THE ROLE OF TRENDING NORMS AND GROUP IDENTITY ON PRO-ENVIRONMENTAL BEHAVIORS

By

Minwoong Chung

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ABSTRACT

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The current study investigates the influence of trending norms messages on behavioral intention via perceived future descriptive norms in the context of two different pro-environmental behaviors. This study also examines the moderating role of group identity in the relationship between trending norms and behavior. The findings show that the effect of trending norms messages on behavioral intention is mediated by perceived future descriptive norms. In addition, the pattern of the trending norms message effect is dependent on group identity. Theoretical and practical implications are discussed.

This dissertation is dedicated to my parents, Maria, and Soo.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Social norms refer to "rules and standards that are understood by members of a group, and that guide and/or constrain social behavior without the force of laws" (Cialdini & Trost, 1998, p. 152). The influence of social norms on behavior has received considerable attention in the field of communication (Shulman et al., 2017), as social norms are fundamentally communication phenomena (Geber & Hefner, 2019). In addition, norms-based communication interventions have been frequently used to promote socially desirable and prosocial behaviors (Silk, Perrault, Nazione, Pace, & Collins-Eaglin, 2017). Notably, communication plays a crucial role in this process, given that social norms campaigns are built upon the premise that norms messages can shape or modify normative perceptions (usually in a way of correcting misperceptions of the prevalence of behavior of interest), which in turn affects subsequent change in behavior (Smith, Atkin, Martell, Allen, & Hembroff, 2006).

Several theories elucidate the underlying mechanism of normative influence on behavior. Regardless of theory, it is generally predicted that greater/stronger perceived norms lead to greater conformity with the norm. For instance, focus theory of normative conduct (Cialdini, Reno, & Kallgren, 1990) suggests that social norms are a strong driver of behavior when they become particularly salient, which enables the norms to be retrieved from memory more easily (Rhodes, Ewoldsen, Shen, Monahan, & Eno, 2014). In addition, theory of normative social behavior (TNSB; Rimal & Real, 2005) also suggests the positive association between prevalence perception and behavior, although the relationship is often conditional; the influence becomes stronger as a person perceives greater social approval toward the behavior, more positive outcomes from the normative conformity, and stronger group identity with the reference group.

There are still gaps in our understanding of the effect of norms on behavior. For example, there is no systematic explanation or prediction for when and how social norms emerging from a numerical minority[1] can also motivate people to conform to the norms, despite theories and evidence indicating that a minority can also influence a majority's attitudes and behaviors (e.g., Marsh et al., 2002; Moscovici, 1980). In addition, existing social norms theories are cross-sectional, in a way that they do not take into account the changes in norms (Boster, Shaw, Carpenter, & Massi Lindsey, 2014). This theoretical void may be practically consequential, especially when considering the situations where norms are dysfunctional, such when a problematic behavior is widespread in a community, whereas a recommended behavior is only conducted by a small number of people in the community. Existing social norms theories and conventional social norms campaigns that rely on a numerical majority cannot be applied to explain or address the issue.

In order to bridge the gap, the current research systematically investigates the effect of trending norms messages on behavior. Trending norms refer to a low-but-increasing prevalence perception of a particular behavior. Recent literature shows that trending norms lead people to conform to the emerging minority norm as if the behavior is already prevalent, because people expect continuing the trend in the future (Mortensen et al., 2019; Sparkman & Walton, 2017). Even though these studies did not provide theoretical explanations for how anticipation drives subsequent behavior, one possible explanation from recent literature on emotion is that people expect positive emotional outcomes resulting from conducting the given desirable behavior, and therefore they engage in the behavior to pursue them (e.g., emotion-as-feedback system theory;

[1] In the current paper, the distinction between a minority and a majority is purely numerical and behavioral. Guided by previous literature on minority influence and positive deviance (e.g., Moscovici, 1980; Spreitzer & Sonenshein, 2007), this study defines a minority as a group of a small number of people who conduct non-typical or counter-normative behavior.

DeWall, Baumeister, Chester, & Bushman, 2016). Despite its early stage of research, empirical evidence has been largely consistent with the trending norms argument and shown its effectiveness on promoting sustainable and even counter-normative behavior, such as water conservation and consuming less meat (Mortensen et al., 2019; Sparkman & Walton, 2017).

The current study also examines the moderating role of group identity on the relationship between trending norms messages and behavior. Extensive previous literature in diverse social science domains have studied how a minority exercises influence on a majority's behavior (e.g., Moscovici, 1980) and have identified important factors that foster the minority influence. The present study particularly focuses on the effect of group identity (i.e., a person's self-concept derived from his/her social group membership; Hogg & Reid, 2006); various theories and empirical evidence suggest that strong identification with a particular social group, regardless of the group being the minority or majority, makes a person more likely to conform to the group's norms (Chung & Rimal, 2016; Moscovici, 1980; Turner & Oakes, 1986).

In order to increase internal and external validity, this study focuses on two different pro-environmental behaviors: unplugging electronic devices when not in use as an energy conservation strategy (hereafter, UNPLUG), and bringing one's own bags for grocery shopping to reduce plastic waste (hereafter, BYOB; Bring Your Own Bags). Pro-environmental or environmentally friendly behaviors refer to intentional actions to minimize the adverse effect of one's behaviors on nature (Kollmuss & Agyeman, 2002). Energy conservation and plastic waste reduction are significant global issues in relation to global greenhouse gas emissions and climate change (Center for International Environmental Law, 2019; U.S. Environmental Protection Agency; EPA, 2008; 2016). In addition, UNPLUG and BYOB are known to be effective ways to conserve energy and reduce single-use plastic waste, respectively (City of San Jose, 2012; U.S.

Department of Energy, 2015; U.S. EPA, 2001). Moreover, given that people have an overall positive attitude toward environmental protection (Anderson, 2017) and a negative attitude toward climate change (Leiserowitz et al., 2018), it is expected that trending norms messages on environmentally friendly behaviors can draw message recipients' attention to the behavior even if it is enacted by only a small number of people. Furthermore, literature suggests that the collective nature of outcomes of pro-environmental behavior can strengthen normative influence (Lapinski, Rimal, DeVries, & Lee, 2007).

In sum, the present study investigates the underlying mechanism by which trending norms messages affect pro-environmental behaviors using a between-subject online experiment. The current study argues that trending norms messages induce a low-but-increasing prevalence perception, and this leads to the greater anticipation of future prevalence, which in turn results in greater intention to conform to the emerging norm, compared to low descriptive norms messages. The effect of trending norms messages is also compared with high descriptive norms messages. In addition, this study also examines the moderating role of group identity on the relationship between trending norms messages and behavioral intention, such that the effect of trending norms messages is stronger when a person strongly rather than weakly identifies with the reference group. The following sections first overview trending norms and relevant concepts, then review the research on group identity. Subsequent parts of the paper introduce the study hypotheses, research questions, and method to test the study predictions and answer the research questions. The results of analyses and the discussion of findings follow.

LITERATURE REVIEW

Trending Norms

Existing theory and literature on social norms provide limited insights for when/how people are susceptible to a numerical minority's norms and the effect of changes in social norms, such as increasing or decreasing prevalence of a particular behavior. Likewise, existing theories may not be enlightening when crafting messages to promote socially desirable behavior that has the potential to be normative, but not yet largely prevalent. The concepts of dynamic norms (Sparkman & Walton, 2017) and trending minority norms (Mortensen et al., 2019) shed light on this issue. Both concepts focused on the prevalence aspect of norms (i.e., descriptive norms; Cialdini et al., 1990) and were operationalized as normative information that underscores a low-but-increasing prevalence of a particular behavior.[2] It has been argued that such normative information would lead people to conform to the emerging minority norm as if the behavior is already prevalent, because people expect continuing the trend in the future (Mortensen et al., 2019; Sparkman & Walton, 2017).

Sparkman and Walton (2017) first introduced the concept of dynamic norms as a possible method to discourage problematic normative behavior and encourage sustainable behavior that is not being enacted by many people in a group. Sparkman and Walton (2017) defined dynamic norms as "the change of a norm over time" (p. 1) but operationalized it as a descriptive norms message that highlights the increasing prevalence of a particular behavior. They argued that messages about an increasing trend, compared to messages about a snapshot state of prevalence

[2] In social norms literature, the term *dynamic* was used to describe the constantly changing nature of social norms. For instance, Rimal and Lapinski (2015) indicated that norms are "dynamic" (p. 394), compared to traditions that are more stable and predictable. Thus, the concept of *trending norms* is considered a more precise term to describe the increasing nature of prevalence than dynamic norms. The current research therefore mainly uses the term, trending norms, for further discussion.

(i.e., static norms), can more effectively promote behavior even if the norms are not prevalent in a group. They hypothesized that this influence occurs through the following two mediating mechanisms: the anticipation of an ongoing trend and perceived importance to others. That is, if people are exposed to norms messages indicating that an increasing number of people are engaging in a particular behavior (especially counter-normative) when a problematic behavior is prevailing, people expect that the increasing trend will continue. In addition, individuals also perceive that other people are making an effort to change their behavior, which implies that the behavior (or the change) is important to them. Sparkman and Walton (2017) argued that these perceptions lead people to conform to the trend, although the behavior is conducted by only a minority.

Sparkman and Walton (2017) conducted a series of online and field experiments to examine if trending norms were more effective in promoting behavior than static norms and to test the mediating mechanisms. Static norms were operationalized as traditional social norms messages that indicate either a high or low prevalence of behavior, without trending information. Their study showed that people who were exposed to trending prevalence information were more likely to conform to the emerging behavior than those exposed to static prevalence information and/or those who did not receive any normative messages across various contexts including interests in limiting meat consumption, ordering a meatless lunch at a cafeteria, and conserving water by using full loads when doing laundry (Sparkman & Walton, 2017). In addition, the data were consistent with the mediation argument: The study reported that the influence of trending norms on the intent to reduce meat consumption was mediated by perceived future prevalence; it

was also mediated by the perceived importance of the behavior to others, which was predicted by the perceived effort of other people (Sparkman & Walton, 2017).[3]

Mortensen et al. (2019) also introduced the idea of trending minority norms, which refers to descriptive normative information that underscores a low-but-growing prevalence of a behavior. It was argued that trending minority norms can drive behavior, even though only a seemingly small number of people are doing it, because human beings are adaptable to changes (Mortensen et al., 2019). Analogous to Sparkman and Walton's approach (2017), Mortensen et al. (2019) suggested that trending minority norms messages lead people to anticipate the future in which the given behavior is prevalent (i.e., "projected commonness", p. 205), so that they become willing to engage in the behavior.

Mortensen et al. (2019) also conducted several lab and online experiments and provided empirical evidence partly consistent with their hypotheses about the communication of a trending minority norm. For instance, participants who read information about a low-but-increasing prevalence of water conservation behaviors used significantly less water when brushing their teeth than those who read low prevalence information regarding the behavior; nonetheless, the mediating effect of perceived anticipated prevalence was not evidenced. In their online experiment, participants who were exposed to trending minority norms messages (compared to those exposed to low prevalence messages) about donating funds to a bogus nonprofit environmental organization showed significantly more willingness to complete an additional survey conducted by the organization and answered significantly more questions in the survey.

[3] One of their field experiments showed that a high descriptive norms message with trending information was more effective than a traditional high descriptive norms message. They conducted another online experiment with an opt-in panel and a hypothetical scenario to replicate the field experiment to investigate the underlying mechanisms. They found that the participants in the high descriptive norms with trending information condition perceived significantly greater future prevalence than those in the high descriptive norms condition. The data also showed that there was no difference between the two conditions in the perceived importance of the behavior to others and the perceived effort of the others. Nonetheless, the comparative effect of trending norms and high descriptive norms was not reported.

In addition, the influence of trending minority norms on the survey completion was mediated by perceived future prevalence of a donation (Mortensen et al., 2019).

In sum, although Mortensen et al. (2019) and Sparkman and Walton (2017) conceptualized trending norms differently, both studies essentially show that normative messages that indicate a low-but-increasing prevalence of a specific behavior can encourage people to enact the behavior. In addition, both studies share the proposition that trending norms indirectly affect behavior: People's anticipation of prevalence of the given behavior in the future mediates the relationship between trending norms messages and behavior. In both studies, the data were largely consistent with the mediating mechanism, depending on the types of experimental methods. The mediation was evidenced when the studies involved online experiments using an opt-in panel, but it was not evidenced when Mortensen et al. (2019) conducted a lab experiment with university students. However, the studies did not report the relative effect of trending norms and high descriptive norms on behavior. In addition, both studies generally used a single item to measure the perception variables and did not provide evidence for the scale validity. Moreover, manipulation checks were not reported in both studies. In other words, Mortensen et al. (2019) and Sparkman and Walton (2017) did not focus on the influence of norms messages on their participants' normative perceptions.

Although the concept of trending norms has been introduced recently to the social norms literature, the influence of a minority group on a majority is not a new idea; in fact, there is considerable literature on minority influence, which will be reviewed in the following section.

Minority Influence

The social norms literature has focused on majority influence (e.g., Rimal & Real, 2005), yet, there has been robust effort to systematically understand how a minority group can also

exercise its influence on a majority. The basic premise of minority influence literature is that a majority is more influential than a minority in general, since it is assumed that "what the majority does is good, because there are many who do it" (Moscovici, 1980, p. 209). In addition, the distinction between a majority and a minority is not only numerical but also value-laden; a minority is defined as a small group of people who holds an attitude or opinion different from the majority and are often seen as "deviant, rebarbative, and even sinister" (Martin & Hewstone, 2008, p. 242).

