Trying to Consume Sustainably: Shifting Behavior with Comprehensive Goal-matching Information

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Abstract

This research seeks to examine whether comprehensive goal-matching information encourages people to consume more sustainably. Comprehensive goal-matching information is defined as contents that cover both the superordinate goal (a.k.a. abstract level information of why the focal goal should be pursued) and the subordinate goal (a.k.a. the concrete level information of how the focal goal can be achieved) of a goal-oriented behavior. I first review current theories about the psychological factors that affect consumer decision making, as well as the associated empirical findings of various techniques that make use of these factors. I then focus on the role of information on consumer decision making. I argue that the Theory of Trying is the best candidate to explain why past attempts to promote sustainable consumer behavior through information campaign have failed. Sustainable consumer behavior is a form of goal pursuit; thus, the key to encourage such behavior is to craft tangible goal-matching information. Goal-matching information can be shallow (i.e., only mentioning subordinate aspect, also known as concrete), deep (i.e., only mentioning superordinate aspect, also known as abstract), or comprehensive (i.e., covering both subordinate and superordinate aspects). The hypothesis is that the comprehensive information out-performs the others because it connects all the dots. Next, I lay out a two-stage process—stage one is trying, followed by actual behavior in stage two. The transition from stage one to stage two is characterized by the removal of contextual constraints. Two experimental studies are designed to test this theoretical framework in the context of plastic consumption. Study 1 asks participants to read different types of information in week 1 and assesses their efforts at trying to consume less plastic in the second and third week. The structure of Study 1 replicates the research of the theory of trying. The results from Study 1 are inconclusive. Study 2 introduces a novel task with a carefully designed sustainable consumption score. The main findings are that the comprehensive

and the concrete-only information are both better than abstract-only information at improving participants' sustainable plastic consumption score. However, the information treatment effect is heavily reduced by a negative interaction effect between the treatment and the individual green consumption value score. For a population that has been trying to be sustainable such as the students in the study, the added value of information comprehensiveness is limited, largely because they already have the appropriate knowledge. In addition, the evidence unambiguously supports the stage two alternative hypothesis, which is that removing contextual constraints promotes sustainable consumer behavior. However, the study finds that when participants are provided with subjectively sustainable alternative products, they are also more likely to spend more in total, suggesting a substitution effect that supports the moral licensing theory.

Introduction

The Earth is a closed ecosystem with limited natural resources. As humans continue to thrive on this planet, researchers increasingly worry about sustainability issues, such as the inevitable depletion of fossil fuels, climate change, and waste disposal. In response to these concerns, efforts such as multilateral agreements, policy changes, and regulations have been made and enforced to slow down the adverse impact . For example, the Paris Accord signed in 2016 is aimed at reducing the impact of climate change by controlling greenhouse gas emission; alternative energy sources such as wind energy have been increasingly encouraged in both developed and developing countries; vigilantism and public shaming became useful tools in cities like Shanghai to enforce recycling standards (Fifield, 2019).

While policy makers rely on laws and regulations to tackle a broad spectrum of environmentally related problems, social scientists work on understanding connections between everyday consumption and pro-environmental behaviors. In other words, social scientists aimed to find effective ways to promote these behaviors and to boost sustainable consumption. This research contributes to this mission by introducing a novel two-stage process framework and by putting it to test with lab experiments. At the same time, this research tries to contribute to extant theories such as the Theory of Planned Behavior, the Theory of Trying, and other behavioral theories by reexamining the role of information and highlighting the importance of information comprehensiveness.

This dissertation is organized as follows. First, I review previously used terminology and describe the formal characteristics of sustainable consumer behavior in extant research. Second, I review current theories that are relevant to sustainable consumer behavior and discuss how they predict consumption. Third, I propose that there is a gap in these theories in that they do not fully

explain how information influences behavior and how it should be constructed in communication strategy. I propose that one solution would be to understand the goal structure and to incorporate the Theory of Trying (Bagozzi & Warshaw, 1990). Fourth, I then introduce a new two-stage process, which highlights the importance of contextual constraint and its potential to affect sustainable consumer behavior. Fifth, I present two experimental studies that test the hypotheses associated with the theoretical exploration.

Pro-environmental Behavior, Sustainable Consumer Behavior, and Interventions

Pro-environmental behavior and sustainable consumer behavior are practically interchangeable in the field of sustainability. These two terms are parts of a more general construct—sustainable consumption and production. The United Nations officially defines sustainable consumption and production as "promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all" (United Nations 2018, para. 1).

A widely accepted definition of pro-environmental behavior is "behavior that consciously seeks to minimize the negative impact of one's actions on the natural and built world" (Kollmuss & Agyeman, 2002, p. 240). Examples of pro-environmental behaviors include reducing energy consumption, limiting resource exploitation, minimizing waste, avoiding emissions of toxic components, promoting recycling. The phrase "pro-environmental behavior" occurred in the 1960s while the expression "sustainable consumer behavior" is introduced to academic and popular discourses more recently. Trudel (2019) defines sustainable consumer behavior as "the extent to which decisions are driven with the intention to benefit or limit the impact on the environment" (p. 85). Likewise, White, Habib, and Hardisty (2019) define it as "actions that result in decreases in adverse environmental impacts as well as decreased utilization of natural resources across the lifecycle of the product, behavior, or service" (p. 24).

Although the wording varies between researchers, the core characteristic remains consistent: the intention behind the behavior is to minimize or reduce negative environmental impact. To be consistent with the current literature, I will use the term "sustainable consumer behavior" (SCB) for the rest of the paper. The next question is then, what do we already know about the facilitating factors of SCB?

Factors that Affect SCB

The causal path to SCB can be viewed from both the perspectives of economics and psychology . Economic theory treats SCB not that differently from other public good investments. The usual paradox that applies to any public good literature also applies to SCB. If an individual maximizes personal utility, given this individual's budget constraint, the maximized utility is at the cost of public welfare loss. The key difference is that the scale of welfare loss is much larger if we are referring to global sustainability. Because of this similarity, procedures that help to promote investment level in other public good settings have also been tried on SCB. One example is using monetary incentives to boost SCB effort. This includes practices such as subsidizing home heating improvement,[1] rewarding purchases of electric cars,[2] and more recently, switching to clean energy with free energy market trading.[3] Using published experimental results from 1987 to 2009, Osbaldiston and Schott (2012) estimate the effect size of incentives alone ranges from 0.46 to 1.90 standard deviation. This number demonstrates that incentives can improve sustainable consumption from medium to very large scales.

Another important component of SCB that interests economists is information. The fundamental goal of providing consumers extra information is to expect them to modify their decision functions to consider other cost or consequences of the consumption. Although the idea seems straightforward, the effect has been mixed or insignificant, varying by implementation method. Stern (1999) looks at historical information programs and finds that simply presenting

[1] An example could be the government program "Energy Saver". URL: https://www.energy.gov/energysaver/incentives-and-financing-energy-efficient-homes

[2] An example could be the federal tax credit for electrical and plug-in hybrid vehicle purchase. URL: https://www.fueleconomy.gov/feg/taxevb.shtml

[3] An example is the firm Arcadia, who matches consumer utility bill with clean energy. This business model helps to support clean energy development, while maintaining its own business through profits of price difference.

information on benefits of SCB does not change behavior, contrary to classical economic theory. In fact, the accuracy and completeness of information is not as important as the ability to attract attention, to gain involvement, and to ensure credibility (Stern, 1999). Nevertheless, Stern claims that even if information can help shape SCB, the effect is usually small and tends to be short-lived.

Consistent with findings by economists, fruitful discoveries have also been reported in psychology. Researchers have identified multiple psychological factors that relate to SCB, on which many interventions have been proposed and tested. Trudel (2019) classifies these factors into four major areas: cognitive barriers, the self, social influence, and social norms, as well as product characteristics and sustainable behavior.

Cognitive barriers are automatic decisions based on habit, affect or familiarity that consumers tend to make while they are in an affective processing mode, rather than cognitively processing information based on facts and careful consideration (Trudel, 2019). SCB is essentially making a consumption decision in the present while discounting future utility simultaneously. This intertemporal decision making requires effortful analytics, which is not likely to be triggered automatically by consumers themselves. This phenomenon can also be explained by construal level theory, which states that people's thinking patterns can be abstract or concrete, depending on how far away the target is psychologically from the self (Trope & Liberman, 2010). In more specific terms, this means that that the closer the object is from the self, the more concretely it will be construed. Conversely, the more distant the object, the more abstractly it will be construed (Trope, Liberman, & Wakslak, 2007). To correct cognitive barriers, scholars have successfully intervened by nudging consumers with defaults and using economic incentives (Trudel, 2019), aligning with economic solutions.

The second area, the self, refers to one's need for signaling the pro-environmental value one upholds, the need to be identified and distinguished from others, and the need of belonging to certain green consumption group (Trudel, 2019). Examples of meeting such needs are providing opportunities for signaling and praising publicly. This is similar to the social norm approach, with the difference being revealing how others are doing as reference. An interesting category studied by Trudel (2019) is product characteristics in a similar vein, scholars suggest that sustainable consumer behaviors can alternatively be promoted through better product design, such as adjusting paper size to avoid paper waste (Trudel & Argo, 2013). White et al. (2019) also acknowledge the relevance of cognition, social influence, and the self. In addition, they highlight the impact of habit formation and tangibility.

Habit is a "fixed way of thinking, willing, or feeling" formed via repetitive experience (Andrews, 1903. p. 121). This feature enables automatic processing whereby a person can perform a routine task subconsciously (Ouellette & Wood, 1998). Therefore, once a habit is formed, it is hard to break. One effective way to change a habit is to force a behavioral change through legislation (Whitmarsh, Lorenzoni, & O'Neill, 2012). It is widely acknowledged that Japan has one of the top recycling and garbage categorization actions, which comes with extremely strict regulations and punishment. Recently, China has paved its path to solving its waste problem by enforcing new garbage disposal standards in major cities, starting with Shanghai. One may suspect that these harsh restrictions would trigger social unrests or at least widespread disapproval since people usually dislike changes or being forced out of their comfort zone. Surprisingly, Shanghai's new "trash rules" were mostly praised by residents in the city, though mild complaints certainly swept across the country (Fifield, 2019). It turns out that consumers will adapt to habit change if

the change is believed to be beneficial. Moreover, the new habit may in turn shape refreshed goals (Wood & Neal, 2007).

An interesting aspect in the review by White et al. (2019) is that the (information) tangibility is a crucial component of shaping consumer behavior. The nature of environmental change is that the process is slow, and the outcome is distant and uncertain in the future, compared to the immediate satisfaction of current consumption (White et al., 2019). Thus, one way to fix this discrepancy is to reverse the psychological distance effect by matching temporal focus and communicating concrete, local and proximal impacts (White et al., 2019). The basic principle of tangibility is thus to bring information close to the self, thereby reducing psychological distance.

Even though recent review papers synthesize on what could affect SCB, they do not offer a systematic model that explains how various aspects result in observed SCB. There are, however, existing theories that at least partially explain the variances. Among them, is the classic Theory of Planned Behavior, a revised model by the social psychologist Icek Ajzen who built on the Theory of Reasoned Action. The theory argues that an individual's specific behavior is partly determined by the intention of this behavior and partly by the individual's perceived control of the behavior. The behavioral intention is further guided by one's attitude towards the behavior, perceived social norm around the behavior, as well as the perceived degree of control (Ajzen, 1991). This theory could explain many of the aforementioned factors that lead to SCB. For example, showing what others are doing to reduce the negative environmental impact can boost consumer SCB. This is because the stimulus shifts consumers' perception of social norms to favor pro-environmental actions, which helps to formulate the intention of SCB and finally realizes it. However, there is also inconsistency between the Theory of Planned Behavior and empirical findings, mostly in the power of attitude. In the context of SCB, as mentioned earlier, information alone does not

necessarily result in behavioral change. There are information campaigns regarding the collective environmental change humans have created through consumption, meant to affect consumer attitude towards the issue. Nevertheless, these occasional information campaigns do not necessarily lead to the expected change in consumption patterns (Weenig & Midden, 1997), even though the Theory of Planned Behavior would have predicted an indirect effect.

To address the inconsistency, other sophisticated models have been developed attempting to more accurately predict SCB. Among them, the Value Belief Norm Theory best explains the unexpected outcome. In this theory, Stern (2000) acknowledges the power of human value, beliefs and pro-environmental personal norms on the actualized pro-environmental behavior. However, unlike the Theory of Planned Behavior, Stern argues that these three aspects are not equal in the magnitude of their effects. Instead, Stern outlines a causal chain all the way from values, to beliefs, to personal norms (defined as the sense of obligation to take pro-environmental actions) to behavior, with the belief component further divided into ecological worldview, to adverse consequences for valued objects, then to perceived ability to reduce threat (Stern, 2000). This one-way causal model thus implies that the further upstream a factor is located, the less impact it has on SCB because of the longer causal chains that would gradually phase out the effect. Meanwhile, upstream factors like human values are not as easily changed as downstream factors such as personal norms. This theory thus highlights the inability of the Theory of Planned Behavior to explain why changing attitudes does not guarantee a behavioral change—the size of indirect effect is too small to be meaningful. Using the same information campaign example, what it does is that it refreshes consumer belief of the adverse consequences of their consumption such as carbon emission. According to the theory, the updated belief will then affect consumers' perceived ability to reduce this threat, which in turn may enhance the obligation to take actions, which may lead to

actual behaviors. In comparison, successful interventions using monetary incentives to directly affect consumers' perceived ability may lead to more significant effects and avoid one segment in the causal chain. The Value Belief Norm Theory also predicts that if there are more "input" sources into the model, the more likely one will observe the SCB "outcome." In fact, this model features the empirical finding that information and incentive can have a synergistic effect on SCB outcome (Stern, 1999). Despite some good insights, this theory has some flaws. For example, the theory predicts that with single treatments, the most effective way to encourage SCB is to change personal norm. However, Osbaldiston and Schott (2012) report that among all the experimental treatments, reducing cognitive dissonance—changing preexisting beliefs and attitudes—have the largest impact. In addition, Stern's theory ignores external constraints that may prevent consumers from acting, such as budget constraint (for instance, organic food is available but is more expensive) or limited choices even if a consumer does have the sense of SCB obligation.

There are also other practical models that are not as concise as the Theory of Planned Action, or as complex as the Value Belief Norm Theory. For example, Seacat and Northrup (2010) adapt the Information Motivation Behavioral skills model, originally developed in social and health psychology, to explain curbside recycling behavior. They find that consumers who are well-informed, highly motivated and equipped with specific behavioral skills are more likely to adopt recycling behavior. While such models exist, they all exhibit one of the flaws described above: they either cannot explain why some interventions do not turn into actions as the theory would predict, or they ignore external conditions that could constrain consumers' internal motivations. Therefore, I would like to propose a new model that considers both psychological processes and contextual constraints, without losing sight of the fundamental findings established in other models.

A Two-stage Sustainable Consumer Behavior Model

The core idea of the new model is that a consumer must first be in a state of readiness for SCB, and the actualization of SCB depends on the removal of the contextual constraints that the consumer faces. This process in a nutshell is setting up a goal and realizing it. Not surprisingly, the SCB is a goal pursuit behavior, just like many other regular consumption behaviors that require continuous striving, such as dieting and exercising.

To illustrate this, we could start with a simple example. Suppose Mario is hungry, he then decides to pick up a dinner order from a local restaurant. In this scenario, "being not hungry" is what Bagozzi calls the "end-state goal"; sending in a pick-up order is Mario's "action plan" to achieving the goal (Bagozzi & Dholakia, 1999). Mario could be very happy after having the meal—in other words, goal achieved. More generally, Bagozzi and Dholakia (1999) define the goal setting and goal pursuit process to be a loop. Consumer begins by setting a goal based on a certain need. Then s/he forms the intention to strive for the goal. S/he then plans for actions that help to achieve the goal. Next, s/he initiates the action and at the same time monitors the progress. In the end, the consumer evaluates the result of the goal pursuit, and the internal feedback helps to determine whether to set up a new goal.

Let us return to the beginning of the example. Now, before Mario pushes the button to send the restaurant order, he may realize that by executing this plan, he is also getting extra packaging materials for his food, such as plastic bags, plastic containers, and single-use dinnerware. His knowledge tells him that he would create unnecessary waste by placing this pick-up order. Is there any way that he could reduce the amount of waste while still enjoying the same food? Maybe, he could tell the restaurant that he would bring his own container and bag for the food, so that no single-use packaging materials would be used for this order. Mario then calls the restaurant with

this idea, only to be informed that, for hygiene concerns, his food cannot be prepared in his way and must be carried out with their own packaging. Eventually, Mario may turn to other restaurants that accept his offer or make his own dinner .

To analyze what is happening in the extended example, I make a modification to the goal hierarchy introduced by Bagozzi and Dholakia (1999), as shown in Figure 1. The focal goal represents the intention in the aforementioned feedback loop; the superordinate goals represent the reasons behind achieving the focal goal, which tend to be more abstract; the subordinate goals represent the ways to achieve the focal goal, which tend to constitute a set of detailed goals (Bagozzi & Dholakia, 1999). To meet all these goals in the three-tiered hierarchy, we need an action plan to serve as the input to get the machine running. In this example, the focal goal (alpha) is to not be hungry; the superordinate goals can be to stay healthy or to survive; the subordinate goal is to get food to eat; and lastly; the action plan is to place a pick-up order at a restaurant. However, while working on the focal goal alpha, another focal goal (beta) pops up—in this case, that is reducing negative environmental impacts. In this light, the superordinate goals for the focal goal beta can be to slow down climate change, provide a better environment for future generations and so on. The subordinate goal is then to reduce waste from the consumption. In this example, attempts to change the original action plan are made in order to pursue both focal goals. Moreover, there are impediments for the new action plan as the initial restaurant does not accept the offer of

using alternative packaging method.

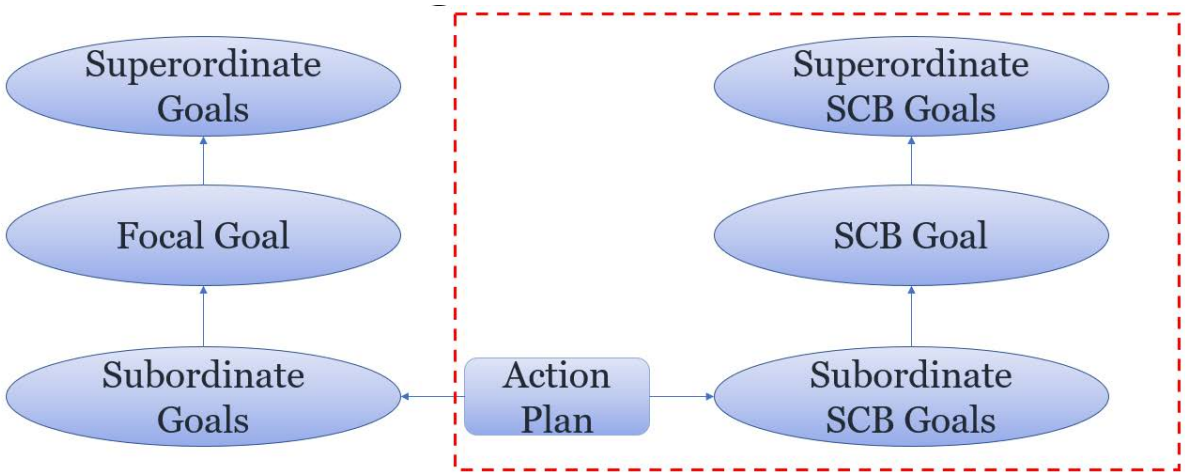

Figure 1. Modified Goal Hierarchy Model

This whole process of forming an action plan is a consumer trying to pursue multiple goals, including SCB. It is called "trying" because goals are naturally "problematic," which require the removal of the contextual constraints for the end-state to be achieved, whether the constraints being environmental, economic or psychological barriers (Bagozzi & Warshaw, 1990). Nevertheless, having contextual constraints does not necessarily prevent consumers from trying, although the level of effort can vary depending on a consumer's conscious desire and unconscious driving force like habit (Bagozzi & Warshaw, 1990). Figure 2 outlines the original theory of trying diagram by Bagozzi and Warshaw (1990), which summarizes the antecedents of consumer trying. The model is built on the Theory of Goal Pursuit (Warshaw & Davis, 1985) and the Theory of Planned

Behavior.

