When and Why Prediction-Based Appeals Influence Consumer Behavior: The Role of Self-Construal

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A Thesis
In the John Molson School of Business

Presented in Partial Fulfillment of the Requirements
For the Degree of
Doctor of Philosophy (Business Administration) at
Concordia University
Montreal, Quebec, Canada

October 2020

CONCORDIA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

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Entitled: When and Why Prediction-Based Appeals Influence Consumer Behavior: The Role of Self-Construal

and submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY (Business Administration)

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Abstract

When and Why Prediction-Based Appeals Influence Consumer Behavior: The Role of Self-Construal

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Concordia University, 2020

Prediction-based marketing prompts consumers to predict their future behavior, typically for socially normative behavior (e.g., voting, recycling, exercising). The prediction increases the likelihood of subsequent norm-consistent action, commonly termed the self-prophecy effect. In this research, I investigate to what extent and why self-construal orientation (independent or interdependent) influences responsiveness to prediction-based advertising in a variety of consumer behavior contexts (i.e., gym attendance, sustainable product choice, monetary donation). I identify that standard prediction-based appeals used in past research (e.g., *Will you…*?) work effectively for individuals with an independent self-construal but not for individuals with an interdependent self-construal (Study 1 and 2), as the accessible self-concept mitigates the experience of cognitive dissonance (Study 3). I introduce socially anchored prediction-based appeals (e.g., *For your loved ones, will you…*?) as an effective alternative (Study 4 and 5) and demonstrate the underlying process for different types of prediction appeals relative to self-construal level (Study 4). Moreover, I demonstrate the mediating role of normative beliefs saliency and the impact of past behavior consistency in prediction-based outcomes that lead to downstream consumer behavior. These findings have implications for the effective application of prediction-based marketing in cross-cultural settings to encourage health-related, prosocial, and pro-environmental behaviors.

Acknowledgements

I am forever indebted to Dr. Onur Bodur, for his unwavering belief in me as a student and researcher, without which I would not be here. Thank you, Onur, for your mentorship, commitment and contributions to my research and training, and patience over the years. Also, I would like to sincerely thank Dr. Bianca Grohmann for the many opportunities she has given me and for her contributions and guidance on this project, as well as her encouragement throughout my degree. Finally, I would like to thank all the members of my committee for their time, feedback, and support.

I dedicate this work to M.H., whose support, love, faith, and encouragement through this process have been unparalleled. He shares the burden of the many sacrifices I have made in pursuit of this achievement.

Contribution of Authors

Dr. Onur Bodur contributed to the conceptual development, the experimental designs and manipulations, directions for analyses, and the preparation of the manuscript throughout the project. Dr. Bianca Grohmann contributed to the conceptual development, positioning of the research question and manuscript, and suggestions on additional analyses. Dr. Bodur and Dr. Grohmann are second and third co-authors, respectively, of the manuscript.

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Introduction

Threats to human health and the sustainability of the planet are worldwide concerns that require a global response. From the risk of pandemics to climate change, individuals around the world are increasingly affected by external factors that precipitate a change in behavior on a local and global scale—a need to come together to work towards a common good for the health and safety of all. Social marketing is an integral part of local and global strategies that require mass behavioral change and adherence to social normative standards during times of crisis (e.g., COVID-19 related handwashing and social distancing; evacuation during wildfires) as well as in regular everyday life (e.g., quitting smoking, getting flu shots, using condoms, reducing energy consumption, recycling). However, effective strategies increasingly necessitate the development of interventions that translate locally in multicultural contexts as well as cross-culturally abroad. In the current research, I examine the moderating role of self-construal on prediction-based marketing, by evaluating the influence of independent and interdependent orientations at both the cultural (chronic) and individual (accessible) level.

Over three decades of research on prediction-based interventions (also termed self-prophecy; Greenwald et al. 1987; e.g., "Will you recycle?") demonstrates that these types of predictions significantly improve rates of consumer engagement for a number of prosocial and self-benefiting behaviors, such as committing to a health assessment (Sprott et al. 2004), voting (Greenwald et al. 1987; Smith, Gerber, and Orlich 2003); recycling (Sprott, Spangenberg, and Perkins 1999); volunteering (Sherman 1980), exercising (Spangenberg et al. 2003), and choosing healthy snacks (Sprott, Spangenberg, and Fisher 2003). The adequacy of the message when self-administered—simply reading a text-based prediction request—has lent itself well to marketing communications, which can effectively reach large consumer segments to influence positive

behavior change in a variety of contexts (Spangenberg et al. 2003). However, like other common social influence or commitment type techniques (Cialdini, Trost, and Newsom 1995; Cross, Gore, and Morris 2003), prediction-based interventions rely on Western-focused individualistic theories (e.g., consistency; Aronson 1968; Festinger 1957) and have been exclusively validated among North American populations. One consequence of this is that the effects of individualistic-centered interventions commonly fail to replicate among collectivistic populations (Aaker and Lee 2001; Agrawal and Maheswaran 2005; Block 2005; Han and Shavitt 1994; Lau-Gesk 2003; White and Simpson 2013; Zhang and Gelb 1996). For example, research shows that individuals from collectivistic (Eastern) cultures do not respond to marketing that appeals to individualistic (Western) values (Han and Shavitt 1994). Similarly, consumers with different self-construal orientations, characteristic of individualist (independent) and collectivistic (interdependent) populations, have been shown to respond differently to common norm-based appeals (e.g., descriptive, injunctive; White and Simpson 2013). This research builds on prior studies that demonstrate divergent responses to social influence techniques and contributes new insight into the generalizability of prediction-based effects based on level of self-construal.

In this article, I evaluate the role of self-construal primarily in the context of sustainable product choice, a novel consumer behavior in prediction-based research, and one that is increasingly relevant to environmentally conscious consumers and brands. Recent US and international polls show that the majority of people around the world now acknowledge the reality of climate change and understand that a major driver of this problem is human activity (Leiserowitz et al. 2018; Smith 2019). Despite the opportunity that choosing "green" products offers consumers to reduce their everyday impact on the environment (e.g., biodegradable ingredients and packaging, sustainably sourced materials) and help slow the negative

implications of consumer consumption on climate change, adoption of environmentally-friendly products remains low (Kennedy et al. 2009; Kollmuss and Agyeman 2002). Prediction-based interventions may be particularly well-suited to bridging this attitude-behavior gap. For example, behavior change that occurs following a prediction request is believed to arise from the intersecting awareness of normative beliefs about the behavior (what a person *should* or *ought to* do) as well as prior behavioral failures to conform with the norm (Spangenberg et al. 2003). Thus, prediction strategies leverage the elements of social normative messaging (Melnyk, Herpen, and van Trijip 2010) and commitment-based approaches (Freedman and Fraser 1966; Scott 1977) to encourage consumers to act in accordance with normative standards by acknowledging their own shortcomings. This research proposes that prediction-based marketing is a feasible strategy for encouraging the consumption of sustainable (vs. traditional) products.

In six studies, I evaluate the effectiveness of prediction-based appeals relative to level of self-construal. I demonstrate that consumers with an independent orientation are uniquely susceptible to standard prediction requests ("Will you…?"). To provide a solution, I examine the underlying process that leads to behavior change from self-prediction and provide a framework for why differential outcomes occur relative to level of self-construal. Based on this, I develop and empirically test an alternative prediction-based appeal—socially anchored (e.g., "For your loved ones, will you…"), to overcome barriers reaching interdependent-type individuals. Finally, I demonstrate that the specificity of the social anchor (close to distal) is an important boundary condition of its effectiveness relative to self-construal orientation. In doing so, this research makes important theoretical and practical contributions to the literature on prediction-based effects.

First, although a large body of research has evaluated prediction-based effects for a variety of behaviors, there are relatively few studies that have examined individual-level moderators of prediction-based interventions (Chandon et al. 2011; Spangenberg and Sprott 2006; Sprott, Spangenberg, and Fisher 2003). I examine the influence of both chronic (e.g., culturally based) and activated (e.g., individual difference) level of self-construal (independent vs. interdependent) on prediction-based effects, and the first culturally relevant moderator. Importantly, I do so across both field and laboratory studies, with real-world behaviors (gym attendance, product choice, and monetary donations to a non-profit organization). Second, I respond to calls to provide more direct evidence regarding the dissonance process related to prediction-based effects (Sprott et al. 2006) by using an objective process tracing method, physiological arousal. In doing so, this novel investigation provides the first objective evidence for the motivational process believed to be induced by prediction-based marketing. Third, this research proposes a self-concept congruency mechanism for standard prediction-based effects that is activated for independent-type consumers but mitigated for interdependent-type consumers. In contrast to prior work on normative influences (Kitayama et al. 2004; White and Simpson 2013; Ybarro and Trafimow 1998), I demonstrate counterintuitive findings regarding the impact of external norms on positive behavior change for independent-type consumers. Moreover, this research also responds to calls to examine the type of normative influence in prediction-based effects (Spangenberg et al. 2016; Sprott et al. 2006) by directly testing the mediating role of social normative beliefs saliency following a prediction request and the moderating role of past behavior adherence to norms. In doing so, I provide empirical evidence demonstrating the cognitive components that are purported to result in cognitive dissonance (Spangenberg et al. 2003; Spangenberg et al. 2012) and motivate downstream consumer behavior from prediction-

based interventions. Finally, this research contributes to the literature by demonstrating the effectiveness of an alternative type of prediction-based appeal that is suited for interdependent-type consumers and provides additional methods to elicit positive responses from prediction-based messaging irrespective of level of self-construal. This work contributes to the growing body of research showing positive behavior change from value-congruent marketing interventions for independent and interdependent consumers, and offers insight into the application of prediction-based interventions in both multicultural and cross-cultural settings.

Hypothesis Development

Standard Prediction Appeals and The Role of Self-Construal

Few studies have identified moderators of prediction-based interventions for socially normative behaviors (Chandon et al. 2011; Spangenberg and Sprott 2006; Sprott, Spangenberg, and Fisher2003). The inclusion of a prediction request ("Will you …?") in advertisements is presumed to make salient peoples' normative values about a behavior (e.g., what they *should* or *ought to* do in a given context) and their past behavior (in)consistency (Spangenberg et al. 2003). Incongruity between pro-behavior values and actual prior behavior leads to a state of cognitive dissonance (Spangenberg et al. 2003), motivating future action in a normative direction. Hence, prediction requests common to self-prophecy effects most often lead to positive behavior change, particularly for prosocial and other socially normative action (see Dholakia 2010, for a review). This research proposes that the efficacy of prediction-based interventions is moderated by level of self-construal (chronic or accessible).

Self-construal relates to the influence of close others and the social context on a person's self-concept and, more specifically, the degree to which individuals view themselves as separate from (independent) versus connected to (interdependent) relational or close others (Markus and

Kitayama 1991). Independent and interdependent self-views are commonly linked to individualistic (Western) and collectivistic (Eastern) cultures, respectively (Cross, Hardin, and Gercek-Swing 2011; Markus and Kitayama 1991, 2010; Triandis 1989), which tend to result in the development of a persistent chronic orientation (Hoshino-Browne et al. 2005; Kitayama and Imada 2010). At the individual level, social identity theory suggests that self-construal is a continuum (Brewer and Gardner 1996; Tajfel and Turner 1986), where one orientation is typically more readily accessible or can be temporarily activated or primed (Gardner, Gabriel, and Lee 1999; Triandis 1989). The dominant or activated level of self-construal influences to a greater extent an individual's attitudes, thoughts, and behaviors in a given context (Cross and Madson 1997; Gardner, Gabriel, and Lee 1999; Snibbe and Markus 2005; Trafimow and Finlay 1996), and the extent to which personal or ingroup goals are more apparent (Gardner, Gabriel, and Lee 1999; Lee, Aaker, and Gardner 2000).

Research shows that prediction-based appeals are more likely to lead to positive behavior change for those who hold stronger (vs. weaker) normative values about the focal behavior (Sprott, Spangenberg, and Fisher 2003). Social influence appeals that emphasize similar injunctive-type norms to those of prediction-based appeals (Cialdini, Kallgren, and Reno 1991) have been shown to be incompatible with individual-level goals and threatening to the autonomy (White and Simpson 2013) and freedom of choice (Kitayama et al. 2004) of independent-type individuals, therefore negatively affecting the intended action relative to the appeal. Cultural psychology research suggests that personal preferences and attitudes, rather than external social norms, are stronger motivators and drivers of behavior for independent-type individuals (Ybarro and Trafimow 1998). The unique role of social normative beliefs in the outcomes of prediction-based interventions suggests that interdependent (vs. independent) type individuals may be more

susceptible to the influence of standard prediction appeals. I propose instead that the joint salience of normative beliefs and past behavior (in)consistencies that occurs following a standard prediction request will be effective at motivating norm-adherent action only for independent-type individuals.

Cultural and individual differences, such as self-construal, directly affect the inherent value individuals place on different types of cognitions (Harmon-Jones, Amodio, and Harmon-Jones 2009), such as discrepant attitudes and behaviors important to the emergence of prediction-based effects. The dissonance experience is stronger when the related discrepant cognitions are highly self-relevant and important to the individual (Festinger 1957; Harmon-Jones, Amodio, and Harmon-Jones 2009), and when it violates the self-concept (Aronson 1992). I propose that the ability of a prediction-based appeal to lead to downstream behavior change will be moderated by level of self-construal. Specifically, I posit that this effect will be driven by whether core aspects of the self-concept are sufficiently threatened and elicit relevant maintenance goals. For example, when the independent level of self-construal is more accessible, maintaining the self-concept (e.g., as an autonomous and unique person), requires acting in accordance with one's internal attributes (attitudes, preferences, desires) and doing so consistently across situations (Markus and Kitayama 1991). Internal attributes are considered diagnostic of the self and value-behavior consistency is integral to the maintenance of self-integrity and a sense of personal competence (Cross, Hardin, and Gercek-Swing 2011; Markus and Kitayama 1991). In the context of prediction requests, the coinciding salience of general social normative beliefs or standards as well as prior behavior contradictions is likely to threaten the accessible self-concept and motivate realignment. Thus, I propose that a standard prediction request will lead to behavior change in a normative direction for independent-type individuals.