Research on minority influence has generally focused on attitude or judgment changes as a primary outcome in a small group setting, whereas social norms studies focus on behavior change on a personal or societal level (Park & Smith, 2007). Nevertheless, the minority influence literature provides implications for when and how a minority becomes influential and persuasive. Guided by dual processing models (e.g., Petty & Cacioppo, 1981), minority influence has often been discussed in relation to message processing and persuasive effects (Martin & Hewstone, 2008). Several theories specifically shed light on the situation where a minority's opinion leads to more cognitive processing (i.e., central route) to message recipients than a majority's, and therefore the effect of persuasion is more persistent (e.g., Baker & Petty, 1994; Moscovici, 1980). In the following sections, two theoretical explanations that have important implications for trending norms are reviewed.

Moscovici (1980) suggested that both majority and minority influence can yield a social conflict, but they have qualitatively distinct influences on individuals. Conversion theory (Moscovici, 1980) argues that when people are exposed to a majority's opinion that is conflicting with their own, they are likely to try to resolve the conflict by accepting the judgment without a deep contemplation of the view (i.e., peripheral route). On the other hand, when people are

exposed to a minority group's opinion that is inconsistent with their own, they are likely to resolve the conflict by trying to understand the opinion and validate it; but only when the minority seems confident of and consistent in what they are proposing. Given that this type of influence motivates people to deliberate the minority group's argument, message recipients are likely to be persuaded via central route. Conversion theory further suggests that, in a small group setting, the outcomes of majority and minority influence are different: Whereas the results of majority influence are likely to be seen through behavior change (e.g., compliance; public but not private acceptance), the results of minority influence are more likely to be seen as attitude change or behavior change when the group members are not present (e.g., conversion; private but not public acceptance), because individuals fear identifying with a social minority group (Moscovici, 1980).

Wood and her colleagues (1994) conducted a meta-analysis of 94 minority influence experimental studies to test the predictions of conversion theory (Moscovici, 1980) and showed overall support for the theory: The study found greater majority influence for public and direct outcomes, and greater minority influence for private and indirect outcomes.[4] The analysis also reported that the influence of a minority was greater as the source was perceived consistent. Moreover, the study further found that the minority impact on private and indirect outcomes was greater when the minority was categorized as in-group and considered similar to oneself (Wood et al., 1994).

[4] Direct outcomes refer to the simple acceptance of a message source's opinion on a particular issue; indirect outcomes refer to the changes in opinion or judgment on an issue that is relevant to the given topic, but not explicitly mentioned in the message. For instance, when a person is exposed to a message about people's attitude toward the legalization of voluntary euthanasia, a direct outcome is to the extent which the message recipient agrees with the position; an indirect outcome is to the extent which he/she favors genetic screening for medical disorders (Martin, Hewstone, & Martin, 2008).

Baker and Petty (1994) also focused on the process by which a minority exercises its influence on a majority and introduced the source-position congruity model: The model assumes that individuals generally consider their beliefs and attitudes as consistent with those of a majority's, and inconsistent with those of a minority's. Based on this assumption, the model suggests that when people are exposed to a pro-attitudinal majority's opinion (or a counter-attitudinal minority's opinion), they do not need to deeply think about the message to accept (or reject) it. On the other hand, when they are exposed to a pro-attitudinal minority's opinion (or a counter-attitudinal majority's opinion), it surprises people and they are likely to ponder the opinion, which arguably leads them to be persuaded via central route (Baker & Petty, 1994).

Baker and Petty (1994) conducted a series of experiments to test the model's predictions. In their study, argument quality was manipulated (i.e., high vs. low) to assess the effect of participants' message scrutiny, such that the stronger influence of argument quality on attitude change indicates greater message scrutiny. Participants received a counter-attitudinal message (i.e., supporting two-year mandatory community service for university students for maintaining current tuition rates) from either a majority (i.e., 86% of state residents and 78% of students at a major state university) or a minority (i.e., 18%, 12%, respectively). The data showed that the argument quality had a greater impact for the participants who received the message from a majority source, and no effect for the participants who received the message from a minority group (Baker & Petty, 1994). In another experiment, the data showed that the argument quality had a significant influence on attitude change when participants received a source-position incongruent message (i.e., a pro-attitudinal message from a minority or a counter-attitudinal message from a majority), whereas it had no influence when participants were exposed to a

source-position congruent message (i.e., a pro-attitudinal message from a majority or a counter-attitudinal message from a minority).

In sum, extensive literature provides theoretical explanations for how and when a minority can influence a majority. The current research reviewed conversion theory (Moscovici, 1980) and the source-position congruity model (Baker & Petty, 1994). These frameworks suggest that messages about a minority group's opinion can drive people to more cognitive processing than messages about a majority group's. This may result in the acceptance of the minority's view and the persuasion effect can be enduring. Specifically, conversion theory (Moscovici, 1980) suggests that a minority's opinion can motivate a majority to scrutinize it, only when the minority group is advocating the position consistently and confidently; trending norms messages that show an increasing trend over years, rather than just temporal and momentary, may indirectly signify this important behavioral characteristic. In addition, evidence shows that minority impact is intensified when the minority is perceived as in-group and similar to oneself (Wood et al., 1994); this implies that a low-but-increasing trend from in-group similar others can bolster the influence of trending norms on behavior. Moreover, the source-position congruity model (Baker & Petty, 1994) suggests that messages about a pro-attitudinal minority group (or a counter-attitudinal majority) can attract attention, which can lead to more cognitive processing of the given messages when compared to messages about a counter-attitudinal minority group (or a pro-attitudinal majority); trending norms messages regarding a minority group's pro-environmental behavior is therefore expected to draw message recipients' attention.

Nonetheless, the minority influence literature has not theorized how an increase in the number of those in a minority group affects its influence. Since it is generally presumed that a majority is more influential than a minority, Moscivici (1980) stated that increasing a minority

numerically is the simplest way to bolster its influence, such that the more people that express an opinion or hold an attitude, the more influential it is to a majority. However, empirical evidence (Nemeth, Wachter, & Endicott, 1977) shows that the relationship between numerical increment and minority influence is not simple. That is, although the increase can reinforce the perception that the minority's opinion/attitude is correct, it can also weaken people's perception of the minority's confidence in their opinion after some point.[5] In other words, when an increasing number of people are accepting of a minority's opinion, others may perceive that the minority's view is legitimate. However, others may also perceive that people are accepting the minority opinion just because others are doing it, without having confidence in the opinion (e.g., bandwagon effect).

It is also important to note that minority influence literature primarily focuses on changes in people's attitude toward or opinion/position on a specific issue in a small group interaction setting, rather than their behavior as a primary outcome. In addition, minority influence studies generally presume that a minority group by definition has a negative connotation, so that people have a reluctance to be identified with the group. Thus, previous minority influence literature offers limited insights for the contexts where a minority group is considered prosocial and favorable *ab inito* and brings a positive social change by conducting a specific behavior, as

[5] Nemeth, Wachter, and Endicott (1977) conducted a small group experiment. Each group had six naïve participants and a varying number of research confederates from one to four. The participants were asked to judge the color of a series of blue slides, after the confederate(s) provided apparently incorrect answers consistently. The main dependent variable was the frequency that the naïve participants answered the same wrong answer. Nemeth et al. (1977) found a nonlinear relationship between the number of confederates and its influence, such that the mean values of the dependent variable across conditions from one to four confederates were 1.35, 1.31, 2.25, and 1.88, respectively: A single minority is more influential than a minority of two, but there was no significant difference between these two conditions. When there were three confederates, the minority influence was the greatest, and it was significantly greater than the influence of a minority of one or two. When a group had a minority of four, the influence decreased; this effect was not significantly different from the other three conditions. The data also showed a significant positive linear relationship between the number of individuals in the minority and participants' perceived correctness of the minority. Yet, the data also revealed a significant negative linear association between the number of individuals in the minority and perceived confidence and certainty of the minority. The correlation coefficient between perceived correctness and confidence was -.07.

demonstrated in trending norms studies. The positive deviance approach may bridge this gap: This approach has been used to explain how to diffuse, or how to amplify the adoption of, positive behavior performed by a small portion of people in a given community to the other community members. The following section will review the positive deviance approach and connect it to the concept of trending norms.

Positive Deviance

Being in the minority of people enacting a particular behavior does not necessarily have a negative connotation, especially when there is a related, problematic behavior that is widespread. In other words, it is possible that there can be some people in a group or community who conduct socially desirable behaviors, while a majority of people do not; those small number of people have been labeled *positive deviants* (Spreitzer & Sonenshein, 2007). The definition of positive deviance varies across the literature, but it generally refers to uncommon, non-normative, beneficial, and voluntary behaviors that a small number of people in a given group/community enact (Marsh, Schroeder, Dearden, Sternin, & Sternin, 2004; Spreitzer & Sonenshein, 2007). In a health behavior context, health campaigns that utilize this minority group (i.e., positive deviants) to promote their desirable behavior is called the positive deviance approach (PDA; Marsh et al., 2004; Singhal, 2010). This approach specifically refers to a process that involves a) identifying individuals who have demonstrated better outcomes compared to other members in a given community of interest; b) analyzing the factors/strategies that enable them to perform better; and c) encouraging other members to adopt the strategies often through strategic communication activities (Bradley et al., 2009; Marsh et al., 2004). Using a PDA to promote behavior change is considered appropriate when a desirable behavior has already been

performed by a portion of people in a community, while a problematic behavior is widespread in the community (Sternin, 2002).

Literature suggests that one of the advantages of PDA is its utilization of local community members as the source of new practices and role models (Marsh et al., 2004; Singhal, 2010; Sternin, 2002). PDA usually highlights the fact that positive deviants are from within the group, often socioeconomically similar others. This provides other people with "social proof" (Singhal, 2010, p. 605) that the solutions (i.e., the minority's deviant behavior) to a community's problem exist in the community, which implies that the solutions are affordable, accessible, and sustainable (Bradley et al., 2009; Marsh et al., 2004).

Empirical evidence generally supports the effectiveness of PDA (e.g., Bradley et al., 2009; Lapping et al., 2002; Singhal, 2010), although most PDA interventions provide insufficient data for inferring a causal relationship. As one of the few exceptions, Marsh and colleagues (2002) conducted a large-scale longitudinal, prospective, randomized trial of PDA in 12 communities in northern Vietnam to address children's malnutrition. The data showed that the children in the communities randomly selected for PDA interventions showed significantly better health outcomes (e.g., better nutrition status and less infections) than those in the control communities (Marsh et al., 2002).

To sum up, although the positive deviance literature does not address the effect of an increase in the number of positive deviants on other members of the social system, it provides evidence that a favorable minority group can induce behavior change to a majority in the same community. More importantly, the literature also suggests that the fact that those positive deviants are among the same community and often similar to others is the key to propel the minority's behavior to become widespread, because it implies that the behavior is feasible and

adoptable (Singhal, 2010). Thus, it can be argued that the influence of trending norms on behavior can also be heightened if a message recipient perceives the minority as in-group and similar to him/her. In fact, such effect of group perception has been theorized to bolster normative influence in social identity and social norms literature (e.g., Rimal & Real, 2005; Tajfel, 1978). The following sections first briefly summarize the concepts discussed so far and then reviews the role of group identity in response to social norms.

Summary

The concepts and theories discussed in the prior sections address how a minority group's attitudes or behaviors can influence a majority's attitudes/behaviors. However, each of the theories proposes distinct essential characteristics that foster that influence. For instance, the trending norms literature suggests the importance of the increasing nature of prevalence; theories of minority influence emphasize the value of behavioral consistency in proposing/endorsing an opinion; and the PDA highlights the importance of the in-group status of the deviant individuals. Another notable distinction is that research on trending norms and the PDA suppose the positive nature of a minority and focus on behavior change as a primary outcome, whereas minority influence theories assume the negative connotation of a minority and generally focus on attitude change in a small group setting as a key outcome of minority influence. Overall, while PDA is an overarching process of an intervention that shows how minority influence can be harnessed to promote social change in a community, only the focal concept of the current research, trending norms, focuses on message effects and the normative aspects of minority influence. The following section reviews how normative influence emanating from reference group members can be strengthened or weakened based on one's perception regarding the reference group.

Group Identity

Social influence, regardless if it emanates from a minority or a majority, appears to be more effective when a recipient perceives the source of that influence is in-group and similar to oneself than out-group and dissimilar (Marsh et al., 2004; Turner, 1991; Wood et al., 1994). Normative influence is stronger when people engage in intergroup interactions as representative of their group and when the social norms are group-defining (e.g., Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), or when people aspire to be like the reference group and consider them as similar to oneself (Rimal & Real, 2005). The following section will discuss how group perceptions affect normative influence based on concepts from social identity theory (SIT; Tajfel, 1978; Tajfel & Turner, 1979) and TNSB (Rimal & Real, 2005).

Any human interaction can fall within the continuum from completely interpersonal to completely intergroup, which determines how the interactants see themselves and the other (Tajfel, 1978; Tajfel & Turner, 1979). In other words, a person's self-conception can shift (i.e., either personal or social identity becomes more salient than the other) based on the type of interaction in which he/she is engaged: In interpersonal interactions in which people relate to each other as a sole individual, they are more likely to have a personal identity salient (i.e., a self-concept that differentiates the person from another person as an individual). On the other hand, in intergroup interactions in which interactants relate to each other as representatives of their groups, they are more likely to categorize themselves as belonging to their group, which results in a social/group identity salient (i.e., a self-concept related to group membership). SIT suggested that, after social/group categorization, people have a tendency to compare their own group (i.e., in-group) and other groups (i.e., out-groups). Given that people have a desire to secure a positive self-concept and maintain high self-esteem (through their social identity in such

intergroup interaction circumstances), individuals are likely to favor their own group over the other groups and exaggerate in-group similarities and between-group dissimilarities (Tajfel, 1978; Tajfel & Turner, 1979; 2004).