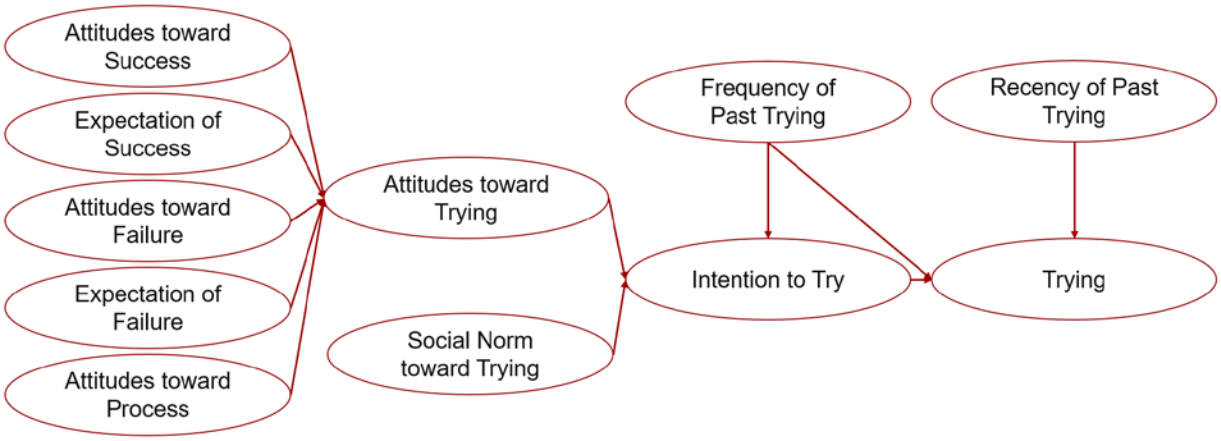

Figure 2. Original Theory of Trying Diagram

The Theory of Trying explains a consumer's process of trying in the following way. Firstly, there could be many potential consequences from trying, some of which could be successful, others not. Secondly, a consumer evaluates the likelihood of each consequence, which then determines the attitude towards them. Thirdly, the attitude towards success/failure and the expectation of the outcome jointly affects the consumer's attitude towards trying. The consumer also evaluates the process in the same fashion, and the attitude towards the process influences the attitude towards trying as well. Fourthly, similar to the Theory of Planned Behavior, the attitude towards trying and any social norm around it jointly affect one's intention to try and actual trying (Bagozzi & Warshaw, 1990). There are two additional elements in the theory of trying. One of them is the frequency of past trying, which in theory affects both the intention to try and trying itself. The other element is the recency of past trying, which alone might steer the trying to another direction (Bagozzi & Warshaw, 1990).

Figure 3 shows the abbreviated two-stage process of SCB. In the first stage, consumers start by trying to achieve the SCB goal, the process of which follows the Theory of Trying. In the second stage, the consumers commit SCB, the process of which requires certain contextual

constraints to be relaxed. These contextual constraints can be either internal or external, and they may vary at individual level and/or group level, based on personal habit, individual income, regional culture, among other factors.

Figure 3. Two-stage Process for Sustainable Consumer Behavior

This model serves as an expansion to the existing literature. It not only includes previously reviewed models as either a part or a special extension of it but is also able to address the contradictions between empirical findings and existing theories. For instance, as mentioned earlier, information campaign tends to fail in changing consumer behavior. According to the new model, the information could have changed consumers' attitudes towards SCB and have encouraged them to try harder. However, it is likely that consumers have already been trying even before the campaign, but they cannot fully commit to it because there are no choices available to achieve that goal. For instance, even though an average consumer tries to switch to wind energy and wants to do it even more after learning about the amount of carbon released from coal plant, s/he cannot get it done if there is no supplier around the community. Moreover, the phenomenon discovered by Stern (1999) on the synergistic effect between information and incentive can also be explained by my model: the information encourages consumers to try SCB and the immediate economic constraint is removed by subsidy. The two-stage model does imply more weight on the contextual constraints on observed SCB. It is important to note that this is a model at the individual level, and it is one that performs best when considering the idiosyncrasy of individual constraints. It is

nonetheless consistent with the general findings from Osbaldiston and Schott (2012) that on average, single treatment creates at best moderate effect on SCB. The treatment could have removed some consumers' constraints or have stimulated some consumers with very slack constraints, but not all of them.

The remaining question about the two-stage model is how it can be used to boost SCB in a controlled lab experiment as well as in the field. There are two important milestones to build following the model: first, we need to find a strategy to increase the level of SCB trying among consumers; second, we need to identify at least one contextual constraint for the target group and test if the removal of it results in actual SCB.

Tangible Comprehensive Goal-matching Information: Definition and Hypotheses

Let us go back to the restaurant order example. For the average consumers, it is unlikely that the main focal goals of their everyday life are set around SCB, except for some who work for pro-environmental NGOs, NPOs or government agencies. Instead, the SCB goals are more likely parallel to other goals that may potentially be achieved in a sustainable way. In Figure 2, I use a dashed box to represent this scenario. The model suggests that one strategy to boost the level of trying is to remind consumers of the SCB goals that could be pursued in the process of achieving other goals. This strategy is called making information tangible. Tangible information on sustainable consumption refers to facts that are framed to help consumers set up SCB goals in common consumption situations.

The tangible information defined here is not a contestation or challenge against the same term used in other papers. In fact, it is a broader concept that includes the known successful information-tweaking technique. For instance, Reczek, Trudel, and White (2018) present their subjects with detailed and concrete information about a product's sustainable attributes; as a result, individuals find these eco-friendly products more appealing and are more likely to choose them. The concrete information is effective in making SCB goals more accessible, especially in communicating the subordinate SCB goals that are associated with the alternative products. Another survey study conducted in a county of Michigan find that personal experience of global warming predicts the perceptions of local risk of global warming (Akerlof et al. 2013). In other words, personal experience has a positive effect on consumer's acknowledge of climate change. This happens because personal experience of the climate is more tangible, in a way that the superordinate SCB goals become local, concrete, and meaningful when they are closer to the self or more personally relevant.

Naturally, concrete information is often tangible because it breaks ideas down to the level of action. This explains why in previous studies concrete information is more useful than abstract information where there is a missing link between the content and the possible plan of action. Telling individuals why something should be done without offering actionable choices feels hollow. At the same time, telling individuals how to do something without saying why it should be done can also be problematic, because the motivation cannot be established without an understanding of the need. Therefore, to make the information most powerful in reshaping consumer behavior towards sustainability, the information should cover both the reasoning and the action parts of the SCB, besides being relatable to other regular consumption behaviors. In other words, having tangible and comprehensive SCB information is the key to effectively influencing behaviors. Figure 2 also implies that habit is an important driving force for not consuming sustainably. For consumers who are not environmental activists, the part in the dashed-line box is often masked by habit—the automatic processing of glossing over SCB-related goals. Therefore, a strategy that reveals the complete SCB goals is an attempt to break this habit as well.

This approach of emphasizing information comprehensiveness is also related to the concept of mindful consumption. Mindful consumption is defined to be a guiding principle of customer-centric approach to sustainability, which is a "metric of performance based on sustainability outcomes that are personally consequential of customers" (Sheth, Sethia, & Srinivas, 2011, p. 24). Consumption always has environmental and economic consequences. Typically, when the consequences start to negatively affect personal and collective well-being, the consumption level must have become unaffordable or unacceptable, which is the symptom of over-consumption (Sheth et al., 2011). Mindful consumption relies on consumer's consciousness about these consequences, which is reflected in their mindset and behavior (Sheth et al., 2011). Mindful

consumers care for their selves, communities, and nature. Their consumption behaviors then show patterns of temperance in acquisition, repetitive consumption (i.e., the buying-discarding-buying cycle), and aspirational consumption (i.e., trading up) (Sheth et al., 2011).

The Trade-offs of Comprehensive Information

The common perception that that more information should always outperform less information rests on the assumption that all information is treated equally when taken into the decision-making process. Economists predicted that humans would make the best decision with comprehensive information, only to find that people have bounded rationality and that they seek satisfactory solutions rather than optimal solutions (Kahneman, 2003). We are currently living in a digital era, where free or cheap information is ubiquitous and easily available, unlike thirty years ago when the information circulation was much more limited in space and time. In fact, we now have too much information to deal with, to the point where we need to deliberately filter out the information that we do not need rather than make substantial effort to acquire information. When information is abundant, attention becomes a scarce cognitive resource, which means that consumers can never use every piece of information to help with decision making (Van Knippenberg et al. 2015). A recent report from Microsoft shows that consumers' average attention span has reduced to just eight seconds on digital contents.[4] Therefore, sending more information to consumers is associated with a higher risk of reduced attention and interest, now more than ever. More detailed explanation of this risk can be related to the limited working memory capacity and mind wandering.

Human memory is often categorized as perceptive memory, short-term memory, and long-term memory. Working memory is controlled short-term memory that is used to execute specific tasks (Baddeley, 1992). The capacity for working memory varies by person, but one thing is certain,

[4] Time (2015). You Now Have a Shorter Attention Span Than a Goldfish. URL: https://time.com/3858309/attention-spans-goldfish/

which is that it is generally much smaller than the capacity for long-term memory. Working memory also does not last long and keeps refreshing itself as an individual continues with his/her task. The ultimate goal of delivering SCB information is to integrate it into long-term memory so that it can constantly affect decision making. But as mentioned earlier, most people will not have much time and interest to digest extensive SCB related information, unless they find it important and are devoted to it (Anderson, 1982). Therefore, a question arises: what would be the appropriate amount of information to be presented in a short period of time? Too little information certainly does not make the most use of people's attention, and yet too much could result in inefficient consequences: 1. one loses interest and gives up halfway; 2. one cannot save the complete knowledge into long-term memory; 3. one begins mind wandering in the middle of the process. The respondents reported in the Microsoft report probably fall into the first category. The second category has been verified by many studies, especially those investigating the serial-position effect (Murdock Jr, 1962). The serial-position effect includes the primacy effect (i.e., people tend to remember contents that are first presented better) as well as the recency effect (i.e. people tend to remember contents that are last presented better). This is because contents presented earlier are more likely to enter long-term memory, and the contents presented later are more likely to remain in working memory. In a nutshell, if a person allocates limited cognitive resources to a lengthy piece of information, s/he would not be able to remember everything.

Mind wandering is a phenomenon whereby one's thoughts wander to unrelated topics, even though the focal task is ongoing. Mind wandering can happen any time in our lives. For example, one could begin thinking about dinner preparation when driving on the highway and not noticing how far the vehicle has moved in the last two minutes. A more relevant example here is that people often find themselves reading but not understanding the article, because they are simultaneously

thinking about other things that distract their attention. In other words, mind wandering negatively affects reading comprehension. Considering the complex nature of the knowledge of sustainability, reading is one of the major ways to acquire information. Mind wandering is thus a significant potential obstacle of knowledge transfer. Studies have found and tested multiple causes of mind wandering. It turns out that working memory capacity has a huge impact on the likelihood of mind wandering, as well as that of reading comprehension subsequently (McVay & Kane, 2012). However, working memory capacity is not something that can be easily improved, and it is hard to quantify in a way that allows us to tailor information to match the capacity. More importantly, an individual's motivation and interest in the topic have a strong relationship with mind wandering. The more motivated and interested in the topic one is, the less likely it is for one's mind to wander (Unsworth & McMillan, 2013). It is then reasonable to predict that for those who are highly interested in living sustainably, more information is likely to be more effective. But sustainability stake holders' target population should be those who are less motivated, which means that there is a trade-off between the amount of information provided versus the amount of information that is actually processed. Finally, another study also finds that mind wandering is more likely to happen when one is reading difficult, as opposed to easy, texts (Feng, D'Mello, & Graesser, 2013). SCB information is usually distant to the self and tends to be abstract, although adjustments can be made to make it more tangible. Therefore, mindlessly adding more content to the information leads to risks higher likelihood of mind wandering, resulting in poor comprehension.

To summarize, introducing comprehensive information may have its benefits and costs. The benefit is that the information is goal-matching, tangible, and thus logically sound. The cost is that there is an increased possibility that the information does not get completely comprehended, especially when individuals have limited cognitive resources, dampening the potential

complementary effect of the abstract and concrete information. As such, under certain restricted situations, partial information may perform a better . Overall, for a real-life implementation, the trade-off between comprehensive and partial is a major concern. For the current research, the primary interest is to test whether the abstract and concrete information—when presented in a combined and comprehensive form— has a significant complementary effect. Therefore, in the studies I am about to introduce, the length of the reading materials is tightly controlled.

Formally, the research question can now be summarized as: can we shift consumption behavior to be more sustainable by making environmentally related information comprehensively goal-matching? Based on the theories above, I have two main hypotheses associated with the question:

H_1: Comprehensive goal-matching environmentally related information increases consumers' level of trying to consume sustainably better than partial information.

H_2: Comprehensive goal-matching environmentally related information increases the likelihood of SCB when contextual constraints are removed.

Two experimental studies are designed to test these hypotheses, and I use the plastic waste crisis as the consumption context.

Plastic Crisis

While the new model is generally adaptable to all sustainability issues, plastic pollution is a recent and rapidly worsening problem and is therefore a suitable candidate for the test. It is not an exaggeration that we are increasingly being surrounded by waste. Since 1950, more than 8 billion metric tons of trash have been produced—as much as the mass of Mount Everest—and approximately 75% of them are sitting in landfills or floating in the ocean, according to a recent news article (Darryl Fears, 2018). Moreover, waste is being generated at an increasingly higher rate. According to the newest data from the environmental protection agency (EPA), the 2015 total municipal solid waste (MSW) generation hit a record high of 262.4 million tons in the United States alone (*National Overview: Facts and Figures on Materials, Wastes and Recycling*, 2018).

Among MSW, plastic has become an increasingly dominant material in the consumer marketplace since its development 80 years ago (Jambeck et al., 2015). According to EPA, the proportion of plastics in MSW has increased to 13.1% in 2015 from a mere 0.4% in the 1960s. Compared to other MSW materials, plastics was mostly landfilled, although it has the potential to be recycled like metals and papers. Unfortunately, little plastic has been recycled, despite consumer effort in sorting and the availability of the magical green bin. As of 2019, merely 9% of the plastic produced was recycled in the United States. (Sandoval, 2019). The EPA reported that 76% of plastics ended up in landfills, with the rest combusted for energy recovery.

Although the plastics generation volume is relatively smaller than paper & paperboard (25.9%), food (15.1%) and yard trimmings (13.2%) (*National Overview: Facts and Figures on Materials, Wastes and Recycling*, 2018), the consequences of dumping plastic materials are chronic and profound, for the following reasons. First, even in the most ideal situation, the degradation of plastic takes more than 50 years. The number grows much larger in environments

such as seawater where temperature is low and highly compressed deep landfill where oxygen availability is limited (Webb, Arnott, Crawford, & Ivanova, 2013). It is estimated that landfilled plastic take more than 100 years to degrade (Webb et al., 2013). If not taken care of, the plastic waste will continue to grow around cities and pollute the environment for a very long time. Meanwhile, it has already been found that plastics could return to the food chain during the degradation process, resulting in an increasingly alarming health risk. Small pieces of plastic have been found in organisms like fish and invertebrates in the ocean and even in lake eco-systems (Thompson, 2013). Perhaps the only comfort in this scenario at the moment is that the microplastics have not been found to cause health issues directly (Neuman, 2019). The stability and reliability of plastics have backfired when plastics reach the wasteland and the water system. This existing stock will continue to grow until an effective reuse solution is developed. All these facts point to the urgency of bringing down the plastic waste generation level.

Efforts have been made to mitigate the plastic waste problem—some successful, others less so. One approach is to promote “green consumption” and to turn more consumers into “green consumers” (Haws, Winterich, & Naylor, 2014). The idea of green consumption is to encourage consumers to switch to products that are less impactful on the environment, but usually with higher cost. Therefore, complementary incentive such as subsidy for electric cars is crucial to boosting green consumption. In the context of plastic waste reduction, the EPA encourages “reduce, reuse and recycle” strategies, sorted by the level of effectiveness. The most radical solution is to bring down the plastic consumption level. A 2010 data reveals that North America has the largest consumption of plastics per capita, which is about 1.4 times of that in Western Europe and about 3.5 times of the World Average (Webb et al., 2013). As a consequence, the plastic waste generation per person is the highest in the United States, which is 0.34 kg per day (Jambeck et al., 2015). This

rate of current consumption is so high and alarming that there is likely room for the reduction of plastic consumption.

Subjective Sustainable Consumption Score

To establish a convenient and comparable measure for sustainable spending, particularly for the upcoming Study 2, a continuous score is designed. This score takes account of subjective ratings of products' environmental sustainability from the target population, instead of drawing from objective facts regarding their production, consumption, and disposal.

The intuition behind this measure development is that the true environmental impact of any product is hard to determine, even by experts in the field. Take the shopping bag as an example. It is one of the most consumed products in the world and uses a variety of materials in its production. The three common categories of shopping bags are plastic, paper, and cotton. More specifically, multiple subcategories exist within each category, depending on the source of the materials, the additives into the raw materials, and even the thickness of the products. For example, high-density polyethylene bags are stronger and thus more durable than low-density polyethylene bags, implying a better potential for reuse and less environmental footprint at the consumption stage. The true ultimate environment impacts of a product is usually analyzed with Life Cycle Assessment (LCA) (Finnveden et al., 2009).

In terms of the LCA outcome of shopping bags, the major types of environmental impacts include energy use and the technological efficiency in producing the materials, waste management differences and the downstream consequences of them, as well as the available choices for consumers to use them. LCA results can be counter-intuitive, as is the case for shopping bag. The earliest comprehensive LCA study on shopping bag is conducted in the United Kingdom. It finds out that, surprisingly, single-use plastic bag introduces the least environmental footprint, if used properly. "Properly", in this case, can be using it twice for shopping and discarding it as a trash bag (Edwards & Fry, 2011). A more recent study, using the same methodology but conducted in

Denmark, concludes the same—plastic bags are more environmentally friendly, compared to paper bags and cotton bags. The most important reason is that the last two are rarely reused enough to cover the environmental cost of producing them (Bisinella et al. 2018). Having conducted a meta-analysis of all shopping bag related LCA studies, the United Nation Environmental Program consistently confirms the same findings from the previous examples. Moreover, it summarizes the pros and cons of different bag types on various aspects of environmental impact. One controversy of plastic bags has to do with littering, and consequently the related land or water pollution. On the other hand, the resistance of degradation reduces not only the amount of carbon dioxide or methane emission, but also the risk of eutrophication and acidification, compared to paper and cotton materials.[5] In view of the natural disasters caused by climate change in 2021,[6] plastic bags seem to be preferrable to paper or cotton bags which are conveniently labelled "green."

