This is an important distinction because individuals

who react to marketing signals only when these signals reflect actual product effectiveness should be less susceptible to the influence of non-diagnostic effectiveness cues. Inman, McAlister, and Hoyer (1990) report that low need for cognition individuals react to the simple presence of a promotion signal without considering relative price information, while high need for cognition individuals react to a promotion signal only when it is accompanied by a substantive price cut. Analogously, we predict that high need for cognition individuals are less likely to be influenced by the inferential effect of non-diagnostic effectiveness cues.

To summarize, we propose that cues such as pictures and brand names can serve as inferential cues to guide consumption decisions and that their impact on product usage is mediated by perceived effectiveness of the featured products. In particular, we predict that marketing cues that increase perceived product effectiveness will reduce usage amount per occasion, and that this usage reduction effect is moderated by cue salience and individuals' need for cognition. Furthermore, our research provides an empirical investigation of the influence of effectiveness marketing cues on initial purchase to paint a more comprehensive picture of the “double-edged sword” of signaling effectiveness.

3.2 PILOT STUDIES

To provide initial support for our proposed theoretical underpinnings, we conducted two pilot studies to examine whether salient cues could indeed change (1) the perceived effectiveness of the featured product and (2) the estimated usage amount on a single occasion. Fifty undergraduate students recruited at a western university were randomly assigned to one of two conditions: a no-picture condition or a picture condition. In the no-picture condition, the

information contained six product descriptions about a new teeth whitening rinse, while in the picture condition, the information provided to participants included the picture of a smiling face with great teeth in addition to the product description (see Appendix A1-A2).

Participants were asked to rate the featured rinse on four 7-point scales anchored by “very ineffective- very effective”, “very diluted- very concentrated”, “much less effective than the average- much more effective than the average”, and “much less concentrated than the average- much more concentrated than the average” respectively (Boulding and Kirmani 1993). The four measures displayed a high degree of reliability ($\alpha = .89$) and were used to form a single measure of perceived effectiveness. The results indicated that simply adding the picture of the smiling face significantly increased perceived effectiveness of the featured new whitening rinse ($M_{\text{picture}} = 4.35$ vs. $M_{\text{no-picture}} = 3.29$, $F(1, 48) = 20.54$, $p < .001$).

Forty students from the same population participated in the second pilot study. Similar to the first pilot, participants were randomly assigned to the picture or no-picture condition. However, instead of judging product effectiveness, they estimated how much rinse they would use on a single occasion. Specifically, they indicated how much rinse they would pour into a cup drawn to scale by counting the lines from the bottom of the cup. We found that participants in the picture condition indicated that they would fill the cup to significantly fewer lines than those in the no- picture condition ($M_{\text{picture}} = 2.45$ vs. $M_{\text{no-picture}} = 4.25$, $F(1, 38) = 5.38$, $p < .05$). That is, adding the picture of a smiling face reduced the indicated consumption volume of the featured new teeth whitening rinse by 42.3%.

The results of the two pilot studies offer initial empirical support for our theorization that consumers infer product effectiveness from marketing cues that are salient in the consumption context and that perceived product effectiveness in turn produces a systematic effect on

consumption. Next, in a series of four experiments, we examine the influence of effectiveness cues on product usage (Studies 1A and 2A) as well as product choice (Studies 1B and 2B). We subsequently present two additional experiments demonstrating that the inferential influence of effectiveness cues on product usage is attenuated when cues are not salient (Study 3) and when individuals are characterized by high (vs. low) need for cognition.

3.3 STUDY 1A: PICTURES AND USAGE

The objective of Study 1A is to provide support for our main thesis that salient effectiveness cues can reduce post-purchase consumption and that the impact of such cues on usage is mediated by perceived product effectiveness. To do so, we examine whether augmenting product descriptions with pictures producing varying effectiveness perceptions influences usage amount. Since consumers may have well-defined usage patterns with familiar products resulting from prior use and other factors extraneous to our research, we selected the product category of herbal insect repellent, which is a new product to the population we sample. We selected three different pictures found in actual packaging of existing insect repellents to create product information for a new herbal insect repellent. We predict that adding cues that enhance inferences of product effectiveness will lead participants to use less of the featured product. In contrast, for cues that generate inferences of lower effectiveness or cues that do not directly influence perceived effectiveness, we expect an increase or no difference, respectively, in product usage.

3.3.1 Method

Participants and Procedure. Two hundred respondents approached at various locations on a mid-Atlantic university campus completed a short study. Participants were randomly assigned to one of the four experimental conditions. In the no-picture condition, respondents viewed six product descriptions for a new herbal insect repellent (Appendix B1). In each of the other three conditions, the information provided for the repellent also contained an additional picture found in actual insect repellent marketing: a crossed-out bug, a live bug or a plant (Appendix B2-B4). A picture of a crossed-out bug was selected because it highlights the effectiveness of the product, whereas a picture of a bug running free was selected because we felt it would lead to thoughts of the product being ineffective. We also selected a picture of a yellow plant because it is not directly related to insect repellent effectiveness. After viewing the product information, respondents were asked to first judge the effectiveness of the featured insect repellent and then indicate how much they would use for a single consumption occasion.

Measures. To measure perceived effectiveness, respondents were asked to indicate how long (in hours) they thought the new herbal insect repellent would provide protection from biting insects. To measure usage amount, we asked respondents to indicate how much repellent they would spray before leaving home for an outdoor picnic on a summer afternoon. Specifically, they were asked to indicate how many seconds they would hold down the button on a 30-ml bottle (drawn to actual size). One respondent indicated he would hold down the spray button for zero seconds and was excluded from the analysis, leaving a total of one hundred and ninety-nine respondents.

3.3.2 Results and Discussion

Perceived product effectiveness. To test whether the addition of different pictures influenced effectiveness perception, we conducted an ANOVA (effectiveness cue: crossed-out bug picture, live-bug picture, plant picture vs. no picture) on how long participants thought the new herbal insect repellent would provide protection. We found a significant effect of effectiveness cue on protection hours ($F(3, 195) = 36.16, p < .001$; see Figure 7). Planned contrasts reveals that, as expected, participants in the crossed-out bug condition indicated longer protection time than participants in the no-picture condition ($M_{\text{crossed-out bug}} = 6.32$ hours vs. $M_{\text{no-picture}} = 4.16$ hours; $F(1, 195) = 42.26, p < .001$), whereas participants in the live-bug condition indicated shorter protection time than those in the no-picture condition ($M_{\text{live-bug}} = 2.92$ hours; $F(1, 195) = 13.79, p < .001$). There was no significant difference between the plant-picture condition and no-picture condition. ($M_{\text{plant}} = 4.10$ hours; $F(1, 195) = .03, p = .86$).

Product Usage. To test whether the addition of different pictures influenced product usage, we conducted a second ANOVA on how much repellent participants would spray before leaving home for an outdoor picnic, which reveals a significant effect of effectiveness cue on spray time ($F(3, 195) = 10.06, p < .001$; see Figure 7). Consistent with our predictions, participants in the crossed-out bug condition indicated they would hold the spray button for a shorter time than participants in the no-picture condition ($M_{\text{crossed-out bug}} = 17.91$ seconds vs. $M_{\text{no-picture}} = 24.12$ seconds; $F(1, 195) = 6.37, p < .01$). Participants in the live-bug condition indicated longer spray time than those in the no-picture condition ($M_{\text{live-bug}} = 31.47$ seconds; $F(1, 195) = 8.84, p < .01$). No significant difference was found between the plant-picture and no-picture conditions. ($M_{\text{plant}} = 24.92$ seconds; $F(1, 195) = .11, p = .74$).