Although the influence of strong/salient group identity in intergroup interactions on conformity to norms was not directly examined in the early stages of social identity research (Tajfel, 1978; Tajfel & Turner, 1979), subsequent studies (i.e., the social identity approach; Turner et al., 1987; Turner & Reynolds, 2011) have argued that social categorization not only transforms people's self-perception but also guides their behavior through conformity to shared in-group norms (e.g., depersonalization; Hogg & Reid, 2006; Turner, 1991). Empirical evidence has generally been consistent with predictions about the relationship between group identification and norm conformity. For instance, Terry and Hogg (1996) conducted a series of experiments and found that the participants' intention to engage in health behavior (i.e., regular physical activity and sun-protective behavior) increased as they perceived stronger descriptive and injunctive norms toward the behavior in question; however, this effect was only significant among the participants who strongly identified with the reference group, and was not significant among those who weakly identified with the group. In addition, Terry and her colleagues (1999) conducted another field experiment and showed that perceived descriptive and injunctive norms regarding household recycling were significantly and positively associated with participants' behavioral intention to recycle, yet this was only true for strong identifiers with the reference group (i.e., a participant's group of friends and peers).

Rimal and Real (2005) also suggested that the influence of descriptive norms on an individual's behavioral decision will be heightened as the person strongly identifies with the reference group, when developing the TNSB. Nonetheless, it is important to note that they took a

slightly different approach to group identity and conceptualized/operationalized it as a multidimensional construct: aspiration and perceived similarity. Aspiration refers to the extent to which a person desires to be like the referent others, and perceived similarity indicates the extent to which a person considers he/she resembles the referent others (Rimal & Real, 2005).

Empirical studies indicate mixed support for the theory's prediction. For example, studies found that the influence of descriptive norms on college students' alcohol consumption was strengthened as they reported greater aspiration to and perceived similarity with their reference group members, although the effects were weak (Rimal & Real, 2005; Rimal 2008). In addition, the moderating role of group identity on the relationship between descriptive norms and behavior was also evidenced in the context of childcare center workers' reported hand-washing behavior (Lapinski, Anderson, Shugart, & Todd, 2013). Nonetheless, evidence also suggests that the relationship between descriptive norms and behavior was moderated by aspiration only (indoor tanning; Carcioppolo, Orrego Dunleavy, & Yang, 2017), or neither aspiration or similarity (college students' drinking; Carcioppolo & Jensen, 2012); another study found that perceived similarity moderated the influence of descriptive norms on self-efficacy, not behavior (yoga practice; Rimal, Lapinski, Cook, & Real, 2005).

The inconsistent findings regarding the moderating effect of group identity in the social norms literature may be attributed to the lack of out-groups and/or the characteristics of social norms used in the studies: Social identity approach suggests that people's group identity becomes salient when they engage in intergroup interactions; in this situation, when their group has norms (e.g., descriptive or injunctive norms) that distinguish their group from the other groups, people are more likely to follow the norms (Hogg & Reid, 2006; Hornsey, 2008). Thus, it is possible that the hypothesized moderation could have been evidenced if the studies reviewed

above had out-groups to compare with and/or had involved norms that differentiate them from the others.

In sum, previous literature suggests that a social/group identity becomes salient when people engage in intergroup interactions. In addition, strong identification with a particular group has been theorized to amplify normative influence on behavior (Tajfel, 1978; Tajfel & Turner, 1979; Turner & Reynolds, 2011; Rimal & Real, 2005). Although the conceptualization and operationalization of group identity have varied across different literature, there is evidence indicating that this effect is overall present regardless of the group being a minority or majority (e.g., Wood et al., 1994; Neighbors et al., 2010). More importantly, evidence also shows that in-group positive deviants are favorably evaluated by other members when they attributed their superior performance to the group (Fielding, Hogg, & Annandale, 2006); given that in-group positive deviants can enhance the group's image, individuals are likely to strongly identify with the deviants (Hogg & Reid, 2006), which may arguably facilitate normative conformity. The following section will propose study hypotheses and research questions based on the literature review so far.

Study Hypotheses and Research Questions

A recent study (Funk & Hefferon, 2019) shows that more than half of Americans, regardless of their political orientation, reported the need for additional efforts by the federal government to protect the environment. In addition, the same report also indicates that an increasing number of people make efforts to live in an environmentally friendly way. As more and more Americans have supported stricter environmental laws and regulations in recent years (Davie & Oliphant, 2019), it is expected that the number of people who engage in pro-environmental behavior will eventually increase, rather than decrease, over the coming decade.

Therefore, the effect of messages with trending information can be best tested in the context of environmentally friendly behaviors.

Previous studies on minority influence and positive deviance have shed light on how a minority can exercise its influence on a majority, and how this effect can be propelled to promote social change. However, these studies do not provide sufficient insights for the situation where a minority is increasing in numbers as more people engage in the target behavior over years. The influence of a minority has also not received much attention in social norms studies, given that theories of social norms elucidate how a person's perception about what a majority of people do and dis/approve of affects the individual's behavior. Recent literature on trending norms (Mortensen et al., 2019; Sparkman & Walton, 2017) bridges this gap by evidencing that increasing prevalence perceptions drive people to anticipate ongoing trends and a future in which the behavior is largely prevalent, which in turn motivates the individuals to conduct the emerging behavior. Nevertheless, trending norms studies have overlooked the effect of norms messages on people's normative perceptions and the factors that can strengthen or weaken normative influence that have been identified in previous literature. The current study examines the moderating role of group identity on the relationship between trending norms and behavior, with the expectation that the influence of trending norms messages will be stronger when the trend is rising among in-group similar others than out-group dissimilar people (Turner et al., 1987; Rimal & Real, 2005).

The current study is an experiment in which participants are exposed to messages about social norms and group identity. Specifically, the current study compares trending norms messages to traditional social norms messages and primes group identity. The trending norms literature (Mortensen et al., 2019; Sparkman & Walton, 2017) suggests that trending norms

messages (i.e., normative information indicating a low-but-increasing prevalence of a behavior) lead to more conformity to the emerging norms, compared to low descriptive norms messages (i.e., normative information indicating a low prevalence of a behavior). The current research first tests the mediation by which trending norms messages influence behavioral intention via perceived future prevalence (i.e., perceived future descriptive norms; the anticipated prevalence of the behavior in the future). This mediation mechanism has been evidenced in previous studies across various pro-environmental behavior contexts (Mortensen et al., 2019; Sparkman & Walton, 2017) especially when online experiments were used to test the mediation. Given that there is no reason to expect that the relationship pattern will be different for the current study context, the following relationship is hypothesized (see Figure 1):

> **H1**: Perceived future descriptive norms will mediate the influence of trending norms messages on behavioral intention such that trending norms messages lead to greater perceived future descriptive norms compared to low descriptive norms messages, which in turn will predict greater behavioral intention.

In addition, previous literature suggests that normative influences on behavior, regardless if the influence is from a minority or a majority, is stronger when a person strongly rather than weakly identifies with the reference group (e.g., Wood et al., 1994; Rimal & Real, 2005). This moderating effect of group identity is also expected for the relationship between trending norms messages and behavior: Given that a minority group depicted in the trending norms messages are essentially positive deviants who can possibly enhance the group's image (Fielding et al., 2006; Hogg & Reid, 2006), it is expected that message recipients are likely to highly identify with them when they are in-group similar others, which in turn can propel conformity to the norm. Hence,

the following hypothesis is proposed to test the moderating role of group identity on the relationship between trending norms messages and behavioral intention.

H2: Group identity will moderate the trending norms message-behavioral intention relationship such that the influence of norms messages on behavioral intention will be the strongest among the participants who receive trending norms messages and highly identify with the reference group relative to other experimental conditions.

Theories of social norms and empirical evidence suggest the direct and positive effect of descriptive norms on behavior, such that a greater prevalence perception leads to more conformity to the norms (e.g., Manning, 2009). In other words, it is generally expected that a low prevalence perception does not strongly motivate subsequent behavior. The trending norms literature shows that even an unpopular behavior can also lead others to conduct the behavior if it is increasingly prevalent. Nonetheless, it is still unclear whether or not trending norms messages are more influential than traditional high descriptive norms messages. At least one study showed that a high descriptive norms message with trending information was more effective than a traditional high descriptive norms message in promoting water conservation behavior (Sparkman & Walton, 2017). However, evidence on the comparative effect of trending norms messages and high descriptive norms messages on behavior has rarely been reported. Thus, in order to further investigate the effect of trending norms and broaden the scope of social norms literature, the current study adds one more norm condition (i.e., high descriptive norms) and proposes the following research questions (see Figure 2 for RQ2):

RQ1: Which type of norms messages (trending norms vs. low descriptive norms vs. high descriptive norms) will be more influential on behavioral intention when controlling for other study variables?

RQ2: a) Which type of norms messages (trending norms vs. high descriptive norms) will have a stronger impact on perceived future descriptive norms? (b) Will perceived future descriptive norms mediate the message-behavioral intent relationship?

METHOD

Overview

The research design is a 3 (norms message conditions: trending vs. low descriptive vs. high descriptive) × 2 (group identity conditions: low vs. high) × 2 (contexts: UNPLUG vs. BYOB) between-subject experiment.[6] A priming task (Brewer & Gardner, 1996) and normative messages regarding a given pro-environmental behavior were used to induce experimental manipulations. Participants in the trending norms condition received a message regarding a low-but-increasingly prevalent pro-environmental behavior, and those in the low and high descriptive norms conditions received low and high prevalence messages, respectively. Participants in the low group identity condition were told that the behavior was conducted by University of Michigan (U of M) students, whereas those in the high group identity condition learned that the behavior was conducted by Michigan State University (MSU) students. The focal behavior depicted in the message was either unplugging electronics when not in use as an energy conservation strategy (i.e., UNPLUG) or bringing one's own bags for grocery shopping to reduce plastic waste (i.e., BYOB), depending on the experimental conditions. The dependent variables of the study were participants' intention to engage in the behavior depicted in the message. Given that the main purpose of the current study was the examination of theoretical relationships, rather than the generalization of the study results to a broad population, a non-probability sampling procedure was used.

[6] Given that the effect of trending norms messages was compared with low descriptive norms messages in H1 and H2, a 2 (norms conditions: trending vs. low descriptive) × 2 (group identity conditions: low vs. high) × 2 (contexts: UNPLUG vs. BYOB) between-subject experimental design was used to test the hypotheses.

Sampling and Participants

A power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) was conducted to estimate the sample size required to test the study predictions. Effect size was obtained from the trending norms literature: Mortensen et al. (2019) conducted an internal meta-analysis and reported an overall small-to-medium effect size (Hedges' g = .29) of the influence of trending norms messages on behavior when compared to low descriptive norms messages. Sparkman and Walton (2017) also reported similar effect sizes (Cohen's d ranged from .31 to .49) in their experiments. The current research converted the mean value of Cohen's d (.40) from Sparkman and Walton's (2017) study to Cohen's f (.20), guided by Cohen (1988). As a result, the power analysis (f = .20, α = .05, power = .80, numerator df = 11, number of groups = 12) showed that the desired total sample was 431.

In total, N = 528 participants were recruited using research participation pools at MSU. These pools were chosen because MSU student participants were needed for the experimental manipulations of group identity. Although one of the pools is open to the public, the study had a restriction that only MSU students could sign up for the study. Study participants received either research credits or $3 Amazon Gift Cards as compensation depending on the pool they signed up for to participate in the study. The differences in the study variables between the two samples were examined using independent sample t-tests (two-tailed) and Pearson's product-moment correlation tests. The results are presented in the preliminary analyses section.

Among the students who signed up, 501 of them participated in the study. After discarding unusable data, the data from 419 participants were used for subsequent analyses.[7] The

[7] The removed surveys included the following: missing data (N = 39; listwise deletion), participants who reported that they were not MSU students (N = 2), participants who indicated that they were both MSU and U of M students (N = 30), outliers in income and monthly service bills (N = 5), and those considered to be a failure in an attention

majority of participants were White (57.8%) and female (68.3%). Their ages ranged from 18 to 27 (M = 20.69, SD = 1.67). The demographic information of the study participants is presented in Table 1.

Procedure

The study was advertised in the research participation pools as a social media campaign evaluation. Participants accessed an online experiment. After reviewing a consent form, participants were informed that the study was part of a research collaboration project between MSU and U of M, and their task was to evaluate a social media campaign that either MSU or U of M would actually use in the following academic year. This introduction was presented with the logos of the two universities.

On the next page, participants were asked to describe three positive characteristics of typical MSU students in one or two sentences for each. Participants were then randomly assigned to one of 12 experimental conditions. A paragraph (i.e., a story about a trip to the city) was given, and participants were asked to count the number of pronouns that appeared in the story. Participants were informed that this task was a warm-up that would help them be prepared for the subsequent campaign evaluations. On the next screen, norms messages with posters were presented (see Figures 3, 4, 5, and 6). Right after the visual stimuli, as an attention check, there was a question with a slider that asked the percentage of people presented in the message.[8] Following the experimental treatments, participants were asked to complete the survey questions. The questionnaire first measured the mediator variable (i.e., perceived future descriptive norms) to establish time order, then the focal outcome variable of the current study (i.e., behavioral

check (N = 6). In sum, data from 82 participants were removed from the main analyses. Missing data on open-ended questions and demographic variables were not removed from the data.

[8] Considering the cases of erroneous inputs, the responses outside ± 5 range from the correct answer were considered a failure in the attention check.

intent to unplug or bring one's own bags for grocery shopping), followed by the variables for induction checks (i.e., perceived trending norms, perceived descriptive norms, and perceived group identity). Next, the survey measured additional variables (e.g., existing pro-environmental behaviors, attitude toward the campaign, etc.) and demographic variables (e.g., gender, age, etc.). Upon completion of the survey, participants were thanked, debriefed, and provided with resources for reducing energy use and plastic waste.