Therefore, there is no easy judgement on whether a product is scientifically more sustainable than its alternatives. In the interest of this series of study, a more appropriate measure is rather, the extent to which people believe a product is sustainable. If the population believes that paper and cotton bags are more sustainable than plastic ones, we would like to see that our treatment encourages people to turn towards the former, and not the latter. Whether or not the direction of change is objectively correct is beyond the scope of the study, but it is important to note that efforts in both education and technology are always needed to revise people's beliefs.

[5] Single-use plastic bags and their alternatives: Recommendations from Life Cycle Assessments. (UN Environment Programme 2020 Report). URL: https://www.lifecycleinitiative.org/library/single-use-plastic-bags-and-their-alternatives-recommendations-from-life-cycle-assessments/

[6] NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). URL: https://www.ncei.noaa.gov/access/monitoring/billions/, DOI:10.25921/stkw-7w73

Potential Moderators and Covariates

Although I argue that my new approach could enhance the influence of information on shaping sustainable consumer behavior, its effect is still likely subject to individual differences caused by psychological and societal factors. The variation of the covariates may make the assumed treatment effects harder to detect, and the existence of the moderators could lead to different effect sizes or directions. This section discusses such moderators and covariates and outlines predictions based on the literature. As an overview, political orientation and green consumption value are possible moderators. In addition, individual consumers' connectedness to nature, need for cognition, and social desirability are considered potential covariates.

Political ideologies can be described as a set of shared beliefs and mental frameworks that helps individuals interpret the structure of the environment, the order of the social society, and ways of achieving them (Jost, 2006). They can be further categorized into different types. In terms of the form of the government, political ideology may refer to dictatorship, autocracy, or democracy. In terms of the underlying economic system, it can be capitalism, socialism, or communism (Adams, 2001). However, besides these abstract classifications, the most commonly discussed ideology today is political orientation, often known as liberalism/conservatism or simply left/right, named according to the French parliament seating tradition (Jost, Federico, & Napier, 2009). It has been found that political orientations are associated with a wide spectrum of psychological attributes such as attitudes (especially towards climate change nowadays), personalities, cognition, and motivations (Jost et al., 2009; Lane, 1962; Tetlock, 1983). The relationship is bidirectional: sometimes political orientation is the determinant of these attitudes; other times, however, it is the reverse (Feldman & Johnston, 2014). Unsurprisingly, researchers have explored the relationship between political orientation and sustainable consumption. For

example, in a research with four related studies, Kidwell, Farmer, and Hardesty (2013) demonstrate that persuasive appeals can enhance sustainable behaviors when they are consistent with consumers' moral foundations under different political orientations, i.e., individualizing for the liberals and binding for the conservatives for enhanced fluency. In another research, Watkins, Aitken, and Mather (2016) find a similar pattern among New Zealand consumers with comparable political orientation divergence. Moreover, they find that the leftist consumers are more likely to show commitment to take political action for desired change towards sustainable consumption behavior. The information treatment in my current research is meant to be informative rather than persuasive. However, given the literature and the media coverage to date, it is likely that political orientation could interact with information treatment (e.g., liberal-leaning individuals would be less resistant to sustainable consumption information and behave more sustainably in subsequent tasks).

Green consumption value is defined by how likely individuals reveal their values of protecting the environment via regular consumer behaviors (Haws et al., 2014). Green consumers by this standard are more mindful of environmental protection and resource management and are more willing to take action in an environmentally friendly way. Based on this definition, and because sustainable consumption requires cognitive effort to analyze the relationship between current consumption and future consequence, it is then reasonable to believe that those who already hold strong green consumption values should also be knowledgeable about the ways to engage in green consumption. In other words, these individuals may have already established intrinsic goals to achieve sustainable consumption in some form. As a result, the informative treatment may have less effect for green consumers but more for those who are less "green." Green consumption value thus serves as a potential moderator.

Social desirability bias refers to the phenomenon of respondents refusing or failing to accurately report themselves on topics that may be sensitive according to moral standards (Grimm, 2010). When it happens, individuals tend to skew their responses towards socially desirable space, resulting in a measurement bias that obscures their true attitudes, feelings, or decisions. Social desirability bias is extremely common in and out of research, covering a wide range of social and personal issues. For instance, Presser and Stinson (1998) find that, with conventional interviewer-administered items, religious service attendance rate appears to be constant over time. However, after switching to self-administered items which reduce, if not minimize, social desirability bias, the attendance rate actually declines steadily. In another research, Holbrook and Krosnick (2010) investigates why surveys yield higher voting rates than official figures and finds that social desirability bias is causing the difference. Allowing respondents to secretly report their voting history shows a drastically reduced turnout rate. In both examples, social desirability bias is mitigated with techniques that reduce human interaction when respondents are to report their past behavior. Human interaction during surveys is one of the known determinants of social desirability bias. Other factors that affect the degree of social desirability bias are individuals' need of social approval, the need of avoiding embarrassment, as well as interviewer's personal characteristics and data collection strategies (Krumpal, 2013). Accordingly, researchers have developed other methods to prevent and reduce this bias, including indirect questioning, forced-choice, and randomized response, in addition to the aforementioned self-administration and interviewer selection (Fisher, 1993; Krumpal, 2013). In the United States, public attitude towards sustainability does not yet have a uniform moral ground, similar to attitude toward climate change. In fact, as mentioned earlier, there is a division between groups from different sides of the political spectrum. However, depending on the sampling design, social desirability bias may still be one of the

variables affecting self-reported results. Previous studies do find that there are low and weak relationships between social desirability and self-reported environmental attitudes and ecological behaviors, but do not find that social desirability have a moderating effect (Milfont, 2009). Therefore, in the current research, social desirability is measured and tested as one of the covariates.

Connectedness to nature is an individual trait that describes the level at which one "feels emotionally connected to the natural world" (Mayer & Frantz, 2004, p. 503). By definition, the level of connectedness to nature can increase when one is physically exposed to the nature. The increase of connectedness to nature was found to be associated with other psychological benefits, such as positive emotions, improved psychological wellbeing, and better ability to solve life problems (Cervinka, Röderer, & Hefler, 2012; Mayer et al. 2009). Recently, Ives et al. (2018) point out that we can move society towards sustainability by reconnecting people with nature. It can be done at a superficial or a deep level depending on the type of intervention, which is in the same spirit as the current research. Since connectedness to nature is not manipulated by any means in this research, it is measured and assumed to be one of the covariates in modeling.

The need for cognition is a personality trait that stands for "the tendency for an individual to engage in and enjoy thinking" (Cacioppo & Petty, 1982, p. 116). In the original study series, the need for cognition is found to be unrelated with social desirability bias, and it serves to distinguish between individuals' attitudes towards the complexity of a cognitive task: individuals with higher need for cognition favor complex task to simple alternatives (Cacioppo & Petty, 1982). One of the most studied areas of the need for cognition is how it affects individuals' interpretation of messages, such as message persuasiveness and information processing. In a follow-up research, Cacioppo, Petty, and Morris (1983) study how the need for cognition interacts with the argument quality of a persuasive message. They find that individuals with higher need for cognition rate better-quality

message more positively and rate worse-quality message more negatively, compared to individuals with lower need for cognition. Consequently, individuals with higher need for cognition respond more strongly to post-communication measures. A similar study by See, Petty, and Evans (2009) also compares the effect of perceived message complexity on information processing among high versus low need for cognition groups. Going beyond broad-stroke observations, Haugtvedt and Petty (1992) expand the literature by examining the message persuasion persistence and resistance among individuals with different levels of need for cognition. They find that the newly formed belief in individuals with high need for cognition decays at a slower rate than it does in those with a low need for cognition. In addition, when new adverse information comes in, the former is more resistant in changing the belief than the latter. In a nutshell, previous research repeatedly find that the perceived complexity of persuasive contents could have different impacts on individuals' attitudes towards the matter, depending on their levels of need for cognition. The information type proposed in this research is informative instead of persuasive, and the length of the different pieces of information is controlled to avoid differences in complexity. However, the perceived complexity will be measured to verify these controls. Meanwhile, attitudes can be regressed on the need for cognition to further examine whether the information is perceived differently. In general, however, the knowledge of environmental sustainability tends to be abstract rather than intuitive and may involve insights from various disciplines, making it more complex than other types of news. Individuals with higher need for cognition in the long run may benefit from this trait and are more easily convinced by sustainable consumer behavior. Therefore, the need for cognition is included as a covariate candidate in the modeling.

Study 1

Study 1 examines whether comprehensive goal-matching information encourages consumers to try SCB harder than partial abstract or partial concrete information during the first stage ($H_{1)}$. The study generally follows the original design created by Bagozzi and Warshaw (1990) for consistency. Some of the questions are removed because while they are appropriate in addressing weight control, they are not suitable for SCB. Meanwhile, the length of the questionnaire is also reduced by taking away the belief measures because they are not directly relevant to the current study topic and may significantly increase the workload for participants. However, the total number of and the frequency of the study waves remain the same.

Method

Subjects. A total of 140 undergraduate students from introductory level consumer science classes in a large mid-western university signed up for this study. They are awarded full extra course credits for finishing all three waves of the study. For those who drop out before completing all waves, partial credits may have been given depending on their course instructors. Among the 140 participants, 135 finished wave 1, 92 finished both wave 1 and wave 2, 77 finished all three waves. The overall attrition rate is 46.7% by the end of the study. The five participants who did not finish wave 1 are dropped from the analysis. Thus, the total number of the observations in wave 1 is 135. Due to some technical issues in the linked downstream studies, seven participants took part in wave 1 more than once. Their first entries are kept for wave 1, but their entries are removed from wave 2 because they have been placed into multiple treatment conditions. Four of these seven participants also showed up in wave 3 and are therefore removed from wave 3 observations. Thus, the total number of the observations in wave 2 is 85. Meanwhile, another

participant who participated in wave 1 & 2 properly but failed to participate in wave 3, leaving the total number of eligible observations in wave 3 as 72.

Design. The study follows a between-subject single factor (information type) design with 3 treatment levels: partial abstract information, partial concrete information, and comprehensive information.

Materials. Questionnaire items from Bagozzi and Warshaw (1990) are replicated with modifications towards the plastic consumption topic (See Appendix A). *Trying* assesses whether an individual tried to consume less plastics during the previous week. *Past Frequency* assesses how much an individual has tried in the past year, measured on a six-point scale (1 = very many times, 6 = not at all). *Recency* assesses the extent to which an individual has tried in the past week, ranging from "did not try at all" to "extremely hard." *Intention to try* in the next week is measured on a seven-point scale (extremely unlikely to extremely likely). A*ttitudes toward trying* is measured by two seven-point scales (1 = extremely bad/unsatisfying, 7 = extremely good/satisfying). *Attitudes toward trying and succeeding, trying but failing, and the process of trying* are all measured in the same way. *Expectations of Success and Failure* are measured on a seven-point scale (1 = extremely unlikely, 7 = extremely likely). *Subjective Norms toward Trying* is measured in the same way. In addition, the Goal Commitment Scale (Hollenbeck et al. 1989) adapted for plastic consumption is applied (See Appendix B). Meanwhile, other scales potentially serving as moderators are unchanged and included in the study. They are: the Green Consumption Value Scale (Haws et al., 2014) (See Appendix C), the Connectedness to Nature Scale (Mayer & Frantz, 2004) (See Appendix D), the Need for Cognition Scale (Cacioppo & Petty, 1982) (See Appendix E) and the Social Desirability Scale (Reynolds, 1982) (See Appendix F). Lastly,

demographic information is collected, such as age, gender, race, and political orientation (liberal versus conservative) (See Appendix G).

Procedure. The study series is administered through the cloud-based subject pool software SONA. Two weeks before the study period, the administrative study details are sent to course instructors and forwarded to the students in their classes. The email invitation and the documentation contain instructions on SONA system registration, system operation and the study introduction to make sure students are aware of the process and are familiar with the platform beforehand. The study is conducted on Qualtrics and is separated into three Qualtrics sections. Each section corresponds to one of the three waves with a unique study link. Due to the high demand of student subjects, the study is also combined with two other unrelated research projects in each of the three waves. The other studies are always placed after the current study, but participants do need to complete all three research projects to be marked complete of each wave. The study redirection process is automated with a thorough text explanation and a pause to ensure data quality of all projects. During the study period, a participant gets immediate access to the wave 1 materials once the sign up is confirmed on the SONA system. Participants' progress is monitored individually and throughout the study as soon as the study link is activated. Once participants finish all the tasks in wave 1, they are redirected back to the SONA system to be labeled as "participated" for this wave. An individualized timer starts at the same time, which after seven days will activate the link to wave two at participant level. Participants then have 24 hours to finish wave 2 tasks online and repeat the process for wave 3. When all three waves are completed, participants will be given full credits automatically. In wave 1, participants are randomly assigned to one of the experimental conditions if they agree to continue with the study. They first read two articles depending on the assigned treatment (control article + abstract article, control article +

concrete article or abstract article + concrete article). After reading each article, two manipulation questions need to be answered before proceeding to the next section (See Appendix H). Following the treatment, participants in all conditions then go through measures in the same order: the Measures of Trying, the Goal Commitment Scale, the Green Consumption Value Scale, the Connectedness to Nature Scale, the Need for Cognition Scale, and the demographic questions. In wave 2, participants once again respond to the Measures of Trying. Their goal commitment is also measured. In wave 3, participants first answer the reduced-form measures of trying: *trying in the past week* and the *intention of trying*, followed by the Goal Commitment Scale. In addition, the Social Desirability Scale is applied before concluding the entire study series.

Results

Descriptive Statistics. Table 1 below is a snapshot of the key dependent variables and scale measures. Overall, the participants claim that they have tried somewhat hard to consume less plastics starting from week 2. The level of effort slightly increases in week 3. They also report a "better than nothing" level of commitment in the first two weeks. The average green consumption value is high, indicating that the sample consists of a large proportion of green consumers.

Table 1. Descriptive Summary of the DV and Scale Measures of Study 1.

	Observations	**Mean**	**Std.**
Past week trying measured in week 2	83	2.82	1.05
Past week trying measured in week 3	71	3.01	1.19
Goal commitment in week 1	132	3.75	0.74
Goal commitment in week 2	83	3.51	0.81
Green Consumption Value	132	4.91	1.00
Connectedness to Nature	132	3.38	0.54
Need for Cognition	132	3.14	0.26
Social Desirability	71	20.28	2.50

Manipulation check. Paired-sample t-test is applied to compare the responses to the two manipulation questions of each article in week 1. After reading the control article, participants on

average rate that the news article puts more weight on describing why the discovery of the stellar system is important (*M = 3.15*) than describing how the system is discovered (*M = 2.72*), and the difference is significant (*p < .05*). This is not surprising because in the current 190-word article, there are 73 words regarding the reason of the importance of the discovery and only 43 words introducing how the discovery is achieved. More importantly, both the treatment articles' answer patterns point to successful manipulation. Participants acknowledge that the abstract article argues more for why plastic consumption must be reduced (*M = 3.71*) than how we can do it (*M = 2.17*), *p < .001*. On the other hand, participants reading the concrete article clearly comprehend that it is more about the approaches to reduce plastic consumption (*M = 4.83*) rather than the importance of it (*M = 1.79*), *p < .001*. The attitude toward trying is calculated by taking the mean of the answers to questions "feeling good" and "feeling satisfied" toward "trying in general" (Cronbach's α is 0.959). Regression of attitude towards trying on treatment conditions, need for cognition, and their interaction terms establishes the significance of one's need for cognition (*F(1,126) = 4.195, p < .05*).[7] As a result, an interaction term between the need for cognition and the attitude toward trying is added to check for robustness in the regression analysis.

Treatment Effects. To examine if there are differences in the intention to try in week one, one-way ANOVA is applied. It appears that in the initial week when the treatment happens, no significant difference is found, *F(2,129) = 1.056, p > .05.* In week 2, the intentions between the groups do not differ either, *F(2,80) = 0.868, p > .05*. However, in the last week, there is a significant difference in the intention, *F(2,68) = 3.780, p < .05*. Post-hoc comparison with Holm-Bonferroni method finds that participants who were previously exposed to the comprehensive information *(M = 5.34)* demonstrate a higher intention to try to consume less plastics, compared

[7] This result comes from the supplemental questions administered in Study2.

to those under the concrete information condition *(M = 4.27)*, but not to the ones under the abstract information condition *(M = 4.45)*. To examine if the level of trying varies across the treatment groups, one-way ANOVA is applied to week 2 and week 3 "trying in the past week" respectively. However, there is no difference between the groups in either week, $F(2,80) = 1.905$, $p > .05$ *and* $F(2,68) = 1.752$, $p > .05$. Within each treatment group, the average level of intention to try and that of trying in the past week are also compared. No significant differences are found in any of these groups, even though the data show that individuals under the abstract and concrete conditions have less persistence—their level of effort decays over time. In contrast, the effort of individuals under the comprehensive condition is relatively robust, if not getting stronger. Table 2 below summarizes the average of the two dependent variables across groups and over three weeks.

Table 2. Average Intention to Try and Trying in the Past Week Between Experimental Conditions and Measure Weeks.

Week	**Intention to Try**			**Trying in the Past Week**		
	Abstract	**Concrete**	**Comprehensive**	**Abstract**	**Concrete**	**Comprehensive**
1	5.17	4.96	5.36	2.79	2.71	2.62
2	4.93	4.71	5.16	2.89	2.55	3.08
3	4.45	4.27	5.35	2.82	2.85	3.39

Path Analysis. The Theory of Trying assumes causal relationships from the antecedents of the intention to try to the intention and to the trying action. Therefore, the path analysis is applied to the test if the data fits this model. Table 3 (Appendix I) summarizes the fit measures and the regression coefficients for both week 2 and week 3 modeling with no additional inputs. The data fits the model poorly in week 2, $\chi 2(20) = 69$, $p > .05$, $CFI = 0.676 < .950$, $TLI = 0.465 < .950$, $RMSEA = 0.168 > .05$. The fit measures are better in week 3, but they still do not fit by any statistical standard, $\chi 2(20) = 39$, $p > .05$, $CFI = 0.871 < .950$, $TLI = 0.786 < .950$, $RMSEA = 0.113 > .05$. Further examination of the modification indices for possible solutions yields no reliable remedies for the current model. This suggests that the current data demonstrates that the

causal relationships in the Theory of Trying cannot be justified. Therefore, the remaining analysis will forgo these causal assumptions but claim correlations.