When the interdependent level of the self is more accessible, maintaining the self-concept (e.g., as a good social member) requires acting in accordance with the needs and preferences of close others, rather than personal attributes, to preserve social harmony and fulfill the responsibilities of one's social roles (Jacobson, Mortensen, and Cialdini 2011; Markus and Kitayama 1991; White and Simpson 2013). Behavior is considered situationally and socially bound and is not attributed to the core self (Cross, Gore, and Morris 2003; Cross, Hardin, and Gercek-Swing 2011; Markus and Kitayama 1991). Accordingly, self-knowledge is more likely to be socially contextualized (e.g., an action defined by the demands and social obligations of the context) than organized around or attributed to a self-defining characteristic (e.g., attitudes or preferences) (Kühnen, Hannover, and Schubert 2001; Morris and Peng 1994). A standard prediction-based appeal separates a behavior from the social environment, asking individuals to predict their future action in isolation from the context in which the action has or will be performed ("Ask yourself: Will you recycle?"). The activation of a single or unified social normative belief about what one *should* or *ought* to do is therefore less likely to be evoked for interdependent-type individuals. Coincidingly, prior behavior inconsistencies will reflect variability in the demands of the social context and will not be particularly informative of or threatening to important aspects of the accessible self-concept (Cross, Gore, and Morris 2003). I therefore predict that:

> **H1a:** When the independent (vs. interdependent) self is accessible, consumers will engage in positive behavior change in response to a standard prediction-based appeal.
>
> **H1b**: When the independent (vs. interdependent) self is accessible, consumers will experience dissonance in response to a standard prediction-based appeal.

Alternative Prediction-Based Appeals

Cross-cultural research suggests that the experience of cognitive dissonance for interdependent-type individuals stems from interpersonal worry about rejection by close others or the potential for social sanction (Kitayama et al. 2004). For example, Eastern (vs. Western) participants exhibit choice justification (i.e., dissonance reduction) following a suboptimal choice made for a close friend versus the self (Hoshino-Browne et al. 2005), or when a choice is made in the presence (vs. absence) of a perceived audience (Imada and Kitayama 2010). Interdependent-type individuals have also been shown to be more attentive when choosing for someone else (Pöhlmann et al. 2007), suggesting the importance of a choice increases when close others are (vs. not) implicated. Consistent with this line of reasoning, it is anticipated that altering the standard prediction message to directly include a reference to close others will influence behavior change for consumers when the interdependent self is more accessible.

Interdependent-type individuals seek to fulfil their social responsibilities in important relationships to maintain social harmony and are therefore motivated by socially anchored goals (Cross, Hardin, and Gercek-Swing 2011; Markus and Kitayama 1991). For example, being attuned to the preferences and needs of ingroup members (e.g., family and friends) is an important social goal that enables role fulfilment (Hoshino-Browne et al. 2005). In addition, the preferences of interdependent individuals are more likely to be inferred based on the preferences of close or relevant others (Aaker and Maheswaran 1997; Pöhlmannet al. 2007). Thus, making a decision that may be inconsiderate of ingroup members is more threatening when the interdependent (vs. independent) level of self is accessible (Hoshino-Browne et al. 2005). I propose that including a close social anchor in a prediction-based message will increase the responsiveness from interdependent-type consumers for two reasons. First, by making salient a

specific reference group, it will establish a meaningful context from which to recall one's past behavior as well as to predict one's future behavior relative to the prediction context, by increasing the saliency of a stable social normative belief about the behavior. Second, social obligations as well as interpersonal concerns about making an appropriate choice that incorporates close others' preferences will become apparent. Consequently, any recall of past behavior inconsistency relative to the socially anchored context will become informative and threatening to the accessible self. Norm-consistent action will therefore be motivated to maintain social accord and reduce interpersonal worry about inadequacy to fulfil significant social roles.

Conversely, independent individuals' personal preferences and attitudes are instrumental in guiding behavior and fundamental to the value of uniqueness (Markus and Kitayama 1991; Ybarro and Trafimow 1998). The consideration of close others' preferences in a prediction context would be less meaningful than the expression of one's personal attributes. Contrary to a standard prediction appeal, awareness of past behavior that is inconsistent with the desires or expectations of specific close others (vs. internal attitudes) is unlikely to be threatening to core values of consistency for independent-type consumers. Accordingly, prior variability in behavior related to others' preferences will be attributable to the expression of personal over ingroup preferences. I therefore predict that the effectiveness of a prediction request will be mitigated when a close social anchor is included in the prediction message for independent-type individuals.

> **H2:** When the interdependent (vs. independent) self is accessible, consumers will engage in positive behavior change in response to a close socially anchored prediction-based appeal (vs. standard appeal).

Normative Beliefs Activation and Past Behavior

The coinciding awareness of discrepant cognitions brought on by a prediction request—what one should do (social normative beliefs) and what one has not always done in the past (past behavior consistency)—is believed to induce cognitive dissonance and motivate downstream behavior in a normative direction (Spangenberg et al. 2003, Spangenberg and Greenwald 1999; Spangenberg and Sprott 2006). Although the extant literature generally supports a dissonance-based process for prediction-based effects, evidence for the role of normative beliefs remains sparse and inconclusive. Prior work on the role of norms has evaluated either the strength of social normative beliefs (Sprott, Spangenberg, and Fisher 2003) or personal normative beliefs (Chandon et al. 2011) as moderators (median-split; low vs. high) on the prediction-behavior relation. For example, Sprott and colleagues (2003) found that a prediction request was more likely to lead to norm-consistent behavior for those who held stronger (vs. weaker) social normative beliefs (as measured two weeks prior to the focal study; Sprott, Spangenberg, and Fisher 2003). In contrast, Chandon et al. (2011) found that personal normative beliefs (high vs. low), rather than social normative beliefs, influenced behavior change following a prediction request.

Other research evaluated the role of social normative beliefs following a prediction request but in the absence of a behavior outcome. For example, Spangenberg et al. (2012), evaluated participants' recall of others' actions (i.e., social norms) regarding a focal behavior directly following a standard prediction request. The authors found that participants tended to underestimate or downplay the behavior of other people. These findings suggest that participants attempted to resolve the dissonance evoked from the prediction request by biasing (in their own favor) one of the two cognitive components—social normative beliefs—believed to be integral to

the dissonance process (Spangenberg et al. 2012). Importantly, the current work differs from past research in that I evaluate the role of social normative beliefs in the prediction-behavior relation directly (i.e., mediation). I also evaluate the impact of the extent to which individuals have behaved consistently with the norm in the past. In doing so, I provide the first empirical evidence for the role of normative beliefs activation as well as the interplay between normative beliefs and past behavior consistency in the process that leads to prediction-based effects.

As previously mentioned, I propose that normative beliefs activation from a prediction appeal (either standard or socially anchored) is influenced by important aspects of the self-concept that are salient at the time of prediction. In addition, the informativeness of normative beliefs to guide behavior should increase in situations when the behavior is new or more ambiguous (e.g., Griskevicius et al. 2006), and thus when prior behavior references (habits or personal standards) are absent or limited. This suggests that to the extent that past behavior has been inconsistent relative to the activated norm, prediction-based appeals will be more likely to influence behavioral outcomes in a normative direction. This notion is supported by findings from Smith et al. (2003) who found that following a behavior prediction, turnout rates to vote increased only among voters who had infrequently voted in the past (irregular vs. regular voters). Similarly, Dickerson et al. (1992) found that making salient participants' positive attitudes about water conservation before having them advocate for the cause, was most effective at eliciting behavior change (e.g., reducing shower duration) when past behavior inconsistency was (vs. not) first recalled. Thus, as past behavior becomes more discrepant from the value, the influence of normative beliefs activation from a prediction request on behavior change should increase.

In summary, I propose that prediction-based appeals (standard or socially anchored) will influence the saliency of normative beliefs about the focal behavior—as a function of level of

self-construal and depending on the extent of past behavior adherence to norms—and will subsequently influence behavior change in a normative direction.

H3a: When past behavior consistency is low, a standard (socially anchored) prediction will increase the saliency of normative beliefs for independent (interdependent) consumers and will lead to behavior change in a norm-consistent direction.

H3b: When past behavior consistency is high, the influence of prediction appeals, through normative beliefs saliency, on behavior change will be attenuated regardless of consumers' level of self-construal.

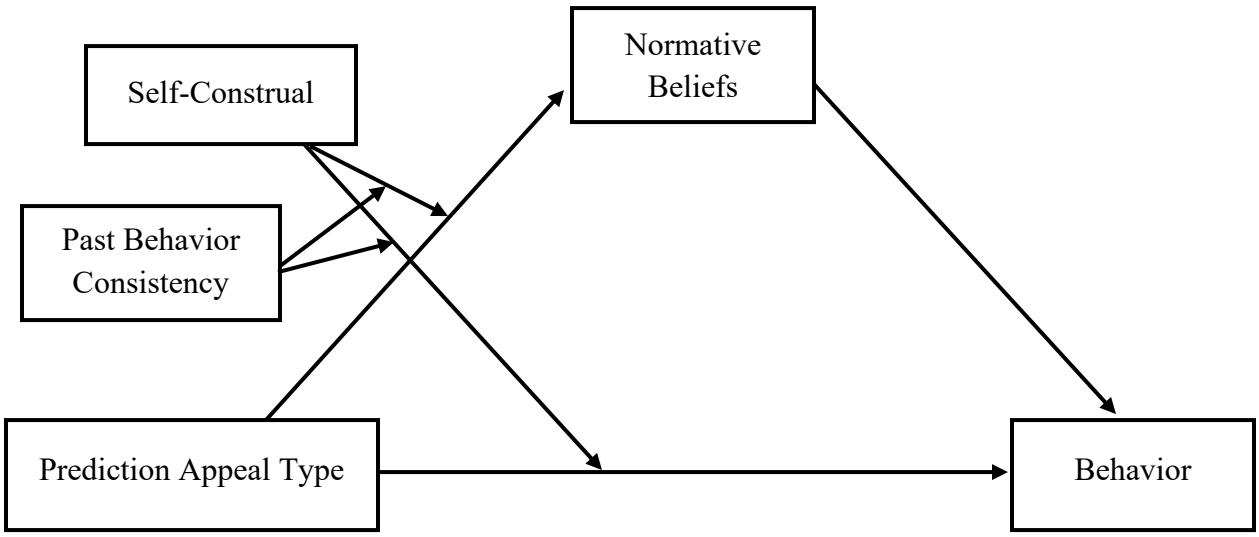

Figure 1. Proposed process model for the influence of self-construal on the relation between prediction-based appeals and behavior.

I investigate the hypotheses across six studies. Studies 1-3 collectively demonstrate that standard prediction appeals are effective for independent (vs. interdependent) type consumers (H1a). Study 1 is a field experiment that assesses exercising behavior of gym members and chronic level of self-construal. Study 2 replicates these findings in the novel consumer context of

sustainable product choice. In Study 3a and 3b, I provide evidence that the experience of cognitive dissonance (physiological arousal and psychological discomfort) following exposure to a standard prediction appeal differs relative to self-construal orientation (H1b). In Study 4, I evaluate an alternative prediction type that includes a close social anchor and show that self-concept congruent prediction appeals have a positive effect on behavior change for interdependent-type consumers (H2). I next evaluate the antecedents of the dissonance-based process and show that the responsiveness to different types of prediction appeals, depending on the level of self-construal, is related to the strength of normative beliefs saliency and as a function of past behavior consistency (H3). In Study 5, I examine a boundary condition of the social anchor inclusion (i.e., specificity) in prediction-based messaging and demonstrate the use of realistic advertising in the context of monetary donations for an environmental non-profit organization.

Study 1 - Gym Attendance

The purpose of Study 1 was to evaluate the influence of self-construal on prediction-based outcomes in a real-world setting. Gym attendance was chosen as the behavior in this initial study to demonstrate the role of self-construal in a comparative consumer behavior context in which prediction-based effects have been previously observed (Chandon et al. 2011; Spangenberg et al. 2003). This study tests hypothesis 1, that only independent-type consumers will be responsive to a standard prediction-based appeal.

Design and Participants

Study 1 was an exploratory field experiment at a university-affiliated public health and fitness facility. The facility offers four-month long (per semester) renewable gym memberships. I

employed a between-participants design with two message conditions (standard prediction vs. no prediction control), with random assignment to conditions. Participants were recruited during the first three weeks of a semester. Staff members distributed recruitment leaflets via membership packets to new and renewing gym members. The leaflet contained information about the general purpose of the study, without mention of an intervention, and an email address to contact researchers to participate. Participants were required to hold an active gym membership and not be enrolled in any personalized training or other fitness programs offered by the facility for the duration of the study (one semester), which could have influenced rates of attendance.[1] Due to the recency of the opening of the facility, the total population of new and returning gym members available for recruitment was relatively small compared to that of a well-established gym. The final sample included 40 individuals between the ages of 18 and 72 (M_{age} = 36.70; 55.0% female; See Table A1 in Appendix A for full sample demographics).

Procedure

Gym members who were interested in participating in the study contacted the researchers by email and were referred to an online link to register. Participants first provided informed consent and indicated agreement for the gym to release their access card attendance data for the 8-week study period. Participants also completed a short online questionnaire that included basic demographics and individual difference measures (e.g., self-construal). Day 1 of the study for each participant was the day of consent. Participants were not contacted again by researchers until the day of the intervention four weeks later. The prediction manipulation was distributed to

[1] As compensation for participation, the gym offered individuals a free trial with a device that can be paired with compatible gym equipment to record individual-related variables during workouts. The correlation between the device trackers' attendance records and that from the access card logs was not statistically significant ($p > .10$). This indicated either that: Participants did not reliably or properly use the device tracker at each workout when exercising with relevant machines, a substantial amount of exercising did not include machines (untracked workouts, e.g., yoga stretching, gym laps), and/or the device tracker did not reliably record data when used. Therefore, exercise related variables were not analyzed.

participants' personal email addresses once via individualized and trackable links (used as a manipulation check). The email read, "Please follow the link below to view a short memo from the researchers." At the end of the study, participants were debriefed by email.