[Insert Figure 7 about here]

Mediation Analysis. We test for the mediating effect of perceived product effectiveness on product usage using the three criteria for a mediation model (Baron and Kenny 1986). First, the independent variable, effectiveness cue, had a significant effect on the perceived effectiveness of how long the repellent would provide protection ($\beta = .89$, S.E. = .16, $p < .001$). Second, effectiveness cue significantly influenced how long participants indicated they would spray the repellent ($\beta = -2.39$, S.E. = 1.11, $p < .05$). Further, when we regressed the dependent variable of spray time on both effectiveness cue and protection time, the effectiveness cue coefficient became non-significant ($\beta = -1.51$, S.E. = 1.18, $p = .2$), while the effect of protection hours remained significant ($\beta = -.99$, S.E. = .48, $p < .05$). Finally, we tested the overall significance of the indirect effect (i.e., the path through the mediator) by constructing a 95% confidence interval as recommended by Shrout and Bolger (2002). Specifically, Shrout and Bolger (2002) suggest that if zero falls outside the 95% confidence interval, the indirect effect is significant, and, thus, successful mediation can be said to be present (for SPSS code, see Preacher and Hayes 2004). The results indicate a confidence interval ranging from -1.46 to -.13, confirming the mediating role of protection time in the relationship between effectiveness cue and spray time. These findings support our thesis that consumers infer effectiveness of the featured products from salient cues, and the perceived product effectiveness consequently serves as an indicator for determining how much to use in a given consumption context.

The results of Study 1A provide direct empirical evidence that signaling effectiveness using marketing cues can reduce post-purchase consumption. We find support for our proposed inference making account by showing that the impact of salient cues on usage is mediated by effectiveness perceptions. Further, the results of Study 1A also rule out an alternative explanation

based on information format or information amount. That is, one might argue that the difference in product usage found in the pilot study is simply driven by the difference in information, because the picture condition contained visual information in addition to verbal information. We rule out these information-based alternative explanations by demonstrating variation across the three pictures conditions that contain the same format and amount of information but differ in their inferences of effectiveness.

3.4 STUDY 1B: PICTURES AND PURCHASE

The objective of Study 1B is to examine the impact on product choice of the addition of pictures that produce varying effectiveness perceptions. The stimuli used in Study 1B were similar to those in Study 1A. Specifically, Study 1B presented participants with information about all of the four insect repellents and asked them to indicate which one they would choose. We employed this within-subject design to emulate everyday purchase decision-making scenarios in which consumers are faced with different products in the same category with very slight product variations.

3.4.1 Method

Participants and Procedure. One hundred and forty-one undergraduate students completed Study 1B as part of a short lab session in exchange for extra credit. Participants were presented with one purchase decision and were asked to consider the products provided and then make a choice. Specifically, they were told to imagine that they are buying an insect repellent and that they were considering information about four new products. Whereas the information

provided for one repellent included only six verbal descriptions (the descriptions were identical those in the no-picture condition of Study 1A; see Appendix B1), the information provided for the other three repellents included an additional picture of a crossed-out bug, a live bug, and a plant respectively (the pictures were also identical to those used in Study 1A; see Appendix B2-B4). The presentation order of the repellents was counterbalanced. After viewing information about the four repellents, participants indicated which of the four insect repellents they would choose.

3.4.2 Results and Discussion

Product Choice. A significant one-sample Chi-square test reveals that the choice shares vary across the four brands of insect repellent ($\chi^2 [3] = 101.75, p < .001$). Specifically, the choice share pattern was consistent with the widely believed beneficial impact of signaling effectiveness on initial purchase. While 56.0% of participants indicated that they would choose the repellent with a cue that signals product efficacy (i.e., the picture of a crossed-out bug), only 1.4% of participants indicated they would choose the repellent with identical product descriptions but featuring a cue associated with lower effectiveness judgment (i.e., the picture of a live bug) and 9.9% of participants indicated that they would choose the repellent featuring just the six verbal descriptions. The remaining 32.6% of the participants indicated they would choose the repellent with a cue that is not directly associated with effectiveness (i.e., a plant).

Taken together, Studies 1A and 1B suggest that signaling effectiveness is a “double-edged sword”. The effectiveness cues produced a positive influence on product choice as commonly believed, but they also generated an unintended reduction in post-purchase

consumption. In other words, although utilizing cues that increase perceived effectiveness may lead to an increase in initial sales, this effect may be offset by an increased inter-purchase time due to lower usage amounts per occasion. Consistent with our proposed inference making account, we find that cues resulting in lower product effectiveness judgments can in fact increase product usage as compared to effectiveness cues. Moreover, our findings suggest that employing “neutral” cues that do not directly promote effectiveness (e.g., in the case of repellents, the picture of a plant) may be a viable strategy, as they can secure considerable choice share without sacrificing post-purchase consumption (neutral-plant vs. no picture = 32.6% vs. 9.9%; $z = -4.66$, $p < .01$).

In Studies 2A and 2B, we explore the “double-edged sword” of signaling effectiveness in another marketing domain – branding. Study 2A examines whether brand names can also serve as a cue for signaling product effectiveness and consequently reduce post-purchase consumption. We expect to replicate the same mediation pattern of perceived effectiveness on the relationship between brand names and product usage. Similar to Study 1B, Study 2B examines the impact of effectiveness brand names on product choice.

3.5 EXPERIMENT 2A: Brand Names and Usage

In Study 2A, we utilize brand names, another cue that is often salient in consumption contexts, to manipulate perceived product effectiveness. Specifically, we randomly assigned participants to otherwise identical descriptions of a new toilet bowl cleaner that differed in the brand name, either titled “BalanceClean” or “BalanceGreen”. Since the word “clean” is directly linked to the desirable end state of cleaning products whereas the word “green” is often related to

environmental concerns and associated with less industrial strength and lower concentration (Luchs et al. 2010), we expect that the brand name “BalanceClean” will lead to enhanced effectiveness judgments as compared to the brand name “BalanceGreen” (similar to the crossed-out bug picture versus the live bug picture in Study 1). Due to the proposed mediating effect of perceived product effectiveness, we further predict that the indicated usage amount of the featured new toilet bowl cleaner will be significantly less when it is titled “BalanceClean” versus “BalanceGreen”.

3.5.1 Method

Participants and Procedure. Forty college students completed a short study at a university center. Participants were first asked to review information provided for a new toilet bowl cleaner. They were randomly assigned to one of the two experimental conditions. In both conditions, the product information provided to participants included the same product descriptions (Appendix C1-C2). However, in one condition, the product was called “All new BalanceGreen toilet bowl cleaner” (Appendix C1), while in the other condition, the product was called “All new BalanceClean toilet bowl cleaner” (Appendix C2). After viewing the product information, participants were asked to indicate usage amount and to judge the featured product’s effectiveness. Finally, participants indicated their familiarity with the brand name.

Measures. We used the same scale described in the pilot study (Boulding and Kirmani 1993) to measure perceived effectiveness. To measure consumption, participants were asked to indicate how much toilet bowl cleaner they would use to sanitize their toilet bowl by counting the lines from the bottom of a cup drawn to scale. Familiarity with the brand name was measured

along three 7-point scales, anchored by “not at all familiar- very familiar”, “definitely do not recognize - definitely recognize” and “definitely have not heard of it before- definitely have heard of it before” (Simonin and Ruth 1998).

3.5.2 Results and Discussion

Familiarity with the brand. The three familiarity items were averaged to form a single measure of familiarity with the brand name ($\alpha = .85$; 1=not at all, 7=very). An ANOVA (effectiveness cue: BalanceClean vs. BalanceGreen) reveals no significant difference in familiarity with the two brand names ($M_{\text{BalanceClean}} = 2.18$ vs. $M_{\text{BalanceGreen}} = 2.17$; $F(1, 38) = .29$, $p = .6$).

Perceived product effectiveness. The four effectiveness items were averaged to form a single measure of perceived product effectiveness ($\alpha = .83$). An ANOVA reveals that participants judged the toilet bowl cleaner as more effective when the brand name was “BalanceClean” as compared to “BalanceGreen” ($M_{\text{BalanceClean}} = 3.94$ vs. $M_{\text{BalanceGreen}} = 2.98$; $F(1, 38) = 35.30$, $p < .001$).

Product Usage. To test whether brand name had a significant effect on estimated usage amount, an ANOVA (effectiveness cue: BalanceClean vs. BalanceGreen) on “cup line” was conducted. We found a significant effect of brand name on estimated usage amount. Consistent with our prediction, the indicated usage amount of the featured new toilet bowl cleaner was significantly less when it was titled “BalanceClean” versus “BalanceGreen” ($M_{\text{BalanceClean}} = 6.35$ vs. $M_{\text{BalanceGreen}} = 7.80$; $F(1, 38) = 6.25$, $p < .05$). Thus, “BalanceClean,” the brand name communicating effectiveness, decreased the single-usage amount by almost 20%.