Regression Analysis. To explore how the level of trying is affected by not only the intentions, attitudes and other factors specified in the Theory of Trying, but also other psychological attributes such as green consumption value, connectedness to nature, and the need of cognition, four regression models are tested, using data from week 2 trying and week 3 trying as the dependent variables respectively. Below are the model specifications:

$$y_{i,t} = \alpha + Z(info\_type_i) + \beta_1\left(attitude_{i,t-1} \times intention\_try_{i,t-1}\right) + \beta_2\left(subjective\_norm_{i,t-1} \times intention\_try_{i,t-1}\right) + \psi\left(intention\_try_{i,t-1} * past\_frequency_{i,t-1}\right) + \gamma\left(intention\_try_{i,t-1} \times commitment_{i,t-1}\right) + \mathrm{e}_i \quad (1\text{-}1)$$

$$y_{i,t} = \alpha + Z(info\_type_i) + \beta_1\left(attitude_{i,t-1} \times intention\_try_{i,t-1}\right) + \beta_2\left(subjective\_norm_{i,t-1} \times intention\_try_{i,t-1}\right) + \psi\left(intention\_try_{i,t-1} * past\_frequency_{i,t-1}\right) + \gamma\left(intention\_try_{i,t-1} \times commitment_{i,t-1}\right) + A(info\_type_i * politics_i) + B(info\_type_i * GSV_i) + \mathrm{e}_i \quad (1\text{-}2)$$

$$y_{i,t} = \alpha + Z(info\_type_i) + \beta_1\left(attitude_{i,t-1} \times intention\_try_{i,t-1}\right) + \beta_2\left(subjective\_norm_{i,t-1} \times intention\_try_{i,t-1}\right) + \psi\left(intention\_try_{i,t-1} * past\_frequency_{i,t-1}\right) + \gamma\left(intention\_try_{i,t-1} \times commitment_{i,t-1}\right) + A(info\_type_i * politics_i) + B(info\_type_i * GSV_i) + \delta CtN_i + \eta NFC_i + \kappa SD_i + \mathrm{e}_i \quad (1\text{-}3)$$

$$y_{i,t} = \alpha + Z(info\_type_i) + \beta_1\left(attitude_{i,t-1} \times intention\_try_{i,t-1}\right) + \beta_2\left(subjective\_norm_{i,t-1} \times intention\_try_{i,t-1}\right) + \psi\left(intention\_try_{i,t-1} * past\_frequency_{i,t-1}\right) + \gamma\left(intention\_try_{i,t-1} \times commitment_{i,t-1}\right) + A(info\_type_i * politics_i) + B(info\_type_i * GSV_i) + \delta CtN_i + \eta NFC_i + \kappa SD_i + \Gamma(Antecedents) + \mathrm{e}_i \quad (1\text{-}4)$$

Equation (1-1) is the base model, where the potential treatment effects, intention to try, antecedents of intention to try, past frequency of trying and the indirect effect of the goal commitment are considered. The dependent variable is self-reported trying in the past week for individual *i* at week *t*. α is the intercept, and *Z* is a vector of coefficients associated with the treatment dummies where abstract condition serves as the reference group. β_1 and β_2 are parameters for the indirect effects of attitude toward trying and subjective norm. ψ is a vector of coefficients associated with the direct effects of intention to try, the frequency of past trying, and their interaction measured in the previous week. γ represents the indirect effect of intention to try and goal commitment from *t-1*. The recency of past trying is excluded from the regression to avoid the risk of multicollinearity due to the significantly high correlation between the recency and past frequency (In week 1, the magnitude is 0.70) and between the recency and the future trying (In week 2 and 3, the magnitudes are 0.57 and 0.73 respectively). The same problem of multicollinearity occurred in the original experiment of trying to lose weight (Bagozzi 1990), where the effect of recency eliminated the effect of the past frequency and was likely skewed upward due to the repeated administration of the questionnaire. Thus, from both the theoretical and the statistical points of view, the recency of past trying is removed for all the regression analysis. Equation (1-2) is the extended model where the potential moderators are added. The direct and indirect effects of political orientation and the green consumption value are collected in vectors *A* and *B*. Equation (1-3) is the full model where

other covariates are considered. δ, η and κ are the coefficients of connectedness to nature, the need for cognition, and social desirability, respectively. Finally, equation (1-4) is the complex model where the indirect effects of all the antecedents of intention to try are present. Their marginal effects are observed in vector Γ.

The regression results for week 2 trying are in Table 4 (Appendix J). Here, the abstract information condition is used as the reference group. Therefore, the estimated effect of the treatment dummies is relative to the reference group. A similar analysis is performed using concrete condition as the reference group, but the effects are not significantly from zero. The base model shows that there is no treatment effect of information. In addition, the indirect effect of goal commitment is not different from zero, rejecting the alternative hypothesis of mediation effect. More surprisingly, the intention to try does not predict the subsequent trying, and this insignificance holds true across the models. In fact, there is no significant predictor at all in the base model. In the extended model, the assumed direct and indirect effects of political orientation do not exist. Nevertheless, there is an interesting interaction effect between the information treatments and the green consumption value. Specifically, compared to the abstract information condition, there is likely a positive treatment effect of the concrete information condition and a possible treatment effect of the comprehensive condition suffering from low power. But these effects are moderated by the green consumption value: the "greener" the individuals, the weaker the treatment effects. Because the average green consumption value of the sample is very high, this interaction effect cancels out the treatment effect. However, this pattern is not robust enough to be carry out in other models. When the covariates are added in for the full model, the effects in the extended model no longer have the power to reject the null hypothesis. Meanwhile, in the full model, we are back to the state where none of the predictors are significantly different from zero

except for the tiny indirect effect of the attitude toward trying, even though they explain more than a third of the total variation. Lastly, the addition of antecedents does not qualitatively alter the previous results but does raise the concern of overfitting in terms of the BIC and the extremely low coefficient magnitudes.

The regression results for week 3 level of trying do not differ much from those in week 2, as shown in Table 4 (Appendix K). The biggest difference for week 3 is in the extended model. The interaction effect between the green consumption value and the information treatment no longer exists, possibly due to the reduced power caused by the dropouts happened in week 3. Moreover, in the full model, there is now a significant negative effect of the social desirability. Lastly, the complex model in week 3also raises suspicion of overfitting due to inflated BIC, stagnant adjusted r-squared, and the tiny insignificant estimated effects from the additional predictors.

Robustness checks are done to both week 2's and week 3's extended and full models, by adding the interaction term of the need for cognition, as previously mentioned. These models return qualitatively the same results with the additional regressor.

Discussion. Results from study 1 can be summarized as follows: the information manipulation effect is strong, but the outcome turns out to be ambiguous. Despite that most of the instruments and the process are replicated from Bagozzi's study, the results fail to fit the theory and to reject the null hypotheses. There are several reasons that might have caused this: the accessibility of the sustainable consumption goal, the measurement changes, the population characteristics and its relationship with the goal, and the possible side effects of the manipulations.

When the Theory of Trying was initially introduced, it was tested on the topic of "weight loss." The fit measures were extraordinarily good, with a CFI of about 0.950, much higher than

the fit measures of study 1. Compared to the nature of plastic consumption, weight is much easier to measure and to track. With a bathroom scale, a pencil, and a notebook, one can easily set up a record of weight over time. But for plastic consumption, it is much more difficult to do the same. Study 1 does not specifically ask participants detailed questions such as the reduced weight of plastic, or the decreased volume of plastic waste, or the amount of disposable plastic switched to greener alternatives; therefore, the measures of the intention to try, past/recent/current trying, and the antecedents of the intention to try are all susceptible to more noise than findings in the research about weight loss. Meanwhile, the original measure of trying was a binomial question. However, in study 1, I change it to multilevel with the hope of making the response category more responsive to the actual behavior, but this change could also enlarge the variance, especially in the case of a small sample. Therefore, these uncontrolled noises may very likely be the source of the model's poor fit. A statistical scanning of the model indices also supports this explanation: there is no strong evidence that misspecification happens for either the week 2 model or the week 3 model.

Meanwhile, it is noticeable that the results are subject to a ceiling effect. The sample heavily favors sustainable consumption, based on the high average score of the Green Consumption Value measure. This could create barriers for the treatment to have salient effect due to one or both of the reasons below. First, it is possible that these relatively green consumers already have the knowledge conveyed in the treatment articles, given that the information presented therein is common knowledge and superficial numeric facts rather than a deep-dive research analysis. Thus, the articles may only have served as a reminder of the existing goals, weakening the overall effect potential. Second, even if the information is new to them, there is likely not much room for improvement because the participants might have tried it in their own

way to some extent given the actual contextual constraint, as the Green Consumption Value Scale partially indicates.

Additionally, the manipulation may have unintentionally affected participants' mindsets. In the mindset theory of action phases, there are two mindset types in different phases of a goal pursuit cycle. Deliberative mindset happens in the decision phase, where one evaluates the desirability and the feasibility of different goals at an abstract level. Once a goal is chosen, one moves on to the action phase with an implemental mindset, where one cognitively details the plan to commit to the goal (Gollwitzer, 2012). Because the article with concrete information focuses on the actions to take against excessive plastic consumption, it may have helped to activate the implemental mindset. To examine this, mindset measures are collected from a small sample post study. Sixty-seven students from the same population who are not in the main study participate in the short post study. They are randomly assigned to one of the information treatments and are asked two questions regarding their current mindset (see Appendix L) following the manipulation. The first question addresses how determined the participants are to take actions, and the second is on how committed individuals are at taking action. The two together represent the implemental mindset. The higher the scores, the stronger the implemental mindset. The average of the determined mindset for the abstract, concrete, and comprehensive conditions are 5.78, 6.78, and 6.76, respectively. The average of the committed mindset among the three groups are 5.61, 5.74, and 6.19, respectively. ANOVA indicates that the determined mindset scores are significantly different between the groups, $F(2,60) = 5.288$, $p < .01$. Therefore, there is little evidence that the manipulation could have altered the mindset. Previous research finds that implemental mindset can lead to higher persistence in goal-directed behavior, but only if there is a conflict between the perceived feasibility and the desirability of the task (e.g. high feasibility but low desirability)

(Brandstätter & Frank, 2002), which is unlikely the case with the findings in the current study. We know from the Green Consumption Value Scale that the desirability of sustainable consumption is high. The concrete information about how to consume sustainably may increase the level of the perceived feasibility, although this is not tested in the experiment. In fact, the group with the highest score on implemental mindset measures also has an increasing trend of trying and reaches the highest level in week 3. The inconsistency could be due to the difference in defining persistence. In Brandstätter & Frank's study, persistence refers to either the time invested in an unsolvable problem or the costly attempts to win a jackpot without any performance feedback in a single experiment session. But from what we are observing in the current study, persistence is about the action readiness over a relatively long period of time, which does not have to be constantly picked up in the working memory. However, since the trend statistics is not significant, the side effect remains inconclusive.

Part of the concerns above are addressed in study 2, where the study is shortened to a single wave, and individuals' actual choice is observed through a mock shopping task. The outcome variables are redesigned for cleaner quantification. The study population stays the same for comparison.

Pilot Study

To generate an item list applicable to the mock shopping task, a pilot study is run to collect the products that the target undergraduate student population is familiar with, buys regularly, and has knowledge about. The pilot study also asks respondents to self-report their estimated monthly spending. These pieces of information will later be examined and modified to help us create the materials and the testing environment of study 2.

Method

Subjects. A total of 179 students from the introductory consumer science classes participated in the pilot study as the second part (out of three) of a study series in which the other sections are irrelevant to the current topic. Six students do not want to participate and are dropped. Students are awarded course credits for their participation.

Design. The pilot is conducted in a survey form with open-ended questions, multiple choice questions, and scale measures. There is no manipulation, so that every respondent answers the same questionnaire.

Materials. The survey questionnaire consists of three open-ended questions, four multiple choice questions, the Green Consumption Value Scale (Appendix C), and demographic questions. The open-ended questions ask respondents to list up to ten products that they would normally buy in a month that are either made of plastics or sold with plastic packaging. The multiple-choice questions investigate respondents' perceived difficulty to act on pro-environmental campaign, willingness to choose alternative non-plastic packaging if it becomes available, how much they are concerned about their personal plastic waste generation, and how often they are concerned about their personal plastic waste generation. These questions can be found in Appendix M.

Procedure. The survey is administered on Qualtrics. Respondents are invited into a behavior lab in a group of no more than twenty-one persons to complete tasks on the computer. They first participate in an unrelated study and are then redirected to the pilot study URL. If they agree to continue, they would answer the questionnaire and then decide whether to take one more unrelated task from another study afterwards. After finishing all three tasks, they are dismissed from the lab. Respondents can choose their preferred date and time to participate, as long as there

are available seats before the final deadline. Regardless of when they start, all respondents finish the study within the same week.

Results. On average, respondents list five products that are made of plastics and five products that have plastic packaging. They aggregate to a total of 853 and 844 respectively. For both categories, there are respondents writing down as few as one item and as many as ten items. This student sample scores moderately on green consumption, with an average green consumption value of 2.96 (on a scale of 1-5). At the same time, they are generally willing to substitute plastic packaging if they are given the opportunity to do so, with the corresponding question average score of 3.73. This student cohort is also moderately concerned about their individual plastic waste creation "about half the time," scoring an average of 3.02 and 2.80 on the related questions respectively. They also find it neither hard nor easy to follow a pro-environmental campaign to reduce the use of plastics (*M = 2.81*). Table 5 below summarizes the results. Lastly, respondents report their monthly spending averaging at $632, with the median being $500 and modes being $200 and $1000. We have removed possible outliers who claim that their monthly spending exceeds $5000.

Table 5. Descriptive statistics of the pilot study measures.

	Observations	**Mean**	**Std.**
Green Consumption Value	173	2.96	0.93
Perceived difficulty to reduce plastic use	173	2.81	1.04
How likely to switch to non-plastic packaging	173	3.73	1.15
How much I concern with plastic waste	173	3.02	0.95
How often I concern with plastic waste	173	2.80	0.96
Number of plastic products listed	173	4.9	2.4
Number of plastic packaging listed	173	4.9	2.4

Based on the pilot results, twenty products from either plastic-made category or plastic-packed category are selected following three rationales:

1. The product is among the most frequently mentioned ones by the pilot study respondents, and

2. There is an alternative product in the market for sale that is made of alternative materials, or

3. There is an alternative product in the market for sale that has an alternative packaging.

The complete product list (Appendix N) is then finalized to be rated in the pretest.

Pretest

As discussed in the literature review, the sustainability of the chosen alternative products may not be higher than their counterparts, due to the complexity of the product lifecycle from production to consumption to disposal. Even with extensive experience and data, researchers still cannot reach a consensus on whether plastic bags are superior to traditional shopping bags, let alone the various items in our basket. Most of them are a combination of different materials produced with different technologies in different fields and end up in different places when arriving at the end of the cycle. Our target population might be relatively more knowledgeable than the average population, increasing the probability of having a different view of the alternatives in terms of their sustainability. Therefore, the pretest here is designed to generate subjective ratings of product sustainability. Even if we do not have an objective measure of each product's sustainability, we are still observing whether or not individuals are trying to consume more sustainably by their personal, subjective standard. There is an opportunity for other researchers to explore the formation of accurate belief on sustainability, but this research question is beyond the scope of the current study.

Method

Subjects. A total of 52 undergraduate students from an introductory consumer science summer class participate in the study. Students are awarded class credits for their participation.

Design. The pretest is administered in a Qualtrics online survey with no manipulation. Every respondent answers the same questionnaire.

Materials. To reduce potential variations between different individuals' personal exposure to a certain type of product, a reference picture of each product and a product title is extracted from popular vendor websites such as Target, Walmart, and local big grocery chains. Then, depending

on the category of the plastic component (packaging or base material), a corresponding question is asked. The question details are listed in Appendix O. The questionnaire ends with demographic questions.

Procedure. The pretest is conducted entirely online on the SONA system for recruitment and credit awarding. Three weeks prior to the launch, the study information and the system introduction are sent to the course instructor to be shared with the students. Another two reminders are sent two weeks and one week before the study starts to make sure that interested respondents have full access to the SONA system. The study lasts a week, during which respondents can freely sign up on the system and land on the study page through a personalized link. Respondents then answer the questionnaire in one sitting before being directed back to the SONA system for automatic credit granting.

Results. Of the twenty pairs of products, the alternative choice is favored in twelve pairs, and the ratings are significantly different between each pair. There are two pairs in response to which participants rate the plastic products as significantly more sustainable than their non-plastic alternatives (plastic bottle vs. steel bottle; plastic food container vs. glass food container). The remaining six pairs' ratings do not statistically differ from each other. Among them, the bread's plastic packaging has a slightly higher average score than the option of bread with no packaging at all. The other five all have the alternative choices scoring higher than the plastic ones. Meanwhile, among the six pairs with insignificant differences, five of them are packaging (four food packaging and one battery packaging), and the other one is kitchenware (straws). The average ratings and the significance levels of all products can be found in Appendix N.

Discussion. Results show that 60% of the products have plastic-free alternatives that are believed to be more sustainable, and the perceived differences are statistically significant.

However, the concerns raised in the life-cycle-analysis review are also present in the results. This may not be surprising because the target population is relatively well educated and has critical thinking skills. Although I do not have accurate figures for the carbon footprints of the products in the questionnaire, some of the contradictory results do make sense. For example, some respondents rate that plastic food containers and plastic bottles are more sustainable than glass food container and steel bottles. Here is a simplified LCA of the case. Both of the former are reusable plastic products, and are known to be stable over time, convenient in use, and hard to break (compared to glass ones). The production of steel and glass[8] involve high temperatures that come from burning fossil fuels, unlike plastic[9] production (Worrell et al. 2010). Let us suppose these products can be used for an equal amount of time. When it comes to the disposal stage, the plastic, steel, and glass products can all be recycled. If the recycling rate is low and they end up being in the landfill, the incredible stability of all these materials shall take a long time to decompose, but in particular steel may take up more land than fragile plastics and glass. In the end, plastic bottles and food containers can indeed be more sustainable. For the remaining product pairs, the insignificance occurs when there is no standard packaging for the alternative. This reflects the ways in which the fruits and vegetables are displayed in bulk, with an item code sticker on each item. This way, the consumers can pack the produce in a variety of ways. One can put it directly into the shopping bag, but others may choose the convenient plastic bags usually offered by the stores for free. With the second approach, the self-packaging option is then not much different from the prepacked options. Nevertheless, since the average sustainability scores are from the same population for study 2, they are still good candidates as a reference of the belief system.

[8] Glass manufacturing is an energy-intensive industry mainly fueled by natural gas. URL: https://www.eia.gov/todayinenergy/detail.php?id=12631#

[9] How Hot Does Water Have to Be to Melt Plastic? URL: https://sciencing.com/hot-water-melt-plastic-8951.html

Study 2

This study examines whether contextual constraints hinder SCB, even if consumers are willing to try. To test H_2, I need to first identify constraints that generally apply to the public. The plastic waste problem mainly comes from excessive packaging, as well as few substitutes for plastics because of its unique properties such as light weight and stability. News reports have repeatedly criticized the plastic waste created in the food industry and the e-commerce industry. In some cases, consumers simply do not realize that they could have reduced plastic waste with alternative shopping habits, as pointed out by CBC Marketplace.[10] In other cases, consumers do not have more environmentally friendly options because retailers insist on sticking with plastic packaging anyway, for low costs and sanitation concerns, as reported in Vox.[11] This study thus formally explores the effect of the choice constraint by conducting a lab experiment with a simulated online shopping environment that always provides alternatives when plastics is involved.

Method

Subjects. There are a total of 223 sign-ups from introductory level consumer science classes in a large mid-western university in the study. None of the students have participated in study 1. They are awarded course credits for their participation at the end of the study. Among these students, 139 are from Spring 2021 courses, 37 are from Summer 2021 courses, and 47 are from Fall 2021 courses. Sixteen students from spring classes, one student from summer classes, and three students from fall classes did not finish the study and were thus dropped from my analysis.

[10] Why buying plastic-free groceries is so hard (Marketplace), URL: https://www.youtube.com/watch?v=n5Qbi_dB3Qo

[11] Plastic waste is everywhere in grocery stores. Can they cut down? URL: https://www.vox.com/2019/10/9/20885735/grocery-store-plastic-waste-produce-aldi-walmart

The spring study was in the first section of a study series with two other unrelated studies that followed afterwards. The summer and fall studies were carried out in stand-alone sections. There were technical issues in the third spring study during the initial launch, preventing students from finishing the series and from getting their credits. Sixteen students therefore restarted the whole series and ended up providing duplicated observations. In the data analysis, only their initial inputs are taken into consideration. Moreover, four students from the summer classes had already taken the study in the spring, and so only their spring answers are considered. In addition, there was one student who took both the spring and the fall studies, and his responses in the fall were discarded as the duplicate. All things considered, there are 202 eligible subjects in this study.