Group Identity Inductions

In order to bolster the effect of group identity induction, the manipulation comprised of three steps. The first step (right after the introduction) was describing three positive characteristics of typical MSU students. The second step (right after the first step) was a priming task designed to make in-groupness and out-groupness salient, modeled after Brewer and Gardner (1996). A paragraph was given to the participants and the study asked them to count the number of pronouns in the paragraph. For low group identity manipulation (i.e., out-group salience), the pronouns consisted of "*they*," "*them*," and "*theirs*." For high group identity manipulation (i.e., in-group salience), the pronouns were replaced by "*we*," "*us*," and "*ours*." For example, the paragraph for the high group identity condition was as follows (Oyserman & Lee, 2008):

> *We* go to the city often. *Our* anticipation fills *us* as *we* see the skyscrapers come into view. *We* allow *ourselves* to explore every corner, never letting an attraction escape *us*. *Our* voice fills the air and street. *We* see all the sights, *we* window shop, and everywhere *we* go *we* see *our* reflection looking back at *us* in the glass of a hundred windows. At nightfall *we* linger, *our* time in the city almost over. When finally *we* must leave, *we* do so knowing that *we* will soon return. The city belongs to *us.* (p. 316)

The third step was to provide the reference group's (i.e., in-group or out-group) behavioral information, presented with norms messages. Drawing upon previous communication literature that successfully manipulated group identity based on educational affiliation (e.g., Carr, Vitak, & McLaughlin, 2013; Lee, 2004; 2006), especially using rival universities (Smith et al., 2016), the current study used U of M and MSU to induce low/high group identity with the reference group, respectively. In the low group identity condition, messages illustrated that the given pro-environmental behavior was being done by U of M students (i.e., "Wolverines"). On the other hand, high group identity messages demonstrated that the behavior was conducted by MSU students (i.e., "Spartans"). At the bottom of the poster, the logo of the corresponding university was presented as a data source and the sponsor of the campaign.

Norms Prevalence Inductions

The induction design was guided by previous literature (Lapinski, Maloney, Braz, & Shulman, 2013; Mortensen et al., 2019; Nemeth et al., 1977; Sparkman & Walton, 2017). Trending norms messages showed a low-but-increasing prevalence of behavior; for example: "More and more Spartans (9% in 2017 → 17% in 2018 → 30% in 2019) are unplugging their electronics to save money, save energy, and to protect pure Michigan." Low descriptive norms messages depicted a low prevalence of the behavior (30% in 2019) without the trending information. High descriptive norms messages described that a majority of people in the reference group (65% in 2019) conducted the behavior.

Measurement

Most of the items were drawn from prior research but revised for the current study context. The study variables, unless otherwise specified, were measured on a 7-point Likert-type scale (1 = *Strongly disagree*, 7 = *Strongly agree*) in which higher scores indicate greater

agreement or higher levels of the variable. The full version of the scaled items is available in Appendix A.

Confirmatory factor analysis (CFA) using the *lavaan* package in R (Rosseel, 2012) was conducted for the scales that contained at least four items. Maximum likelihood parameter estimation was used to test the fit of each measurement model and fit specifications were established *a priori*. Given the large sample size of the current study, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were assessed. Specifically, CFI and TLI closer to 1 (Hayes, Slater, & Snyder, 2008; Hu & Bentler, 1999), RMSEA less than .06, and SRMR less than .08 (Hu & Bentler, 1999) were considered a good fit. When the measurement models substantially deviated from these values, internal consistency and parallelism theorems were employed to generate predicted correlations between all items of the same latent variable (Hunter & Gerbing, 1982), using the *lessR* package in R (Gerbing, 2014). These predicted correlations were then subtracted from their respective obtained correlations to produce the errors/residuals. Items that produced the largest errors of fit or had the weakest factor loadings were removed from each measure until the measurement model provided a good fit to the data. For the scales that contained less than four items, significant inter-item correlations were used to assess the fit. When the data were consistent with the unidimensional measurement model, the items were summed and averaged to form an index, and scale reliabilities were tested. The fit indices for measurement models (including scale reliabilities) are presented in Table 2. The zero-order correlations, means, and standard deviations of the study variables are presented in Table 3.

Mediating Variables. *Perceived future descriptive norms* were measured by 10 items modified from prior studies (e.g., Mortensen et al., 2019, Rimal & Real, 2005). Five items asked

participants to estimate the extent to which the behavior would be prevalent 1 year from now (e.g., "Next year, I think an increasing number of Spartans will unplug their electronic devices when not in use"), and the other 5 items asked their estimation for 5 years from now (e.g., "Five years from now, I think an increasing number of Spartans will unplug their electronic devices when not in use"). The data showed that the measurement model was multidimensional: A two-factor model that considered the items for 1 year and 5 years separately showed a better fit than the one-factor model, and the difference was significant, $x^2(1) = 513.28$, $p < .001$. Thus, additional CFAs were performed separately for each model. One item from each model that produced the largest error was removed. As a result, both models provided a good fit to the data (CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .01). The items for 1 year were labeled *Perceived future descriptive norms in 1 year*, and the items for 5 years were labeled *Perceived future descriptive norms in 5 years*. Participants were additionally asked to provide percentage estimations of the prevalence of the behavior in the future (1 year and 5 years from now) using a slider.[9]

Dependent Variable. *Behavioral intent to unplug or bring one's own bags for grocery shopping* was measured by 7 items derived from previous studies (Ajzen, 2015; Ajzen, Joyce, Sheikh, Cote, 2011; Lapinski et al., 2007) including "I am planning to make sure I unplug electronic devices when not in use." Three items were removed and the data were consistent with a unidimensional measurement model (CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .00).

[9] The percent estimation items were used to analyze if participants anticipated a majority would conduct the given behavior in the future. The results are presented in Additional Analysis 1. Given that the current study already had two separate mediators, these percent estimation items were not included in mediation analyses.

Participants were then asked to explain their response in an open-ended question: "What are the things that make you more or less willing to unplug electronic devices when not in use?"[10]

Induction checks. *Perceived trending norms* and *Perceived group identity* were measured for manipulation checks; each of these was operationalized as a multidimensional model.

First, *Perceived trending norms* were measured by two separate constructs: *Perceived descriptive norms* and *Perceived increasing trend*. Perceived descriptive norms were measured by four items derived from TNSB studies (e.g., Rimal & Real, 2005). The sample items include "I think most Spartans unplug their electronic devices when not in use." One item was removed and the correlation coefficients among the remaining three items were .74, .78, and .79. The three items were then summed and averaged to form the index.

Perceived increasing trend was measured by 10 items. Five of the items were asked on a Likert-type scale, modified based on the perceived descriptive norms measurement items. The sample items include "I think there is an increasing trend in Spartans to unplug electronic devices when not in use." The other five items were asked on a 7-point bi-polar scale (1 = *Not at all* to 7 = *Very much*) with the question: "How would you describe the popularity of unplugging behavior among Spartans? Is it …" The items were "Increasing," "Ascending," "Rising," "Escalating," and "Going up." These items were modified from previous literature (Robins, Noftle, Trzesniewski, & Roberts, 2005; Wolf, Randall, Almen, & Tynes, 1991) and higher scores indicated greater increasing trend perceptions. When these 10 scaled items were analyzed together, the data were not consistent with a unidimensional model. A two-factor model considering the first five and the other five items separately showed a significantly better fit than

[10] Informal thematic analysis was conducted to identify patterns in the responses. The results are presented in the Additional Analysis 2.

the one-factor model, $x^2(1) = 329.51$, $p < .001$. Therefore, additional CFAs were conducted separately.

For the Likert-scale items, one item was removed and the measurement model with the remaining four items provided a good fit (CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .01). For the bi-polar items, one item was also removed, and the model provided a good fit to the data (CFI = 1.00, TLI = .99, RMSEA = .05, SRMR = .01). The items were summed and averaged to form indices accordingly. The former measurement model was labeled *Perceived increasing trend (L)*, and the latter model was labeled *Perceived increasing trend (B)*.[11]

Second, *Perceived group identity* was operationalized as a multidimensional model: *Perceived group identification* and *Perceived similarity*. Perceived group identification was measured by five items derived from social identity literature (David & Turner, 1996; Doosje, Ellemers, & Spears, 1995; Terry & Hogg, 1996). The sample items include "I see myself as a Spartan." One item was removed, and the model showed a fair fit to the data (CFI = 1.00, TLI = .99, RMSEA = .08, SRMR = .01). The remaining four items were summed and averaged to form the index. Perceived similarity was measured by four items derived from TNSB studies (e.g., Rimal & Real, 2005), including: "I think most Spartans are similar to me in the way they think." The data also showed a fair fit (CFI = .99, TLI = .98, RMSEA = .08, SRMR = .02). Thus, the four items were used to form the index.

Potential Covariates. Potential covariates that have been evidenced in prior research to influence people's pro-environmental behavior or the theoretical relationships in the current study were measured.

[11] These labels were derived from the first letter of scale types. L indicates Likert-type and B indicates bi-polar.

Existing pro-environmental behaviors was measured by 11 items derived from previous literature (Ajzen, 2015; Ajzen et al., 2011), including "I make an effort to conserve energy in my daily living." Nine items that asked the frequency of various environmentally friendly behavior were measured on a 7-point Likert-type scale: 1 = *Never*, 2= *Very rarely*, 3 = *Rarely*, 4 = *Occasionally*, 5 = *Frequently*, 6 = *Very frequ*ently, 7 = *Always*. Given the low reliability of the measurement model, two items that were highly correlated with each other (r = .52) were summed and averaged to form the index.

Attitude toward behavior was measured by six bi-polar items (e.g., Unpleasant/Pleasant, Dislike/Like, etc.) derived from previous research (Ajzen, 2015; Ajzen et al., 2011). Two items were removed, and the model showed a good fit to the data (CFI = 1.00, TLI = 1.00, RMSEA = .00, SRMR = .00).

Attitude toward the campaign was measured by nine bi-polar items (Alhabash, McAlister, Quilliam, Richards, & Lou, 2015; Choi, Miracle, & Biocca, 2001), including Bad/Good and Unappealing/Appealing. Two items were removed, and the model and the remaining seven items provided a good fit to the data (CFI = .99, TLI = .99, RMSEA = .04, SRMR = .02).

Perceived societal injunctive norms were measured by six items derived from social norms literature (Lapinski, Anderson, et al., 2013; Park & Smith, 2007). The sample items include "A majority of people in the United States approve of unplugging their electronic devices when not in use." Two items that produced the largest errors were removed, and the model showed a good fit (CFI = 1.00, TLI = .99, RMSEA = .04, SRMR = .02).

Given that the current study used rival universities for the group identity manipulation, *Rivalry effect* was measured by five items derived from previous studies (James & Eisenberg,

2004; Smith & Schwarz, 2003; Smith, Seger, & Mackie, 2007). Due to the poor fit and low reliability, three items that were highly correlated with each other were summed and averaged to form the index. The Pearson correlation coefficients among the items were .51, .58, and .70.

Innovativeness was measured by eight items (Hurt, Joseph, & Cook, 1977), including "I enjoy trying out new ideas." Three items were removed, and the model provided a fair fit to the data (CFI = .97, TLI = .95, RMSEA = .08, SRMR = .03).

Political orientation (Anderson, 2017; Sparkman & Walton, 2017) was measured by a single item, "How would you describe your political orientation?" in which higher scores indicate a more conservative political ideology.

Demographic variables. Demographic information was collected from the participants at the end of the survey, including age, gender, racial background, employment status, and education level. Participants' affiliation status with MSU and U of M was also asked. In addition, given the context of the current study, some financial information was collected, such as study participants' housing type, home ownership status, and whether or not they pay for electricity/recycling, waste disposal, and trash removal services.

RESULTS

Pilot Tests

Three pilot tests were conducted to check the effectiveness of the experimental inductions. Participants were recruited using a research participation pool at MSU, and the participants who signed up for the pilot tests were screened and excluded from the subsequent pilot tests and main experiment. Participants received $3 Amazon Gift Cards as compensation. A series of two-way analysis of variance (ANOVA) was conducted to see the direct, cross-over, and interaction effects of experimental manipulations on perception variables. Specifically, perceived descriptive norms, perceived increasing trend, perceived group identification, and perceived similarity were used. Both statistical significance and effect sizes were considered. These tests were conducted for only one context: UNPLUG. A summary of key findings of the three pilot tests is presented in Table 4.

Pilot 1. The original versions of experimental stimuli and survey questionnaires were pre-tested with data from 79 participants who had an affiliation with MSU. The design was a 3 (norms conditions: trending vs. low descriptive vs. high descriptive) × 2 (group identity: low vs. high) between-subject online experiment. The university in which the participant was enrolled (MSU) was used for high group identity manipulation, and an outgroup university (Rutgers University) was used for low group identity manipulation. Rutgers University was initially chosen as an out-group because it is one of the Big Ten universities, but joined the conference the last, and is geographically the farthest away from MSU.

The analysis of perceived descriptive norms yielded a significant main effect of norms manipulations, $F(2, 73) = 4.79$, $p = .01$, partial $\eta^2 = .12$. Participants in the high descriptive norms condition reported higher prevalence perceptions ($M = 4.19$, $SD = 1.37$), followed by

those in the low descriptive norms condition (M = 3.53, SD = 1.33) and the trending norms condition (M = 3.08, SD = 1.11). Post-hoc analyses using the Scheffe test[12] (p = .05) indicated that perceived descriptive norms were significantly lower in the trending norms condition than the high descriptive norms condition. The main effect of the group identity inductions (p = .42, partial η^2 = .01) and the interaction effect (p = .91, partial η^2 = .00) on perceived descriptive norms were not significant and weak.

The main effect of norms manipulations on perceived increasing trend was not significant and weak, $F(2, 73) = .56$, p = .57, partial η^2 = .02. The data showed that the strongest trending perceptions were reported by the participants in the high descriptive norms condition (M = 4.67, SD = 1.00), followed by those in the trending norms condition (M = 4.51, SD = 1.29) and the low descriptive norms condition (M = 4.33, SD = 1.15). The main effect of group identity inductions (p = .93, partial η^2 = .00) and the interaction effect (p = .86, partial η^2 = .00) on perceived increasing trend were not evidenced.