Measures

The Twenty-Statements Test (TST; Kuhn and McPartland 1954) 10-item short form was used to measure self-construal. Participants were asked to write in any order 10 different statements to answer the question "Who am I?". Statements were later coded for the number of independent (i.e., "I am smart"), interdependent ("I am a sister"), and allocentric (i.e., "I am a caring citizen") type statements (Trafimow, Triandis, and Goto 1991; Ybarro and Trafimow 1998). A ratio score of independence was calculated by dividing the number of independent responses by the total number of responses (Trafimow, Triandis, and Goto 1991). Higher scores represented greater independence (lesser interdependence). The Exercise Self-Regulation Questionnaire (Ryan and Connell 1989) is a 16-item measure that asks participants to rate the reasons why they exercise regularly on a 7-point Likert-type scale (1 = *not at all true*, 7 = *very true*). The four subscales (4-items each) assess: external regulation, related to rules and avoidance of punishment (e.g., "because I feel like I have no choice about exercising"; "others make me do it"); introjection regulation, related to self- and other-approval or avoidance of disapproval (e.g., "because I would feel like a failure if I did not"); identification regulation, related to self-valued goals or personal importance (e.g., "because feeling healthier is an important value to me"); intrinsic regulation, for enjoyment or fun (e.g., "because I enjoy exercising"). In the current sample, the Cronbach's alpha for each subscale was acceptable (external $\alpha = .91$, introjection $\alpha = .85$, identification $\alpha = .81$, intrinsic $\alpha = .68$).

The dependent variable was average weekly gym attendance (in days) post-intervention (a 4-

week period). The gym facility gathered attendance data for the duration of the study through frequency of personal access card use, which members must swipe at the front desk to enter the gym. Gym attendance on the day of the intervention was excluded from analysis.

Materials

The prediction manipulation was given through an advertisement (600 x 341 pixels) presented on a blank online survey page. The advertisement displayed either a prediction request, "Ask yourself: Will you work out at the [fitness facility]?" or a control message, "Work out at the [fitness facility]", consistent with prior manipulations (Spangenberg et al. 2003). Below the advertisement was a short sentence from the researchers thanking participants for their participation, as well as three internet URLs that linked to innocuous online articles (e.g., Canada's Food Guide) to mask the purpose of the contact. The links did not contain any content at the time that could directly influence exercising behaviors (e.g., motivational strategies, exercise tips, advice). The email contact was identical between conditions except for the prediction appeal.

Results and Discussion

An examination of the access card data confirmed that all participants were active members of the gym facility during the study. In addition, response data showed that all participants clicked to open the intervention webpage link sent by email and were exposed to the advertisement. Consistent with random assignment, there were no statistically significant differences on demographics (i.e., sex, age, employment, or student status) across groups. In addition, message conditions did not statistically differ on active weight loss dieting at the beginning of the study ($\chi^2(1) = .01$, $p = .92$), nor on any of the SRQ-E subscales, $F(4, 34) = .90$, $p = .47$. Therefore, both intrinsic and extrinsic motivations to work out were similar across

groups[2]. Two independent raters who were blind to the hypotheses coded the TST responses. Krippendorff's alpha reliability coefficient between raters was high (α = .93, 95% CI [.87, .97]).

Effect of Prediction Request and Self-construal on Gym Attendance. A multiple regression was conducted to determine whether self-construal moderates the relation between a prediction request and gym attendance. Average weekly attendance (number of visits) post-treatment served as the criterion (M = 1.51, SD = .97). Message condition (-1 = control, 1 = prediction), and ratio of independent statements (M = .65, SD = .23) mean centered were entered as predictors, followed by their interaction term. Average pre-treatment attendance (M = 1.95, SD = 1.22) served as a covariate. The overall model predicting weekly average attendance rates accounted for 63.0% of variance, $F(4, 35) = 14.87$, $p < .001$. As shown in Table 1, pre-treatment average weekly attendance and message were significant predictors of post-treatment attendance (p's < .01). The two-way interaction between message and independence was marginally significant ($R^2\Delta = .04$, $p = .06$). To test hypothesis 1, the conditional effect of prediction on gym attendance was probed at different levels of independence. For gym members lower on independence (-1 SD = -.25), the conditional effect of a prediction-based appeal on average weekly gym attendance was non-significant ($p = .40$). However, at the mean ($p = .003$, 95% CI [.12, .56]) and higher levels (+1 SD = .25; $p < .001$, 95% CI [.25, .84]) of independence, the effect was statistically significant, such that viewing a prediction request (vs. a control) led to one additional day of gym attendance per week for members with greater independent self-construal. Figure 2 illustrates these results. The Johnson–Neyman value of ratio of independence for which the conditional effect of prediction on average weekly gym attendance transitioned

[2] Including any of or all the SRQ-E subscales as covariates in the main analysis did not change any of the conditional main effects and none of the subscales was a significant predictor of gym attendance (p's > .05). Also, age was not a significant predictor of self-construal level or gym attendance (p's > .05).

between significant (at $\alpha = .05$ level of significance) and non-significant was -0.11, such that values below this point (i.e., greater interdependence) were non-significant.

To determine whether the experimental procedure led to atypical differences in gym attendance for participants in the control condition, a post-hoc comparative sample of gym members who had not participated in the study was obtained. An email was distributed by the gym facility to eligible members. Members who agreed to participate provided informed consent for researchers to obtain their access card data for the previous semester. The comparative (N = 20; M_{age} = 38.84; 79% female) and the original control groups did not statistically differ on any demographic variables (p's > .05). Multivariate analysis confirmed that average gym attendance between control conditions (advertisement control: M_{pre} = 1.67, SD = .71; M_{post} = 1.07, SD = .58; no advertisement control: M_{pre} = 1.62, SD = .95; M_{post} = 1.42, SD = .91) was not statistically different, $F(2, 37) = 1.73$, $p = .19$. This post-hoc sample provides additional evidence suggesting that receiving an advertisement to simply "work out" (without a prediction request) is no more effective at influencing gym attendance than not being exposed to an advertisement.

Next, I examined the effect of the prediction request on change in gym attendance, relative to self-construal. Recall that participants in the study had recently either joined the gym or renewed their membership at the start of a school semester. One of the challenges faced by fitness facilities is decline in attendance over time and attrition (Schmaltz 2018). Coupled with the increasing demands on students over the course of a semester, I expected an overall decline in gym attendance through the duration of the study in our sample. Prior research has shown that a prediction appeal (vs. control) can reduce the decline of gym attendance (pre to post-treatment; Spangenberg et al. 2003). It was therefore expected that any decrease in gym attendance from pre- to post-intervention would be less in the prediction (vs. no prediction) condition, but

specifically for members with an independent (vs. interdependent) self-construal. Average weekly gym attendance during the 4-week pre-intervention period did not statistically differ between prediction conditions ($M_{control}$ = 1.68, SD = 0.71; M_{pred} = 2.25, SD = 1.57), $F(1, 38)$ = 2.26, p = .14. A change score was calculated for each participant by subtracting the average weekly post-intervention attendance rate from the average weekly pre-intervention rate. The first analysis using multiple regression was repeated but now included the change score as the criterion. The overall model was marginally significant, $F(3, 36) = 2.22$, $p < .10$, $R^2 = 16$. As shown in Table 1, the condition main effects of appeal type and level of independence were non-significant (p's > .10). The two-way interaction between appeal type and level of independence was statistically significant (p = .04, $R^2\Delta$ = .11). Importantly, the conditional effect of appeal type on behavior change was statistically significant only at higher levels of independence (+1 SD; p = .02). For gym members with more independent orientations, the decline in gym attendance over time was significantly less in the prediction condition (M = 0.11) than the control (M = -0.87). Further, attendance improved from pre- to post-intervention in the prediction condition for more independent-type members only. Conversely, for members with less independent orientations (-1 SD; e.g., more interdependent), the prediction appeal (M = -0.47) and the no prediction control appeal (M = -0.21) resulted in similar declines in average weekly gym attendance over time (p > .20).

Table 1.

The Effect of Standard Prediction on Average Weekly Gym Behavior (Study 1)

	Attendance (Days)			Attendance Decline[b]		
Predictor	B	B SE	*t*	B	B SE	*t*
Pre weekly attendance	.51	.09	5.81**	-	-	-
PREDiction[a]	.34	.11	3.20**	-.69	.43	-1.61
INDependence	.30	.44	.68	-.07	.62	-.11
PRED × IND	.84	.44	1.90[c]	1.34	.62	2.18*

Note. [a] Prediction (-1 = no prediction control, 1 = standard prediction). [b] Attendance decline over time = (Average post-intervention gym attendance – average pre-intervention gym attendance). [c] $p = .06$.
*$p < .05$. **$p < .01$.

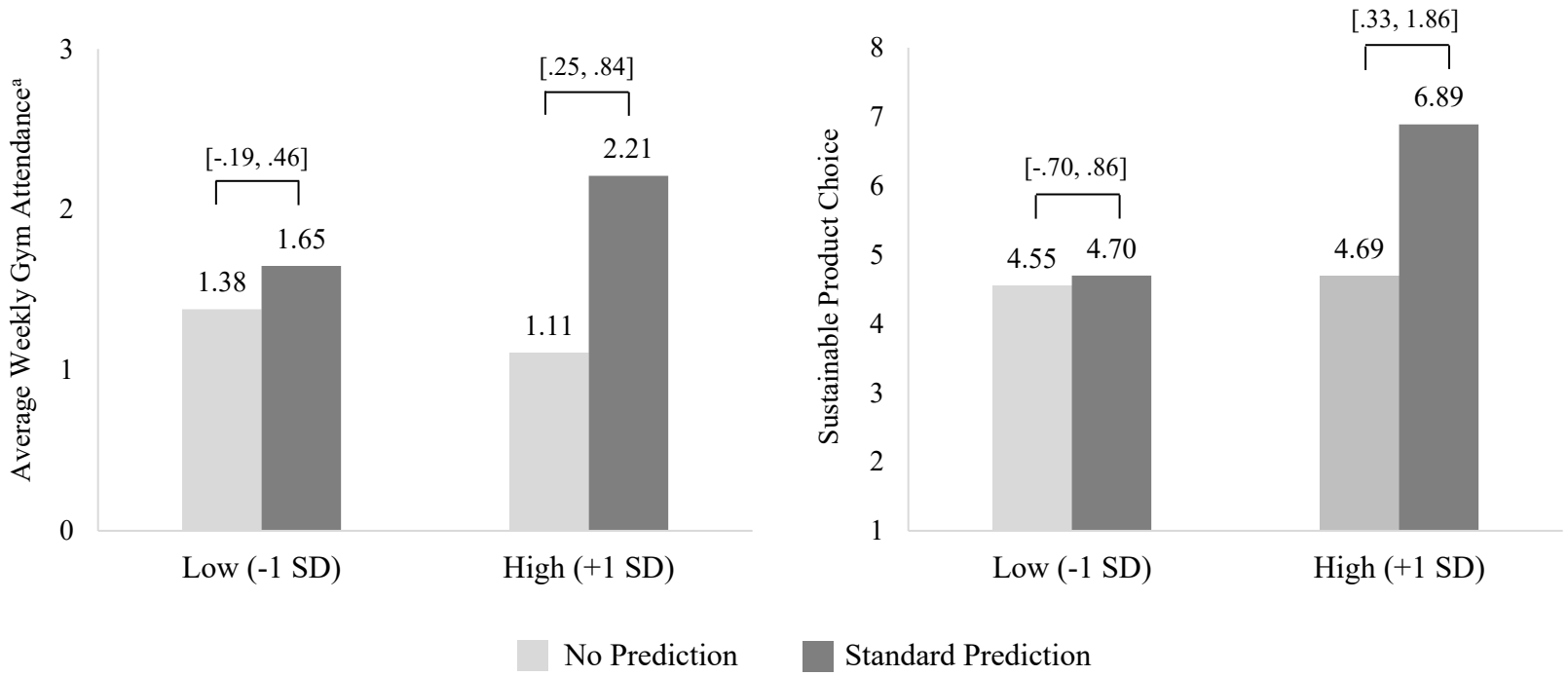

Figure 2. The effect of a standard prediction and level of independence (low or high; self-construal) on consumer behavior: Average weekly gym attendance in days (Study 1; left) and sustainable product choice (Study 2; right). Superscripts indicate statistically significant contrasts ($p < .05$). Values in brackets above bars show the 95% confidence interval of the contrast.
[a] Values shown are at level of covariate (pre-message attendance).

Study 2 - Sustainable Product Choice

The purpose of Study 2 is to examine the effectiveness of prediction-based messaging on sustainable product consumption, a novel consumer behavior context in prediction-based research. In addition, this study aims to replicate findings from Study 1 on the moderating role of self-construal on the prediction-behavior relation, providing further support for hypothesis 1.

Design, Participants, and Procedure

Seventy-five undergraduate students (M_{age} = 20.61; 53.3% male; See Appendix A for detailed sample demographics), who were fluent in English, participated in the laboratory study for course credit. The study employed a single factor (message: prediction vs. no prediction control) between-participants design. Participants were randomly assigned to a condition at the beginning of the computerized survey. After completing basic demographics, participants viewed an appeal containing the message manipulation and then completed advertisement recall questions about the topic and copy, to confirm involvement with the task (Spangenberg and Sprott 2006). Next, participants took part in a brief (approx. 5 minutes) unrelated filler task to help mask the purpose of the appeal manipulation, where they were asked to rate a sequence of fictitious brand names on familiarity, liking, and similarity. Participants then completed the focal product choice task (described below), the measure of self-construal (TST-10 statements; Kuhn and McPartland 1954) from Study 1, additional demographics, and a hypothesis probe.

Materials

Message Manipulation. The prediction manipulation was presented in an advertisement (730 x 440 pixels) displayed at the center of a computer screen. The prediction appeal header displayed the name of a non-profit university-based organization and their logo. The copy in the

center of the ad read, “Ask yourself: Will you buy environmentally-friendly products?” (see Appendix B for the appeal). The header of the control advertisement read “Tide” with the brand’s logo displayed in the upper left corner. The body of the control ad contained the slogan, “Tough on Stains”.