Mediation Analysis. The data also fulfill the criteria for a mediation model (Preacher and Hayes 2004), indicating that the impact of brand name on product usage is mediated by perceived product effectiveness. More specifically, brand name had a significant effect on perceived product effectiveness ($\beta = .96$, S.E. = .16, $p < .001$) and usage amount ($\beta = -1.45$, S.E. = .58, $p < .05$). However, when usage amount was regressed on both brand name and perceived effectiveness, the effect of brand name became insignificant ($\beta = .16$, S.E. = .72, $p = .83$), while the effect of perceived effectiveness remained significant ($\beta = -1.67$, S.E. = .52, $p < .01$). Finally, we tested the overall significance of the indirect effect (i.e., the path through the mediator) by constructing a 95% confidence interval around the indirect effect (Preacher and Hayes 2004; Shrout and Bolger 2002). Results indicated a confidence interval ranging from -2.8 to -0.7. Since zero falls outside of the confidence interval, we conclude that perceived product effectiveness plays a mediating role in the relationship between brand name and product usage.⁶

3.6 EXPERIMENT 2B: BRAND NAMES AND PURCHASE

Study 2B examines the impact on product choice of brand names that generate different effectiveness judgment. The stimuli used in Study 2B were the same as those in Study 2A. Similar to Study 1B, Study 2B used a within-subjects design, simulating a purchase situation and asked participants to indicate which of the two toilet bowl cleaner brands they would choose.

3.6.1 Method

⁶ Note that the brand name “BalanceGreen” might have increased perceived environmental friendliness and therefore increased its usage level. As we did not measure environmental friendliness, we do not know whether this second mediating process also exists.

Participants and Procedure. Forty-six college students approached at a university center completed Study 1B in exchange for a candy bar. Participants were presented with one purchase decision and were asked to evaluate the products provided and then make a choice. Specifically, they were told to imagine that they are buying a toilet bowl cleaner and that they are considering two new products. While one product was called “All new BalanceGreen toilet bowl cleaner”, the other product the product was called “All new BalanceClean toilet bowl cleaner”. The descriptions for the two products were otherwise identical (See Appendix C1-C2). The presentation order of the two brands was counterbalanced. After viewing information about the products, participants indicated which of the two toilet bowl cleaners they would choose.

3.6.2 Results and Discussion

Product Choice. A non-significant one-sample Chi-square test reveals no difference in choice between the two featured brands ($\chi^2 [1] = .00, p=1$). Whereas 50.0% of participants indicated that they would choose the brand that signals effectiveness (i.e., “BalanceClean”), the other half of the participants indicated they would choose the brand that does not signal effectiveness but promotes environmental friendliness (i.e., “BalanceGreen”). This finding suggests that unlike the influence of effectiveness perceptions on product usage observed across our studies, product effectiveness is only one of many possible factors (e.g., environmental friendliness) that may be influential in the domain of product choice.

Together, the results of Studies 2A and 2B suggest that while they consistently reduce product usage, effectiveness cues do not necessarily increase product choice as commonly believed. These findings further stress the fact that signaling effectiveness may hurt long-term

product sales. One limitation is that the previous studies employed a hypothetical consumption estimation scenario in which the featured product was not physically present and consumed. The question arises as to whether the impact of cues on product usage persists in actual consumption. In the next two studies, we examine the effect of effectiveness cues on actual product usage. Further, Studies 3 and 4 discriminate among alternative theoretical accounts and provide boundary conditions for the effect by investigating the moderating roles of cue salience and individuals' need for cognition on the relationship between effectiveness cues and product usage.

3.7 EXPERIMENT 3: MODERATING ROLE OF CUE SALIENCE

The main objective of Study 3 is to test our thesis that the impact of signaling effectiveness on product usage occurs primarily due to inferences made based on effectiveness cues that are salient in the decision context. If this is the case, then the effect should be attenuated when cue salience is low. Specifically, in addition to manipulating the presence of an effectiveness picture, we manipulate the salience of an efficacy description by changing font format (i.e., bold vs. plain text). We predict that when the efficacy description is salient, usage amount will be low regardless of additional pictorial cues signaling effectiveness. However, when the efficacy description is not salient, usage amount should be reduced when the additional effectiveness picture is present. Further, Study 3 demonstrates the impact of signaling effectiveness on product usage in an actual consumption scenario. We present participants with the teeth whitening rinse featured in the pilot studies and ask them to pour the amount of rinse they would use into a plastic cup provided by the experimenter.

3.7.1 Method

Participants and Procedures. Two hundred and forty-one undergraduate students from a western university participated in a product trial study for extra course credit. Study 3 employed a 2 (Efficacy Attribute Salience: bold vs. no-bold) x 2 (Pictorial Cue Salience: picture vs. no-picture) between-subjects design. Participants sat in separate lab rooms during each session. Upon arriving at the lab, respondents were randomly assigned to one of the four experimental conditions. The stimuli used in Study 3 were similar to those in the pilot studies except that we added a product description presenting the product efficacy attribute: “Clinically proven to be effective for fast teeth whitening”. For participants in the no-bold conditions, all descriptions were in plain font. They were either provided with only product descriptions or a pictorial cue highlighting effectiveness (i.e., the picture of a smiling face) in addition to the product descriptions (see Appendix D1-D2). For participants in the bold condition, the font for the efficacy description “Clinically proven to be effective for fast teeth whitening” was in bold text while the font for other descriptions remained in a plain font. Again, the picture of a smiling face was either present or absent (see Appendix D3-D4).

All participants were asked to raise their hand after finishing examining the product information. The experimenter then gave each participant a bottle of the featured new teeth whitening rinse and a plastic cup. Participants were asked to pour the amount of whitening rinse they would use on a single occasion into the plastic cup and they were told to feel free to spend time trying and evaluating the product. At the end of the session, participants were quizzed about the objective of the study and then were debriefed, thanked and dismissed. None of the participants correctly guessed the true purpose of the experiment.

Measures. The amount of whitening rinse that participants poured into the plastic cup served as our main dependent variable. Rinse bottles were measured before and right after each lab session using a scale calibrated to 0.01 gram. The amount of rinse that each participant poured into the cup was determined by taking the difference in the weight of each rinse bottle between the ex-ante and ex-post measurements.

3.7.2 Results and Discussion

A 2 (Efficacy Attribute Salience: bold vs. no-bold) x 2 (Pictorial Cue Salience: picture vs. no-picture) ANOVA reveals a significant interaction between efficacy attribute salience and pictorial cue salience ($F(1, 237) = 5.85, p < .05$) and marginal significant main effects of efficacy attribute salience ($F(1, 237) = 3.14, p < .1$) and pictorial cue salience ($F(1, 237) = 2.61, p = .1$; see Figure 8). Consistent with the findings of the pilot studies, in the conditions where the efficacy attribute was not salient in the consumption context (i.e., when the description “Clinically proven to be effective for fast teeth whitening” was in a plain font), the addition of an effectiveness pictorial cue (i.e., adding the picture of a smiling face) significantly decreased the amount of rinse poured ($M_{\text{no-bold, no-picture}} = 24.43$ grams vs. $M_{\text{no-bold, picture}} = 19.79$ grams; $F(1, 273) = 8.38, p < .01$). However, in the bold conditions where the efficacy attribute was salient (i.e., when the description “Clinically proven to be effective for fast teeth whitening” was in bold text), participants poured about the same amount of rinse whether the effectiveness picture was present or not ($M_{\text{bold, no-picture}} = 19.61$ grams vs. $M_{\text{bold, picture}} = 20.53$ grams; $F(1, 273) = .32, p = .57$).

[Insert Figure 8 about here]

To summarize, Study 3 replicates the proposed effect of signaling effectiveness on product usage in an actual product-trial scenario. Our results indicate that the presence of a salient cue stressing product effectiveness reduced actual usage amount of the whitening rinse by over 18%, regardless of it being a description expressing actual product efficacy – the attribute “Clinically proven to be effective for fast teeth whitening” in bold text – or a non-diagnostic pictorial cue highlighting the sought-after end state (in this case, adding the picture of a smiling face).