Design. The study follows a three information types (partial abstract information, partial concrete information, and comprehensive information) by two choice conditions (having alternative choices and not having alternative choices) between-subject design.

Materials. Some of the *Measures of Trying* used in study 1 are modified ("next month" instead of "next week" for the study context) and are used again in study 2. The remaining items include frequency of past trying, intention to try, subjective norm toward trying, and overall attitude toward trying (See Appendix A). The Goal Commitment Scale is also edited ("next week" to "next month") and readministered in study 2 (See Appendix B). Meanwhile, the Green Consumption Value Scale (See Appendix C), Connected to Nature Scale (See Appendix D), Need for Cognition Scale (See Appendix E), Social Desirability Scale (See Appendix F), and Demographic Questions (See Appendix G) are unaltered and placed in study 2 after the main task. Student participants from the summer classes also answered two implemental mindset related questions following the manipulation checks (See Appendix L). The two questions ask about the extent to which subjects know where, when, and how sure they are to take actions to reduce plastic

consumption. The questions are adapted from a published study to test whether the articles also manipulated subjects' mindset status (Brandstätter & Frank, 2002). Students from the fall classes answer two more questions following each article (See Appendix H) regarding the level of its perceived complexity and perceived persuasiveness.

Procedure. The study is conducted online with Qualtrics and administered through the cloud-based subject pool software SONA. Prior to the study period, course instructors are notified about the schedule and the outline of the study. They then help distribute the detailed instructions on SONA system registration and the study introduction two weeks before the study launches. During the study period, a participant gets immediate access to the study materials once their sign-up is confirmed on the SONA system. Participants' progress is monitored individually and throughout the study as soon as the study link is activated. Participants are first presented the consent form, and then randomly assigned to one of the experimental conditions upon the agreement to continue. Then they read two articles depending on the treatment and answer the corresponding manipulation check questions. Participants under partial abstract condition read the *control article* and the *abstract content article*; participants under the partial concrete condition read the *control article* and the *concrete content article*; and participants under the comprehensive information condition read the *abstract content article* and the *concrete content article* (See Appendix H). As for the participants from the summer classes, they answer the two mindset questions immediately following the manipulation checks. As in study 1, participants' intention to try and the degree of goal commitment are measured following the treatment.

Next, all participants are assigned a shopping task, which asks them to plan their shopping for a month and choose products within the given budget. There are 20 sets of products in four categories: 11 sets of grocery items, 4 sets of kitchenware items, 2 sets of personal care items, and

3 sets of other items. These products are among the most popular purchases according to the pilot study's self-reports from the same population. For participants under *having alternative choices* condition, each set contains two comparable products, one is considered greener than the other. The less green product often consists of plastic material, while the greener alternative may or may not contain plastics. For example, the two products could be a food container made of glass and one made of plastics. They could also be biodegradable plastic trash bags and regular disposable plastic ones. The prices of the products are directly drawn from the large vendors in the university area, such as Target, Walmart, Pick 'n Save, and Trader Joe's. The complete item list is available in Appendix N. Under both conditions, participants are given a budget of $250, which is half of the median monthly spending from the pilot study. This budget is sufficient if a participant chooses to buy one of each item under the *having alternative choices* condition, which costs a total of 247.70 dollars. Participants can see their current spending after making their choices under each category and are free to go back and edit their choices before "checking out." When the shopping task is done, participants complete the Green Consumption Value Scale, Connectedness to Nature Scale, Need for Cognition Scale, Social Desirability Scale, and demographic questions, in this order. They are then redirected back to the SONA system to get the course credit automatically.

Results

Calculating scores. To standardize the subjective environmental impact of participants' purchase planning, two scores are generated from the following equation:

$$S_i = 5 - \sum_j P_j \times Q_j \times \left(6 - R_j\right) \times {B_i}^{-1} \quad (2\text{-}1)$$

Here, subscript i represents the individual, and subscript j represents the product. S_i is a participant's sustainable consumption score. P_j is the price of a product j, which is strictly positive and Q_j is the non-negative quantity that individual i decides to purchase. Therefore, the product

of P_j and Q_j is the subtotal spending on product j. R_j is the average sustainability rating of project j derived from the pretest study, which ranges from 1 to 5. $(6 - R_j)$ is therefore the reversed sustainability rating of the product, or the impact score. B_i is the budget of the individual i, and in this case, it is a fixed number of 250 due to the preset spending limit in study 2. The product inside the summation is thus the weighted environmental impact consumption score of the individual i by purchasing a certain amount of product j. Lastly, these weighted scores are summed at product level and then subtracted by 5 to form the final sustainable consumption score.

The score S_i has the following properties. It decreases in the spending on each of the available products to reflect the fact that less consumption is more environmentally sustainable. It increases in the sustainability rating of the purchased product. Therefore, in the case where alternative choices are available, buying the more sustainable product instead of the less sustainable one may increase the outcome score. Finally, S_i has a lower bound of 0 and an upper bound of 5. The boundaries can only be theoretically reached under extreme conditions. For example, the only way to reach 5 is to purchase nothing, and the only way to reach 0 is to spend every cent on products that have sustainability ratings of 1. Another interesting extreme scenario is that an individual can spend the whole budget on the most sustainable products (those with ratings of 5) but ends up having a sustainable consumption score of 4. Once again this is intuitive because as long as one consumes, environmental impact follows.

In the upcoming analysis, the two sustainable consumption scores to be considered are the overall score that include all products and a plastic-specific score that only involves the consumption of products that are made of, packed by, or contain plastic materials. Meanwhile, as in study 1, the score calculation of the published scales strictly follows the scale instructions. Table 6 (Appendix P) is a descriptive summary of all the scores discussed above. At study population

level, the sustainable consumption scores are not highly correlated with the scale measures, neither are the spendings. The goal commitment is negatively correlated with political orientation (r = -0.38), highly correlated with green consumption value (r = 0.50), and moderately correlated with connectedness to nature (r =0.28). Political orientation is also negatively correlated with green consumption value (r = -0.37) and connectedness to nature (r = -0.24). Lastly, green consumption value is highly correlated with connectedness to nature (r = 0.55).

Manipulation checks. Paired-sample t-test is applied to compare the responses to the two manipulation check questions about each article. Consistent with study 1, having read the control article, participants do feel that the news essay focuses more on why the discovery of the stellar system is important (*M = 3.270*) than how the system is discovered (*M = 2.433*), and this time the difference is still significant ($p < .001$). Participants do recognize that the three sentences explaining the importance are more extensive than the concise description of the technique used for the discovery. Meanwhile, both the treatment articles successfully pass the manipulation checks and remain robust. Participants who read the abstract content article report that it talks about why we should reduce plastic consumption (*M = 3.885*) much more than how we can do it (*M = 1.923*), $p < .001$. At the same time, participants who read the concrete content article think that it involves more details on how we could reduce plastic consumption (*M = 4.714*) than why it is important to do so (*M = 1.827*), $p < .001$. Similar to Study 1, the attitude towards trying is calculated by taking the average of “feeling good” and “feeling satisfied” toward “trying in general” (Cronbach’s alpha is 0.890). As mentioned in study 1, the need for cognition has main effect on the attitude toward trying. In addition, the perceived complexity of the three articles is also significantly different from one another. The control article is rated the least complex (*M = 2*.400), followed by the concrete content article (*M = 2*.967). The abstract content article is rated the most

complex (*M = 3.*643). Therefore, the interaction effect of need for cognition and the attitude toward trying on the intention to try are added as a robustness check in the study 2 analysis.

Treatment Effects. Two-away ANOVA is applied to test the treatment effect on both the sustainable consumption scores. For the overall score, the main effect of the information type is not significant, $F(2,196) = 0.560, p > .05$, while a strong main effect of the choice condition exists, $F(1,196) = 7.860, p < .001$. Post-hoc comparison with Holm-Bonferroni method confirms that participants who do not have alternative shopping choices actually achieve higher sustainable consumption scores ($M = 3.657$) than those who have alternative choices ($M = 3.417$), $p < .01$. Meanwhile, no interaction effect is statistically significant, $F(2,196) = 0.015, p > .05$. For the plastic-specific score, again the main effect of the information type does not exist, $F(2,196) = 0.350, p > .05$. The main effect of the choice condition holds stronger, $F(1,196) = 35.997, p < .001$. Post-hoc comparison with Holm-Bonferroni method indicates that this time participants under choice condition earn a higher sustainable consumption score ($M = 4.106$) than those under no-choice condition ($M = 3.657$). The interaction effect between information type and choice condition remains non-significant with the new score, $F(2,196) = 0.138, p > .05$.

Since the sustainable consumption scores have two driving factors, additional analysis is performed to check if the spending pattern is altered due to alternative shopping choices. To do this, two-way ANOVA is applied to test the variation of the total spending $\sum_j P_j \times Q_j$. Results show that consistently there is no main effect of the information type, $F(2,196) = 0.373, p > .05$. Nor is there any interaction effect, $F(2,196) = 0.022, p > .05$. However, there is a significant main effect of the choice condition, $F(1,196) = 14.846, p < .001$. Post-hoc comparison with Holm-Bonferroni method reveals that when participants have choices, they tend to spend much more ($M = \$126.09$) than if they do not have them ($M=\$99.11$), $p < .001$. Additionally, spending on just

plastic-related products is also tested using the same methods. The result pattern continues for the two-away ANOVA, where neither the main effect of the information type not the interaction effect is significant, *F(2,196) = 0.155, p > .05 & F(2,196) = 0.111, p > 0.05* and the main effect of the choice condition remains significant, *F(1,196) = 28.765, p < .001*. The Holm-Bonferroni post-hoc analysis shows that, unlike the pattern we found in the total spending, participants under choice condition spend moderately less on plastic products (*M = $68.24*) than those who only have plastic choices (*M = $99.11*), *p < .001*.

Regression Analysis. Three linear regression models are applied for each of the four dependent variables: overall sustainable consumption score, plastic sustainable consumption score, total spending, and plastic specific spending. The general model forms are listed in the following three equations:

$$y_i = \alpha + \Gamma D(info\_type_i * choice\_type_i) + \psi(intention\_try_i * past\_frequency_i) + \gamma(intention\_try_i \times commitment_i) + e_i \quad (3\text{-}1)$$

$$y_i = \alpha + Z(info\_type_i * choice\_type_i) + \psi(intention\_try_i * past\_frequency_i) + \gamma \times (intention\_try_i \times commitment_i) + A(info\_type_i * politics_i) + B(info\_type_i * GSV_i) + e_i \quad (3\text{-}2)$$

$$y_i = \alpha + Z(info\_type_i * choice\_type_i) + \psi(intention\_try_i * past\_frequency_i) + \gamma \times (intention\_try_i \times commitment_i) + A(info\_type_i * politics_i) + B(info\_type_i * GSV_i) + \delta CtN_i + \eta NFC_i + \kappa SD_i + e_i \quad (3\text{-}3)$$

Here, y_i represents one of the outcome measures for individual *i*. Information type * choice type is a set of dummy variables of the experiment conditions plus an interaction term. *Z* is a vector of coefficients associated with these dummy variables. ψ is a vector of coefficients associated with the intention to try, frequency of past trying, and their interaction term. γ is the coefficient for the

interaction between the intention to try and the goal commitment. A is a vector of regression coefficients for information type, political orientation, and their interaction term. B is a vector of regression coefficients for information type, green consumption value, and their interaction term. δ, η and κ are coefficients for connectedness to nature, need for cognition, and social desirability respectively. The first equation (3-1) is the base model where no potential moderators or covariates are considered. The second equation (3-2) includes political orientation and the green consumption value as the moderators. The last equation (3-3) further includes the remaining scale measures as possible covariates.

Table 7 (Appendix Q) shows the regression results of the three models on the overall sustainable consumption score and the plastic specific consumption score. The reference group of this analysis is the one under abstract information condition and no choice condition. Therefore, the estimated effects of the information conditions are relative to the abstract condition. Similarly, the estimated effect of the choice condition is relative to the no choice condition. The same analysis is performed using the concrete information condition as the reference group, but the results are generally not significant. Among the predictors, the experiment condition choice type is no longer a significant predictor of the overall score, and the negative value indicates that in the current sample, participants in the choice condition have a lower score (0.25) than those in the no-choice condition. This treatment effect becomes salient when the moderators are added (in the extended model). In the extended model, a significant direct effect of the comprehensive information type exists. Participants in comprehensive information condition earn a higher overall score from the shopping planning task than those in the abstract information condition. Participants in concrete information condition also score higher than those in the abstract information condition, but the difference is not significant ($p=0.079 > .05$). Further analysis finds no statistical difference in the

score between the concrete information condition and the comprehensive information condition. However, this direct effect is moderated by the green consumption value in the comprehensive information condition. A higher green consumption value would lead to a lower treatment effect. In the study 2 sample, the green consumption value averages at 4.90, eliminating the positive direct effect in the previous analysis. Lastly, in the full model where three more covariates are included, the results are qualitatively the same as in the extended model, although doing so increases the risk of overfitting, which is reflected by the increase of the BIC.

The other half of the Table 7 summarizes the results when using the plastic score as the dependent variable to address the negative treatment effect from the choice condition possibly due to the higher spending on the alternative products. Once again, the abstract information condition and the no choice condition are the reference group. Results using the concrete information condition as the reference group are suppressed due to general insignificance. This time, as expected, the base model predicts that individuals in the choice condition score significantly higher. Meanwhile, the model also indicates that goal commitment has a positive effect on the score, consistent with the theory development. This additional effect, however, suffers from relatively low power in the extended model and in the full model. In the extended model, the interactions between the information treatment and the green consumption value are similar to those in the previous model series. The positive information direct effect vanishes due to the high green consumption value associated with the sampled individuals. Another existing effect for both the extended and the full model is the negative interaction between the comprehensive information type and political orientation. More precisely, the more politically conservative the individuals are, the more resistant they are to the information treatment. The average political orientation of the sample is 3.39 (extremely liberal 1 --- 7 extremely conservative), which means that participants

are slightly liberal. But the average negative interaction effect decreases the average plastic scores by more than three quarter points. Again, in the full model, the effects of the covariates (i.e., connectedness to nature, need for cognition, and social desirability) are not significant and do not interfere with the existing patterns of the model. The increase of BIC again confirms that the full model may be more vulnerable to overfitting.

Table 8 (Appendix R) summarizes the regression series results for spending. The reference group is still the abstract information condition and no choice condition. Comparison using the concrete information condition as the reference group yields a similar pattern as that from the score analysis. In terms of total spending, the base model shows that individuals who have alternative choices on average spend $27.40 more than those who do not have such options. The overspending pattern persists across the models. Information type is a significant predictor for total spending as it is for the overall score, but its effect is moderated by green consumption value. Specifically, in the concrete information condition, individuals on average spend $97.53 less, and in the comprehensive condition, $190.93 less, than those in the abstract condition. Further analysis finds no significant difference of plastic specific spending between concrete and comprehensive information conditions. However, the information direct effect is reduced due to the negative interaction effect between the information treatment and the green consumption value, given the high average sample scores on the green consumption value scale. Similar to the scores, the information direct effect is reduced due to the conservative political orientation. Once again, the finding is robust even when other covariates are included in the model. The extended model and the full model for spending performs comparably in terms of BIC and the adjusted r-squared measure, unlike the sustainable consumption score models. As for plastic spending, the base model

indicates that, unlike the total spending, individuals who have alternative choices do spend less on plastic related products by about $30 on average.

The visual demonstration of the interactions between the dependent variables and the green consumption value for each information condition group can be found in Figure 3 (Appendix T). The visual demonstration of the interactions between the dependent variables and the political orientation for each information condition group can be found in Figure 4 (Appendix U).

Discussion. With better outcome variables, study 2 generally yields clearer results than study 1. However, these results still fail to reject the null Hypothesis 1. In fact, group comparison shows that there is no main effect of information type or the interaction effect between the information type and the choice type. Nevertheless, the somewhat contradictory treatment effect and the moderation effect of the green consumption value from the regression analysis in study 1 is now clearly present in all non-base models. Note that these effects only emerge when individuals in the abstract information condition are contrasted with the individuals in concrete information condition and those in the comprehensive information condition. There are no statistical differences between the other two treatment groups. This pattern, combined with the negative moderation effect, leads to the following findings. Firstly, the abstract information that helps form the superordinate SCB goals has the least impact on individuals, among all stimuli. The concrete information, on the other hand, has a relatively large effect on the subsequent behavior, and the magnitude is comparable for individuals in the other two conditions. This is consistent with the literature that the concrete information works better on changing consumer behavior than abstract information. But more importantly, if individuals are already green consumers, the treatment effect is vastly diminished. This phenomenon can actually be explained by the first three items in the green consumption value scale: “It is important to me that the products I use do not harm the

environment"; "I consider the potential environmental impact of my actions when making many of my decisions"; "My purchase habits are affected by my concern for our environment." The high-scoring answers to these questions to some extent reflect the number of actions an individual has already tried to be green in the past. Therefore, telling these individuals what they perhaps have already known does not provide added value to their intentions. Also, according to the goal hierarchy, those who actively performs certain behaviors are usually backed up by their superordinate goals. In other words, the SCB goal structure that I am trying to build within the individuals may already exist. Therefore, the highly green profile within the current population does not leave enough room for further manipulation, resulting in tiny effect sizes that are relatively weak even with a much larger sample size. Future study should sample from a much less green population to further test the hypotheses. That said, it may not be ideal to target an extremely anti-green group either because they may have formed a belief to reject all information related to environmental sustainability, in which case a mirrored anti-SCB goal structure has been constructed. The results provide some evidence that individuals who are more politically conservative are more likely to resist this kind of information.

Information type aside, the choice condition becomes the most significant predictor in study 2. This is consistent with the literature and supports Hypothesis 2. It also echoes with the willingness to switch in the pilot study. It is worth noting that the overall score is lower, and the overall spending is higher when people have alternative choices, contradicting the prediction. The results would match the prediction only if the comparison is narrowed down to the spending on the plastic products. One possibility is that individuals feel more comfortable buying what they believe to be more sustainable items and end up buying more of them. Another possibility is that the alternative choices are more expensive, which increase spending despite not adding more

counts. To illustrate the latter, we can look at an everyday example—organic milk, whose per gallon price is $8.54 for paper box unit and $6.99 for plastic bottle. The sustainability ratings are 3.31 and 2.35, respectively. According to the formula, buying nothing results in an overall score of five. The marginal score reduction for buying one gallon of paper boxed organic milk is then $8.54 \times \frac{6-3.31}{250} = 0.092$. Similarly, the marginal score reduction for buying one gallon of plastic bottled organic milk is 0.102. So, buying the same amount alternative product does generate higher overall score. A counter example is lettuce. Buying two counts of lettuce packed by paper tape costs $3.98, and the same counts of lettuce with plastic packaging costs $2.79. The sustainability ratings for them are 3.37 and 2.60, respectively. The marginal overall score decreases are then 0.042 and 0.038. In this case, buying the same amount of lettuce with non-plastic packaging lowers the overall score. To estimate whether the price difference is the driving force for lower overall scores in the choice condition, column 4 in Table 9 (Appendix S) calculates the marginal score changes of buying one count of less-sustainable product and the score changes of buying comparable amount of the alternative product. The food bag is an extreme case where one unit of disposable food bags contains 300 counts while one unit of reusable food bags contains only 5. In this case, the corrected ratio is calculated by dividing actual average purchase amount among who actually buy reusable food bags by the actual average purchase amount among who actually buy the disposable food bags. The marginal effect is thus greatly reduced to the normal level. A similar revision is also made to two other products marked with asterisk in Table 9, column 1. Next, the aggregated effect is calculated by reversing the signs of the marginal effects of the products that are rated less sustainable, as shown in Table 9, column 5, and then summing them up. The positive sum value at the end of column 5 means that, even though the alternative products are generally more expensive, buying comparable amount of them would still raise the overall sustainable

consumption score. This finding thus supports the first assumption above, that individuals indeed spend significantly more when they are given alternative choices.