Product Choice Task. The product choice task instructions informed students that they would be shown pairs of products across different product categories and be asked to indicate which option in each pair that they most preferred, on a continuous scale (1 = *Option A*, 9 = *Option B*). In addition, participants were informed that they would receive one of their product choices (randomly selected by researchers) at the end of the study as partial compensation for participation, such that product selections represented actual choices. The two product categories were wine corkscrews and meal bars. Order of presentation was randomized between participants (see Appendix B for stimuli). In each pair of products, only one option displayed environmentally-friendly attributes (counterbalanced left and right). The sustainable option also displayed a 15% price premium over the traditional option, consistent with higher market pricing for sustainable products and within consumers’ willingness to pay thresholds (Drozdenko, Jensen, and Coelho 2011; Tully and Winer 2013). To prevent a potential ceiling effect should students decide to simply choose the options that had higher dollar values (i.e., the sustainable options), the attributes of the less expensive traditional options were enhanced (Peloza, White, and Shang 2013).

Results

Participants spent an average of 10.00 seconds (SD = 3.66) viewing the advertisements (M_{Pred} = 10.77, SD = 4.05; M_{Control} = 9.22, SD = 3.06) and the difference between the control and prediction ad conditions was marginally significant ($t(73) = -1.19$, $p = .07$). The TST responses

were coded by two independent raters and intercoder reliability was high (α = .97, 95% CI [.96, .97]). As in Study 1, a self-construal ratio score representing independence was calculated by dividing the number of independent statements by the total number of statements. Higher scores indicate greater independence[3]. After reverse coding, the dependent variable was the mean of the two product choices (M = 4.97, SD = 2.45), where higher values indicate choice for the sustainable options.

Effect of Prediction Request and Self-construal on Sustainable Product Choice. A regression analysis was conducted using message (control = -1, prediction = 1) and independence ratio (M = .69, SD = .28) mean-centered as predictor variables, as well as their interaction term. The overall model accounted for 14.51% of the total variance, $F(3,71) = 4.02$, p = . 01. The conditional main effects of message (B = .59, SE = .27, t = 2.16, p = .03) and independence ratio (B = 2.11, SE = 1.00, t = 2.12, p = .04) were statistically significant. In addition, the two-way interaction was marginally significant (B = 1.85, SE = 1.00, t = 1.85, p = .07, $R^2\Delta$ = .04). In further support of hypothesis 1, a spotlight analysis at -1 and +1 standard deviations from the mean on independence ratio confirmed that at lower levels of independence (-1 SD = -0.27), the effect of message on choice was non-significant (p > .10). However, at the mean and higher levels (+1 SD = 0.27) of independence, the effects of message on choice were statistically significant (at the mean: p = .03, 95% CI [.05, 1.13]; at +1 SD: p < .01, 95% CI [.33, 1.86]). Figure 2 illustrates these results. Thus, as level of independence increased, so too did choice share for sustainable product options following exposure to the prediction-based appeal.

[3] An examination of ratio of independence scores showed higher values among Caucasian participants (M = 0.73, SD = .23; n = 45) and lower values among Asian participants (M = .58, SD = .35, n = 15), suggesting that the measure of self-construal reflects cultural as well as individual differences.

Discussion

The results of Study 2 provide additional evidence that a prediction-based appeal is particularly effective for individuals with higher levels of independent self-construal. This study also demonstrates the effective application of prediction-based appeals to elicit sustainable product consumption. In studies 1 and 2, I used a measure of self-construal orientation. To further establish the role of self-construal in prediction-based effects, studies 3 (a and b) and 4 evaluate instead the individual level of self-construal. Research demonstrates that a particular self-view can be made primarily accessible by emphasizing related independent (e.g., "me" or "I") or interdependent (e.g., "us") cognitions (Brewer and Gardner 1996; Trafimow, Triandis, and Goto 1991; Zhu and Meyers-Level 2009). This allows for the temporal examination of the influence of a particular self-concept orientation on behavior (Cross, Hardin, and Gercek-Swing 2011) irrespective of the cultural orientation of the participant (Gardner, Garbriel, and Lee 1999; Lee and Jeyaraj 2014; Trafimow, Triandis, and Goto 1991; Ybarra and Trafimow 1998). Further, research has shown that a similar pattern of results is obtained when using a self-construal prime as when using cultural indicators (e.g., Eastern vs. Western participants; Gardner, Gabriel, and Lee 1999; Lee, Aaker, and Gardner 2000; Trafimow, Triandis, and Goto 1991).

Study 3 - Cognitive Dissonance

The purpose of Study 3a and 3b is to elucidate why behavior responses diverge for standard prediction-based appeals for individuals with different levels of self-construal. Specifically, I measure the physiological (3a) and psychological (3b) experience of cognitive dissonance following exposure to a standard prediction request (vs. control). In Study 3a, I employ the first object process tracing method to evaluate dissonance within the prediction request paradigm. Festinger (1957) considered cognitive dissonance a "drive-like" state, one that

produces tension and the energy or motivation to reduce it. Accordingly, research has shown that dissonance produces measurable changes in physiological arousal using measures of electrodermal activity (Croyle and Cooper 1983; Elkin and Leippe 1986; Fazio and Cooper 1983; Harmon-Jones et al. 1996; Losch and Cacioppo 1990). Electrodermal activity (EDA) is a broad term used to define changes in the electrical properties of skin related to eccrine sweat secretion, which is exclusively controlled by the sympathetic branch of the autonomic nervous system (Figner and Murphy 2011). Croyle and Cooper (1983) demonstrated physiological arousal as a concomitant of cognitive dissonance by employing a typical induced-compliance procedure (Festinger and Carlsmith 1959). Using a measure of skin conductance while participants completed a counter-attitudinal (dissonance condition) or consonant essay, the authors showed that those in the dissonance condition experienced more physiological arousal than did those in other conditions (Croyle and Cooper 1983). Consistent with earlier work, I employed skin conductance level (SCL), a general estimate of resting or baseline arousal (Bouscein 2012), as the primary measure of EDA. In Study 3b, I provide additional evidence of this mechanism using a validated self-report measure of cognitive dissonance (Elliot and Devine 1994), and as an extension of earlier prediction-based research (Spangenberg et al. 2003). The simple act of questioning participants directly about a dissonance episode may itself be physiologically arousing (Elkin and Lieppe 1986, Croyle and Cooper 1983). Therefore, the psychological and physiological effects of dissonance were measured in parallel studies.

In addition, prior studies indicate that behavioral outcomes can be mitigated by the simultaneous measurement of the dissonance process, due to misattribution of the cognitive or physiological response (Croyle and Cooper 1983; Fried and Aronson 1995; Harmon-Jones, Amodio, and Harmon-Jones 2009; Zanna and Cooper 1974). Consistent with prior work that has evaluated

dissonance from prediction requests (Spangenberg et al. 2003; Spangenberg et al. 2012), I evaluated the behavioral (Study 1 and 2) and dissonance outcomes (Study 3a and b) of prediction-based appeals in separate studies that employed a consistent design. In accordance with H1b, I predict that independent-type consumers will experience dissonance following exposure to a standard prediction appeal. However, cognitive dissonance will not arise for interdependent-type consumers.

Study 3a - Physiological Arousal

Design and Participants

This study used a 2 (appeal type: standard prediction, control) × 2 (self-construal: independent, interdependent), between-participants design, with random assignment to a condition. One hundred forty undergraduate business students at a major metropolitan university, between the ages of 18 and 37 years (M_{age} = 21.21, 51.4% male), participated in the study for course credit.

Apparatus

Electrodermal activity was recorded using the Q^{TM} sensor 2.0, a wireless biosensor weighing 22.7g and measuring 56.6 x 38.1 mm. The sensor records skin conductance in microSiemens (μS) at sampling rates ranging from 2-32 Hz, by passing a small amount of direct current between two 1cm diameter dry electrodes, which are in contact with the skin. The sensor can be worn either on the distal forearm (wrist) or palmar surface (fingertips). Research has demonstrated that the Q^{TM} sensor EDA recordings from the distal forearm and ipsilateral fingers are highly correlated, and Q^{TM} sensor readings are also highly correlated with commercial FDA sensor readings (Poh, Swenson, and Picard 2010). In the current study, the sensor was worn on the wrist to limit obstruction of movement during the computer-based study. All data was

recorded at the maximum 32 Hz. Each sensor was matched, and its time synchronized, with a specific computer in the lab for each session to accurately aggregate EDA and survey data for analysis.

Procedure

At the beginning of each session, all participants received an initial verbal briefing from the researcher detailing the purpose of the EDA sensor and noting that it would not cause any harm or discomfort. After participants provided informed consent, the researcher assisted each participant in fastening the sensor snugly around the wrist of the hand not preferred for the computer mouse, and then activated the sensor. To reduce artifacts in the data, participants were instructed to rest the hand wearing the sensor on the table beside the keyboard or in their lap as much as possible and to minimize physical movement during the experiment. Participants completed the study in groups of up to eight individuals. They were randomly assigned to computers at individually divided desks in a temperature-controlled room (between 21.0^{o} and 23.0^{o} C; Bouscein 2012). Participants sat with their backs to the back of the experimenter to control for potential observer effects.

The study began with an unrelated reading passage (approx. 3 minutes in length), which allowed participants to settle into the lab environment. Next, participants were asked to wear headsets and participate in a relaxation exercise that employed a breathing technique (Brown and Gerbarg 2012), to reduce heart rate and lower any residual physiological arousal resulting from the unfamiliar lab setting. A 3-minute rest period followed the relaxation exercise where participants were asked to sit quietly and not to engage in any activity. A baseline measure of physiological arousal was obtained during this period. Participants then completed the brief self-construal priming task and manipulation check. The priming task asked participants to write a

paragraph describing a particularly meaningful activity that they engaged in either alone (independent condition) or with family and/or friends (interdependent condition; Zhu and Meyers-Level 2009). The self-view index (Agrawal and Maheswaran 2005; Hamilton and Biehel 2005; Lee, Aaker, and Gardner, 2000; Zhang and Shrum 2009, Zhu and Meyers-Levy 2009) was used as a manipulation check and measured whether participants thought only about themselves (independent cognition) or about others (interdependent cognition), while completing the previous writing task (1 = *not at all* and 7 = *a lot*). Next, participants completed the advertisement recall task from Study 2. The advertisements were similar to Study 2 except that the organization name was changed to *Environment Canada*. In addition, the control appeal now contained the same organizational header as the prediction appeal and displayed no message. Another 3-minute rest period immediately followed exposure to the message manipulation and constituted the measure of post-prediction physiological arousal. After an unrelated filler task, participants completed basic demographics. All sensors were subsequently removed, and participants were debriefed before leaving.

Results

Inspection of the EDA data revealed that the Q^{TM} sensor failed to record reliably for one participant and they were removed from further analysis (n = 139; see Appendix A for final sample demographics). MANOVA results indicated a significant effect of the self-construal prime on type of thoughts, $F(2, 136) = 16.13$, $p < .001$, $\eta^2 = .19$. Contrasts confirmed that participants in the independent condition reported significantly greater focus on thoughts about themselves only ($M = 4.75$, SD = 1.61) than did those in the interdependent condition ($M = 3.28$, SD = 1.76), $F(1, 137) = 26.14$, $p < .001$, 95% CI [.90, 2.03]. Conversely, participants in the interdependent condition reported significantly greater focus on thoughts about others and

themselves (M = 5.55. SD = 1.60) than did those in the independent condition (M = 4.31, SD = 1.66), $F(1, 137) = 20.28$, $p < .001$, 95% CI [.70, 1.79]. A review of advertisement topic and copy recall responses confirmed that all participants attended to the message manipulation.

Effect of Prediction Request and Self-construal on Physiological Arousal. Baseline and post-prediction average SCL were computed for each participant from the corresponding 3-minute EDA recordings from the Q^{TM} sensor. To evaluate hypothesis 1b, that self-construal will moderate the effect of a prediction appeal on dissonance, a two-way ANCOVA was performed using mean SCL post-prediction as the dependent variable and mean baseline SCL as a covariate. As shown in Figure 3, a significant two-way interaction emerged between message type and self-construal on post-prediction SCL, $F(1, 134) = 4.62$, $p = .03$, $\eta^2 = .03$. The main effects of message and self-construal were not statistically significant (p's > .10). In support of H1b, Bonferroni corrected contrasts revealed that participants in the independent condition experienced greater physiological arousal after viewing the standard prediction message (M = .73, SE = .07) than the control, and this difference was marginal (M = .52, SE = .07, $p = .05$, 95% CI [-.001, .406]. However, the difference between arousal level following the standard prediction (M = .45, SE = .07) or the control (M = .56, SE = .08) appeal was not statistically significant for those in the interdependent condition ($p = .28$). Lastly, participants in the independent condition had statistically greater arousal than did those in the interdependent condition following the prediction message only ($p < .01$, 95% CI [.076, .483]).[4]

[4] An alternative analysis using arousal change (post minus pre SCL) as the dependent variable is consistent with the main findings.

Study 3b - Psychological Discomfort

Design, Participants, and Procedure

This study employed a 2 (appeal type: standard prediction, control) × 2 (self-construal: independent, interdependent) between-participants design with random assignment. Amazon Mechanical Turk (MTurk) participants were paid $1.20 USD as compensation. The U.S. respondents were between the ages of 19 and 65 years (M_{age} = 37.38; 60.1% female; N = 168; See Appendix A for detailed sample demographics). In the study, participants first completed initial demographics followed by the self-construal task (Study 3a). Participants then reported a baseline measure (pre-message) of cognitive dissonance. Cognitive dissonance was assessed using a three-item scale (uncomfortable, uneasy, bothered; current sample α = .88) of psychological discomfort (Elliot and Devine 1994; Spangenberg et al. 2003). Items were rated on 7-point scales (1 = *not at all*, 7 = *very much*). Participants then viewed one of the two appeals. The header on the appeals was replaced with a U.S.-based non-profit organization, the *Nature Conservancy*. Consistent with Study 3a, the standard prediction appeal read, "Ask yourself: Will you purchase environmentally-friendly products?". The control ad contained the organization header with no ad copy. After exposure, participants repeated the measure of cognitive dissonance, and completed additional demographics and a hypothesis probe.