Importantly, the results of Study 3 identify cue salience as an important boundary condition, which provides direct empirical evidence for our theoretical explanation that the impact of effectiveness cues on consumption mainly arises from inference making. In support of this explanation, we find that when the attribute depicting actual product efficacy (“Clinically proven to be effective for fast teeth whitening”) is salient, usage amount is low whether there is an additional cue signaling effectiveness (adding the picture of a smiling face) or not. Conversely, when this efficacy attribute is not salient, usage amount is only reduced when the additional effectiveness cue is present. These findings are consistent with results from Study 1A in which we found that when the efficacy description “In a highly effective waterproof formulation” is printed in plain font and thus not salient in the consumption context, indicated usage amount of the featured insect repellent is reduced only when the picture of a crossed-out bug signaling product effectiveness is present.

3.8 EXPERIMENT 4: MODERATING ROLE OF NEED FOR COGNITION

Study 4 further tests our proposed inference making account by examining the moderating role of individuals' need for cognition. Specifically, we argue that the reduction in post-purchase consumption occurs because people infer product effectiveness based on non-diagnostic cues. Thus, we predict that individuals with high (vs. low) need for cognition should be less likely to react to these effectiveness cues. Additionally, in Study 4, we add mood and arousal measures to investigate the alternative explanation that effectiveness cues influence people's mood or arousal states and consequently decrease usage amount.

3.8.1 Method

Participants and Procedure. Seventy-five college students recruited from a large introductory marketing class completed Study 4 for extra course credit and the chance to win three \$100 VISA gift cards. Study 4 used a between-subjects design, with effectiveness cue (picture vs. no-picture) as the manipulated factor and need for cognition (Cacioppo, Petty and Kao 1984) as the measured factor. Participants sat in isolated cubicles during each session. The stimuli used in the current study were identical to those used in the pilot studies. Participants were randomly assigned to either the no-picture or picture condition in which they viewed only the product descriptions of a new teeth whitening rinse or the picture of a smiling face in addition to the same set of product descriptions (see Appendix 1A and 1B), respectively.

As in Study 3, participants were presented with an actual product-trial scenario. That is, each participant was given a bottle of the featured new teeth whitening rinse and asked to pour the amount of rinse they would use on a single occasion into a plastic cup. After spending as

much time as they would like to try and evaluate the product, participants were asked to complete a short questionnaire, which included measures for mood, arousal state, and need for cognition. At the end of the session, participants were quizzed about the hypothesis of the study and then were debriefed, thanked and dismissed. Three participants were suspicious about the study hypotheses and were excluded from the analysis, leaving a total of seventy-two participants.

Measures. The final survey asked participants to indicate how they felt *at that moment* by responding to ten items, each on a seven-point scale. The items consisted of six arousal items anchored by “stimulated- relaxed”, “excited- calm”, “frenzied- sluggish”, “jittery- dull”, “wide-awake- sleepy” and “aroused- un-aroused” (Merhrabian and Russell 1974); and four mood items anchored by “sad- happy”, “bad mood- good mood”, “irritable- pleasant”, and “depressed- cheerful” (Lee and Sternthal 1999). Participants also completed the eighteen-item, six-point (1=definitely disagree; 6=definitely agree) need for cognition scale developed by Cacioppo, Petty and Kao (1984).

The amount of whitening rinse that participants poured into the plastic cup served as our dependent variable. Rinse bottles were measured before and immediately after each lab session, and the amount of rinse poured was determined by taking the difference in the weight of each rinse bottle between the ex-ante and ex-post measurements.

3.8.2 Results and Discussion

Product Usage. We first conducted a one-way ANOVA (effectiveness cue: no picture vs. picture) on usage amount. The results of this study successfully replicated our previous findings

that the addition of the picture of a smiling face to product descriptions of the rinse reduced the usage amount of the featured whitening rinse. Participants in the no-picture condition poured significantly less (18.7%) rinse into the cup than participants in the picture condition (M picture = 16.19 grams vs. M no-picture = 19.92 grams; $F(1, 70) = 4.49, p < .05$).

Mood and Arousal States. To test the emotion-based alternative explanation for the effect, we created composite measures for mood and arousal states by averaging the scores for the four mood items ($\alpha = .73$) and the six arousal items ($\alpha = .93$). Individual one-way ANOVAs reveal that the picture of a smiling face did not change participants' mood ($F(1, 70) = .01, p = .91$) or their arousal state ($F(1, 73) = 0.12, p = .73$), suggesting that the negative impact of effectiveness cues on product usage is not due to mood or arousal. Additional evidence against this alternative account of spillover of positive or negative emotions on usage responses is provided by the fact that the crossed-out bug picture in Study 1 and the smiling face picture in the current study are ostensibly of opposite valence, yet they elicit a similar effect – reduced usage.

Need for Cognition. Finally, we examined how individuals' need for cognition influenced the effect of this salient yet non-diagnostic effectiveness signal (i.e., the picture of a smiling face) on rinse usage amount. After recoding the nine reverse-coded items, we averaged the scores from the eighteen-item six-point need for cognition scale to obtain an overall measure for need for cognition ($\alpha = .80$). To test whether need for cognition moderates the relationship between effectiveness cue and usage amount, we regressed usage amount on effectiveness cue, need for cognition and the effectiveness cue x need for cognition interaction. We obtained a significant interaction between effectiveness cue and need for cognition ($\beta = 5.54, S.E. = 2.74; p < .05$), along with a significant main effect of effectiveness cue ($\beta = -3.88, S.E. = 1.73; p < .05$).

These results suggest that the usage patterns induced by consumers' intuitive beliefs about the relationship between a smiling face with perfect teeth and the effectiveness of the whitening rinse vary depending on consumers' need for cognition. To further test whether the decrease in usage is mainly driven by individuals with low rather than high need for cognition, we follow the post-hoc probing procedure recommended by Aiken and West (1991). Specifically, we first calculated high and low need for cognition by adding or subtracting the standard deviation from the mean ($M = 3.97$, $SD = 0.63$). We then conducted a simple slope analysis, which examines the relationship between effectiveness cue and product usage at each level of need for cognition (high vs. low). As seen in Figure 3, for individuals with low need for cognition, the relationship between effectiveness cue and product usage is -7.81 ($p < .01$); adding the picture of the smiling face with great teeth significantly reduced the usage amount of the new whitening rinse. However, for individuals with high need for cognition, the addition of the picture did not generate any significant impact on product usage ($\beta = -.83$, $p = .72$)⁷.

[Insert Figure 9 about here]

To summarize, besides ruling out the alternative explanation of mood and arousal differences, the results of Study 4 also provide further support for our inference making account by showing that effectiveness cues influence the usage amount of individuals whose need for cognition is low. Conversely, individuals who have a higher natural tendency to engage in cognitive thinking are unaffected by the effectiveness cue. Interestingly, although our theory does not make a prediction regarding the normative baseline for high need for cognition

⁷ The same pattern of the results obtains when we conduct a simple even three-level split (i.e., a significant interaction of effectiveness cue x need for cognition ($F(1, 66) = 3.85$, $p < .05$).

individuals, we find in this experiment that high need for cognition consumers consistently used less of the featured product than low need for cognition individuals, regardless of the effectiveness cue's presence. We speculate this is because the descriptions used in the current study are reasonable arguments that stress functional benefits of the product (e.g., “Long-lasting fresh breath protection” and “Invigorates and promotes healthy gum tissue”) and high need for cognition processed these claims whereas low need for cognition did not.