There was substantial difference in perceived group identification between the two group identity conditions, $F(1, 73) = 102.34$, $p < .001$, partial η^2 = .58, r = .75. Participants in the high group identity condition reported significantly stronger perceived identification with the reference group (M = 5.01, SD = 1.51) than those in the low group identity condition (M = 2.09, SD = .96). The main effect of norms manipulations (p = .18, partial η^2 = .05) and the interaction effect (p = .62, partial η^2 = .01) on perceived group identification were not significant and the effect sizes were small. Unlike perceived group identification, there was no significant difference in perceived similarity between the two group identity conditions, $F(1, 73) = .41$, p = .53, partial

[12] This method was preferred over other post-hoc tests due to its robustness to unbalanced cell size experimental design.

η^2 = .01, r = .07. Participants in the low group identity condition reported weaker perceived similarity (M = 4.24, SD = .99) than those in the high group identity condition (M = 4.40, SD = 1.17).

In order to bolster the effect of group identity manipulations, a common task was added to the experiment: In the second pilot, the survey asked all participants to describe three positive characteristics of typical MSU students right after the general introduction to the study. In addition, the university for the low group identity conditions was changed: In the first pilot, participants were asked to report their three least favorite universities and the top choice was U of M (about 42%). Based on the data, the experimental stimuli were revised (i.e., using U of M for low group identity manipulation) and tested in Pilot 2.

Pilot 2. The revised experimental stimuli and questionnaire with minor changes in wording were tested with data from 51 MSU students. The experimental design was the same as the first pilot, but U of M was used for low group identity manipulation.

The norms manipulation checks showed similar patterns to Pilot 1, but the effects were stronger in Pilot 2. An ANOVA test on perceived descriptive norms showed that the effect of norms manipulations was significant, $F(2, 45) = 12.77$, $p < .001$, partial η^2 = .36. The highest perceived descriptive norms were reported by the participants in the high descriptive norms condition (M = 4.96, SD = 1.21), followed by those in the trending norms condition (M = 3.40, SD = 1.36) and the low descriptive norms conditions (M = 2.84, SD = 1.16). The Scheffe test showed that participants in the high descriptive norms condition reported significantly stronger perceived descriptive norms than those in the trending norms and the low descriptive norms conditions. The effect of the group identity inductions (p = .79, partial η^2 = .00) and the

interaction effect between experimental conditions (p = .25, partial η^2 = .06) on perceived descriptive norms were not significant and the effect sizes were small.

The effect of norms inductions on perceived increasing trend did not reach statistical significance, $F(2, 45) = 2.62$, p = .08, partial η^2 = .10. Nevertheless, the pattern was consistent with the intended direction. Participants in the trending norms condition reported stronger increasing trend perceptions (M = 4.80, SD = 1.37) than those in the high descriptive norms condition (M = 4.71, SD = 1.24) and the low descriptive norms condition (M = 3.93, SD = .91). The direct effect of group identity inductions (p = .94, partial η^2 = .00) and the interaction effect (p = .86, partial η^2 = .01) were not significant and the effect sizes were negligible.

There was a significant difference in perceived group identification between the group identity conditions, $F(1, 45) = 126.03$, $p < .001$, partial η^2 = .74, r = .85. Participants in the high group identity condition (M = 5.82, SD = 1.20) reported stronger identification with the reference group than those in the low group identity condition (M = 2.27, SD = 1.04). The main effect of norms manipulations (p = .41, partial η^2 = .04) and the interaction effect (p = .65, partial η^2 = .02) on perceived group identification were not significant and trivial. A significant difference in perceived similarity between the two conditions was evidenced, $F(1, 45) = 9.57$, p = .003, partial η^2 = .18, r = .40. Participants in the high group identity condition (M = 5.04, SD = .88) reported higher perceived similarity with the reference group than those in the low group identity condition (M = 4.14, SD = 1.21). The main effect of norms manipulations (p = .92, partial η^2 = .00) and the interaction effect (p = .07, partial η^2 = .11) on perceived similarity were not significant and the effect sizes were small.

Given the non-significant effect of the norms inductions on perceived increasing trend, the experimental stimuli were revised for a third pilot: The time points depicted in the trending

norms messages were increased from two points (i.e., 17% in 2017 → 30% in 2018) to three points (i.e., 9% in 2017 → 17 % in 2018 → 30% in 2019). In addition, the years were also changed from 2018 to 2019 to match the time that the survey was conducted. Moreover, a new set of bi-polar scaled items to measure perceived increasing trend was developed based on previous literature (Robins et al., 2005; Wolf et al., 1991). Another small pilot test was conducted to check the effect of revised norms manipulations on perceived increasing trend using both existing and new bi-polar scaled items.

Pilot 3. The third pilot test involved two norms conditions: low descriptive vs. trending norms. Group identity was not induced and the visual stimuli for low group identity manipulations were used for both norms conditions. The data from 19 MSU students were analyzed. One-tailed independent sample t-tests and Pearson's correlation tests were performed to examine the difference in perceived increasing trend between the two norms conditions. The data showed a significant difference in perceived increasing trend between the norms conditions, $t(17) = -2.12$, $p = .03$, $r = .45$. On average, participants in the trending norms condition reported stronger increasing trend perceptions ($M = 5.24$, $SD = .49$) than those in the low descriptive norms condition ($M = 4.44$, $SD = 1.08$). The pattern was consistent when the perception was measured by the new set of bi-polar scaled items, $t(17) = -2.25$, $p = .02$, $r = .48$. Participants in the trending norms condition perceived stronger increasing trend ($M = 4.62$, $SD = .78$) than those in the low descriptive norms condition ($M = 3.76$, $SD = .88$). As a result, the revised stimuli and both sets of measurement items for perceived increasing trend were used in the subsequent main experiment. The data from the pilot tests were not included in the main analyses.

Preliminary Analyses

After computing the study variables based on the CFA results, a series of independent sample t-tests (two-tailed) and Pearson's correlation tests was performed to see if there were significant differences in the study variables between the two research participation pools and to examine the effect sizes. The data showed statistically significant differences in almost every continuous variable, except for perceived future descriptive norms in 5 years, monthly service bills, message believability, and political orientation.[13] Except for these four variables, the correlation coefficients ranged from -.13 to .52. In order to account for the differences between the samples, the research participation pools were dummy-coded (0 = *Student-only pool*, 1 = *Public pool*) and added as a covariate in the main analyses.

Manipulation Checks

A series of two-way ANOVAs were conducted to investigate if the experimental manipulations yielded the intended patterns, and if there was any cross-over or interaction effects of the experimental inductions on the perception variables. For the norms manipulations, perceived descriptive norms and perceived increasing trend (both Likert-type and bi-polar scaled items) were used to see if the data were consistent with the following: Participants in the trending norms condition a) perceived lower prevalence of the behavior than those in the high descriptive norms condition, but b) did not differ from those in the low descriptive norms condition in their perception of the prevalence of the behavior, and c) perceived a greater increasing trend relative

[13] Participants in the public pool reported higher perceived future descriptive norms in 5 years (M = 5.71, SD = .84) compared to those in the student-only pool (M = 5.57, SD = 1.06). The difference was not significant, $t(417) = -1.30$, p = .20, r = .07. Similarly, participants in the public pool reported higher monthly service fees (M = 29.40, SD = .15.65) than those in the other pool (M = 24.33, SD = 20.95). The difference was not significant, $t((265) = -1.55$, p = .13, r = .11. Likewise, participants in the public pool reported higher message believability (M = 5.62, SD = 1.01) than participants in the other pool (M = 5.46, SD = 1.10). The difference was not significant, $t(417) = .47$, p = .13, r = .07. Participants in the student-only pool were slightly more politically conservative (M = 3.76, SD = .15) than those in the public pool (M = 3.70, SD = 1.65), but the difference was not significant, $t(416) = .34$, p = .73, r = -.02.

to the other norms conditions. For group identity manipulations, perceived group identification and similarity were used. Both statistical significance and effect sizes were considered. When the omnibus ANOVA tests showed a significant difference between groups, the Scheffe follow-up procedure ($p = .05$) was performed to examine pairwise differences among the conditions. All mean values reported in the manipulation checks section were significantly different from the scale midpoint of 4.

Perceived descriptive norms. There was a significant difference among the three norms conditions, although the effect size was small, $F(2, 413) = 6.90$, $p = .001$, partial $\eta^2 = .03$. A greater prevalence perception was reported in the high descriptive norms condition ($M = 5.06$, $SD = 1.19$), followed by the trending norms condition ($M = 4.67$, $SD = 1.34$) and the low descriptive norms condition ($M = 4.49$, $SD = 1.57$). The Scheffe test showed a significant difference between low descriptive norms and high descriptive norms. There was no evidence of a main effect of group identity manipulation ($p = .45$, partial $\eta^2 = .00$) and the interaction effect ($p = .05$, partial $\eta^2 = .01$) on perceived descriptive norms.

Perceived increasing trend. The effectiveness of the trending norms manipulation was tested in two ways. First, when using the Likert-type scaled items (i.e., perceived increasing trend [L]), there was a significant main effect of the norms manipulation, $F(2, 413) = 9.11$, $p < .001$, partial $\eta^2 = .04$. Participants in the trending norms condition reported a greater increasing trend perception ($M = 5.32$, $SD = .88$), followed by those in the high descriptive norms condition ($M = 5.19$, $SD = 1.04$) and the low descriptive norms condition ($M = 4.83$, $SD = 1.13$). The Scheffe test indicated that the low descriptive norms condition differed significantly from both the trending norms and high descriptive norms conditions. The data also showed a weak but statistically significant main effect of group identity manipulation ($p = .04$, partial $\eta^2 = .01$) and

the interaction effect (p = .01, partial η^2 = .02) on increasing trend perceptions. Second, when using the bi-polar scaled items (i.e., perceived increasing trend [B]), a significant main effect of the norms manipulation was evidenced, $F(2, 413) = 7.54$, p = .001, partial η^2 = .04. A greater increasing trend perception was reported by the participants in the trending norms condition (M = 5.39, SD = .88), followed by those in the high descriptive norms (M = 5.08, SD = .95) and low descriptive norms (M = 4.93, SD = 1.22) conditions. The Scheffe test showed that the trending norms condition differed significantly from both the low and high descriptive norms conditions. Unlike the previous test, the data indicated a non-significant and weak main effect of group identity manipulation (p = .20, partial η^2 = .00) and the interaction effect (p = .06, partial η^2 = .01) on perceived increasing trend (B).

In sum, the data were largely consistent with the predicted patterns for norms manipulations, although the effect sizes were not substantial: Participants in the high descriptive norms condition reported significantly higher prevalence perceptions than those in the other norms conditions. In addition, participants in the trending norms condition anticipated greater future prevalence than those in the other conditions. The data showed significant cross-over and interaction effects between the experimental manipulations when perceived increasing trend was measured by a Likert-type scaled items; nonetheless, the effect sizes were trivial. Therefore, the norms manipulations were considered effective.

Perceived group identification. There was a significant main effect of the group identity manipulation on perceived group identification, $F(1, 413) = 312.03$, $p < .001$, partial η^2 = .43, r = .65. Participants in the high group identity condition (M = 6.01, SD = .84) reported significantly higher perceived group identification than those in the low group identity condition (M = 3.45, SD = 1.96). The main effect of the norms manipulations (p = .22, partial η^2 = .01) and

the interaction effect (p = .35, partial η^2 = .01) on perceived group identification were not significant and the effect sizes were small.

Perceived similarity. There was a significant main effect of the group identity manipulation on perceived similarity, $F(1, 413) = 26.83$, $p < .001$, partial $\eta^2 = .06$, $r = .25$. A significantly greater perceived similarity was reported by the participants in the high group identity condition ($M = 5.33$, $SD = .90$) than those in the low group identity condition ($M = 4.76$, $SD = 1.30$). The main effect of norms manipulations (p = .33, partial η^2 = .01) and the interaction effect (p = .81, partial η^2 = .00) on perceived similarity were non-significant and weak. Thus, the group identity manipulation was considered successful.

Identifying Covariates

Guided by Tabachnick and Fidell (2012), a series of statistical tests was conducted to identify optimal covariates that were a) significantly associated with the dependent variable, b) but not causally dependent on the norms and group identity inductions; and c) not significantly associated with each other. The focal variables of the current study were not included in the analyses. In addition, given that the research participation pools were already determined as a covariate in the preliminary analysis, the sample difference was not included in the analyses either.

First, for continuous variables, Pearson's product moment correlation tests were examined to identify which variables were significantly related with the dependent variable (see Table 3). The data showed that existing pro-environmental behavior ($r = .54$, $p < .001$), attitude toward the campaign ($r = .18$, $p < .001$), perceived societal injunctive norms ($r = .40$, $p < .001$), innovativeness ($r = .15$, $p = .002$), age ($r = .17$, $p = .001$), income ($r = .20$, $p < .001$), and believability ($r = .21$, $p < .001$) were significantly associated with the behavioral intention. Most

of these variables were significantly associated with each other: Pearson's correlation coefficients ranged from .15 to .51. Among these variables, existing pro-environmental behavior and perceived societal injunctive norms were considered as potential covariates, because the other variables showed relatively weak associations with the behavioral intention. The remaining two variables were moderately related with each other, $r = .31$, $p < .001$. Given that existing pro-environmental behavior was more highly associated with the dependent variable, perceived societal injunctive norms were not considered as a covariate in the main analyses in order to preserve statistical power. A two-way ANOVA showed that existing pro-environmental behavior was not causally dependent on the norms and group identity inductions.