Results

Manipulation check. MANOVA results indicated a significant effect of self-construal on type of thoughts, $F(2, 165) = 73.19$, $p < .001$, $\eta^2 = .47$. Participants in the interdependent condition reported greater other-focused thoughts (M = 6.28, SD = 1.17) than those in the independent condition (M = 3.53, SD = 1.90; $p < .001$, 95% CI [2.27, 3.24]). Likewise, participants in the independent condition reported greater self-focused thoughts (M = 5.34, SD =

1.69) than those in the interdependent condition (M = 2.56, SD = 1.70; p < .001, 95% CI [2.27, 3.30]).

Effect of Prediction Request and Self-construal on Psychological Discomfort. A two-way ANCOVA was conducted to evaluate whether the effect of a prediction message by self-construal influenced cognitive dissonance post-message, with pre-message cognitive dissonance entered as a covariate. As shown in Figure 3, results showed a marginally significant interaction between message and self-construal on subjective dissonance, $F(1, 163) = 3.33$, $p = .07$, $\eta^2 = .02$. In addition, there was a marginally significant main effect of message, $F(1, 163) = 3.45$, $p = .06$. Consistent with Study 3a, and in further support of H1b, Bonferroni corrected contrasts revealed that independents (M = 1.98, SE = .09) experienced higher levels of subjective dissonance after the standard prediction message than did interdependents (M = 1.75, SE = .09), and this difference was marginally significant (p = .07). In addition, independent participants experienced greater dissonance in the standard prediction condition than in the control (M = 1.66, SE = .08; p < .01, 95% CI [.08, .56]). Conversely, cognitive dissonance did not statistically differ between message conditions (control: M = 1.74, SE = .08) for interdependent participants (p = n.s.).[5]

Study 3a and 3b Discussion

Consistent with behavioral results from studies 1 and 2, only participants in the independent condition experienced greater physiological arousal and psychological discomfort after viewing a prediction-based appeal (vs. control), indicative of cognitive dissonance. The pattern of results in studies 1 to 3 strongly supports a relation between dissonance level post-prediction and the later performance of the behavior (e.g., dissonance reduction strategy), as a function of self-construal orientation.

[5] An alternative analysis using change in psychological discomfort (post minus pre) as the dependent variable is consistent with the main findings.

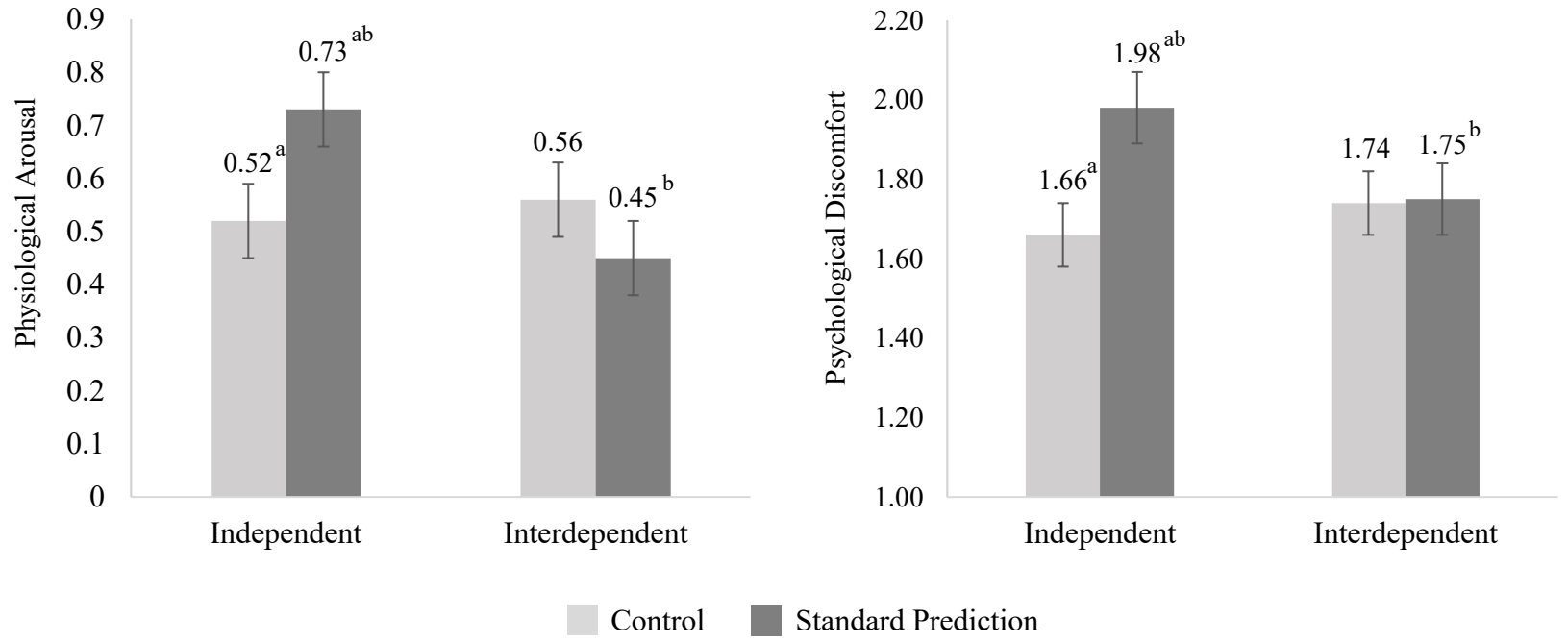

Figure 3. The effect of standard prediction and level of self-construal on indicators of cognitive dissonance: Physiological arousal (Study 3a; left) and psychological discomfort (Study 3b; right). Values shown above bars are at level of covariate, baseline average SCL (M = .51) or pre-treatment psychological discomfort (M = 1.83), respectively. Error bars represent ±1 standard error of the mean.

Study 4 - Socially Anchored Prediction Appeals

The purpose of Study 4 is twofold. First, I introduce and evaluate value-congruent prediction messages to increase the effectiveness for interdependent-type consumers. Specifically, I include an alternative prediction-based message with a close social anchor. I predict that a socially anchored request will lead to positive behavior change for interdependent consumers but mitigate that for independent consumers (H2). Second, I provide a deeper investigation into the dissonance-based process by focusing on the antecedent factors (normative beliefs saliency and past behavior consistency) expected to trigger the proposed self-concept consistency mechanism for different levels of self-construal, and the consequences on downstream behavior (H3). In contrast to prior research that found individuals biased their self-reported social normative beliefs in a downward direction following a prediction request (Spangenberg et al. 2012), the current research provides a behavioral opportunity to mitigate dissonance through positive behavior change before reporting normative beliefs. Social normative beliefs that arise following a prediction request should therefore continue to be salient and accurate after a behavior task, and similarly for self-reports of past behavior.

Design, Participants, and Procedure

Data was collected for Study 4 using MTurk. Participants were paid $1.00 USD as compensation for completing the survey. The study used a 3 (prediction request type: standard, socially anchored, no message control) x 2 (self-construal: independent, interdependent) between participants design (N = 372, 57.3% male; M_{age} = 36.05; See Appendix A for detailed sample demographics), with random assignment to conditions. Participants first completed the self-construal manipulation and manipulation check (same as Study 3), followed by the appeal

exposure task. The standard and control prediction appeals from Study 3 were included in this study (*Nature Conservancy*), as well as a new socially anchored appeal that added "For you and your family," at the beginning of the prediction question (see Appendix C for the appeal). After a short (5 minute) unrelated filler task, participants then completed a product choice task, similar to Study 2, where they were asked to choose an option among pairs of products (traditional vs. environmentally-friendly; counterbalanced left and right between participants) in the categories of Bluetooth speakers, laptop sleeves, and lunch containers (see Appendix C for stimuli). At the end of the study, participants completed individual difference measures for social normative beliefs (Chandon et al. 2011; Sprott, Spangenberg, and Fisher 2003), past behavior regarding sustainable consumption, and social desirability (short-form; Steenkamp, Jong, and Baumgartner 2010; see Appendix C for full measure description). Demographic questions and a hypothesis probe concluded the study.

Measures

Normative beliefs were measured on 3-items ($\alpha = .93$) using 9-point likert-type scale (1 = *strongly disagree*, 9 = *strongly agree*): "People whose opinions I value think it is important to buy environmentally-friendly products," "Most people who are important to me think it is important to buy environmentally-friendly products," and "Most people I know buy environmentally-friendly products" (Sprott, Spangenberg and Fisher 2003). Prior behavior was measured on a 5-point likert-type scale (1 = *never*, 5 = *always*; "How often do you purchase environmentally-friendly products, when they are available?). Sustainable product preference was measured across three product categories (Bluetooth speaker, laptop sleeve, lunch container), within-subjects, on 9-point scales (1 = *Option A*, 9 = *Option B*). A mean variable was computed where higher scores indicate greater preference for sustainable products.

Results

Manipulation check. MANOVA results revealed a significant effect of self-construal on type of thoughts, $F(2, 369) = 66.51$, $p < .001$, $\eta^2 = .26$. Participants in the independent condition reported greater self-focused thoughts ($M = 5.67$, SD = 1.43) than those in the interdependent condition ($M = 4.03$, SD = 2.22; $p < .001$, 95% CI [1.26, 2.02]). Conversely, participants in the interdependent condition reported greater other-focused thoughts ($M = 6.13$, SD = 0.79) than those in the independent condition ($M = 4.50$, SD = 2.09; $p < .001$, 95% CI [1.30, 1.95]).

Effect of Prediction Type. The influence of prediction type and self-construal on product preference was first evaluated in a two-way ANOVA. It was predicted that the effectiveness of different types of prediction appeals to motivate behavior would be influenced by the activated level of self-construal (H1 and H2). Results indicated a significant interaction, $F(2, 366) = 9.22$, $p < .001$, $\eta^2 = .048$. Bonferroni corrected contrasts revealed that independent and interdependent participants differed on product preference in both the standard and socially anchored prediction conditions, consistent with H2. Specifically, independent participants expressed greater preference for sustainable products following the standard appeal ($M = 6.66$, SE = .31) than did interdependent participants ($M = 5.39$, SE = .33; $p < .01$, 95% CI [.38, 2.17]). In contrast, interdependent participants expressed greater sustainable product preference following the socially anchored appeal ($M = 6.40$, SE = .33) than did independent participants ($M = 4.92$, SE = .38, $p < .01$, 95% CI [.56, 2.39]). Product preference did not differ between the independent and interdependent conditions in the control condition ($p = .43$). Findings are illustrated in Figure 4. For independents, the standard prediction appeal resulted in significantly greater preference for sustainable products compared to the socially anchored appeal ($p < .001$, 95% CI [.65, 2.82]) or the control ($M = 5.53$, SE = .32; $p = .035$, 95% CI [.06, 2.20]). For participants in the

interdependent condition, sustainable product preference was greater after the socially anchored than the standard appeal, and this difference was marginal (p = .09). Further, the difference between the control (M = 5.17, SE = .33) and the socially anchored prediction was statistically significant (p = .027, 95% CI [.10, 2.35]). Lastly, the differences between the influence of the control and socially anchored appeals in the independent condition, and the control and standard appeals in the interdependent condition, on sustainable product preference were non-significant (p's > .40).

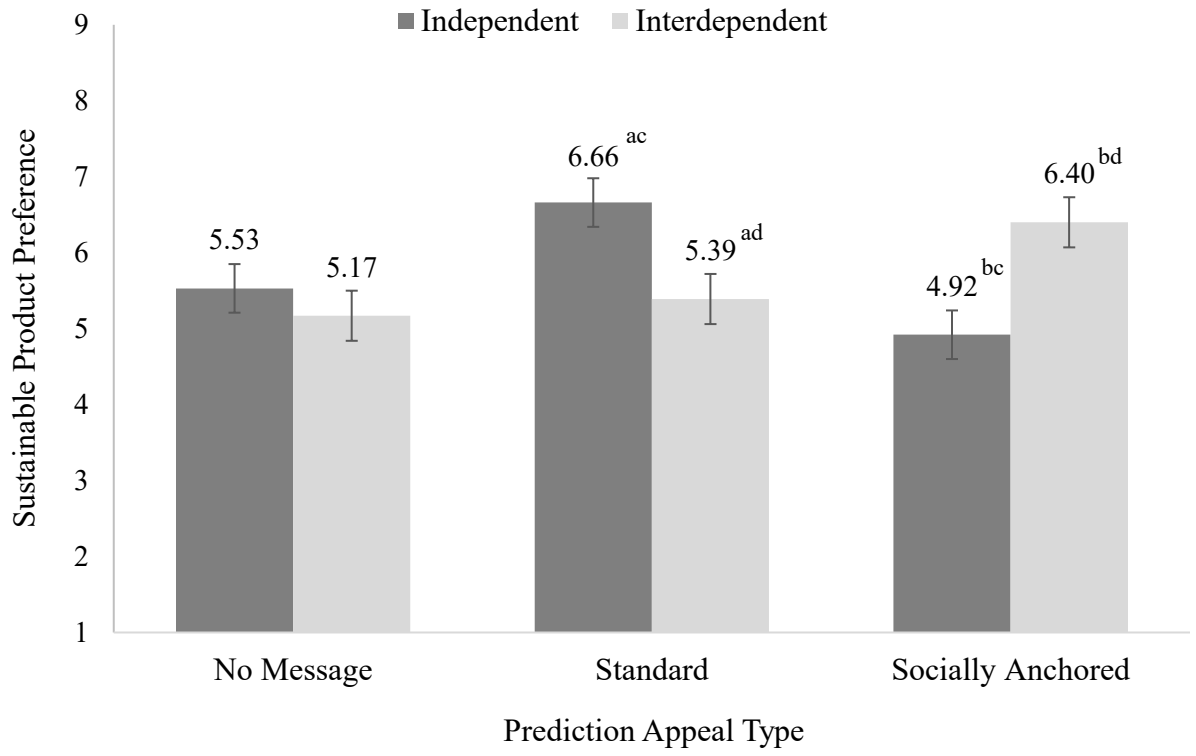

Figure 4. The effect of type of prediction on sustainable product preference at level of self-construal. Error bars represent ±1 standard error of the mean. Superscripts indicate significant (p < .05) and marginally significant (^{d} p < .10) contrasts between prediction types.