3.9 DISCUSSION

Our primary objective was to investigate the impact of signaling product effectiveness on post-purchase consumption. Building upon prior findings showing that consumption behaviors are often constructed based on inferences about contextual cues rather than directed by deliberate thoughts and stable preferences, we propose that consumers use effectiveness cues salient in the consumption context to infer effectiveness of the featured products and accordingly decide how much to consume. Across four studies, we consistently demonstrate that contrary to consumers’ intuition that marketing cues signaling effectiveness would translate into higher usage amount (see results reported in the introduction), effectiveness marketing cues can increase perceived product effectiveness and reduce product usage (Studies 1A, 2A, 3 and 4). We examine underlying mechanisms, showing that this reduction in usage results from inference making and is moderated by cue salience (Study 3) and individuals’ need for cognition (Study 4). Our findings are robust across both hypothetical and actual consumption scenarios, across both context-specific (e.g., insect repellent protection time) and context-insensitive measures (Boulding and Kirmani 1993) of perceived effectiveness, and across various product categories,

including insect repellent, whitening rinse, and toilet bowl cleaner. We also empirically test the impact of signaling effectiveness on product choice (Studies 1B and 2B) and find that marketing cues highlighting effectiveness can (however not always) increase product choice.

Our findings offer important theoretical implications. Attitudinal measures such as purchase intention have been the dominant measures for the impact of salient cues on consumer preferences. However, prior research has not addressed whether the impact of cues influence consumption volume. Our results show that pairing different cues with the same product descriptions can lead to quite dissimilar inferences about product effectiveness and in turn produce systematic variation in usage of the same product with identical ingredients and formula. These findings support the emerging view that individuals' consumption behaviors are largely constructive and can be context-specific (e.g., Bargh and Chartrand 1999; Fabrigar, MacDonald and Wegener 2005). Our results are also consistent with Shiv, Carmon and Ariely's (2005) work on placebo effects, which shows that marketing actions, such as pricing, can influence efficacy perceptions of products. Additionally, our research contributes to the emerging literature that stresses the rich mix of purchase and usage drivers. For example, Thompson, Hamilton and Rust (2005) show that the inclusion of too many product features increases predicted utility and initial choice yet decreases experienced utility after usage. Analogously, our results demonstrate the ironic effects of signaling effectiveness on stimulating choice, yet curbing post-purchase consumption.

Our findings also offer rich implications for practice. Brand managers often signal product effectiveness with salient marketing cues such as pictures and brand names in labeling and packaging, with the conviction that they produce a positive impact on sales. Our research reveals that signaling effectiveness is a "double-edged" sword, which may potentially hurt long-

terms sales when the cues curb usage without proportionally stimulating choice. For example, in Studies 2A and 2B we find that a brand with a name signaling environmental friendliness, “BalanceGreen” increased its usage relative to a brand with a name leading to inferences of greater effectiveness, “BalanceClean,” yet it had an equivalent choice share. Alternatively, employing “neutral” marketing cues that do not directly promote effectiveness may be a viable strategy. In Studies 1A and 1B, we show that adding the picture of a plant to a repellent package can boost product choice (vs. not adding any picture at all) without reducing product usage (vs. adding the picture a crossed-out bug). Interestingly, based on the choice shares, the product with the effectiveness cue of a crossed-out bug seems to have a commanding 70% choice share advantage over the product with the neutral picture (a plant), 56% versus 33% for the crossed-out bug brand and plant picture brand, respectively. However, due to its greater usage rate of 24.9 seconds per use versus 17.9 seconds for the crossed-out bug brand, buyers will consume the plant picture product much more quickly, reducing the overall advantage of the effectiveness cue to only 21% ($[0.56/0.33]*[17.9/24.9]$).

This begs the question, what are solutions to the unfavorable impact of signaling effectiveness? While effectiveness perceptions play a prominent role in deciding product usage, it is among a variety of factors that determine product choice. Therefore, one solution is to employ cues that can stimulate purchase without enhancing effectiveness inferences.

Alternatively, since our results suggest that effectiveness cues only decrease usage when they are salient in the consumption context, another possible solution is to add effectiveness cues in the purchase context and remove them in the consumption context. For example, companies can present effectiveness signals in advertisements or on the outer box of the product (e.g., using the picture of a smiling face with great teeth on the outside package of a toothpaste) to increase

product choice, but avoid presenting any salient effectiveness cues on the product itself (e.g., using only verbal descriptions on the toothpaste).

There are several interesting avenues for future research that merit pursuit. For example, effectiveness is often difficult to judge objectively (e.g., Hoch and Ha 1986; Hoch and Deighton 1989). The ambiguity of experienced effectiveness may moderate our results if studied over time; if consumers can tell whether using less of the toilet bowl cleaner is not working, they should start using more. Interestingly, over-users may be less likely to curtail their usage because it is more difficult to tell that they are using too much, leading to an asymmetric relationship between effectiveness ambiguity and over/under usage. Additionally, we have focused on effectiveness cues for products that are functional in nature (e.g., teeth whitening products, insect repellent). Future research could broaden the examination of effectiveness to differentiate functional effectiveness from hedonic effectiveness. For example, we can envision that for product categories where effectiveness is hedonic (e.g., chocolate, vitamin water, Viagra) the more effective consumers perceive the product to be, the more excitement they might derive from additional consumption. The notion of effectiveness in this domain is more hedonic in nature and may lead to (a) an increased effect at the point of choice, and (b) an increase in use if consumers make the inference that if using a little makes them feel good, then using a lot will be even better.

Future research may also examine how effectiveness cues impact product usage when directions specify the usage amount. From a social welfare perspective, it is important to inspect whether the addition of efficacy cues leads consumers to use the proper amount or the lack of efficacy cues leads consumers to use too much. For example, patient non-compliance with medication instructions is a major problem. In their meta-analysis, Bangalore et al. (2007) report

that a fixed-combination regimen (i.e., a formulation of two or more active ingredients combined into a single dosage form) led to a 26% reduction in non-compliance compared to a free drug (separate medication for each drug) regimen. Research testing the efficacy of usage cues in helping patients to comply with their prescribed dosage could potentially yield important insights.

To conclude, our findings suggest that effectiveness cues are a double-edged sword – they can enhance choice shares (but not always as shown in Study 2B) but they consistently decrease product usage and repurchase rates. Future research should monetize this interplay by supplementing scanner panel data with product’s effectiveness cues to would help firms identify the right balance between effectiveness signals’ influence on choice versus usage.