Second, for categorical variables, one-way ANOVAs and the Scheffe tests were conducted to detect the direct main effects on the dependent variable. The data showed that there were significant differences in behavioral intention between male and female participants, $F(2, 416) = 3.14$, $p = .04$, partial $\eta^2 = .02$. Female participants ($M = 5.26$, $SD = 1.27$) reported significantly higher intent than male participants ($M = 4.93$, $SD = 1.26$). The data also showed a significant difference among housing type, $F(3, 415) = 6.48$, $p < .001$, partial $\eta^2 = .05$. Participants who lived in residence halls reported significantly lower behavioral intention ($M = 4.71$, $SD = 1.44$) compared to those who lived in apartments ($M = 5.25$, $SD = 1.19$) and houses ($M = 5.45$, $SD = 1.15$). There was also a significant difference in the dependent variable among home ownership status, $F(2, 412) = 8.33$, $p < .001$, partial $\eta^2 = .04$. Participants who reported that they did not either own or rent their homes showed significantly lower behavioral intention ($M = 4.56$, $SD = 1.60$) than those who rented ($M = 5.20$, $SD = 1.33$) or owned their houses ($M = 5.38$, $SD = .76$). Omnibus ANOVA tests also showed significant differences in racial backgrounds and employment status; however, the Scheffe tests revealed non-significant

pairwise differences, and therefore these variables were not considered as covariates. In order to preserve statistical power, gender (due to its weak effect size) and home ownership status (due to its conceptual relevance to the housing type but weaker effect size) were not selected as covariates.

As a result, existing pro-environmental behavior, housing type (dummy coded; 0 = *The other housing type*, 1 = *Residence hall*), and research participation pools were included as covariates in the main analyses.[14]

Hypotheses Testing

Overview. The current research involved two different pro-environmental behaviors to increase internal and external validity. Thus, each hypothesis testing was conducted three times: when the two experimental contexts were collapsed, UNPLUG only, and BYOB only. In addition, given that the CFA showed that perceived future descriptive norms were multidimensional and had two separate constructs, each test involved two different mediators: perceived future descriptive norms in 1 year and 5 years. The following sections are organized accordingly. A summary of the hypotheses testing results is presented in Table 5.

Hypothesis 1. H1 predicted that participants who received trending norms messages would perceive greater future descriptive norms than those who received low descriptive norms messages, which would predict greater behavioral intention. A series of mediation tests using PROCESS model 4 (Hayes, 2018) in SPSS was conducted to test the study prediction. Norms conditions (0 = *Low descriptive norms*, 1 = *Trending norms*) were entered as an independent variable, perceived future descriptive norms (1 year or 5 years) were mediators, and behavioral

[14] The same procedures were repeated for each experimental context. As a result, the selected covariates for UNPLUG were existing pro-environmental behavior and research participation pools. The identified covariates for BYOB were existing pro-environmental behavior, housing type, and research participation pools.

intention was a dependent variable. Existing pro-environmental behavior, housing type, and research participation pools (or context-specific covariates) were included as covariates. 1,000 bootstrapped samples were used to estimate bias-corrected 95% confidence intervals of the indirect paths. The data were considered consistent with the mediation hypothesis when a) the indirect effect of the independent variable on the dependent variable through the mediator was significant (i.e., the 95% confidence interval for the coefficient did not include zero), and b) the direct effect of the independent variable on the dependent variable (i.e., the effect without passing through the mediator) was not significant.

Two contexts collapsed. From a simple mediation analysis conducted using ordinary least squares path analysis, the norms conditions indirectly influenced intentions to engage in pro-environmental behavior through its effect on perceptions about the prevalence of the behavior next year. Participants who received trending norms messages anticipated greater prevalence of the behavior next year than those who received low descriptive norms messages ($B = .67$, $p < .001$), and participants who perceived greater future descriptive norms reported a stronger intention to conform to the trending behavior ($B = .27$, $p < .001$). A bootstrap confidence interval for the indirect effect based on 1,000 bootstrap samples was entirely above zero ($B = .18$, 95% CI: .07 to .31). There was no evidence that the norms conditions influenced behavioral intention independent of its effect of perceived future descriptive norms in 1 year (i.e., the direct effect; $B = -.20$, $p = .12$). The pattern remained the same when perceived future descriptive norms in 5 years was included as a mediator (see Tables 6 and 7). Thus, the data were consistent with the hypothesis.

UNPLUG only. The same procedures were repeated for each experimental context. For UNPLUG, existing pro-environmental behavior and research participation pools were included

in the analyses as covariates. When perceived future descriptive norms in 1 year was a mediator, the data showed that both indirect (B = .16, 95% CI: -.07 to .37) and direct effect (B = -.16, p = .41) were not significant. Participants in the trending norms condition, compared to those in the low descriptive norms condition, reported higher future descriptive norms in 1 year (B = .99, p < .001). However, the anticipated prevalence in 1 year did not significantly influence their behavioral intention to unplug electronic devices when not in use (B = .16, p = .09). Nonetheless, the pattern was different when perceived future descriptive norms in 5 years was a mediator. The data showed a significant indirect effect (B = .19, 95% CI: .03 to .40) and non-significant direct effect (B = -.18, p = .27) of norms manipulations on the dependent variable. Participants in the trending norms condition anticipated a greater prevalence of unplugging behavior in 5 years than those in the low descriptive norms condition (B = .53, p < .001), which in turn resulted in greater behavioral intention (B = .35, p < .001). In sum, when perceived future descriptive norms in 1 year was a mediator, the data were not consistent with the hypothesis; nonetheless, when perceived future descriptive norms in 5 years was a mediator, the data were consistent with the hypothesis (see Tables 8 and 9).

BYOB only. For BYOB, existing pro-environmental behavior, housing type, and research participation pools were added in the model as covariates. When perceived future descriptive norms in 1 year was a mediator, the indirect effect was significant (B = .15, 95% CI: .03 to .30), whereas the direct effect was not significant (B = -.19, p = .29). As predicted, participants who were exposed to trending norms messages reported greater perceived future descriptive norms in 1 year than those who were exposed to low descriptive norms messages (B = .38, p = .01). In addition, the anticipated prevalence significantly predicted participants' behavioral intention to bring their own bags for grocery shopping (B = .39, p < .001). However, when perceived future

descriptive norms in 5 years was a mediator, both indirect (B = .03, 95% CI: -.05 to .13) and direct effects (B = -.08, p = .68) of norms manipulations on behavioral intention were not significant. Specifically, there was no statistically significant difference in anticipated prevalence of the behavior in 5 years between the participants who received trending norms messages and those who received low descriptive norms messages (B = .11, p = .44). In sum, the data were consistent with the hypothesis when perceived future descriptive norms in 1 year was a mediator, but not consistent when perceived future descriptive norms in 5 years was a mediator (see Tables 10 and 11).

Hypothesis 2. H2 predicted the moderating effect of group identity, such that the behavioral intention would be the strongest among the participants who received trending norms messages and strongly identified with the reference group, compared to those in the other experimental conditions. In order to test the hypothesis, the current study conducted a two-way analysis of covariance (ANCOVA) on behavioral intention. The independent variables were norms conditions (low descriptive norms vs. trending norms) and group identity conditions (low group identity vs high group identity). The identified covariates were included in the analyses.

Two contexts collapsed. When the effects of covariates were controlled, there was non-significant main effect of norms manipulations, p = .81, partial η^2 = .00, and group identity inductions, p = .68, partial η^2 = .00, on the dependent variable. However, a weak but significant interaction effect was evidenced, $F(1, 271) = 4.04$, p = .045, partial η^2 = 02. In other words, when group identity was included in the analysis, there was no direct effect of either norms or group identity manipulations, but the effect of norms messages on behavioral intention was dependent on the group identity conditions. For the high group identity condition, stronger behavioral intention was reported by participants in the trending norms condition (Adjusted M =

5.35, 95% CI: 5.11 to 5.59) than those in the low descriptive norms condition (Adjusted *M* = 5.13, 95% CI: 4.89 to 5.37). On the other hand, for the low group identity condition, stronger intention was evidenced among participants in the low descriptive norms condition (Adjusted *M* = 5.33, 95% CI: 5.08 to 5.58) than those in the trending norms condition (Adjusted *M* = 5.05, 95% CI: 4.80 to 5.30).

A planned contrast analysis (Rosenthal & Rosnow, 1985) was conducted to further examine whether the behavioral intention among the participants in the trending norms, high group identity condition was significantly stronger than those in the other conditions. A contrast of +3 was assigned to the trending norms, high group identity condition, and -1 was assigned to the other experimental conditions based on the *a priori* predicted differences among means. The planned contrast analysis was not significant, $p = .24$, partial $\eta^2 = .02$. Thus, the data were considered inconsistent with the study prediction (see Tables 12 and 13 for the descriptive statistics and ANCOVA results and Figure 7 for the interaction plot).

UNPLUG only. The same procedures were repeated for each experimental context separately. Context-specific covariates were included in the analyses. For UNPLUG, the data showed non-significant main effect of norms manipulations, $p = .99$, partial $\eta^2 = .00$, group identity inductions, $p = .21$, partial $\eta^2 = .01$, and the interaction effect between the two inductions, $p = .19$, partial $\eta^2 = .01$, on the dependent variable. The strongest intention was reported by the participants in the low descriptive norms, high group identity condition (Adjusted *M* = 5.46, 95% CI: 5.12 to 5.80), followed by those in the trending norms, low group identity condition (Adjusted *M* = 5.24, 95% CI: 4.92 to 5.56), the trending norms, high group identity condition (Adjusted *M* = 5.23, 95% CI: 4.90 to 5.56), and the low descriptive norms, low group

identity condition (Adjusted M = 5.02, 95% CI: 4.68 to 5.36). Thus, the data were not consistent with the hypothesis (see Tables 14 and 15 for the descriptive statistics and ANCOVA results).

BYOB only. Neither the main effect of norms inductions (p = .54, partial η^2 = .00) nor group identity manipulations (p = .998, partial η^2 = .00) on the dependent variable was significant. However, there was a significant interaction effect between the two experimental inductions on behavioral intent, $F(1, 137) = 14.05$, $p < .001$, partial η^2 = .09, which suggested that the effect of norms messages (i.e., trending norms vs. low descriptive norms) on behavioral intention depended on the levels of group identity. For the high group identity condition, stronger behavioral intention was reported by participants in the trending norms condition (Adjusted M = 5.48, 95% CI: 5.13 to 5.83) than those in the low descriptive norms condition (Adjusted M = 4.91, 95% CI: 4.58 to 5.24). However, for the low group identity condition, significantly stronger intention was found among participants in the low descriptive norms condition (Adjusted M = 5.59, 95% CI: 5.22 to 5.96) than those in the trending norms condition (Adjusted M = 4.80, 95%: CI: 4.41 to 5.18). As a result, the data were not consistent with the hypothesis (see Tables 16 and 17 for the descriptive statistics and ANCOVA results and Figure 8 for the interaction plot).

Research Questions

Research question 1. RQ1 asked which type of normative messages (trending norms vs. low descriptive norms vs. high descriptive norms) would be more influential on behavioral intention when controlling for other study variables. A one-way ANCOVA was performed to answer this question. The three norms conditions were an independent variable and behavioral intention was a dependent variable. The identified covariates were included in the analyses.

Two contexts collapsed. There was a non-significant effect of norms manipulations on the dependent variable, p = .62, partial η^2 = .00. The intention was the strongest among the

participants in the low descriptive norms condition (Adjusted M = 5.20, 95% CI: 5.03 to 5.38), followed by trending norms condition (Adjusted M = 5.18, 95% CI: 5.01 to 5.36) and high descriptive norms condition (Adjusted M = 5.09, 95% CI: 4.91 to 5.26). The descriptive statistics and ANCOVA results are presented in Tables 18 and 19.

UNPLUG only. The effect of norms inductions on intentions to unplug appliances was not statistically significant, p = .96, partial η^2 = .00. Participants in the high descriptive norms condition reported the strongest intent to unplug electronic devices when not in use (Adjusted M = 5.28, 95% CI: 5.06 to 5.49), followed by those in the low descriptive norms (Adjusted M = 5.243, 95% CI: 5.02 to 5.47) and the trending norms conditions (Adjusted M = 5.236, 95% CI: 5.02 to 5.45). The descriptive statistics and ANCOVA results are presented in Tables 20 and 21.

BYOB only. A non-significant main effect of norms inductions on the dependent variable was evidenced, p = .27, partial η^2 = .01. The strongest intention was reported among the participants in the low descriptive norms condition (Adjusted M = 5.18, 95% CI: 4.91 to 5.44), followed by those in the trending norms (Adjusted M = 5.13, 95% CI: 4.85 to 5.41) and the high descriptive norms conditions (Adjusted M = 4.88, 95% CI: 4.60 to 5.16). The descriptive statistics and ANCOVA results are presented in Tables 22 and 23.

Research question 2. RQ2 asked which type of norms messages (trending norms vs. high descriptive norms) would have a stronger impact on perceived future descriptive norms, and whether perceived future descriptive norms would mediate the message-behavioral intent relationship. Simple mediation tests using PROCESS model 4 (Hayes, 2018) in SPSS were performed to answer the research question. The independent variable was norms conditions (0 = *High descriptive norms*, 1 = *Trending norms*) and the dependent variable was behavioral intention. The identified covariates (or context-specific covariates) were included in the analyses.

Two contexts collapsed. When perceived future descriptive norms in 1 year was a mediator, a significant mediation effect was found: The indirect effect of norms manipulations on behavioral intent was significant (B = .11, 95% CI: .03 to .21), and the direct effect was not significant (B = -.01, p = .91). Participants in the trending norms condition reported significantly greater perceived prevalence of the behavior next year than those in the high descriptive norms condition (B = .29, p = .003), and participants who anticipated greater future prevalence reported a stronger intention to engage in trending pro-environmental behavior (B = .38, p < .001). However, when perceived future descriptive norms in 5 years was entered in the model as a mediator, the data showed that both indirect (B = .02, 95% CI: -.01 to .07) and direct effects (B = .07 p = .57) of norms manipulations on the dependent variable were not significant. The data showed that perceived future descriptive norms in 5 years significantly predicted behavioral intention (B = .18, p = .02). However, participants who received trending norms messages did not perceive substantially greater future prevalence of behavior 5 years later than those who received high descriptive norms messages, B = .12, p = .26. The results are presented in Tables 24 and 25.