Hypothesis 3 proposes that prediction request type influences the saliency of normative beliefs as a function of self-construal level and past behavior consistency, and that this will impact behavior change in a normative direction. These predictions were tested in two regression models (see Table C1 in Appendix C for all coefficients) and a PROCESS model (Hayes 2018). For brevity and ease of interpretation, the control condition was removed for the remaining analysis (n = 247; results including the control condition are consistent with the reduced model described below). Normative beliefs were positively related to past behavior consistency (r = .47, p < .01) and sustainable product preference (r = .55, p < .01). In addition, prior behavior consistency was positively related to preferences (r = .31, p < .01).

Normative Beliefs Saliency. The first regression model tested the influence of prediction request type by self-construal on normative beliefs saliency, conditional on the degree of past behavior consistency. Prediction type (-1 = standard; 1 = social anchor), self-construal (independent = -1, interdependent = 1) and measured prior behavior were entered as predictors, including all two- and three-way interactions. Normative beliefs saliency served as the dependent variable. The overall model predicting saliency of normative beliefs was statistically significant, $F(7, 239) = 10.29$, $p < .001$, $R^2 = .23$. The 3-way interaction between prediction type, self-construal, and past behavior was significant ($\beta_{\text{indirect}} = -.336$; SE = .12, $t = -2.83$, $p < .01$; $R^2\Delta = .03$). Specifically, the conditional effect of prediction type by self-construal (interaction term) emerged when past behavior was low (-1SD = 2.33; $\beta_{\text{indirect}} = .636$; $F(1, 239) = 16.21$, $p < .001$) and at the mean ($M = 3.27$; $\beta_{\text{indirect}} = .318$; $F(1, 239) = 8.06$, $p < .01$), but disappeared when past behavior was high (+1 SD = 4.22; $\beta_{\text{indirect}} < -.001$, $p = n.s.$). The conditional effect of prediction type at levels of self-construal was probed when past behavior was low (-1 SD). Results revealed that the standard request increased the saliency of normative beliefs for independent participants

($\beta_{indirect}$ = -.662, SE = .22, t = -2.94, p < .01, 95% CI [-1.12, -.22]). In contrast, the socially anchored prediction request increased the saliency of normative beliefs for interdependent participants ($\beta_{indirect}$ = .611, SE = .22, t = 2.76, p < .01, 95% CI [.17, 1.05]).

Sustainable Product Preference. A second regression tested the influence of prediction request type by self-construal on sustainable product preference, conditional on the degree of past behavior consistency. The model was identical to that for normative beliefs saliency, but preference for sustainable products served as the dependent variable. The overall model predicting product preference was statistically significant, $F(7, 239) = 5.78$, $p < .001$, $R^2 = .14$. The 3-way interaction between prediction request type, self-construal, and past behavior was marginally significant ($\beta_{indirect}$ = -.286; SE = .16, t = -1.75, p = .082; $R^2\Delta = .011$). Consistent with the ANOVA results, the conditional effect of prediction request type and self-construal emerged when past behavior was low (-1SD = 2.33; $\beta_{indirect}$ = .977; $F(1, 239) = 20.14$, $p < .001$) and at the mean (M = 3.27; $\beta_{indirect}$ = .701; $F(1, 239) = 20.91$, $p < .001$) and was marginally significant when prior behavior was high (+1 SD = 4.22; $\beta_{indirect}$ = .434, $F(1, 239) = 3.90$, p = .05). The Johnson Neyman technique revealed that the exact value of past behavior defining the region of significance (at 95% confidence level) of the conditional effect of prediction request type and self-construal was 4.23 (β_{JN} = .434, SE = .22, t = 1.97, p = .05), where values above were non-significant.

Conditional Moderated Mediation. A PROCESS model (12[6], 10,000 bootstrap samples; Hayes 2018) assessed the conditional indirect effect of prediction type (-1 = standard prediction,

[6]Alternative models evaluated for comparison with model 12 were non-significant, including: 1) models indicating self-construal as a moderator on the path between prediction type and normative beliefs, and past behavior consistency as a moderator on the path between normative beliefs and behavior (model 22 or 29) and 2) models indicating self-construal and past behavior consistency as primary and secondary moderators, respectively, on the alternate path between normative beliefs and behavior (model 19 or 20).

1 = socially anchored prediction) and self-construal (independent = -1, interdependent = 1) on sustainable product preference, through normative beliefs (mediator), depending on the degree of past behavior consistency (secondary moderator). When accounting for normative beliefs in the model, the conditional effect of prediction type by self-construal by past behavior consistency (3-way interaction) became non-significant (β_{indirect} = -.047, p = *n.s.*), indicating full mediation. Moreover, the index of the conditional moderated mediation was statistically significant (β_{indirect} = -.239, SE = .09, 95% CI: [-.422, -.055]). The conditional indirect effects of prediction request type on sustainable product preference at levels of self-construal (through normative beliefs saliency) are presented in Table 2. In line with our hypotheses, when prior behavior was inconsistent (-1 SD), an indirect effect of a standard (vs. socially anchored) prediction on product preference via normative beliefs saliency emerged for independents (β_{indirect} = -.472, SE = .22, 95% CI: [-.899, -.047]). In contrast, an indirect effect of socially anchored (vs. standard) prediction on preference via normative beliefs saliency emerged for interdependents (β_{indirect} = .435, SE = .20, 95% CI: [.035, .817]). When past behavior was consistent (+1 SD), the indirect effects of prediction type by level of self-construal disappeared.

Table 2.

Conditional Indirect Effect of Prediction Type at Level of Self-Construal (Via Normative Beliefs Saliency) on Sustainable Product Preference (Study 4)

	Low Past Behavior (-1 SD)				High Past Behavior (+1 SD)			
	B	Boot SE	LLCI	ULCI	*B*	Boot SE	LLCI	ULCI
Independent	-.472	.219	**-.899**	**-.047**	-.063	.114	-.287	.166
Interdependent	.435	.198	**.035**	**.817**	-.064	.120	-.308	.169

Note. Prediction type (-1 = standard; 1 = socially anchored). Confidence intervals at 95% (LLCI = lower limit, ULCI = upper limit). Statistically significant indirect effects are presented in bold.

Study 5 - Specificity of The Social Anchor

The purpose of Study 5 is to identify conditions that influence the effectiveness of social anchors in prediction-based appeals and those in which prediction-based appeals may be equally effective for both levels of self-construal. The self-concept maintenance framework previously discussed suggests that the nature of the social anchor will have an impact on consumer responses to prediction requests relative to level of self-construal. Specifically, prior research highlights the significance of close or relational others in decision making and other important processes for interdependent-type individuals (Aaker and Maheswaran 1997; Hoshino-Browne et al. 2005; Markus and Kitayama 1991; Pöhlmann et al. 2007). Accordingly, Study 4 showed that a close socially anchored prediction request leads to positive consumer outcomes for interdependent (vs. independent) individuals. In Study 5, I assess the impact of the specificity of the anchor to help clarify its role in prediction-based interventions and provide effective

recommendations, both in the context of self-construal and pro-environmental behaviors. I anticipate that the social anchor specificity, from close social others (e.g., loved-ones or family) to distal and more general references (community or humanity), will moderate behavior outcomes as a function of self-construal orientation. For instance, similar to the standard prediction, it is anticipated that more distal social anchors will reduce the social relevance of the prediction context and alleviate the threat of social sanction or inadequacy to fulfill significant social roles, for more interdependent individuals. However, broader social anchors will reinforce a general (vs. specific) normative standard and attenuate potential choice restriction and threats to autonomy for independent-type individuals. Study 5 evaluates a range of social anchors, including an anchor absent of any explicit social reference, a "self-transcendent" (Bolderdijk et al. 2013; Evans et al. 2013) anchor—the environment. I predict that the close social anchor (vs. distal social anchors) will lead to positive behavior change from self-prediction for interdependent-type individuals. Conversely, more distal social anchors (vs. the close anchor) will lead to positive behavior change from self-prediction for independent-type individuals. Lastly, I predict that the self-transcendent anchor will elicit similar responses from a prediction request across levels of self-construal by evoking a broader sense of moral responsibility to the world, which has inherent implications for both the self and others. Specifically, threats to moral integrity are also dissonance inducing because individuals strive for moral goodness (Aronson 1968, 1992). Contextualizing a prediction request with a self-transcendent anchor is likely to be threating to one's moral integrity, irrespective of self-construal orientation. Study 5 extends findings into another pro-environmental behavior context (i.e., monetary donations) and revisits the influence of chronic self-construal orientation using an alternative measure to that used in studies 1 and 2.

Design and Procedure

Study 5 was conducted on MTurk with a US-based sample ($N = 704$; $M_{age} = 37.42$; 61.4% male; See Appendix A for detailed sample demographics). The study used a five factor (prediction: standard, loved-ones, community, humanity, the environment), between participants design and measured self-construal. The study was advertised as a series of short unrelated surveys about consumer evaluations and workers were paid $1.00 USD for their participation.[7] The procedure was similar to study 4. Following initial demographic questions, participants completed the advertisement exposure task, where they viewed a randomly assigned prediction appeal. The advertisements (600 x 630 pixels) presented the logo of *The Nature Conservancy* in the top right corner, a prediction request in the center, and a short description of the organization's purpose below the prediction. All prediction conditions included the phrase, "Will you donate?". The standard appeal had no additions. For all other prediction types, the phrase, "For [group]," was added before the prediction. The social anchor conditions represented a range from close to distal group memberships, including: "your loved-ones", "your community", and "humanity". The close social anchor was changed from Study 4 from "For you and your family" to "For your loved-ones" to remove the self from the prediction statement (i.e., for you) and to generalize the anchor to relational (family) as well as important close others. The final prediction type included the self-transcendent benefit, "the environment". Lastly, "Ask yourself:" was removed from the prediction statement to create a more realistic message (see Appendix D for an advertisement example).

After viewing one of the appeals, participants completed a short unrelated filler task (approx. 5 minutes) that asked about ratings for fictious retailers. Next, participants were asked

[7] Study 5 was conducted in late spring (May-June). Therefore, donation rates were unaffected by holiday or seasonal increases in giving (e.g., Easter, Christmas).

to view "a message from one of our partners" before continuing with the survey. The header of the message on the following screen (dependent variable task) read, "1 click = 1 cent donation to The Nature Conservancy," and indicated that participants had the opportunity to click the logo of the organization presented below the message to generate a $0.01 donation for every click, that would be paid by researchers on behalf of the participant (see Appendix D for the task). The page submit button was disabled for 40 seconds to ensure participants read the entire message and had time to decide before moving forward. Participants were informed that they did not have to click, but if they chose to do so, they could remain on the page for as long as they wished (i.e., they did not have to stop when the next button appeared at the end of the 40 second delay). Remaining on the page to engage in the task for a prolonged period, and therefore increasing the total time spent on the survey, would be costly to MTurk workers whose pay is predetermined for a specified survey length. After the donation task, the survey continued with individual difference measures (i.e., self-construal, past behavior), additional demographic questions, and concluded with a hypothesis probe.

Measures

Self-construal was assessed using the Self-Construal Scale (Singelis 1994). The scale is comprised of two 12-item subscales that measure independent and interdependent orientation. Items are rated on 7-point scales (1= *strongly disagree*; 7 = *strongly agree*). Cronbach's alpha for each subscale in the current sample was good ($\alpha_{IND} = .87$, $\alpha_{INT} = .87$; $r = .718$, $p < .01$). Following a similar method used in prior research to create a continuous score on the scale (Hannover, Birkner and Pohlmann 2006; Holland, Roeder, van Baaren, Brandt, and Hannover 2004; Pöhlmann et al. 2007), a difference score was created from each of the summed subscale scores (independent - interdependent, standardized). Positive scores represent an independent

orientation, and negative scores represent an interdependent orientation. To measure past behavior, participants were asked whether they donated to an environmental non-profit in the past six months. The continuous dependent variable was number of clicks on the non-profit logo and represented the donation dollar value in cents. Donation values in the sample ranged from $0 to $10.06. The total donation made to the non-profit organization using researchers' funds and on behalf of participants was $269.60.

Results

An independent samples t-test indicated a significant difference in number of clicks in the donation task for those who had (M = 24.14, SD = 72.16) and had not (M = 54.34, SD = 102.60) donated in the last six months, $t(702) = 4.56$, $p < .001$, 95% CI [17.18, 43.21]. Therefore, participants' self-reported past donation behavior did not reflect their performance in the earlier donation task but suggests actual recall of prior (in)action. In addition, there was a statistically significant difference between level of self-construal in the Caucasian (M = 2.28, SD = 8.55; n = 443) and the Asian (M = -2.12, SD = 9.49; n = 50) subgroups in the sample and in the expected direction, $t(491) = 3.41$, $p = .001$, 95% CI [1.86, 6.94]. Levene's test of equality of variances was non-significant ($p = .86$). This suggests that differences in self-construal orientation using the alternative measure (Singelis 1994) are also consonant with cultural status. A multiple regression was conducted to evaluate the effect of prediction appeal type at level of self-construal and past behavior on donation value. Four dummy coded variables (1 = prediction type; 0 = all else) were entered first as predictors (x1 = loved-ones, x2 = community, x3 = humanity, x4 = environment). Level of self-construal (mean-centered; positive values = independence, negative values = interdependence) and past donation behavior (-1 = did not donate; 1 = donated) were also entered as predictors, followed by all two- and three-way interactions. The model predicting donation

value was statistically significant, $F(19, 684) = 2.99$, $p < .001$, $R^2 = .08$. The highest order unconditional three-way interaction was marginally significant, $F(4, 684) = 2.05$, $p = .08$, $R^2\Delta = .01$. Importantly, the conditional two-way interaction between prediction type and self-construal was statistically significant when past donation behavior was absent ($p < .001$) and non-significant when past donation behavior was present ($p = .32$). The full model is presented in Appendix D (Table D1).