In view of the results that these individuals are trying hard to switch from less-sustainable options, two implications arise. First, the existence of choices backfires by encouraging individuals to consume more than if there were no alternatives. At the end of the day, these individuals successfully and partially boost their scores by avoiding less-sustainable products, but they ultimately fall into the trap of comfort shopping and score lower than others who do not have better choices in the first place. One way to account for this behavior is that the moral licensing effect (Blanken, van de Ven, & Zeelenberg, 2015) is taking place. Buying green creates a sense of balance for these individuals so that they could feel comfortable and ethically permitted to consume more. This is even more likely for the individuals who are inclined to take a moralistic stance on sustainability issues. Second, since the individuals in my sample highly value green consumption, they may have successfully tried to consume less when this is the only way to do it without alternative choices. In other words, they are simply following their routine of being sustainable. Future investigation can look into whether the substitution effect is the main factor by, for example, setting up a new experiment condition where alternative choices are also equivalently less sustainable. Meanwhile, studies could target the value itself by asking people if they feel more comfortable/less guilty to buy more products that are supposed to be more eco-friendly. It would also be interesting to explore if there are different answer patterns for people with higher versus lower green consumption values.

General Discussion

This research first expands the literature of sustainable consumer behavior by introducing a two-stage process of manipulating consumer behavior. The model incorporates current findings of various factors that affect sustainable consumer behavior, such as cognition, the self, social influence. By incorporating insights from the Theory of Trying and classic microeconomic theories, it is possible to explain some previous empirical findings that do not align with existing theories. This is done by dividing the antecedents of sustainable behavior into two stages: trying to consume sustainably in stage one and doing so in stage two. Things that typically influence consumers internally likely encourage them to try harder, usually by revising their beliefs or changing their attitudes towards it. However, trying does not necessarily translate into action, mainly because consumers are often unable to do so if they face situational constraints. Therefore, to make sustainable consumer behavior happen, these constraints need to be relaxed or removed, which is the key to the second stage of the whole process. To sum it up, this novel model not only supports synergistic effect of multiple treatments but also has the potential to solve the conundrum that in some situations a single treatment does not necessarily lead to actual behavioral change.

The second theoretical contribution of this research is that I clarify how and why different types of information contents could have various results in affecting sustainable consumer behavior. Sustainable consumer behavior is inherently difficult because often times it requires consumers to sacrifice convenience, durability, and low cost. Put another way, sustainable consumer behavior is essentially a goal-pursuit behavior and individuals have to try to achieve this goal, often at a cost. As a result, a complex set of factors should be considered in goal-related literature in addition to looking for information about what could impact SCB the most. Every focal goal is associated with a superordinate goal and a subordinate goal. When the focal goals are

closely related, all the associated goals can also be linked. For example, getting nutrition can be the superordinate goal for both eating and drinking after work. However, in day-to-day life for an average person, sustainable consumer behavior is more of a distant goal. As such, the most effective way for sustainability related information to work is to reveal its complete goal structure and to connect it to subordinate goals. In other words, the ideal information should be comprehensive and should enable individuals to know *why* consumption should be sustainable and *how* it can be done.

To put these theoretical questions to the test, two experimental studies are conducted, using plastic consumption as the context. Study 1 modifies the original Theory of Trying experiment by replacing the weight loss goal with the goal to consume less plastics, but it keeps most of the questionnaire structure intact. More importantly, a treatment of three levels is introduced to test whether comprehensive information is the best candidate among all to encourage trying in stage one. Study 1 results are inconclusive: causal relationships from the Theory of Trying are not replicated, and the treatment effects are not distinguishable, either. The biggest difference between study 1 and Bagozzi and Warshaw (1990)'s design is that the dependent variable in week 2 and week 3 are adjusted from a Boolean question to a Likert five-point scale. Other questions are the same except that the focal topic is changed. The dependent variable adaptation is inspired by a recommendation by Bagozzi and Warshaw (1990) to enhance measurement accuracy. However, as discussed earlier, this might not have corrected the ambiguity of the behavior itself.

There are a few directions that can potentially enhance the model performance. First, study 1 follows the weekly schedule, but the sensitivity of the dependent variable varies depending on the shopping patterns in different cultures. In the United States, consumers tend to buy in bulk and less frequently. If an individual shops less than once per week, current measures are not able to

pick up changes in time or cause unnecessary bias. In East Asia, this concern is greatly reduced because consumers go to fresh markets frequently. Therefore, having longer gaps between waves can be one way to improve the results. Second, both studies in this research use plain text as the medium of communication. While it is probably the least likely to introduce extra noise compared to other media options, plain text may have a relatively weak impact on participants. One way to address this is to rewrite the contents in the form of multiple-choice questions with feedback in the form of "knowledge check." This is because feedback is known to increase the amount of relevant information remembered in a later stage (Kulhavy, 1977). Another way is to turn the text information into other media form, especially video because it is found that video story-telling has a larger effect in cognitive processing than text (Yadav et al., 2011). Third, trying measured with a general question may be more difficult to answer than with a few detailed questions. For example, alternatively, one can ask respondents if they manage to use fewer plastic bags or to reuse some plastic products that would otherwise be thrown away. Having collected the answers, researchers can formulate a composite score if there is internal reliability. Fourth, study 1 indicates that if the treatment effect exists, the effect is quite small. Study 1 also reveals that the sample is on the high end of green consumption, which is also a limitation of this research. To further test whether comprehensive information is the best candidate, switching to a less green population may yield more salient results, since the SCB superordinate goal would appear to participants as less familiar a priori.

The second study examines whether the trying motivation can turn into action by removing one of the most frequent contextual constraints—that is, the constraint of not having a more sustainable alternative. The study adopts a mock online shopping task to observe and compare behaviors at the time when the information treatment is administered. Since sustainable

consumption is achieved by reducing consumption as well as switching to more sustainable choices, a sustainable consumption score is calculated balancing both aspects. Study 2 finds partial support to the hypothesis that the comprehensive information is the more effective than abstract information. However, comprehensive information and concrete information are found to be equally good, which takes us back to previous findings that concrete information is the best candidate. Nevertheless, further analysis shows that individual's high green consumption value dampens the treatment effects, implying that the added value of information comprehensiveness is limited if consumers already have the abstract level knowledge that helps build the value they have. Therefore, as in study 1, the same sample limitation applies. Future studies should sample from another population, particularly a group that is likely to score with moderate green consumption value. There is no point doing the study on a population with low green consumption value because these people are likely to be anti-sustainability. Study 2 consistently shows that contextual constraints are the primary obstacle for individuals to enact sustainable consumption. When individuals are given alternative choices, they select significantly fewer disposable plastic products and subsequently rank higher on the plastic sustainable consumption scores. This is all happening when the combined intention to try does not differ between the choice groups. These results demonstrate that the two-stage process is an appropriate framework to explain sustainable consumer behavior. Study 2 also generates interesting insights on the ways moral licensing may weaken the benefit of providing sustainable/greener products since consumers who believe they are green may have an incentive or a justification for buying more. If consumers also happen to be materialistic (Richins & Dawson, 1992), the weakening effect can be even larger since they are more likely to acquire more products for achieve personal satisfaction. Future research can take a

deeper dive and look for ways to neutralize the substitution effects and try to bring the complementary back to the table.

Study 2 certainly has its own limitations because it is a restricted lab experiment considering a simple scenario with reduced conditions and limited number of choices. Below are possible extensions and enhancements to this research. First, instead of a mock shopping task, one can consider a field experiment in grocery stores or shopping malls. Field experiment can address the externality challenge against both the behaviors and the representativeness of the sample. With field experiment, one can also get an unrestrained shopping list (from receipts) and has the potential to test the breadth of the treatment effects. Second, researchers can consider simplified dependent variables for reduced noise. Take the sign-up rates of renewable-energy-based electricity among those who are not aware of such choices, for example. Signing up for "clean" electricity is different from installing solar panels in households, which requires upfront fixed costs and continuous maintenance. In states where renewable energy is available and energy trading is allowed, gas and electricity companies offer plans of substituting power source from fossil fuels with renewables such as wind and solar. Common packages are 50% for a small fee and 100% for additional cost, or a free choice of the percentage allocation. In the Madison, Wisconsin area, for example, by signing up for a 50% conversion rate with the Green Power Tomorrow plan in a household of 1,000 square feet, the average user faces a small increase of $5.70 in their monthly cost.[12] Therefore, one could contribute to the green power transformation without large financial burden. A field experiment can then be done to examine the conversion rate of comprehensive information in comparison to other types of information. Third, study 2 involves a mixed basket of product pairs such as disposable plastic versus paper packaging, reusable plastic versus reusable

[12] Green Power Tomorrow. URL: https://www.mge.com/our-environment/green-power/green-power-tomorrow

metal, recyclable plastic versus recyclable glass. The items are chosen by based on their popularity and market availability. One can expect that the sustainability discrepancy between these pairs is different based on either objective fact about the production or the subjective ratings. It is possible that in scenarios where the non-plastic and plastic choices are equally reusable, the treatment would not differentiate the choices more than if the pairs are between, for instance, single-use plastic and reusable silicone product. Lastly, Study 2 only considers removing one constraint while there are still other kinds of constraints to consider. Although the lack of suitable alternatives is a general constraint, certain populations may have their unique constraints to overcome. Further research can be done to examine if the framework is applicable to those consumers with different concerns.

Despite these findings, there are limitations and a need of extension for the model. Firstly, although the model is able to explain why habit could be a main obstacle between consumers and sustainable consumption, it does not provide clear guidance on how to overcome it. Both the comprehensive information and the additional choices used in this research are short-term manipulations at best, which cannot guarantee the establishment of a long-term goal pursuit structure in the future. Although education can potentially make sustainable consumption a habit from early on, both current knowledge and the experiment result demonstrate that regulating the producers would be a much better approach than trying to influence consumer behavior.

Secondly, the information can be presented using other techniques. The intention behind using informational strategy is in part an effort to follow the United Nations Environment Program's advice on promoting a "soft landing" on sustainable consumption, without forcing consumer behavioral change. As stated earlier, the key to success is to remind consumers of SCB goals while accomplishing other goals via consumption. In the current research, I have not tried to

inform consumers of the true cost of consumption. The true cost refers to all the life cycle costs associated with the products consumed, including the pre-consumption costs such as production, transportation, distribution, and the post-consumption costs that arise from waste management and pollution control. These costs can be made salient to consumers. For example, one could consider implementing it at the product level, just as nutrition labels are regulated. The carbon footprint of producing these products can be printed on the packaging, and the appropriate way of dealing with the products' end of life can also be highlighted on their labels. The effect of this practice, however, is well dependent on how much the labels attract consumer attention, which requires thoughtful design of commercial labels (Graham, Orquin, & Visschers, 2012). Perhaps the greatest challenge is that people have a strong motivation to study nutrition labels for direct physical benefit but not necessarily for carbon footprint. Moreover, even if people do have the motivation to use nutrition labels, they may not use them to the best potential (Higginson, Kirk, Rayner, & Draper, 2002). The use of nutrition labels is positively correlated with the attitudes towards healthy eating and the knowledge of nutrition (Miller & Cassady, 2015). The former determines the likelihood of people reading the labels, and the latter determines how well they can make use of them. It turns out that education plays an important role in these relationships (Christoph, An, & Ellison, 2016). Therefore, informing consumers at the product level must harness the power of education, which can help consumers to build intrinsic goals and shape labels in a way that nudge consumers towards these goals (Cooke & Papadaki, 2014). The good news is that researchers have found that health goals can improve the attention on the nutrition label (Bialkova et al., 2014), which may inspire researchers to explore a similar effect between sustainability goal and sustainability labels.

Thirdly, the two-stage process is not limited to sustainable consumer behavior modeling. Future research can explore its applicability in scenarios where the expected behavior is difficult

to achieve and thus goal oriented, or in scenarios where individuals usually face contextual constraints that prevent the behavior from materializing. Lastly, the comprehensive information essentially tries to link a difficult behavior with an everyday behavior through an action plan and an explanation of the underlying reason. Individuals therefore need to comprehend the relationships between the goals and the associated actions. However, the attitude and approaches to tackle complex relationships may vary from culture to culture. For example, individuals with holistic thinking style are more likely to deal with these practical relationships better than those with individualistic thinking style (Nisbett, Peng, Choi, & Norenzayan, 2001). Individuals of Asian origin, even living in an independent culture (Markus & Kitayama, 1991), are also more likely to be frugal because they are educated this way (Kim & Chun, 1994). This is also related to sustainable consumption, given that one of the key sustainable aspect of being frugal is reusing objects for out-of-design purposes (Lastovicka, Bettencourt, Hughner, & Kuntze, 1999). Researchers can then take a closer look at how the model can be culturally adjusted for best performance.

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Appendix A. Measures of trying

Study 1 Week 1 Questions:

1. Past Frequency (W2) (S2)

During the past year I tried to consume less plastics:

A. Many times; B. Several times; C. A couple of times; D. Once; E. Not at all

2. Recency

How hard did I try to consume less plastics anytime during the past week? "1" indicates "did not try at all" and "5" indicates "extremely hard".

3. Intention of trying (W2) (W3)

I intend to try to consume less plastics during the next week. 7 points, from “Extremely unlikely” to “Extremely likely”.

4. Subjective norm of trying (W2)

Most people who are important to me think that I should try to consume less plastics during the next week. 7 points, from “Extremely unlikely” to “Extremely likely”.

5. Expectation of succeeding (W2)

Assuming I try to consume less plastics during the next week, how likely or unlikely that I actually would consume less plastics? 7 points, from “Extremely unlikely” to “Extremely likely”.

6. Attitude towards trying and succeeding part 1 (W2)

My trying and succeeding at consuming less plastics during the next week would make me feel: 7 points, from “Extremely bad” to “Extremely good”.

7. Attitude towards trying and succeeding part 2 (W2)

My trying and succeeding at consuming less plastics during the next week would make me feel: 7 points, from “Extremely unsatisfying” to “Extremely satisfying”.

8. Expectation of failing (W2)

Assuming I try to consume less plastics during the next week, how likely or unlikely that I would fail to consume less plastics? 7 points, from “Extremely unlikely” to “Extremely likely”.

9. Attitude towards trying but failing part 1 (W2)

My trying but failing at consuming less plastics during the next week would make me feel: 7 points, from “Extremely bad” to “Extremely good”.

10. Attitude towards trying but failing part 2 (W2)

My trying but failing at consuming less plastics during the next week would make me feel: 7 points, from “Extremely unsatisfying” to “Extremely satisfying”.

11. Attitude towards trying process part 1 (W2)

My trying to consume less plastics during the next week, ignoring whether or not I actually succeed at less plastic consumption, would make me feel: 7 points, from “Extremely bad” to “Extremely good”.

12. Attitude towards trying process part 2 (W2)

My trying to consume less plastics during the next week, ignoring whether or not I actually succeed at less plastic consumption, would make me feel: 7 points, from “Extremely unsatisfying” to “Extremely satisfying”.

13. Overall attitude toward trying part 1 (W2)

All things considered, my trying to consume less plastics during the next week would make me feel: 7 points, from “Extremely bad” to “Extremely good”.

14. Overall attitude toward trying part 2 (W2)

All things considered, my trying to consume less plastics during the next week would make me feel: 7 points, from “Extremely unsatisfying” to “Extremely satisfying”.

Study 1 Week 2-3 only:

15. Trying (W2) (W3)

How hard did I try to consume less plastics during the past week? "1" indicates "did not try at all" and "5" indicates "extremely hard"

Study 2 only:

16. Intention of trying

I intend to try to consume less plastics during the next month. 7 points, from “Extremely unlikely” to “Extremely likely”.

17. Subjective norm of trying

Most people who are important to me think that I should try to consume less plastics during the next month. 7 points, from “Extremely unlikely” to “Extremely likely”.

18. Overall attitude toward trying part 1

All things considered, my trying to consume less plastics during the next month would make me feel: 7 points, from “Extremely bad” to “Extremely good”.

19. Overall attitude toward trying part 2

All things considered, my trying to consume less plastics during the next month would make me feel: 7 points, from “Extremely unsatisfying” to “Extremely satisfying”.

Note: Items reused in study 1 week 2 are marked as “(W2)”; items reused in study 1 week 3 are marked as “(W3)”; items reused in study 2 are marked as “(S2)”.

Back to Study 1.

Back to Study 2.

Appendix B. Goal Commitment Scale

Think about setting a goal of "less plastic consumption during the next week", to what extent do you agree or disagree with the following statements? 5 points, from “Strongly disagree” to “Strongly agree”.

1. It's hard to take this goal seriously.

2. It's unrealistic for me to expect to reach this goal.

3. It is quite likely that this goal may need to be revised, depending on how things go.

4. Quite frankly, I don't care if I achieve this goal or not.

Note: in study 2, “next week” is rephrased to “next month”.

Back to Study 1.

Back to Study 2.

Appendix C. Green Consumption Value Scale

In this section, we are interested in your attitude towards green consumption. There are no right or wrong answers. Please answer each question carefully and honestly. 7 points, from “Strongly disagree” to “Strongly agree”.

1. It is important to me that the products I use do not harm the environment

2. I consider the potential environmental impact of my actions when making many of my decisions.

3. My purchase habits are affected by my concern for our environment.

4. I am concerned about wasting the resources of our planet

5. I would describe myself as environmentally responsible.

6. I am willing to be inconvenienced in order to take actions that are more environmentally friendly.

Back to Study 1.

Back to Pilot Study.

Back to Study 2.

Appendix D. Connected to Nature Scale

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you are presently experiencing. 5 points, from “Strongly disagree” to “Strongly agree”.

1. I often feel a sense of oneness with the natural world around me.

2. I think of the natural world as a community to which I belong.

3. I recognize and appreciate the intelligence of other living organisms.

4. I often feel disconnected from nature. (R)

5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

6. I often feel a kinship with animals and plants.

7. I feel as though I belong to the Earth as equally as it belongs to me.

8. I have a deep understanding of how my actions affect the natural world.

9. I often feel part of the web of life.

10. I feel that all inhabitants of Earth, human, and nonhuman, share a common ‘life force’.

11. Like a tree can be part of a forest, I feel embedded within the broader natural world.

12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature. (R)

13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

14. My personal welfare is independent of the welfare of the natural world. (R)

Note: Reversely scored items are marked as “(R)”.

Back to Study 1.
Back to Study 2.

Appendix E. Need for Cognition Scale

For each of the statements below, please indicate whether or not the statement is characteristic of you or of what you believe. For example, if the statement is extremely uncharacteristic of you or of what you believe about yourself (not at all like you) please place a "1" on the line to the left of the statement. If the statement is extremely characteristic of you or of what you believe about yourself (very much like you) please place a "5" on the line to the left of the statement.