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FIGURE 1: CONCEPTUALIZATION OF WASTE IN CONSUMPTION

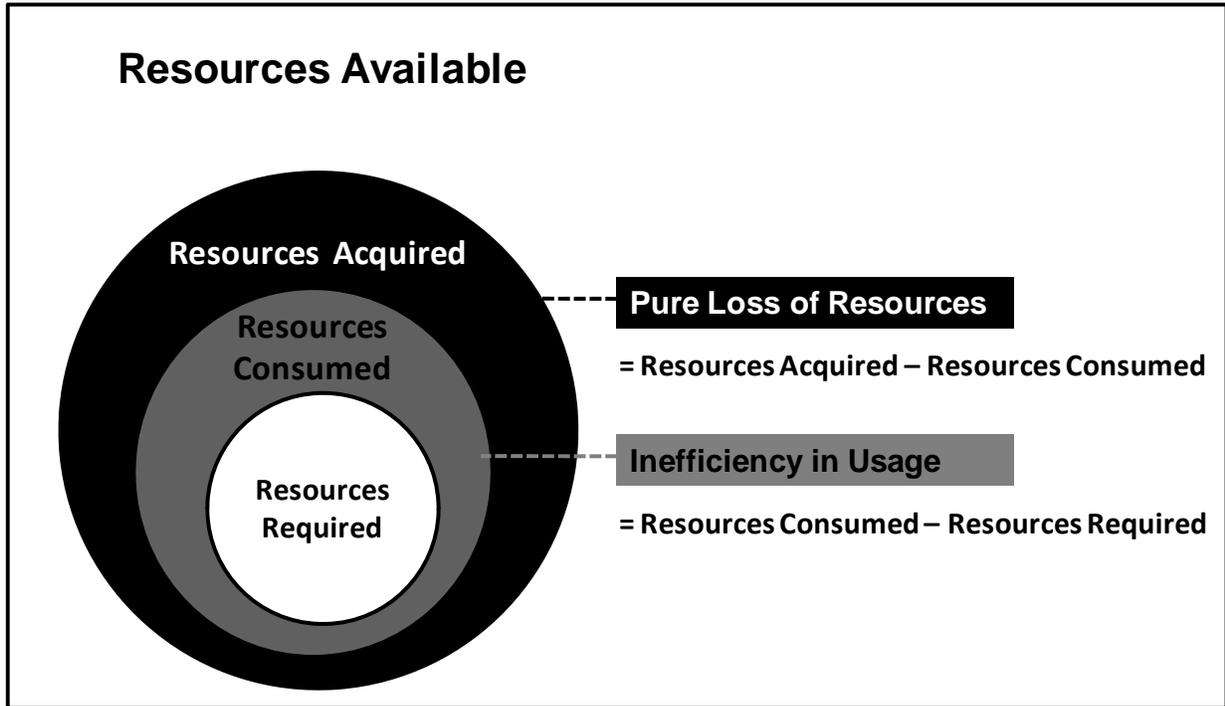
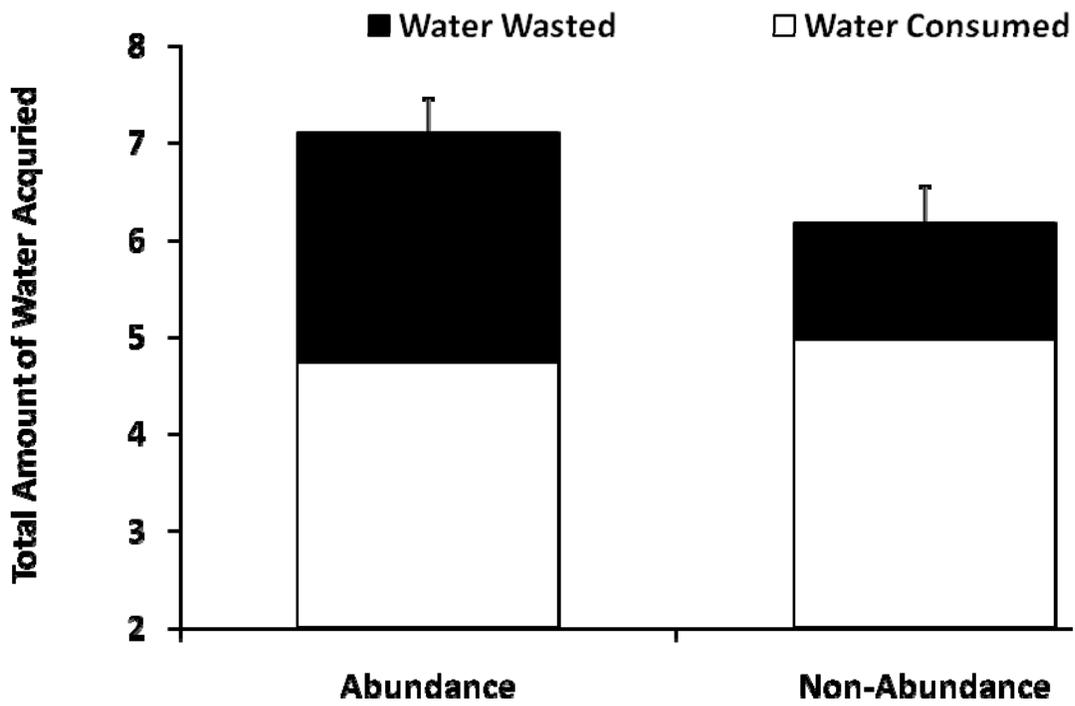


FIGURE 2: IMPACT OF RESOURCE CUE ON AMOUNTS OF WATER ACQUIRED,
CONSUMED AND WASTED (*IN OZ.*)

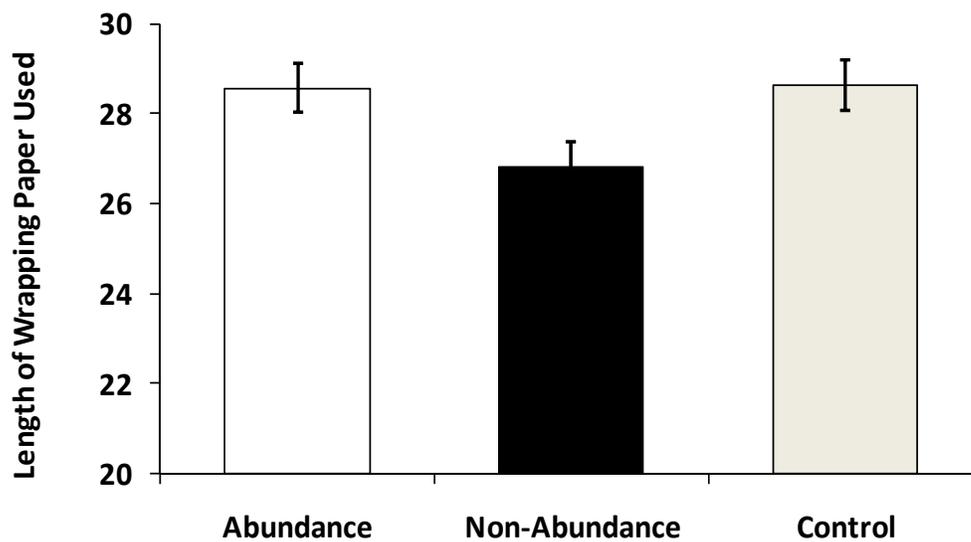
(EXPERIMENT 1)



Error bars: +/- 1 SE

FIGURE 3: IMPACT OF RESOURCE CUE ON WRAPPING PAPER USAGE * (*IN INCHES*)

(EXPERIMENT 2)



Error bars: +/- 1 SE

FIGURE 4: IMPACT OF PERCEPTION OF ABUNDANCE VS. NON-ABUNDANCE ON
PERCENTAGE OF PARTICIPANTS TURNING LIGHTS OFF

(EXPERIMENT 3)

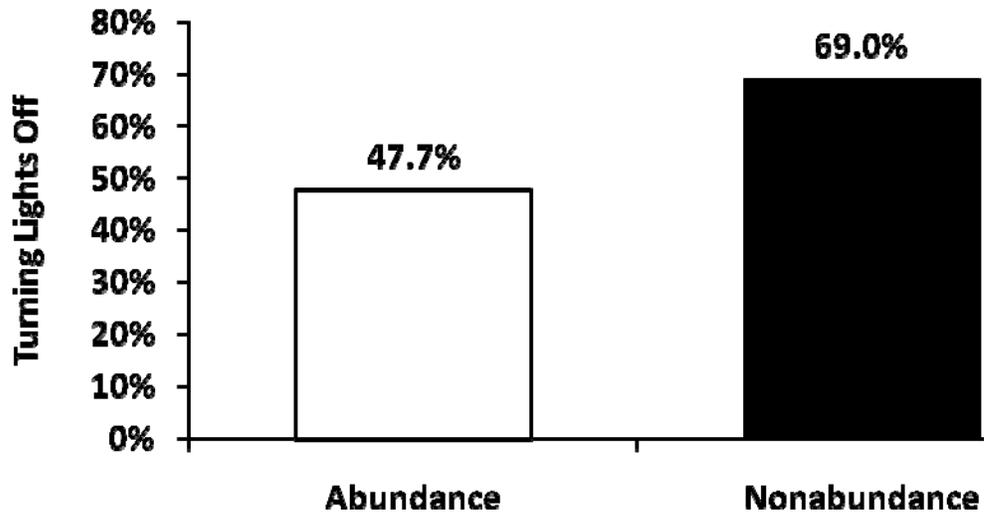
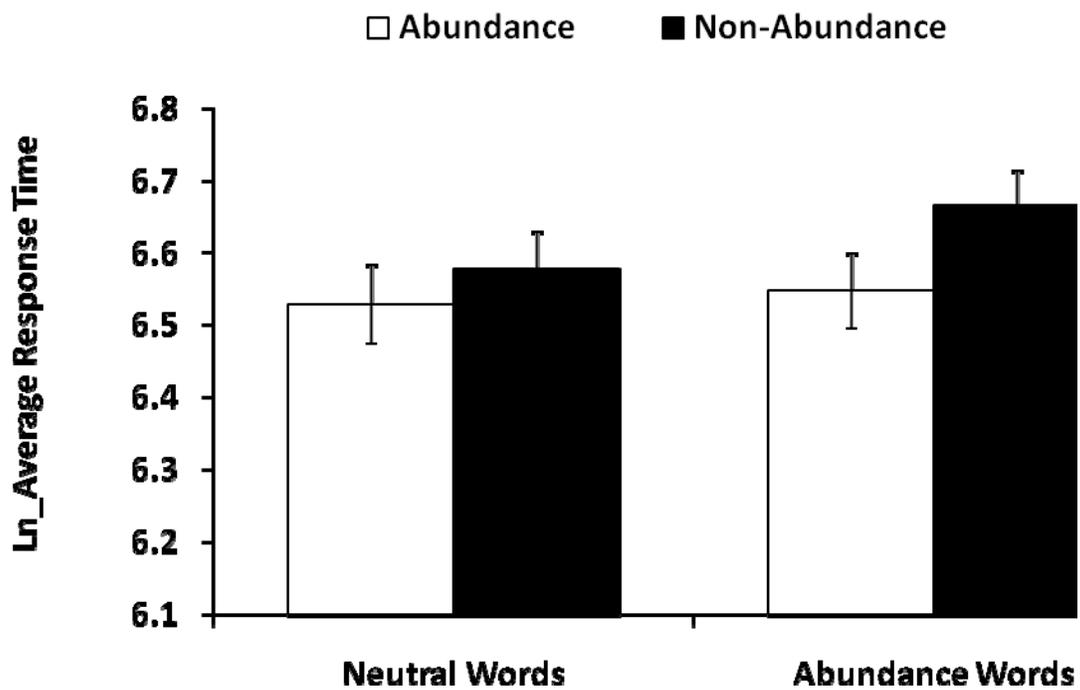