To evaluate the influence of self-construal on the effectiveness of prediction appeals (i.e., as the anchor becomes more distant), spotlight analysis was conducted at -1 SD (-8.19; interdependent) and +1 SD (8.19; independent) on self-construal, for participants who had not previously donated in the last six months. For interdependents, donation value (in cents) was highest after exposure to the loved-ones ($M = 72.59$) and community ($M = 85.35$) anchored appeals, followed by the environment ($M = 58.75$), humanity anchor ($M = 19.28$), and standard ($M = 18.56$) appeal. Contrasts revealed that the difference between the standard appeal and the social anchor loved-ones (B = 54.03, SE = 24.33, 95% CI [6.26, 101.80]) or community (B = 66.78, SE = 23.49, 95% CI [20.66, 112.91]) was statistically significant. In addition, the difference between the standard appeal and the self-transcendent anchor (environment) was marginally significant (B = 40.19, SE = 23.68, $p = .09$). However, the difference between the humanity and standard appeal on donation value was non-significant (B = .719, SE = 22.05, $p > .90$). Conversely, for independents, donation value (in cents) was similar after exposure to the standard appeal and all anchor types, except for the anchor loved-ones ($M_{stand} = 69.36$; $M_{loved} = 24.22$, $M_{comm} = 61.00$, $M_{human} = 65.62$, $M_{enviro} = 68.84$). Specifically, the difference between the standard appeal and the social anchor community (B = -8.36, SE = 19.54), humanity (B = -3.74, SE = 19.49) or environment (B = -.52, SE = 20.09) was not statistically significant (p's > .60).

However, the difference between the standard appeal and the social anchor loved-ones was statistically significant (B = -45.14, SE = 21.44, 95% CI [-87.23, -3.05]).

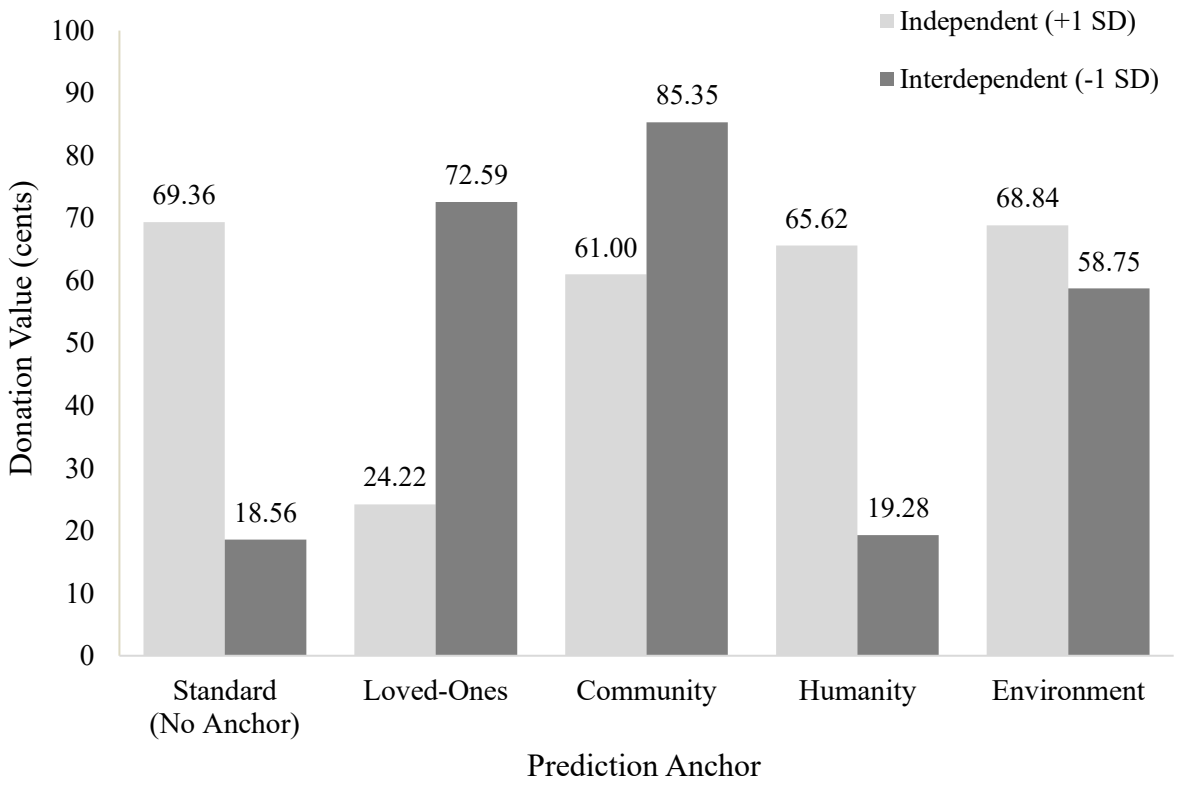

Figure 5. The effect of anchor specificity in prediction messaging at level of self-construal on donation value (cents). Values shown are for individuals who did not donate in the last six months.

Discussion

The pattern of results from studies 1, 2, and 4 in the standard and close social anchor (i.e., family, loved-ones) conditions, relative to self-construal level, were replicated and provide additional support for hypotheses 1 and 2. Specifically, the standard (close social anchor) appeal was effective only for participants in the independent (interdependent) condition. In addition, results indicate that as the social anchor changes from close or proximal (i.e., loved-ones or community) to more distal (i.e., humanity), the positive effect of the anchored prediction on

behavior is attenuated for individuals with greater interdependent self-construal. Conversely, the more distal social anchors (i.e., community and humanity) are as effective as the standard appeal for individuals with a greater independent orientation. Findings indicated that the community anchored prediction, however, was as effective at eliciting behavior for interdependents as was the loved-ones anchored prediction, and as effective as the standard prediction for independents. This pattern of results emerged also for the self-transcendent anchor (the environment). Importantly, the positive impact of the community and the environment anchor on behavior was equivalent across levels of self-construal. Therefore, both types of anchors are viable options to elicit a response from prediction-based appeals, whether for independent or interdependent consumers.

Combined, studies 3 and 4 provide additional insight into the role of past behavior adherence for prediction-based effects. Study 5 found that participants who had (vs. had not) donated to a non-profit in the last six months were less likely to donate again following self-prediction, consistent with our framework. In Study 4, participants indicated how often they purchased sustainable product options. Results showed that participants who did not typically buy environmentally-friendly products, but did so on occasion, were susceptible to prediction-based advertising. Therefore, the recency and the consistency of past behavior appear to be important to prediction-based outcomes but the relevance of each may depend on the behavioral context. Prediction-based interventions are likely most effective to encourage individuals into action for novel behaviors, but also behaviors for which regularity is important and individuals tend to fall short, such as for sustainable consumption.

General Discussion

The current studies demonstrate that level of self-construal is an important moderator of prediction-based appeals. I add to the substantial body of evidence showing the efficacy of prediction requests to influence normative behaviors in a variety of contexts but offer the unique perspective that cultural and individual-level differences in self-construal play an important role in determining consumers' responsiveness to standard prediction-based messaging. Across six studies, I showed that both chronic and activated level of self-construal alter the relation between predictions and consumer outcomes for gym attendance, sustainable product choice, and donation behavior. For independent consumers, a standard prediction message increased the likelihood of behavior change in a normative direction. However, for interdependent consumers, standard prediction appeals were not effective. Instead, I found that leveraging important values relevant to the accessible self-concept—using a close or proximal social anchor directly in the prediction message—increased interdependent-type consumers' responsiveness to prediction-based interventions. Further, I identify a boundary condition to the use of social anchors. I demonstrate that more distal social anchors mitigate the positive response from prediction for interdependent consumers but are more effective than close social anchors for independent consumers. Importantly, the effectiveness of prediction-based messaging with a "community" or self-transcendent anchor, such as "environment", leads to similar positive outcomes for both levels of self-construal. Consistent with the proposed self-concept maintenance mechanism, I found that the experience of cognitive dissonance following a standard prediction request was evoked only for independent-type consumers. Further investigation revealed that differences in the activation of social normative beliefs, when past behavior was inconsistent with the norm,

explained the divergence relative to self-construal orientation, following exposure to different types of prediction-based messages (i.e., standard or socially anchored).

Theoretical and Practical Implications

In contrast to the extant literature (Chandon et al. 2011; Spangenberg and Sprott 2006; Sprott, Spangenberg, and Fisher 2003), this research is the first to investigate the impact of a culturally relevant variable on the efficacy of prediction-based marketing communications. I highlight that self-construal moderates susceptibility to prediction requests and show when and why prediction-based appeals are more (or less) effective at influencing downstream consumer behavior. The current research extends prior work that demonstrates the influence of culture or social identity on the efficacy of other marketing communications (Aaker and Lee 2001; Agrawal and Maheswaran2005; Han and Shavitt 1994; Lau-Gesk 2003; Vaidyanathan, Aggarwal, and Kozłowski2013; White and Simpson 2013; Zhang and Gelb 1996) by showing how both culturally laden (measured) as well as individual-level (primed) self-construal affect behavioral outcomes from prediction requests.

I propose and find evidence for a self-concept maintenance mechanism that elucidates differences from self-prediction on downstream consumer behaviors based on self-construal orientation. For instance, our process findings suggest that standard prediction requests motivate maintenance of important aspects of the self-concept when an independent self is more accessible. Conversely, a socially anchored (close others) prediction request motivates self-concept maintenance when the interdependent self is more accessible. The current research therefore also extends prior work in standard dissonance paradigms (e.g., choice justification, counter-attitudinal), which suggest distinctions for independent or interdependent consumers on dissonance-based processes (Hoshino-Browne et al. 2005; Imada and Kitayama 2010; Kitayama

et al. 2004), by evaluating the impact of self-construal in a novel paradigm (behavior prediction) in real consumer contexts (exercising, product choice, monetary giving).

In addition, most prior work that examined dissonance or consistency motives related to level of self-construal have used culture as a proxy (e.g., samples from US vs. Japan) (Heine and Lehman 1997; Hoshino-Browne et al. 2005; Kitayama et al. 2004; Kokkoris and Kühnen 2013). This is one of the few papers to evaluate the role of activated self-construal on a consistency-based process (see also Lee and Jeyaraj 2014). This is important because self-construal is not only a cultural distinction but differs within culture at the individual-level (Brewer and Gardner 1996; Gardner, Gabriel, and Lee 1999), and thus can have a significant influence on the effectiveness of prediction-based messaging on a broad scale, as demonstrated in the current research.

In addition, this work builds on and clarifies the role of norms in prediction-based effects (Spangenberg et al. 2003, Spangenberg and Greenwald 1999; Spangenberg et al. 2012; Sprott and Spangenberg 2003). Specifically, this research is the first to evaluate normative beliefs as a mediator in the prediction-behavior relation. I find that the activation of social normative beliefs is instrumental in the self-concept maintenance mechanism that leads to behavior change from self-prediction, particularly when consumers have acted inconsistently in the past. When prior behavior adherence with norms has been low, a standard (socially anchored) prediction appeal increases the saliency of normative beliefs about the focal behavior for consumers with an independent (interdependent) orientation, which motivates norm-consistent future action. These results also clarify earlier work that suggests that the informativeness of normative beliefs to guide behavior following a prediction request should increase relative to the extent of previous inaction (Smith, Gerber, and Orlich2003).

The result that self-construal impacts a person's susceptibility to prediction-based interventions does not directly contradict earlier self-prophecy or prediction-based research, which found an overall effect of standard prediction across multiple samples (Dholakia 2010). In the current research, I found consistent effects of self-prediction at the mean level of self-construal, as well as at higher levels of independence. The current research suggests, however, that an important factor in the relation between prediction requests and behavior change was masked in prior research that was conducted exclusively among North American samples, which likely encompassed a higher prevalence of independent-type individuals. This research thus makes a case for the validation of persuasion techniques across diverse settings or the accounting for culturally relevant differences, particularly in social marketing communications, which are responsible for eliciting widespread behavior change that have implications for both the self and society (e.g., sustainable consumption, social distancing, voting, giving).

There are inherent challenges public policy makers and marketers face in encouraging consumers to voluntarily modify behaviors, especially for those that have implicit costs, such as the time and effort required to attend the gym or the economic and personal toll of prolonged social distancing. I observed in our field experiment an increase in gym attendance from one to two days a week on average following exposure to a standard prediction message, for individuals who are more independent. Although results are from an exploratory study, working out even one additional time per week can have measurable health implications for many individuals, and adds to the findings that demonstrate the efficacy of prediction messaging to increase other health related behaviors (Sprott et al. 2004; Sprott, Spangenberg, and Fisher 2003; Williams, Block, and Fitzsimons 2006). Consumers are equally as reluctant to modify their behavior in an environmentally conscious direction. Our work highlights that prediction-based messages, which

evoke social normative beliefs and awareness of prior inaction, are well suited to encourage sustainable product consumption by leveraging the well-documented attitude-behavior gap towards environmentally-friendly behaviors (Kennedy et al. 2009; Kollmuss and Agyeman 2002). This research therefore also extends prior work on the influence of prediction-based interventions on other environmentally conscious consumer behaviors (e.g., recycling; Sprott, Spangenberg, and Perkins 1999; Spangenberg et al. 2003).

Limitations and Future Research Directions

There are notable limitations in addition to opportunities for future research. The field experiment obtained a smaller sample size than expected, due to the recency of the opening of the gym facility. Also, the researcher's email message that contained the appeal may have indirectly influenced exercising behavior. Accordingly, I provided additional evidence that the attendance rate of gym members in the control condition (no prediction appeal) did not significantly differ from a separate group of members who did not receive an appeal (post-hoc sample). The moderating role of self-construal observed in the field experiment was subsequently replicated across three additional studies, including for sustainable product choice and cognitive dissonance. This research also used preference for sustainable products, rather than choice, in Study 4 to measure behavior following a prediction request. This is not inconsistent with the extant literature on prediction-based effects, which commonly uses intentions as a dependent variable (Chandon et al. 2011; Sherman 1980; Sprott, Spangenberg, and Fisher 2003; Sprott et al. 2004).