UNPLUG only. When perceived future descriptive norms in 1 year was included in the model as a mediator, the data showed a significant mediation effect. The 95% confidence interval for the indirect effect of norms manipulations on behavioral intent did not include zero (B = .10, 95% CI: .01 to .24) and the direct effect of norms conditions on the dependent variable was not significant (B = -.14, p = .38). Participants who received trending norms messages perceived greater future descriptive norms in 1 year than those who received high descriptive norms messages (B = .42, p = .003), which in turn resulted in greater behavioral intention (B = .24, p = .02). However, when perceived future descriptive norms in 5 years was entered in the

model as a mediator, both indirect (B = .02, 95% CI: -.04 to .07) and direct (B = -.06, p = .70) effects of norms inductions on behavioral intention were not significant. There was no substantial difference in perceived descriptive norms in 5 years between the participants who received trending norms and those who received high descriptive norms messages (B = .10, p = .46). In addition, the anticipated prevalence did not significantly predict behavioral intention (B = .18, p = .06). The results are presented in Tables 26 and 27.

BYOB only. Regardless of mediators, a significant mediation effect was not found. When perceived future descriptive norms in 1 year was a mediator, a bootstrap confidence interval for the indirect effect based on 1,000 bootstrap samples included zero (B = .05, 95% CI: -.07 to .20). In addition, the direct effect of norms inductions on the dependent variable was not significant (B = .20, p = .33). The data showed that perceived future descriptive norms in 1 year significantly predicted behavioral intention to unplug electronics when not in use (B = .46, p < .001). Nonetheless, participants in the trending norms condition did not perceive substantially greater future descriptive norms than those in the high descriptive norms condition (B = .11, p = .45). When perceived future descriptive norms in 5 year was a mediator, a bootstrap confidence interval for the indirect effect also included zero (B = .02, 95% CI: -.04 to .11). In addition, the direct effect of norms manipulations on behavioral intention was not significant (B = .23, p = .27). The data showed that participants who received trending norms message did not report significantly greater perceived future descriptive norms in 5 years than those who received high descriptive norms messages (B = .08, p = .59), and their anticipated prevalence perception did not predict their behavioral intention (B = .18, p = .14). The results are presented in Tables 28 and 29.

Additional Analyses

Additional Analysis 1: Percent estimation analyses. The main effects of norms manipulations on percentage estimations (1 year and 5 years) were analyzed to examine whether participants who received low prevalence messages (i.e., those in the trending norms and low descriptive norms conditions) anticipated a majority would engage in the given behavior in the future. Two-way ANOVA (norms conditions: trending vs. low descriptive vs. high descriptive; group identity conditions: low vs. high) tests on percent estimations for 1 year and 5 years were conducted to detect the main effect of norms manipulations, the cross-over effect of group identity inductions, and the interaction effect between the two manipulations on percent estimations. When an ANOVA test showed a significant main effect, the Scheffe follow-up procedure ($p = .05$) was performed to examine pairwise differences among the conditions. The results are summarized in Table 30.

Two contexts collapsed. A two-way ANOVA indicated substantial differences in percentage estimations in 1 year across the three norms conditions, $F(2, 413) = 322.08$, $p < .001$, partial $\eta^2 = .61$. A higher anticipated percentage of prevalence was reported in the high descriptive norms condition ($M = 70.49$, $SD = 11.40$), followed by the trending norms ($M = 43.92$, $SD = 7.62$) and the low descriptive norms condition ($M = 43.30$, $SD = 11.57$). From the baseline, participants in the high descriptive norms condition anticipated an approximately 5% increase, and those in the trending and low descriptive norms conditions anticipated about a 13-14% increase of prevalence in 1 year. The Scheffe test showed that the high descriptive norms condition differed significantly from both the trending norms and low descriptive norms conditions. The data also showed a weak but significant main effect of group identity

manipulation (p = .01, partial η^2 = .02) and non-significant interaction effect (p = .25, partial η^2 = .01).

The same procedure was repeated for percentage estimations in 5 years. The data again showed a significant main effect of norms conditions, $F(2, 413) = 76.18$, $p < .001$, partial η^2 = .27. Participants in the high descriptive norms condition reported a higher percentage estimation (M = 80.42, SD = 10.60), followed by those in the trending norms (M = 63.65, SD = 14.01) and the low descriptive norms condition (M = 61.51, SD = 16.79). Compared to their responses on the estimation in 1 year, participants in the high descriptive norms condition anticipated a 10% increase (15% increase from the baseline), and those in the trending norms condition predicted a 20% increase (34% increase from the baseline), and those in the low descriptive norms condition anticipated about an 18% increase of prevalence in 1 year (32% increase from the baseline). Consistent with the percentage estimation in 1 year, the Scheffe test also showed that the high descriptive norms condition significantly differed from both the trending norms and low descriptive norms conditions. The main effect of group identity manipulation (p = .42, partial η^2 = .00) and the interaction effect (p = .84, partial η^2 = .01) were not evidenced.

UNPLUG only. The data showed a significant main effect of norms manipulations on percent estimations in 1 year, $F(2, 201) = 163.82$, $p < .001$, partial η^2 = .62. A higher percent estimation was reported among the participants who received the high descriptive norms messages (M = 69.67, SD = 12.32), followed by those who received the trending norms messages (M = 43.13, SD = 6.32), and those who were exposed to the low descriptive norms messages (M = 42.08, SD = 11.76). From the baseline, participants in the high descriptive norms condition expected approximately a 5% increase, those in the trending norms condition anticipated about a

13% increase, and those in the low descriptive norms expected a 12% increase. The Scheffe test showed that the high descriptive norms condition significantly differed from both the trending and low descriptive norms conditions. The main effect of group identity manipulation (p = .08, partial η^2 = .02) and the interaction effect (p = .07, partial η^2 = .03) were non-significant and the effect sizes were small.

A similar pattern was found for their percent estimations in 5 years. The data also showed a significant main effect of norms manipulations, $F(2, 201) = 42.77$, $p < .001$, partial η^2 = .30. Participants in the high descriptive norms conditions reported the highest estimation (M = 79.18, SD = 12.54), followed by the trending norms condition (M = 61.09, SD = 13.76), and the low descriptive norms condition (M = 58.28, SD = 17.33). Compared to their responses on percent estimations for 1 year, participants in the high descriptive norms condition predicted about a 10% increase (14% from the baseline), those in the trending norms condition anticipated about an 18% increase (31% from the baseline), and those in the low descriptive norms condition expected about a 16% increase (28% from the baseline). The Scheffe test also yielded a significant difference between the high descriptive norms condition and the other two norms conditions. The data showed a non-significant and weak main effect of group identity manipulations (p = .92, partial η^2 = .00) and the interaction effect (p = .36, partial η^2 = .01).

BYOB only. The data showed a significant main effect of norms inductions on percent estimations in 1 year, $F(2, 206) = 158.21$, $p < .001$, partial η^2 = .61. Consistent with the previous findings, the highest percent estimations were reported among the participants in the high descriptive norms condition (M = 71.37, SD = 10.34), followed by the trending norms condition (M = 44.74, SD = 8.74), and the low descriptive norms condition (M = 44.33, SD = 11.37). From the baseline, participants in the high descriptive norms condition anticipated about a 6%

increase, and those in the trending and low descriptive norms condition expected about a 14-15% increase of the behavior in 1 year. The Scheffe test showed that the high descriptive norms condition significantly differed from both the trending and low descriptive norms conditions. The data also showed a significant main effect of group identity manipulations on percent estimation in 1 year, although the effect size was small, $F(1, 206) = 4.72$, $p = .03$, partial $\eta^2 = .02$. The interaction effect was not found ($p = .94$, partial $\eta^2 = .00$).

The data also showed a significant main effect of norms manipulations on percent estimations in 5 years, $F(2, 206) = 35.81$, $p < .001$, partial $\eta^2 = .26$. Participants who received high descriptive norms messages reported higher estimates ($M = 81.75$, $SD = 7.91$) than those who received trending norms messages ($M = 66.29$, $SD = 13.87$) and low descriptive norms messages ($M = 64.22$, $SD = 15.94$). Compared to their responses on 1 year estimations, participants in the high descriptive norms condition anticipated about a 10% increase (17% from the baseline), those in the trending norms condition predicted about a 22% increase (36% from the baseline), and those in the low descriptive norms condition expected about a 20% increase (34% from the baseline). The Scheffe test showed a significant difference between the high descriptive norms condition and the other norms conditions. The main effect of group identity manipulations ($p = .23$, partial $\eta^2 = .01$) and the interaction effect ($p = .29$, partial $\eta^2 = .01$) were not significant and the effect sizes were small.

In sum, regardless of experimental contexts, participants in all norms conditions expected that the given pro-environmental behavior would be more prevalent in the future; participants in the high descriptive norms condition consistently reported a higher percent estimation than those in the other two norms conditions. In addition, those who received low prevalence messages (i.e.,

participants in the trending norms and low descriptive norms conditions) expected that the behavior would be conducted by more than half of the people in the reference group in 5 years.

Additional Analysis 2: Thematic analysis of the open-ended question. Using the participants' responses on the open-ended barrier question (asked right after the behavioral intention items), informal thematic analysis was conducted (Braun & Clarke, 2006). After discarding missing data and unusable responses,[15] data from 256 participants were analyzed. The unit of analysis was each participant's response. First, the author read through the data set and generated codes. The code generation was both deductive and inductive: It was guided by both the theoretical concepts of the current study (i.e., the focal variables and potential covariates) and the participants' responses. Given that participants were asked to provide the reasons for their behavioral decision in one or two sentences, more than one code was often generated in a single analysis unit. This step produced 32 different codes with 369 cases. Second, the author identified potential overarching themes that could describe groups of codes. In this procedure, the codes appeared less than four times (i.e., less than 1% of the total cases; 13 codes with 22 cases) were considered minor and therefore disregarded. With the remaining 19 codes with 347 cases, eight overarching themes were identified. The themes were considered internally homogeneous and externally heterogeneous. The identified themes and example comments are presented in the following sections. The selected comments were minimally edited for presentation to keep the original responses. The unique ID numbers associated with the comments were assigned in the data cleaning process before the main analyses. The descriptive statistics of thematic analysis are presented in Table 31.

[15] The responses were considered unusable when it was filled with symbols/special characters and when the participants just wrote their intention without any explanations.

Theme 1: Environmental attitudes and beliefs. The most frequently appeared theme (*n* = 98; 28.24% of 347 cases) was related to participants' attitudes toward and beliefs regarding pro-environmental behavior. Most participants reported that they concerned for the environment. For example, Participant 10 reported that "I am conscious of my environmental footprint and always plan to bring my own bags to reduce my plastic use […]; "Participant 120 mentioned that "My decision to be willing to unplug electronic devices when not in use stems from the idea of me being environmentally conscious […]." Although not many, some participants showed doubt about the effectiveness of the given pro-environmental behavior. For example, Participant 99 mentioned that "[…] I do not believe that me alone switching to my own shopping bags will make any environmental difference […]." Some participants' responses were related to the fact that the experimental stimuli did not include the factual benefits of the behavior.[16] For instance, Participant 84 reported that "This issue does not have a lot of benefits to me as the campaign did not describe any. […]"

Theme 2: Habits. The second most frequently appeared theme (*n* = 85; 24.50% of 347 cases) was habitual. Many participants reported that they were not used to do the given pro-environmental behavior, and therefore they would be likely to forget to do it. For example, Participant 6 wrote that "I know from habits formed in my family system that I will not bring my own bags to grocery shop on my own. […];" Participant 79 mentioned that "I know I should, but from bad habit, I just forget to unplug when not in use." On the other hand, some participants reported that they were already used to do the behavior, and thus they would continue to do it. For instance, Participant 125 reported that "[…] I already do bring my own bags or reuse the ones i have already collected and that is why i am more willing to bring my own bags."

[16] The benefits of the given pro-environmental behavior were presented at the end of the survey when participants were debriefed.

Theme 3: Economic reasons. The third most prevalent theme (*n* = 58; 16.71% of 347 cases) was related to economic reasons. Participants in the UNPLUG context frequently reported that they would unplug their electronics when not in use to lower their electric bills. For example, Participant 4 mentioned that "Unplugging my electronic devices when I am not using them will decrease the amount I pay for my electricity bill. […];" Participant 26 reported that "[…] willing to unplug my devices when not in use because I pay for electricity bill." Some participants in the BYOB context indicated that they would not bring their own bags for grocery shopping because they used plastic bags for other purposes. For instance, Participant 110 mentioned that "I often use grocery bags to line my trash can so I enjoy having them around. […];" Participant 149 also reported that "[…] I save the bags that I use at the store for things I do at home." Some participants who shopped at a particular grocery store reported that they would bring their own bags, because the store no longer provided plastic bags for free. For example, Participant 20 mentioned that "I am an avid shopper at Aldi, a grocery store that requires it's shoppers to bring their own bags."

Theme 4: Inconvenience. The next frequently appeared theme (*n* = 54; 15.56% of 347 cases) was a behavioral inconvenience. Regardless of experimental contexts, many participants reported that engaging in the given pro-environmental behavior would be a hassle. For example, Participant 22 mentioned that "I think that the time it takes to unplug the electronic device and the hassle of finding it and putting it back into its slot after I take it out makes me less likely to unplug my electronic device. […];" Participant 29 reported that "I feel that it is more of a hassle to actually get bags for shopping […]." Participants in the BYOB context particularly mentioned that they would not be likely to bring their own bags for grocery shopping, because oftentimes the shopping was unplanned. For example, Participant 54 mentioned that "I am not willing to

bring my own bags to the grocery store because i would have to plan ahead of time to remember to leave my own grocery bags out, which is very difficult as i never really know when i go to the grocery store;" similarly, Participant 68 also reported that "I get grocery whens I am already out and about and it is not normally planned so I don't have my bags on hand. […]"

Theme 5: Prevalence perceptions. Another theme (n = 22; 6.34% of 347 cases) was related to prevalence perceptions. For example, Participant 19 reported that "[…] now that I know other students are doing it, I wont feel weird pulling up to the store with random bags;" Participant 191 mentioned that "[…] knowing that only 30% of people actually participate makes me feel as though it isn't really an important cause that would merit much effort." Some participants specifically mentioned the ongoing trend presented in the stimuli. For instance, Participant 17 mentioned that "[…] Also, the increasing percentage of people bringing their own bags when grocery shopping shows that it is becoming a trend and will likely continue to grow." Participant 115 mentioned that "I feel that conservation of energy is an important concept that should be respected by Spartans. It seems like the amount of Spartans unplugging will increase over time."