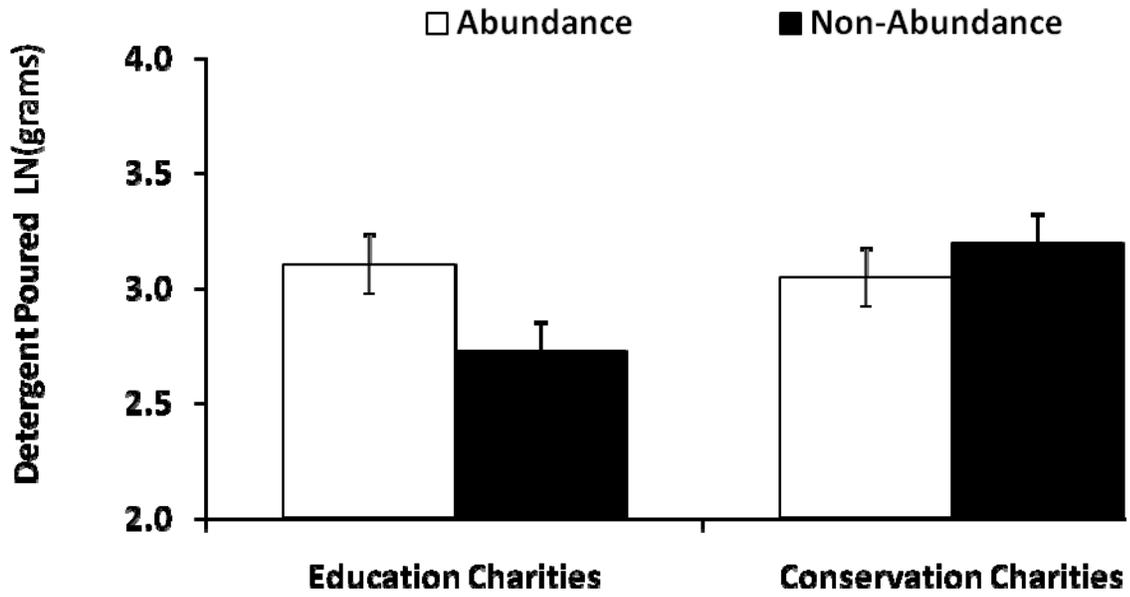
FIGURE 5: IMPACT OF RESOURCE CUE ON REACTION TIME TO ABUNDANCE VS. NEUTRAL WORDS (*LN_MILLISECONDS*)

(EXPERIMENT 4)



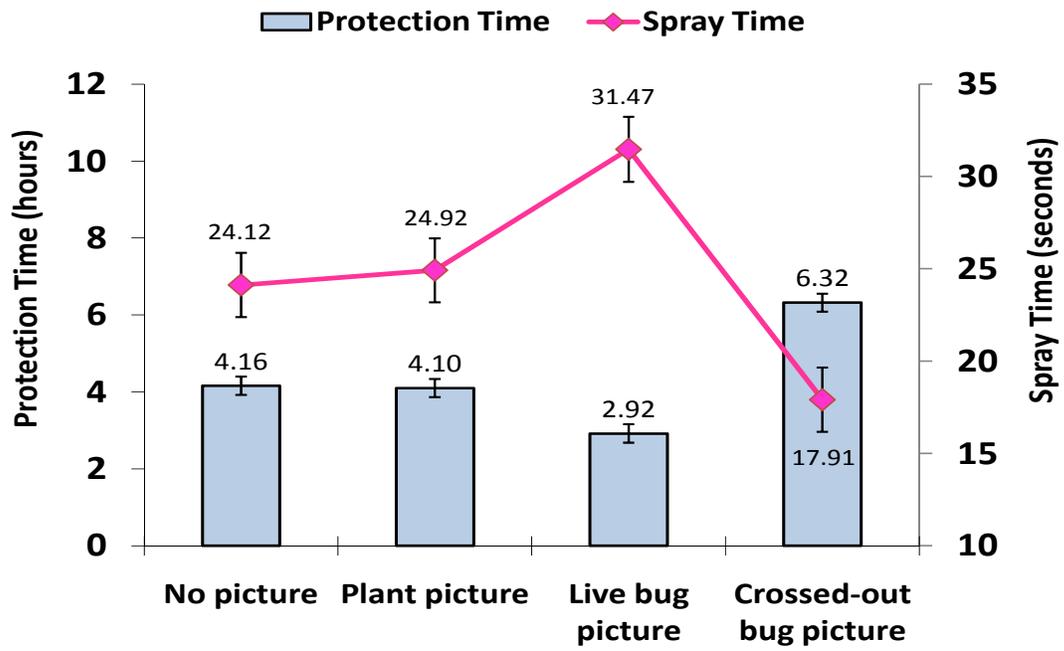
Error bars: +/- 1 SE

FIGURE 6: IMPACT OF RESOURCE CUE AND CHARITY TYPE ON AMOUNT OF
DETERGENT POURED (*LN_GRAMS*)
(EXPERIMENT 5)



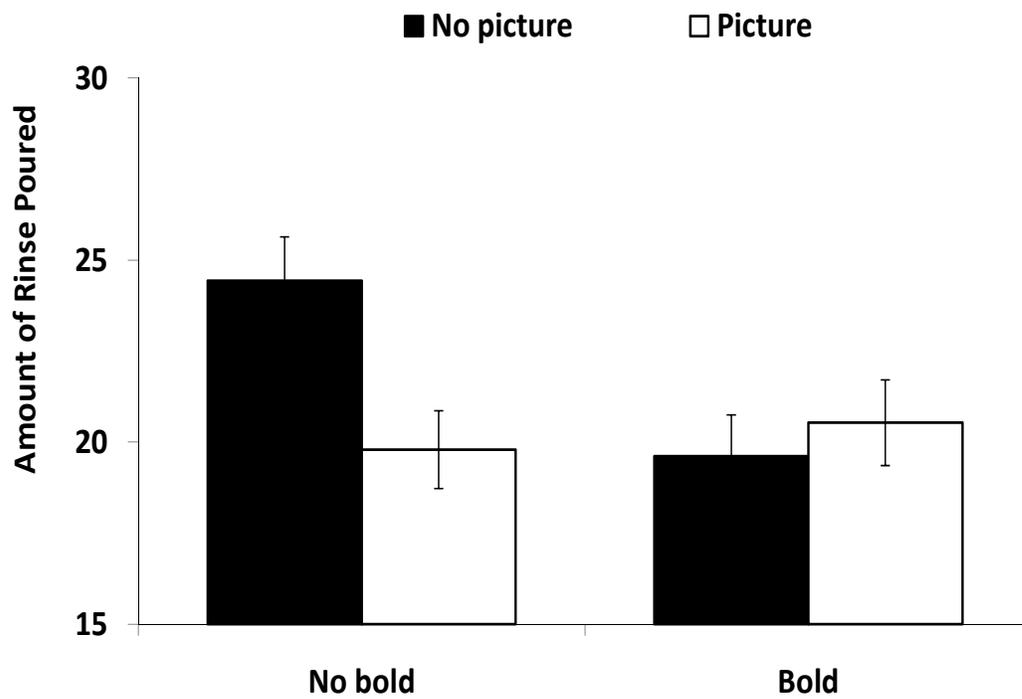
Error bars: +/- 1 SE

FIGURE 7: THE IMPACT OF EFFECTIVENESS CUES ON PROTECTION HOURS AND
SPRAY TIME
(EXPERIMENT 1)