Future research could examine alternative ways to activate a particular self-construal, especially ones that may be incorporated into the prediction message. For example, prior research has shown that using individualist icons (e.g., American flag, superhero) can prime an

independent orientation (Hong et al. 2000). In addition, the use of pronouns (e.g., I, me, mine [independent]; us, ours [interdependent]) can make accessible different self-construal levels (Gardner et al. 1999). Inclusion of similar primes or others (see Cross, Hardin, and Gercek-Swing 2011) directly in a prediction-based message may reverse the impact of the interdependent (independent) self on the effect of standard (socially anchored) prediction requests, thereby increasing the generalizability of prediction messaging across populations.

Additional considerations may be required for the implementation of social anchors in prediction-based advertising for a wider variety of behaviors than used in the current research. For example, the logic or fluency of donating to help save the environment "for your loved-ones" or "for humanity" is greater than that of exercising "for your community". Also, more independent-type consumers (vs. interdependent) may have greater difficulty visualizing the benefits of their behavior for others versus the self. It therefore may be necessary to draw a clear link between the benefit to the self or to others and certain behaviors, for which visualizing the connection is particularly difficult. One solution is to include a benefit description in the prediction-based appeal to highlight the other- or self-related benefit of the behavior. For example, an others-related benefit description could read, "exercise boosts an individual's ability to manage interpersonal stress and conflict by elevating mood, which leads to increases in overall relationship satisfaction". Coupled with a close social anchor prediction, "For your loved-ones, will you…?", the description may increase the generalizability of the effect across less obvious behavior pairings. An avenue for future research is to evaluate the effectiveness of benefit descriptions in prediction-messaging for different behaviors, relative to level of self-construal.

Further research could also examine the process that leads to longer-term behavior change from self-prediction. The persistent behavior change (over 4 weeks) observed in the field experiment suggests that self-concept maintenance (related to dissonance), is not the only mechanism responsible for lasting outcomes. Theoretically, dissonance or motivational based (e.g., intention implementation) processes should be extinguished following the first opportunity to engage in the focal behavior (Spangenberg et al. 2016). Although dissonance is activated and motivates prediction-consistent action initially (Spangenberg et al. 2003), the long-term behavioural benefits jumpstarted by prediction messaging may be maintained by one or more alternative processes (e.g., Lokhorst et al. 2013; Van Kerckhove, Geuens, and Vermeir 2012). This remains an important avenue for future study. In addition, further studies could examine how prediction-based interventions can be used in conjunction with other types of support and implementation strategies (Fennis et al. 2011; Sheeran, Webb, and Gollwitzer 2005) to overcome barriers to making and sticking to positive behavior changes.

Commitment-based pledges are readily used to try to engage consumers in sustained behavior change. For example, in the Spring of 2020, Change.org was asking individuals to "pause and consider" whether to make a pledge that they will practice social distancing, wash hands, and refrain from stockpiling much needed health supplies (https://www.change.org/p/people-of-the-world-pledge-to-socially-distance-support-health-workers-coronavirus). They also leveraged social influence by asking individuals to share their pledge with others through social media. These types of pledge requests are similar to asking, "Will you…?", and show promise in helping individuals develop personal intentions to engage in prosocial behavior. Despite the challenges faced by marketers and public policy makers in reaching consumers with adaptive messaging, such as cultural and individual-level differences like self-construal, prediction-based

interventions are an effective strategy that can be readily applied in a variety of contexts for a variety of prosocial, pro-environmental, and health-related behaviors. Our research highlights, however, that prediction-based marketing requires an understanding and use of value-congruent content in multicultural and cross-cultural contexts.

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Appendix A

Table A1.

Demographic Information for Each Study – Percent of Sample (n)

	Study					
Variable	1	2	3a	3b	4	5
Gender (*N*)	(40)	(75)	(139)[a]	(168)	(372)	(704)
Male	45.0 (18)	53.3 (40)	51.8 (72)	39.9 (67)	57.3 (213)	61.4 (432)
Female	55.0 (22)	46.7 (35)	48.2 (67)	60.1 (101)	42.5 (158)[b]	38.6 (272)
Age						
18-25	45.0 (18)	94.7 (71)	95.7 (133)	13.7 (23)	11.6 (43)	9.5 (67)
26-40	15.0 (6)	5.3 (4)	4.3 (6)	51.2 (86)	64.2 (239)	57.4 (404)
41-54	20.0 (8)	-	-	23.2 (39)	15.6 (58)	23.3 (164)
55+	20.0 (8)	-	-	11.9 (20)	8.6 (32)	9.7 (68)[c]
Ethnicity						
Caucasian	75.0 (30)	60.0 (45)	67.6 (94)	79.8 (134)	60.2 (224)	62.9 (443)
Black/African American	2.5 (1)	8.0 (6)	1.4 (2)	8.3 (14)	29.6 (110)	23.2 (163)
Asian/Middle Eastern	12.5 (5)	20.0 (15)	24.5 (34)	3.0 (5)	4.8 (18)	7.4 (52)
Latin American	5.0 (2)	5.3 (4)	4.3 (6)	3.0 (5)	3.5 (13)	5.5 (39)
Other/Unspecified	5.0 (2)	6.7 (5)	2.2 (3)	5.9 (10)	1.9 (7)	1.0 (7)
Annual income[d]						
Less than $10,000	-	46.7 (35)	-	-	4.0 (15)	3.4 (24)
$10,000-20,000	-	36.0 (27)	-	-	4.8 (18)	4.3 (30)
$21,000-40,000	-	13.3 (10)	-	-	22.6 (84)	22.2 (156)
$41,000-60,000	-	2.7 (2)	-	-	33.6 (125)	31.1 (219)
$61,000-80,000	-	1.3 (1)	-	-	18.6 (69)	18.9 (133)
$81,000-100,000	-	-	-	-	8.3 (31)	9.6 (68)
Greater than $100,000	-	-	-	-	8.1 (30)	10.5 (74)

Note. [a] Final sample after removal of one participant. [b] One participant did not specify. [c] Missing age value for one participant. [d] Income measure included only in product choice and donation studies. Including income in any model did not alter the results.

Appendix B

Study 2: Materials

Example Prediction Appeal – Standard

Product Choice Task

Appendix C

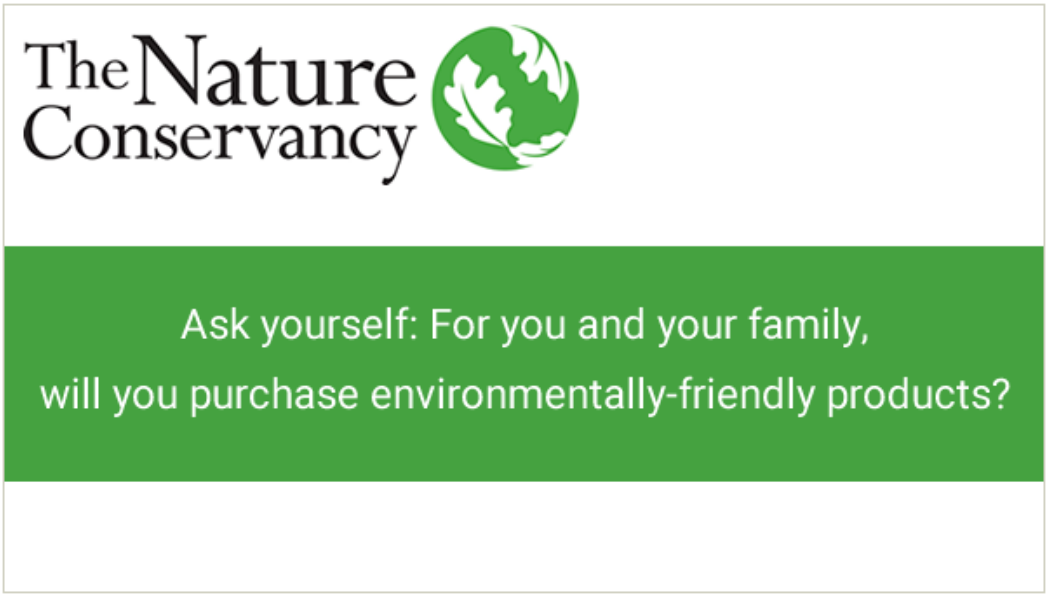
Study 4: Supplementary Measure

Social Desirability Scale- Short Form (Steenkamp, Jong, and Baumgartner 2010)

This measure assesses participants' attempts to manage self-presentation when completing an experimental task. The scale comprises two 10-item subscales for moralistic (MRT) and egoistic (ERT) response tendencies. Items are measured on a 7-point Likert-type scale (1 = *strongly disagree* and 7 = *strongly agree*). After reverse coding, higher scores indicate greater tendency to respond in a socially desirable way.

Study 4: Materials

Example Prediction Appeal - Socially Anchored



Product Choice Task

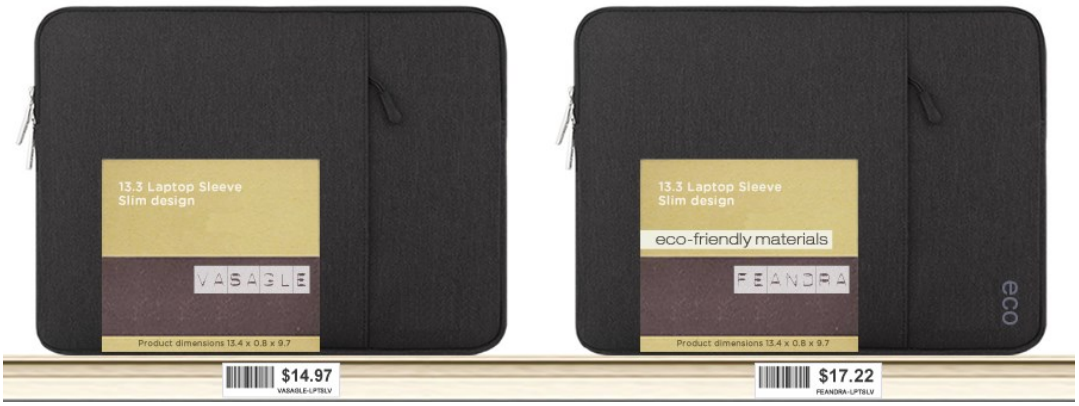


Table C1.

Multiple Regressions Models for Outcome Variables (Study 4)

	M: Normative Beliefs		Y: Product Preference	
Predictor	B (SE)	*t*	B (SE)	*t*
X: Appeal Type (AT)	0.05 (0.40)	0.13	0.20 (0.57)	0.35
W: Self-construal (SC)	-0.13 (0.40)	-0.31	-0.93 (0.56)	-1.67[a]
Z: Past Behavior (PB)	0.88 (0.12)	7.43**	0.60 (0.16)	3.65**
XW: AT × SC	1.42 (0.40)	3.51**	1.64 (0.56)	2.95*
XZ: AT × PB	-0.03 (0.12)	-0.28	-0.11 (0.16)	-0.67
WZ: SC × PB	0.02 (0.12)	0.14	0.31 (0.16)	1.88[a]
XWZ: AT × SC × PB	-0.34 (0.12)	-2.83*	-0.29 (0.16)	-1.75[a]
Model: F (R^2)	10.29 (0.23)		5.75 (0.14)	
XWZ: $R^2\Delta$	0.03		0.01	

Note. [a] $p < .10$.
* $p < .01$, ** $p < .001$.

Appendix D

Study 5: Materials

Example Prediction Appeal – Self-Transcendent

Donation Task

FUND DRIVE

1 click = 1 cent donation to The Nature Conservancy

By clicking on The Nature Conservancy logo below,
you will generate a donation of 1-cent per click to the organization.
All proceeds will be directly donated to the organization on your behalf.

The next button (>>) to continue will appear in 40 seconds. You do *not* have to click during this period. If you click to donate, you can stay for as long as you want. There are no limits on the number of clicks or time.

Table D1.

Effect of Anchored Prediction Appeals on Donation Behavior (Study 5, N = 704)

	B	SE	*t*	*p*	LLCI	ULCI
X1: Loved-Ones Anchor	-2.82	11.02	-0.26	0.80	-24.45	18.82
X2: Community Anchor	14.52	10.57	1.37	0.17	-6.24	35.28
X3: Humanity Anchor	-6.86	10.38	-0.66	0.51	-27.24	13.53
X4: Environment Anchor	10.80	10.66	1.01	0.31	-10.14	31.73
Self-Construal (SC)	2.50	1.16	2.16	0.03	0.22	4.77
X1 × SC	-3.72	1.57	-2.38	0.02	-6.80	-0.65
X2 × SC	-2.97	1.48	-2.00	0.05	-5.88	-0.06
X3 × SC	-0.59	1.49	-0.40	0.69	-3.52	2.34
X4 × SC	-3.74	1.56	-2.39	0.02	-6.80	-0.67
Past Donation Behavior (PB)	-7.71	7.51	-1.03	0.31	-22.45	7.04
X1 × PB	-7.26	11.02	-0.66	0.51	-28.90	14.37
X2 × PB	-14.69	10.57	-1.39	0.17	-35.45	6.06
X3 × PB	-5.35	10.38	-0.51	0.61	-25.73	15.04
X4 × PB	-9.04	10.66	-0.85	0.40	-29.97	11.90
SC × PB	-0.60	1.16	-0.52	0.60	-2.88	1.67
X1 × SC × PB	2.33	1.57	1.49	0.14	-0.75	5.41
X2 × SC × PB	1.62	1.48	1.09	0.27	-1.29	4.53
X3 × SC × PB	-0.32	1.49	-0.22	0.83	-3.25	2.61
X4 × SC × PB	-1.25	1.56	-0.80	0.42	-4.32	1.82

Note. Confidence intervals at 95% (LLCI = lower limit; ULCI = upper limit).