1. I prefer complex to simple problems.

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

3. Thinking is not my idea of fun. (R)

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

5. I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.

6. I find satisfaction in deliberating hard and for long hours.

7. I only think as hard as I have to. (R)

8. I prefer to think about small daily projects to long term ones.

9. I like tasks that require little thought once I've learned them.

10. The idea of relying on thought to make my way to the top appeals to me.

11. I really enjoy a task that involves coming up with new solutions to problems.

12. Learning new ways to think doesn't excite me very much.

13. I prefer my life to be filled with puzzles I must solve.

14. The notion of thinking abstractly is appealing to me.

15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

16. I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.

17. It's enough for me that something gets the job done; I don't care how or why it works.

18. I usually end up deliberating about issues even when they do not affect me personally.

Note: Reversely scored items are marked as "(R)".

Back to Study 1.

Back to Study 2.

Appendix F. Social Desirability Scale M-C short form

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally.

1. It is sometimes hard for me to go on with my work if I am not encouraged.

2. I sometimes feel resentful when I don't get my way.

3. On a few occasions, I have given up doing something because I thought too little of my ability.

4. There have been times when I felt like rebelling against people in authority even though I knew they were right.

5. No matter who I'm talking to, I'm always a good listener. (R)

6. There have been occasions when I took advantage of someone.

7. I'm always willing to admit it when I make a mistake. (R)

8. I sometimes try to get even rather than forgive and forget.

9. I am always courteous, even to people who are disagreeable. (R)

10. I have never been irked when people expressed ideas very different from my own. (R)

11. There have been times when I was quite jealous of the good fortune of others.

12. I am sometimes irritated by people who ask favors of me.

13. I have never deliberately said something that hurt someone's feelings. (R)

Note: Reversely scored items are marked as “(R)”.

Back to Study 1.

Back to Study 2.

Appendix G. Demographic and Political Orientation Questions

1. What is your age?

2. What is your gender?

3. With which culture do you most identify (please be as specific as possible)? (e.g. Indian, Malaysian, Chinese, American, ...)

4. What is your race/ethnicity?

5. Is English your native language?

6. Please rate your English WRITTEN communication proficiency: Basic, Intermediate, Advanced or Expert.

7. Political orientation

We hear a lot of talk these days about liberals and conservatives. Where would you place yourself on this scale? 7 points, from “Extremely liberal” to “Extremely conservative”.

Back to Study 1.

Back to Study 2.

Appendix H. Study 1 & Study 2 Information Stimuli and Manipulation Check Questions

1. Control Article

Thanks to a bevy of telescopes in space and on Earth — and a pair of amateur astronomers in Arizona — a University of Wisconsin–Madison astronomer and his colleagues have discovered a Jupiter-sized planet orbiting at breakneck speed around a distant white dwarf star.

The system, about 80 light years away, violates all common conventions about stars and planets. The white dwarf is the remnant of a sun-like star, greatly shrunken down to roughly the size of Earth, yet it retains half the sun's mass. The massive planet looms over its tiny star, which it circles every 34 hours thanks to an incredibly close orbit. In contrast, Mercury takes a comparatively lethargic 90 days to orbit the sun.

While there have been hints of large planets orbiting close to white dwarfs in the past, the new findings are the clearest evidence yet that these bizarre pairings exist. That confirmation highlights the diverse ways stellar systems can evolve and may give a glimpse at our own solar system's fate. Such a white dwarf system could even provide a rare habitable arrangement for life to arise in the light of a dying star.

Word Count: 190

Q1: To what extent did the article focus on <u>why</u> the discovery of the novel stellar system is important? "1" indicates "none at all" and "5" indicates "a great deal".

Q2: To what extent did the article focus on <u>how</u> the researchers found the novel stellar system? "1" indicates "none at all" and "5" indicates "a great deal".

*Q3: I feel that the message from this article is: "1" Very simple, "2" Somewhat simple, "3" Neither simple nor complex, "4" Somewhat complex, "5" Very Complex.

*Q4: To what extent do you agree or disagree with the following argument: "This article intends to be persuasive." “1” indicates “Strongly disagree” and “5” indicates “Strongly agree”.

2. Abstract Content Article

Plastic production and consumption is heavily impacting the environment. The impact largely comes from two aspects: greenhouse gases such as carbon dioxide generated from the production, and waste accumulated from the consumption of plastics.

Plastics are made most commonly from petroleum and natural gas. Making virgin plastic is fuel intensive and carbon heavy. Worldwide, we consume approximately 100 million tons of plastic each year. From the EPA's more conservative estimate to the more liberal one, that's anywhere from 100 to 500 million tons of carbon dioxide emitted. Therefore, reducing plastic consumption can help to slow down climate change caused by greenhouse gas emissions.

According to EPA's statistical report in 2017, plastic waste was 35.4 million tons in the United States, which was 13.2 percent of municipal solid waste generation. The overall amount of recycled plastics is relatively small—8.4%. 15.8% was combusted for energy recovery. The remaining 75.8% of plastic waste was landfilled. Plastics that did not enter the municipal solid waste system is often observed in the ocean or scattered in the environment. Therefore, reducing plastic consumption can save land resources from landfills and lower the level of pollution.

Word count: 190

Q1: To what extent did the article focus on <u>why</u> people should reduce plastic consumption? "1" indicates "none at all" and "5" indicates "a great deal".

Q2: To what extent did the article focus on <u>how</u> people can reduce plastic consumption? "1" indicates "none at all" and "5" indicates "a great deal".

*Q3: I feel that the message from this article is: “1” Very simple, “2” Somewhat simple, “3” Neither simple nor complex, “4” Somewhat complex, “5” Very Complex.

*Q4: To what extent do you agree or disagree with the following argument: "This article intends to be persuasive." “1” indicates “Strongly disagree” and “5” indicates “Strongly agree”.

3. Concrete Content Article

The EPA introduces three ways to substantially reduce plastic consumption, which is reduce, reuse and recycle. Below are ideas of how you can do it.

Reduce

1. Look for products that use less packaging. Buying in bulk, for example, can reduce packaging and save money.
2. Buy reusable over disposable items. Look for items that can be reused; little things can add up. For example, you can bring your own silverware and cup to work, rather than using disposable items.
3. Use refillable water canteens, rather than bottled water

Reuse

1. Buy used. You can find many things at specialized reuse centers and consignment shops. Often, used items are less expensive and just as good as new.
2. Maintain and repair products, so that they won't have to be thrown out and replaced as frequently.
3. Borrow, rent or share items that are used infrequently, like party decorations and tools.

Recycle

1. There are several methods for collecting recyclables, including curbside collection, drop-off centers, and deposit or refund programs. You can participate whichever is available.

2. You help close the recycling loop by buying new products made from recycled materials.

Word Count: 190

Q1: To what extent did the article focus on why people should reduce plastic consumption? "1" indicates "none at all" and "5" indicates "a great deal".

Q2: To what extent did the article focus on how people can reduce plastic consumption? "1" indicates "none at all" and "5" indicates "a great deal".

*Q3: I feel that the message from this article is: “1” Very simple, “2” Somewhat simple, “3” Neither simple nor complex, “4” Somewhat complex, “5” Very Complex.

*Q4: To what extent do you agree or disagree with the following argument: "This article intends to be persuasive." “1” indicates “Strongly disagree” and “5” indicates “Strongly agree”.

*: Only appears in fall 2021 study.

Back to Study 1.

Back to Study 2.

Appendix I.

Table 3. Path Analysis for Week 2 and Week 3 Trying, Based on the Theory of Trying.

			Week 2		Week 3	
Level 1 Path	**Level 2 Path**	**Level 3 Path**	**Coef.**	**P-value**	**Coef.**	**P-value**
Attitude toward Success → Attitude toward Trying			0.33	0.001	0.44	0.000
Expectation of Success → Attitude toward Trying			0.20	0.030	0.17	0.019
Attitude toward Failure → Attitude toward Trying			-0.28	0.003	-0.13	0.133
Expectation of Failure → Attitude toward Trying			0.12	0.065	0.01	0.729
Attitude toward Process → Attitude toward Trying			0.10	0.104	-0.02	0.720
	Attitude toward Trying → Intention to Try		0.20	0.225	0.55	0.012
	Subjective Norm → Intention to Try		0.24	0.010	-0.10	0.283
	Frequency of Past Trying → Intention to Try		-0.36	0.007	-0.29	0.050
		Intention to Try → Trying	0.03	0.813	-0.20	0.030

	Frequency of Past Trying → Trying	0.04	0.634	0.10	0.191
	Recency of Past Trying → Trying	0.57	0.000	0.67	0.000
	Concrete Condition → Trying	-0.27	0.280	0.35	0.095
	Comprehensive Condition → Trying	0.14	0.537	0.34	0.086
DF		20		20	
χ2		68.9	0.000	39.2	0.006
CFI		0.676		0.871	
TLI		0.465		0.786	
RMSEA		0.168[0.126,0.213]		0.113[0.059,0.164]	

Back to Study 1 Results.

Appendix J.

Table 4. Regression Results for Week 2 Trying Models.

Parameter	Week 2 Trying							
	Base Model		+ Moderators		+ Covariates		+ Antecedents	
	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value
Intercept	2.200	0.044	0.462	0.786	1.333	0.555	1.216	0.596
Concrete Info Condition	-0.247	0.337	3.151	0.057	2.000	0.248	1.567	0.384
Comprehensive Condition	0.151	0.571	3.132	0.065	2.845	0.087	2.813	0.100
Frequency of Past Trying	0.048	0.883	-0.148	0.667	-0.058	0.878	-0.040	0.918
Intention to Try	-0.146	0.622	-0.255	0.401	-0.303	0.317	-0.392	0.242
Frequency of Past Trying x Intention to Try	-0.053	0.425	-0.018	0.786	-0.032	0.662	-0.027	0.728
Attitude toward Trying x Intention to Try	0.048	0.083	0.044	0.130	0.077	0.020	0.014	0.843
Subjective Norm x Intention to Try	0.016	0.255	0.014	0.312	0.015	0.301	0.007	0.623
Intention to Try x commitment	0.011	0.741	0.022	0.527	-0.004	0.910	0.019	0.699
Political Orientation			0.206	0.097	0.201	0.150	0.146	0.324
Concrete Info Condition x Political Orientation			-0.236	0.175	-0.187	0.320	-0.148	0.453
Comprehensive Condition x Political Orientation			0.021	0.922	0.101	0.660	0.115	0.639
Green Consumption Value			0.335	0.159	0.411	0.121	0.459	0.105
Concrete Info Condition x Green Consumption Value			-0.541	0.048	-0.334	0.249	-0.274	0.365
Comprehensive Condition x Green Consumption Value			-0.591	0.031	-0.547	0.039	-0.565	0.038
Connectedness to Nature					-0.427	0.123	-0.543	0.069
Need for Cognition					0.580	0.243	0.652	0.204
Social Desirability					-0.098	0.032	-0.077	0.111
Attitude toward Successful x Attitude toward Trying x Intention to Try							0.002	0.769
Attitude toward Failure x Attitude toward Trying x Intention to Try							0.008	0.158
Attitude toward Process x Attitude toward Trying x Intention to Try							0.000	0.889
Expectation of Success x Attitude toward Trying x Intention to Try							0.005	0.305
Expectation of Failure x Attitude toward Trying x Intention to Try							-0.001	0.844

Adjusted R-Squared	20.4%	25.5%	40.1%	39.2%
BIC	255	269	231	247

Back to Study 1 Results.

Appendix K.

Table 5. Regression Results for Week 3 Trying Models.

	Week 3 Trying							
	Base Model		+ Moderators		+ Covariates		+ Antecedents	
Parameter	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	2.286	0.071	0.262	0.899	0.606	0.816	-0.961	0.730
Concrete Info Condition	0.066	0.827	3.150	0.128	3.642	0.070	4.479	0.043
Comprehensive Condition	0.455	0.147	2.679	0.172	2.574	0.170	1.925	0.337
Frequency of Past Trying	-0.242	0.460	-0.271	0.465	-0.021	0.954	0.096	0.808
Intention to Try	0.076	0.827	-0.078	0.827	-0.002	0.996	0.207	0.585
Frequency of Past Trying x Intention to Try	-0.009	0.900	-0.005	0.946	-0.030	0.665	-0.059	0.445
Attitude toward Trying x Intention to Try	-0.019	0.578	-0.027	0.432	-0.027	0.432	-0.070	0.406
Subjective Norm x Intention to Try			0.017	0.302	0.024	0.145	0.013	0.475
Intention to Try x commitment			0.080	0.075	0.065	0.134	0.049	0.296
Political Orientation			0.206	0.190	0.259	0.091	0.245	0.129
Concrete Condition x Political Orientation			-0.160	0.465	-0.228	0.283	-0.236	0.280
Comprehensive Condition x Political Orientation			0.141	0.578	0.087	0.722	0.229	0.388
Green Consumption Value			0.413	0.128	0.601	0.044	0.775	0.016
Concrete Info Condition x Green Consumption Value					-0.582	0.080	-0.747	0.048
Comprehensive Condition x Green Consumption Value					-0.455	0.137	-0.375	0.253
Connectedness to Nature					-0.271	0.372	-0.427	0.193
Need for Cognition							0.913	0.140
Social Desirability							-0.136	0.012
Attitude toward Successful x Attitude toward Trying x Intention to Try							0.00	-0.001
Attitude toward Failure x Attitude toward Trying x Intention to Try							0.00	-0.004
Attitude toward Process x Attitude toward Trying x Intention to Try							0.01	0.009
Expectation of Success x Attitude toward Trying x Intention to Try							0.002	0.680
Expectation of Failure x Attitude toward Trying x Intention to Try							-0.001	0.753
Adjusted R-Squared	32.6%		35.3%		41.2%		40.4%	

BIC	227	242	244	260

Back to Study 1 Results.

Appendix L. Mindset Measurements

1. Think about the action of reducing plastic consumption. Do you already know when, where and how to take action? 9 points, from “Not at all” to “Completely”.

2. Think about the action of reducing plastic of consumption. How sure are you at the moment that you will take action? 9 points, from “Not at all” to “Completely”.

Back to Study 1 Discussion.

Back to Study 2 Materials.

Appendix M. Pilot Study Questions

1. Please think about the products that you would normally buy for a month of living, then list the ones that are made of plastics. (You can write down up to 10 of them.)

2. Please think about the products that you would normally buy for a month of living, then list the ones that are sold with plastic packaging. (You can write down up to 10 of them.)

3. Please estimate your monthly spending (in US dollars).

4. Suppose there is a pro-environmental campaign that calls for reducing the use of plastics, how hard is it for you to do that? (1 = Extremely easy, 5 = Extremely difficult)

5. Suppose companies are able to switch packaging material from plastics to other environmentally friendly alternatives by charging a premium, how likely are you going to follow the switch? (1 = Extremely unlikely, 5 = Extremely likely)

6. Generally speaking, how much are you concerned with the plastic waste you generate? (1 = Not at all, 2 = A little, 3 = A moderate amount, 4 = A lot, 5 = A great deal)

7. Generally speaking, how often are you concerned with the plastic waste you generate? (1 = Never, 2 = Sometimes, 3 = About half the time, 4 = Most of the time, 5 = Always)

Back to Pilot Study.

Appendix N. Pretest and Study 2 Product Details and the Pretest Scores

Product Shortcut	Product Details	Product Price	Sustainable Score
Milk_paper	Organic 2% milk, 0.5 gallon packaged in a recyclable paper bottle.	$4.29	3.31***
Milk_plastic_recycle *	Organic 2% milk, 1 gallon packaged in arecyclable plastic bottle.	$6.99	2.35***
Egg_paper	A dozen large white eggs packaged in a recyclable paper box.	$1.29	2.44
Egg_plastic_disposable *	A dozen large white eggs packaged in a disposable plastic box.	$1.29	2.33
Bread_none	Fresh baked French baguette with no packaging.	$2.90	2.77
Bread_plastic_disposable *	An 8.3 oz French baguette packaged in a disposable plastic bag.	$1.98	3.04
Broccoli_rubber	Broccoli bunch tied up by a rubber band.	$2.44	3.25
Broccoli_plastic_disposable *	Broccoli bunch packaged in a disposable plastic bag.	$2.59	3.10
Lettuce_paper	Romaine lettuce 1 ct with a paper tape.	$1.99	3.37**
Lettuce_plastic_disposable *	Romaine lettuce 2 ct packaged in a disposable plastic bag.	$2.79	2.60**
Tomato_none	One beefsteak tomato with no packaging.	$1.19	2.73
Tomato_plastic_recycle *	Two beefsteak tomatoes packaged in a recyclable plastic box.	$2.69	2.46
Orange_none	One naval orange with no packaging.	$0.75	2.81
Orange_plastic_disposable *	Seven naval oranges packaged in a disposable plastic bag.	$4.99	2.63
Juice_paper	Lemonade 1.75L packaged in a recyclable paper bottle.	$2.09	3.73***
Juice_plastic_recycle *	Lemonade 2.00L packaged in a recyclable plastic bottle.	$1.89	2.52***
Soda_metal	12 cans of 12 fl oz Coca Cola.	$4.99	3.50***
Soca_plastic_recycle *	6 plastic bottles of 16.9 fl oz Coca Cola.	$3.59	2.25***

Chips_metal	Potato chips 5.2 oz packaged in a metal tube.	$1.59	3.06***
Chips_plastic_disposable *	Potato chips 8.0 oz packaged in 12 disposable plastic cups.	$4.99	2.12***
Chocolate_paper	72% Cacao chocolate bar 3.5 oz packaged with paper.	$2.79	3.42***
Chocolate_plastic_disposable *	72% Cacao chocolate squares 4.8 oz packaged in separate disposable plastic bags.	$4.79	2.75***
Cup_paper	10ct 12oz single-use paper cups.	$3.00	2.96***
Cup_plastic_disposable *	20ct single-use disposable plastic cups.	$5.00	1.90***
Food_bag_plastic_reusable	5 reusable plastic sandwich bags.	$4.44	3.06***
Food_bag_plastic_disposable *	300 disposable plastic sandwich bags.	$4.42	1.63***
Food_container_glass	A 1.1L glass food container.	$9.99	2.56***
Food_container_plastic_reusable *	A 1.1L reusable plastic food container.	$7.99	3.77***
Straw_silicone	4pk silicone reusable straws.	$5.99	3.37
Straw_plastic_reusable *	8pk plastic reusable straws.	$5.39	3.23
Shampoo_plastic_reusable	Shampoo 16 fl oz in a reusable plastic pump bottle.	$9.99	3.71***
Shampoo_plastic_disposable *	Shampoo 32 fl oz in a disposable plastic pump bottle.	$10.99	2.29***
Toothpaste_metal	Natural Toothpaste Fluoride Free 5.25oz in a Metal Tube.	$9.99	3.50***
Toothepaste_plastic_recycle *	Natural Toothpaste Fluoride Free 5.50oz in a recyclable plastic Tube.	$4.79	2.25***
Bottle_metal	A stainless steel water bottle 24oz.	$19.99	2.94*
Bottle_plastic_reusable *	A reusable plastic water bottle 24oz.	$11.99	3.48*
Battery_paper	24 AA batteries packaged in a paper box.	$15.84	3.13
Batter_plastic_disposable *	24 AA batteries packaged by hard disposable plastic material.	$15.43	2.94
Trashbag_plastic_degradable	40ct 33 Gal. degradable plastic bags packaged in a paper box.	$26.44	3.33***
Trashbag_plastic_disposable *	40ct 33 Gal. disposable plastic bags packaged in a paper box.	$11.14	1.50***

Products with * are the only choices for no-choice treatment.

Back to pilot study.
Back to pretest results.
Back to study 2.