Error bars: +/- 1 SE

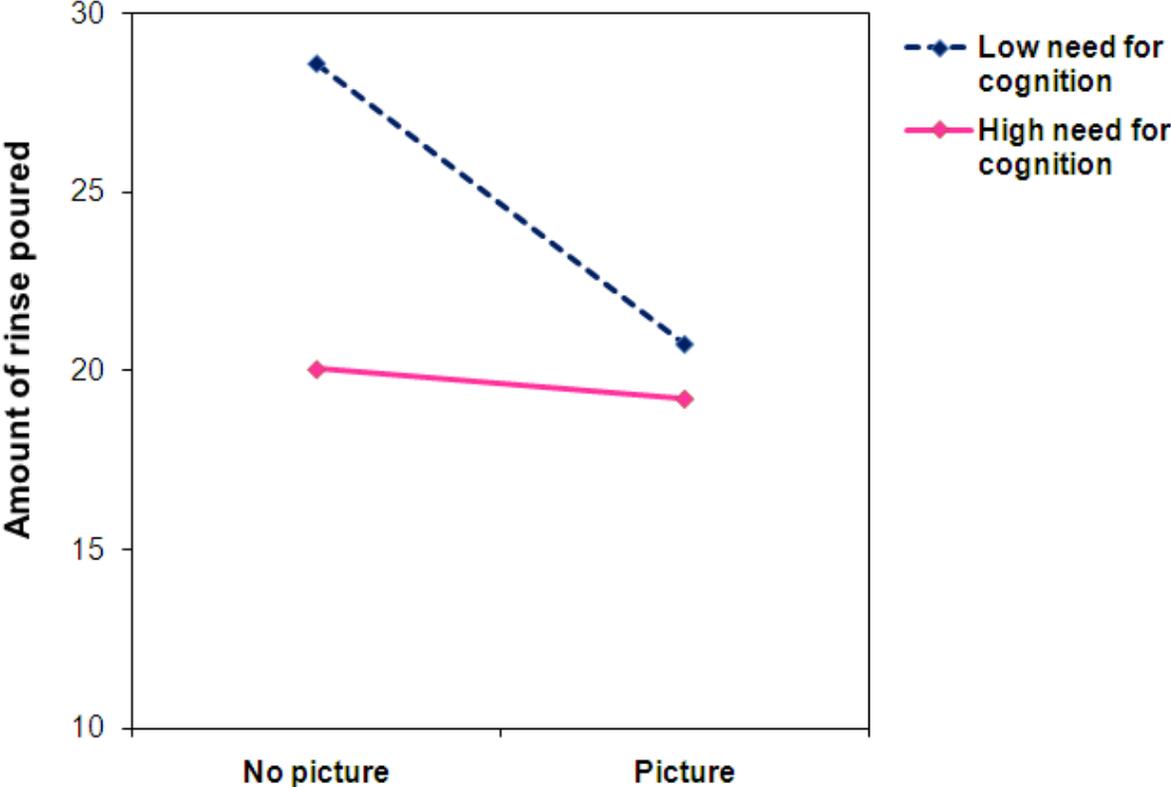
FIGURE 8: THE IMPACT OF EFFICACY ATTRIBUTE SALIENCE AND PICTORIAL CUE SALIENCE ON PRODUCT USAGE (IN GRAMS)
(EXPERIMENT 3)



Error bars: +/- 1 SE

FIGURE 9: THE IMPACT OF EFFECTIVENESS CUES AND NEED FOR COGNITION ON
PRODUCT USAGE (IN GRAMS)

(EXPERIMENT 4)



APPENDIX A1: STIMULI USED IN PILOT STUDIES AND EXPERIMENT 4

(NO-PICTURE CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue
- Convenient size, 32 oz/1000ml

APPENDIX A2: STIMULI USED IN PILOT STUDIES AND EXPERIMENT 4

(PICTURE CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue
- Convenient size, 32 oz/1000ml



APPENDIX B1: STIMULI USED IN EXPERIMENT 1 (NO-PICTURE CONDITION)

NEW All Herbal Insect Repellent

- For repelling mosquitoes, gnats, ticks & other biting insects
- All natural ingredients & Deet free
- Tough enough for extreme environments
- Safe for the entire family
- In a highly effective waterproof formulation
- Long lasting natural scent of lemon grass cedar wood

APPENDIX B2: STIMULI USED IN EXPERIMENT 1 (CROSSED-OUT BUG CONDITION)

NEW All Herbal Insect Repellent

- For repelling mosquitoes, gnats, ticks & other biting insects
- All natural ingredients & Deet free
- Tough enough for extreme environments
- Safe for the entire family
- In a highly effective waterproof formulation
- Long lasting natural scent of lemon grass cedar wood



APPENDIX B3: STIMULI USED IN EXPERIMENT 1 (LIVE-BUG CONDITION)

NEW All Herbal Insect Repellent

- For repelling mosquitoes, gnats, ticks & other biting insects
- All natural ingredients & Deet free
- Tough enough for extreme environments
- Safe for the entire family
- In a highly effective waterproof formulation
- Long lasting natural scent of lemon grass cedar wood



APPENDIX B4: STIMULI USED IN EXPERIMENT 1 (PLANT CONDITION)

NEW All Herbal Insect Repellent

- For repelling mosquitoes, gnats, ticks & other biting insects
- All natural ingredients & Deet free
- Tough enough for extreme environments
- Safe for the entire family
- In a highly effective waterproof formulation
- Long lasting natural scent of lemon grass cedar wood



APPENDIX C1: STIMULI USED IN EXPERIMENT 2 (BALANCEGREEN CONDITION)

All New **BalanceGreen** Toilet Bowl Cleaner

- Clings to surfaces for longer
- Removes stubborn rust & mineral deposits
- EPA registered, disinfecting formula
- Kills staph, pseudomonas, salmonella, E coli & HIV-1
- Minimizes hard water build-up
- 30 oz, family size

APPENDIX C2: STIMULI USED IN EXPERIMENT 2 (BALANCECLEAN CONDITION)

All New **BalanceClean** Toilet Bowl Cleaner

- Clings to surfaces for longer
- Removes stubborn rust & mineral deposits
- EPA registered, disinfecting formula
- Kills staph, pseudomonas, salmonella, E coli & HIV-1
- Minimizes hard water build-up
- 30 oz, family size

APPENDIX D1: STIMULI USED IN EXPERIMENT 3 (NO-BOLD, NO-PICTURE
CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- Clinically proven to be effective for fast teeth whitening
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue

APPENDIX D2: STIMULI USED IN EXPERIMENT 3 (NO-BOLD, PICTURE CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- Clinically proven to be effective for fast teeth whitening
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue



APPENDIX D3: STIMULI USED IN EXPERIMENT 3 (BOLD, NO-PICTURE CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- **Clinically proven to be effective for fast teeth whitening**
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue

APPENDIX D4: STIMULI USED IN EXPERIMENT 3 (BOLD, PICTURE CONDITION)

NEW All Natural Teeth Whitening Rinse

- 100% Pure & Natural
- Contains our proprietary blend of Vitamin C, Xylitol & CoQ10
- No artificial sweeteners or ingredients
- **Clinically proven to be effective for fast teeth whitening**
- Long-lasting fresh breath protection
- Invigorates and promotes healthy gum tissue