Appendix O. Pretest Questions

1. Below are grocery items that students often purchase. Please evaluate each of these items, and rate to what degree are their packaging materials environmentally sustainable? 1 represents "not sustainable at all", 5 represents "very much sustainable".

2. Below are kitchenware that students often purchase. Please evaluate each of these items, and rate to what degree are they environmentally sustainable? 1 represents "not sustainable at all", 5 represents "very much sustainable".

3. Below are personal care products that students often purchase. Please evaluate each of these items, and rate to what degree are their packaging materials environmentally sustainable? 1 represents "not sustainable at all", 5 represents "very much sustainable".

4. Below are other products that students often purchase. Please evaluate each of these items, and rate to what degree are they environmentally sustainable? 1 represents "not sustainable at all", 5 represents "very much sustainable".

Back to Study 2 Pretest.

Appendix P. Study 2 Descriptive and Correlation Matrix

Table 6. Outcome Measures, Scale Measures Summary Statistics and Correlations.

	Mean	Std.	OCS	PCS	TS	PS	GC	PO	GSV	CTN	NFC	SDS
Overall Sustainable Consumption Score (OCS)	3.54	0.64	1.00									
Plastic Specific Consumption Score (PCS)	3.87	0.56	0.69	1.00								
Total Spending (TS)	112.20	52.05	-0.99	-0.62	1.00							
Plastic Specific Spending (PS)	84.13	42.49	-0.71	-0.99	0.67	1.00						
Goal Commitment (GC)	3.66	0.80	0.12	0.17	-0.08	-0.13	1.00					
Political Orientation (PO)	3.39	1.50	-0.11	-0.10	0.10	0.08	-0.38	1.00				
Green Consumption Value (GSV)	4.90	1.17	0.02	0.08	0.01	-0.04	0.50	-0.37	1.00			
Connectedness to Nature (CTN)	3.42	0.60	0.06	0.08	-0.04	-0.05	0.28	-0.24	0.55	1.00		
Need for Cognition (NFC)	3.11	0.31	0.08	0.03	-0.10	-0.05	0.02	-0.15	0.15	0.19	1.00	
Social Desirability (SDS)	20.14	2.72	-0.01	-0.05	0.01	0.05	-0.04	-0.02	-0.06	-0.04	0.05	1.00

Back to Study 2.

Appendix Q.

Table 7. Regression Results for Overall and Plastic Specific Sustainable consumption Scores.

	Overall Sustainable Consumption Score						Plastic Specific Consumption Score					
	Base Model		+ Moderators		+ Covariates		Base Model		+ Moderators		+ Covariates	
Parameter	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value	Coef.	P-value
Intercept	3.31	0.000	2.51	0.000	2.11	0.018	3.18	0.000	2.37	0.000	2.25	0.002
Concrete Condition	0.03	0.830	1.11	0.079	1.15	0.072	0.03	0.837	1.07	0.036	1.07	0.038
Comprehensive Condition	-0.01	0.949	2.33	0.003	2.27	0.004	-0.01	0.909	2.19	0.000	2.21	0.001
Choice Condition	-0.25	0.108	-0.31	0.046	-0.30	0.060	0.48	0.000	0.44	0.000	0.45	0.000
Concrete Condition x Choice Condition	0.05	0.837	0.10	0.632	0.10	0.658	-0.04	0.807	0.00	0.989	0.00	0.982
Comprehensive Condition x Choice Condition	-0.08	0.713	0.00	0.983	-0.03	0.898	-0.07	0.702	0.00	0.982	-0.03	0.869
Frequency of Past Trying	0.09	0.427	0.08	0.480	0.10	0.386	0.11	0.226	0.09	0.330	0.10	0.278
Intention to Try	0.05	0.661	0.07	0.563	0.06	0.587	0.04	0.672	0.05	0.577	0.05	0.560
Frequency of Past Trying x Intention to Try	-0.02	0.289	-0.02	0.430	-0.02	0.334	-0.03	0.122	-0.02	0.272	-0.02	0.207
Attitude toward Trying x Intention to Try	-0.01	0.308	-0.01	0.207	-0.01	0.224	0.00	0.740	-0.01	0.443	-0.01	0.502
Subjective Norm x Intention to Try	0.00	0.980	0.00	0.865	0.00	0.890	0.00	0.850	0.00	0.820	0.00	0.819
Intention to Try x commitment	0.03	0.063	0.03	0.077	0.03	0.062	0.02	0.044	0.02	0.085	0.02	0.079
Political Orientation			0.07	0.269	0.07	0.293			0.08	0.128	0.08	0.159
Concrete Condition x Political Orientation			-0.10	0.246	-0.09	0.303			-0.12	0.083	-0.11	0.123
Comprehensive Condition x Political Orientation			-0.23	0.013	-0.21	0.022			-0.23	0.002	-0.23	0.003
Green Consumption Value			0.11	0.149	0.09	0.265			0.13	0.032	0.12	0.061
Concrete Condition x Green Consumption Value			-0.16	0.103	-0.17	0.082			-0.14	0.074	-0.15	0.065
Comprehensive Condition x Green Consumption Value			-0.32	0.007	-0.32	0.008			-0.29	0.002	-0.30	0.003
Connectedness to Nature					0.09	0.337					0.04	0.598
Need for Cognition					0.11	0.485					0.10	0.445
Social Desirability					-0.01	0.639					-0.01	0.311
Adjusted R-Squared	1.5%		4.7%		3.8%		15.0%		19.1%		18.7%	
BIC	441		456		469		356		370		383	

Back to Study 2 Results.

Appendix R.

Table 8. Regression Results for Total and Plastic Specific Spendings.

	Total Spending						Plastic Specific Spending					
	Base Model		+ Moderators		+ Covariates		Base Model		+ Moderators		+ Covariates	
Parameter	**Coef**	**P-value**	**Coef**	**P-value**	**Coef**	**P-value**	**Coef**	**P-value**	**Coef**	**P-value**	**Coef**	**P-value**
Intercept	110	0.002	179	0.000	223	0.002	121	0.000	190	0.000	208	0.000
Concrete Condition	-3	0.830	-98	0.054	-101	0.048	-2	0.832	-92	0.021	-92	0.022
Comprehensive Condition	0	0.983	-191	0.002	-185	0.004	0	0.994	-177	0.000	-177	0.000
Choice Condition	27	0.028	33	0.009	31	0.015	-33	0.001	-30	0.002	-31	0.002
Concrete Condition x Choice Condition	-2.7	0.877	-8.0	0.647	-6.8	0.703	3.7	0.789	-0.4	0.979	0.1	0.993
Comprehensive Condition x Choice Condition	6.3	0.730	-0.1	0.996	2.5	0.892	4.2	0.770	-1.0	0.943	1.6	0.910
Frequency of Past Trying	-4.1	0.648	-3.7	0.687	-5.7	0.546	-6.0	0.399	-4.7	0.514	-5.9	0.422
Intention to Try	-2.1	0.818	-3.1	0.737	-2.8	0.759	-1.5	0.837	-2.1	0.767	-2.4	0.741
Frequency of Past Trying x Intention to Try	1.1	0.516	0.7	0.688	1.1	0.527	1.4	0.273	0.9	0.496	1.2	0.366
Attitude toward Trying x Intention to Try	1.0	0.223	1.2	0.151	1.2	0.165	0.4	0.537	0.7	0.308	0.6	0.359
Subjective Norm x Intention to Try	0.0	0.960	0.1	0.907	0.0	0.935	-0.1	0.829	0.1	0.871	0.1	0.871
Intention to Try x commitment	-1.8	0.100	-1.9	0.104	-2.1	0.077	-1.6	0.072	-1.4	0.112	-1.5	0.094
Political Orientation			-6.7	0.205	-6.6	0.217			-7.3	0.081	-7.0	0.098
Concrete Condition x Political Orientation			9.0	0.175	8.4	0.212			10.3	0.047	9.6	0.070
Comprehensive Condition x Political Orientation			18	0.012	17	0.022			19	0.001	18	0.002
Green Consumption Value			-9	0.139	-7	0.246			-10	0.028	-10	0.051
Concrete Condition x Green Consumption Value			14	0.080	15	0.065			12	0.054	12	0.049
Comprehensive Condition x Green Consumption Value			27	0.005	26	0.007			24	0.002	24	0.002
Connectedness to Nature					-6.1	0.415					-2.1	0.717
Need for Cognition					-13	0.313					-11	0.275
Social Desirability					0.6	0.675					1.1	0.319
Adjusted R-Squared	4.0%		7.4%		6.6%		10.6%		15.1%		14.9%	
BIC	2203		2209		2213		2107		2111		2115	

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Appendix S. Marginal Score Changes

Table 9. Marginal impact of comparable purchasing.

Product	Price	Unit	Rating	Margin	Compare
Milk_plastic_recycle	$6.99	1.00	2.35	-0.102	0.102
Milk_paper	$4.29	2.00	3.31	-0.092	-0.092
Egg_plastic_disposable	$1.29	1.00	2.33	-0.019	0.019
Egg_paper	$1.29	1.00	2.44	-0.018	-0.018
Bread_plastic_disposable	$1.98	1.00	3.04	-0.023	-0.023
Bread_none	$2.90	1.00	2.77	-0.037	0.037
Broccoli_plastic_disposable	$2.59	1.00	3.10	-0.030	0.030
Broccoli_rubber	$2.44	1.00	3.25	-0.027	-0.027
Lettuce_plastic_disposable	$2.79	1.00	2.60	-0.038	0.038
Lettuce_tape	$1.99	2.00	3.37	-0.042	0.000
Lettuce_tape *	$1.99	1.62	3.37	-0.034	-0.034
Tomato_plastic_recycle	$2.69	1.00	2.46	-0.038	0.038
Tomato_none	$1.19	2.00	2.73	-0.031	-0.031
Orange_plastic_disposable	$4.99	1.00	2.63	-0.067	0.067
Orange_none	$0.75	7.00	2.81	-0.067	-0.067
Juice_plastic_recycle	$1.89	1.00	2.52	-0.026	0.026
Juice_paper	$2.09	1.14	3.73	-0.022	-0.022
Soda_plastic_recycle	$3.59	1.00	2.25	-0.054	0.054
Soda_metal	$4.99	0.70	3.50	-0.035	-0.035
Chips_plastic_disposable	$4.99	1.00	2.12	-0.078	0.078
Chips_metal	$1.59	1.54	3.06	-0.029	-0.029
Chocolate_plastics_disposable	$4.79	1.00	2.75	-0.062	0.062
Chocolate_paper	$2.79	1.37	3.42	-0.039	-0.039
Cup_plastic_disposable	$5.00	1.00	1.90	-0.082	0.082
Cup_paper	$3.00	2.00	2.96	-0.073	-0.073
Food_bag_plastic_disposable	$4.42	1.00	1.63	-0.077	0.077
Food_bag_plastic_reusable	$4.44	60.00	3.06	-3.135	0.000
Food_bag_plastic_reusable *	$4.44	2.10	3.06	-0.109	-0.109
Food_container_plastic_reusable	$7.99	1.00	3.77	-0.071	-0.071
Food_container_glass	$9.99	1.00	2.56	-0.138	0.138
Straw_plastic_reusable	$5.39	1.00	3.23	-0.060	0.060
Straw_silicone	$5.99	2.00	3.37	-0.126	0.000
Straw_silicone *	$5.99	1.02	3.37	-0.065	-0.065
Shampoo_plastic_disposable	$10.99	1.00	2.29	-0.163	0.163
Shampoo_plastic_reusable	$9.99	2.00	3.71	-0.183	0.000

Shampoo_plastic_reusable *	$9.99	0.93	3.71	-0.085	-0.085
Toothpaste_plastic_recycle	$4.79	1.00	2.25	-0.072	0.072
Toothpaste_metal	$9.99	1.05	3.50	-0.105	-0.105
Bottle_plastic_reusable	$11.99	1.00	3.48	-0.121	-0.121
Bottle_metal	$19.99	1.00	2.94	-0.244	0.244
Battery_plastic	$15.43	1.00	2.94	-0.189	0.189
Battery_paper	$15.84	1.00	3.13	-0.182	-0.182
Trashbag_plastic_disposable	$11.14	1.00	1.50	-0.201	0.201
Trashbag_plastic_degradable	$26.44	1.00	3.33	-0.283	-0.283
Marginal Effects Compare Sum					0.266

*: Units adjusted by getting actual average purchase ratio.

Back to Study 2 discussion.

Appendix T

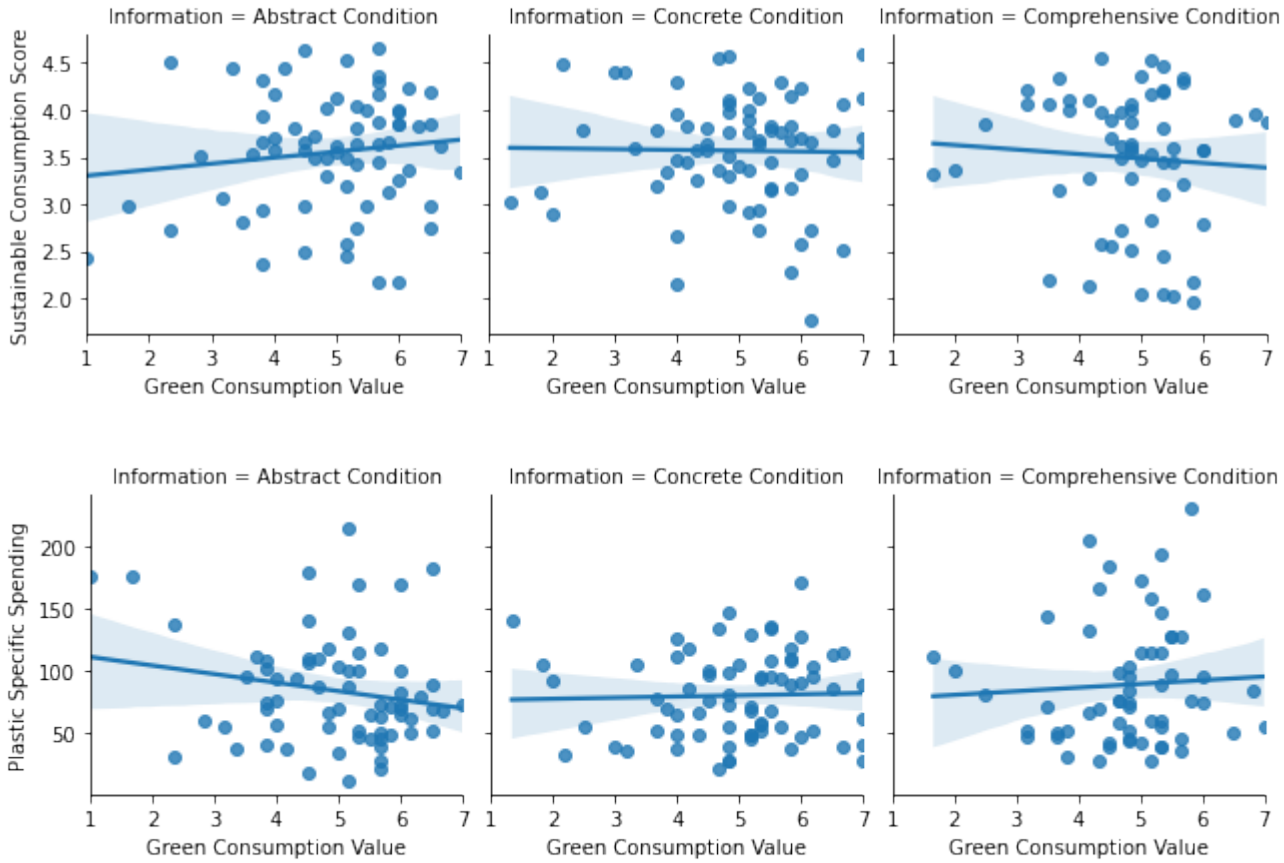

Figure 3. The interaction between overall sustainable consumption score, plastic specific spending and the green consumption value for each information condition group.

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Appendix U

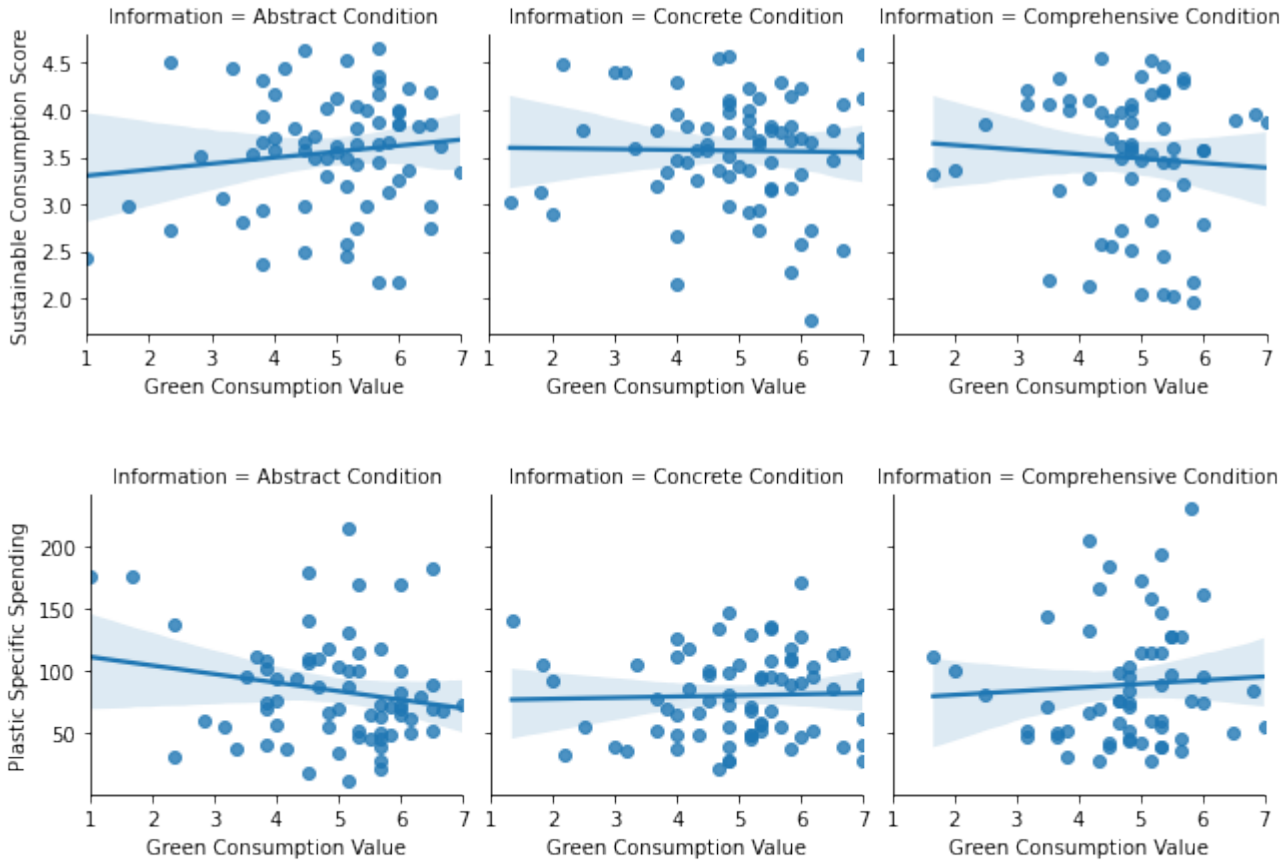

Figure 4. The interaction between plastic specific consumption score, total spending and the political orientation for each information condition group.

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