Theme 6: Situational reasons. Another prevalent theme (n = 22; 6.34% of 347 cases) included situational reasons. Some participants in the UNPLUG condition reported that their decision would depend on the type of electronics. For example, Participant 58 mentioned that "I will unplug my phone charger when it is not in use but I will not unplug my television after I am done with it. […];" similarly, Participant 120 also reported that "[…] I am more willing to unplug devices when I don't use the device as often as others, such as a toaster (use once a week, so unplug) compared to a phone charger (use multiple times a day, so leave plugged in)." Some participants in the BYOB context mentioned that their decision would be dependent on the

amount of grocery shopping. For example, Participant 145 mentioned that "I tend to not bag things at all when I know I am only going to be purchasing one or two items. When I know that I am going to be carrying more items, I ensure I have bags with me to carry my things." Participant 215 also reported that "[…] [I']m less likely to bring my own bags if [I']m only picking up one thing, but for a big shop I always bring my own bags."

Theme 7: Group identity. The next frequently appeared theme (n = 4; 1.15% of 347 cases) was related to perceived group identity. For example, Participant 18 mentioned that "being a part of the MSU community and seeing that others in my community are doing this makes me want to do it too. […];" Participant 48 also reported that "Because other Spartans are already participating in this campaign. I feel like I should do as well."

Theme 8: Safety. The last theme (n = 4; 1.15% of 347 cases) was related to safety concerns. This theme was found among a small number of participants in the UNPLUG condition. Few participants reported that they would unplug electronics when not in use to prevent fire incidents. For instance, Participant 121 mentioned that "The hazard of fires would make me want to unplug my electronics. […];" Participant 187 also mentioned that "I unplug my devices when they are not in use to prevent electrical fires. […]"

In sum, the informal thematic analysis identified eight major themes from the participants' responses to the open-ended barrier question. Among the themes, environmental and habitual reasons encompassed more than half of the data.

Additional analysis 3: TNSB test. Given that the current research involved both the low and high descriptive norms conditions, additional analyses were conducted to test some TNSB (Rimal & Real, 2005) predictions. Specifically, the moderating roles of group identity and perceived injunctive norms on the relationship between perceived descriptive norms and

behavioral intention were examined. ANCOVA tests with experimental conditions (i.e., norms conditions: low descriptive vs. high descriptive; group identity conditions: low vs. high) as independent variables and behavioral intention as a dependent variable were first conducted. Simple moderation analyses using PROCESS model 1 (Hayes, 2018) with perception variables were followed. Specifically, perceived descriptive norms were an independent variable; perceived group identification,[17] perceived similarity, and perceived societal injunctive norms were moderators (added separately); behavioral intention was a dependent variable. Identified covariates were added in the model as covariates/control variables and all variables were mean-centered prior to analyses. When an interaction term yielded a significant R^2 change, a simple slope analysis was conducted to examine the pattern of the interaction. The results are summarized in Table 32.

Two contexts collapsed. A two-way ANCOVA was first conducted. The data showed no significant main effects of norms manipulations, $p = .31$, partial $\eta^2 = .00$, group identity inductions, $p = .90$, partial $\eta^2 = .00$, and the interaction effect, $p = .24$, partial $\eta^2 = .01$, on behavioral intent. When the effects of the covariates were considered, the strongest behavioral intention was reported among the participants in the low descriptive norms, low group identity condition (Adjusted $M = 5.28$, 95% CI: 5.03 to 5.53), followed by the high descriptive norms, high group identity condition (Adjusted $M = 5.14$, 95% CI: 4.91 to 5.38), the low descriptive norms, high group identity condition (Adjusted $M = 5.12$, 95% CI: 4.89 to 5.36), and the high descriptive norms, low group identity condition (Adjusted $M = 5.01$, 95% CI: 4.76 to 5.26). Simple moderation tests were also conducted with perception variables. The data showed that the interaction effects were not statistically significant and R^2 increases due to the interaction terms

[17] Perceived aspiration was not measured in the current research.

were minuscule, regardless of moderator: perceived group identification (R^2 change = .01, p = .12), perceived similarity (R^2 change = .00, p = .27), and perceived societal injunctive norms (R^2 change = .00, p = .58).

UNPLUG only. An ANCOVA test was first conducted. There were non-significant main effects of norms inductions (p = .82, partial η^2 = .00), group identity manipulations (p = .24, partial η^2 = .01), and the interaction effect (p = .06, partial η^2 = .03) on behavioral intention. The strongest intention was reported among the participants in the low descriptive norms, high group identity condition (Adjusted M = 5.49, 95% CI: 5.18 to 5.79), followed by the high descriptive norms, low group identity condition (Adjusted M = 5.35, 95% CI: 5.06 to 5.63), the high descriptive norms, high group identity condition (Adjusted M = 5.24, 95% CI: 4.96 to 5.51), and the low descriptive norms, low group identity condition (Adjusted M = 5.03, 95%: CI: 4.73 to 5.33). Regression tests with perception variables were followed. The data showed a significant interaction effect between perceived descriptive norms and perceived group identification on the dependent variable, B = -.07, t = -2.88, R^2 change = .04, p = .005. A simple slope analysis revealed that, however, the direction was not consistent with the TNSB prediction. Regardless of perceived group identification with a reference group, an increase in perceived descriptive norms enhanced behavioral intention. Nonetheless, the effect of perceived descriptive norms on behavioral intention was greater for those with low perceived group identification than those with high perceived group identification (see Figure 9). When perceived similarity (R^2 change = .00, p = .36) and perceived societal injunctive norms (R^2 change = .01, p = .30) were moderators, the R^2 changes were minimal and the interaction terms were not significant.

BYOB only. There were weak and non-significant main effects of norms manipulations (p = .08, partial η^2 = .02) and group identity manipulations (p = .63, partial η^2 = .00) on behavioral

intention. However, a significant interaction effect between the two conditions on behavioral intention was evidenced, $F(1, 137) = 8.36$, $p = .004$, partial $\eta^2 = .06$. Nonetheless, the analysis revealed that the pattern was not consistent with the theory prediction: Greater behavioral intention was reported by participants in the low descriptive norms, low group identity condition (Adjusted $M = 5.49$, 95% CI: 5.11 to 5.87), followed by those in the high descriptive norms, high group identity condition (Adjusted $M = 5.07$, 95% CI: 4.70 to 5.44), the low descriptive norms, high group identity condition (Adjusted $M = 4.86$, 95% CI: 4.52 to 5.20), and the high descriptive norms, low group identity condition (Adjusted $M = 4.62$, 95% CI: 4.23 to 5.02); a significant difference was evidenced between the low and high descriptive norms under the condition of low group identity. A regression test also showed a significant interaction effect between perceived descriptive norms and perceived group identification on the dependent variable, $B = .12$, $t = 3.47$, R^2 change = .05, $p < .001$. A simple slope analysis showed a crossover interaction: Participants with low perceived identification, increase in perceived descriptive norms weakened behavioral intention. On the other hand, participants with high perceived identification, increase in prevalence perceptions strengthened their intention to bring their own bags for grocery shopping (see Figure 10). A significant interaction effect and R^2 increase were not evidenced when perceived similarity (R^2 change = .01, $p = .18$) and perceived societal injunctive norms (R^2 change = .00, $p = .39$) were moderators.

DISCUSSION

Social norms theories and practice rely on a majority effect. Theories elucidate how perceptions about what most others do and dis/approve of drive behavior. Likewise, communication interventions which use social norms may focus on providing information about normal or dis/approved behavior. Given the reliance on a majority effect in social norms theories, there is a gap in our understanding of when and how social norms emanating from a numerical minority can be influential, despite theories and evidence from minority influence and positive deviance literature. In addition, existing theories do not provide a systematic explanation or prediction for the effect of changes in the number of people in the reference group (that is, changes in the percentage of people who enact the desirable behavior) and how those changes impact people's normative perceptions and behavioral decisions. These theoretical voids can result in practical challenges because there are situations where norms are dysfunctional and prosocial behaviors are trending among a group of people (e.g., when a problematic behavior is widespread in a group or community, whereas a recommended behavior is only conducted by a small number of people in the group). In such a situation, solutions cannot be based on traditional social norms theories and practices that rely on the influence of the majority. Using the concept of trending norms, the current research tried to bridge these theoretical gaps and tackle the practical issue of how to approach social norms interventions when there is not a numerical majority of people who engage in a behavior.

Trending norms messages highlight an increasing prevalence of a particular behavior, when a numerical majority in a group is not doing the behavior. Prior studies have shown evidence for an indirect effect of trending norms messages on behavior via anticipated future prevalence (Mortensen et al., 2019; Sparkman & Walton, 2017). Nonetheless, much is unclear

about the effect of trending norms messages on normative perceptions and behavior. The current research examined the effect of trending norms messages on behavioral intention via the perceived future descriptive norms. The effect was compared, not only with low descriptive norms, but also high descriptive norms messages. In addition, the current study developed measurement items for perceived trending norms to examine the effect of trending norms messages on people's normative perceptions. Furthermore, this study tested the moderating role of group identity on the relationship between trending norms messages and behavior. The data showed the mediation effect of perceived future descriptive norms on the message-behavioral intention relationship. Participants who received trending norms messages generally perceived greater future descriptive norms than those who received low and high descriptive norms messages, which resulted in greater behavioral intention. Although the trending norms messages from in-group similar others were not substantially more influential than the other types of messages, the pattern of the message effect was dependent on how the reference group is perceived. In the subsequent sections, the results and their implications are discussed.

Trending norms indirectly influenced behavioral intention. When the effects of trending norms messages were compared with low descriptive norms messages, the data were mostly consistent with the mediating mechanism across the two different mediators (i.e., perceived future descriptive norms in 1 year and 5 years) and the two experimental contexts. Relative to low descriptive norms messages, trending norms messages led to greater perceived future descriptive norms and those who perceived greater future descriptive norms showed stronger behavioral intention to engage in the trending behavior. This finding cumulates additional evidence of the mediating role of perceived future descriptive norms found in previous studies,

by testing the relationship in two different pro-environmental behavior contexts (Mortensen et al., 2019; Sparkman & Walton, 2017).

The indirect effect of trending norms messages on behavioral intention was also evidenced when the effect was compared with high descriptive norms messages, when perceived future descriptive norms in 1 year was a mediator. In other words, participants who received trending norms messages perceived even greater future prevalence of given pro-environmental behavior in 1 year than those who received high descriptive norms messages. In addition, those who anticipated greater future prevalence then reported significantly stronger intention to conform to the trending behavior. Although this pattern was not evidenced in the context of BYOB and/or when perceived future descriptive norms in 5 years was a mediator, the finding itself is interesting and sheds light on the comparative effect of trending norms messages and high descriptive norms messages on behavior. In other words, the data suggests that a low prevalence message can be even more influential than a traditional high prevalence message, if the former has trending information in it. Future research replicating this finding in different topics is strongly encouraged to have a clearer understanding of the influence of trending norms, compared to traditional high descriptive norms messages.

Even though the data were largely consistent with the predicted mediation mechanism, the patterns were not identical across the experimental contexts; the possibility of this was the rationale for including multiple contexts. For instance, the effect of norms manipulations (low descriptive norms vs. trending norms) on the intention to bring one's own bags to shop was mediated by perceived future descriptive norms in 1 year. However, the effect of the norms inductions on the intent to unplug was mediated by perceived future descriptive norms in 5 years. This finding buttresses the importance of considering behavioral attributes in social norms

research (Rimal, Lapinski, Turner, & Smith, 2011). In other words, although both behaviors are environmentally friendly, each behavior has different underlying characteristics, which may have different interaction patterns with normative influence.

Bringing one's own bags for grocery shopping is arguably more well-known and public pro-environmental behavior compared to unplugging electronics when not in use which is typically private or unobserved. In addition, many states in the U.S. have banned or charged fees for single-use plastic bags (National Conference of State Legislatures, 2020). Although this was not the statewide case for Michigan when the study was conducted, it is possible that there were many participants aware of the regulations for single-use plastic bags in other states. These behavioral characteristics can prompt people to be more frequently exposed to information regarding what is normal and socially dis/approved behavior, which reinforces their normative perceptions about the behavior (or makes the existing norms salient) and propels the subsequent normative conformity. As a result, it is possible that people who are exposed to trending norms messages regarding familiar, public, and regulatory behavior anticipate significantly greater future prevalence of the behavior in the near future, relative to those who receive low descriptive norms messages, which in turn results in greater behavioral intention to conform to the trending norms.

On the other hand, people are less likely to be exposed to social prevalence and dis/approval information regarding unfamiliar, private, and unregulated behaviors, which arguably hinders norms reinforcement and delays normative conformity. Consequently, there may be no significant difference in anticipated prevalence of the behavior in the near future between people who receive trending norms messages and those who receive low descriptive norms messages; however, it is likely that there is a significant difference in the anticipated

prevalence in the distant future, which drives subsequent behavioral intention to engage in this type of behavior. Future research on different, diverse topics is strongly encouraged to increase internal and external validity and to have a clearer understanding of how various behavioral attributes influence the effect of trending norms messages.

Low descriptive and trending norms messages did not directly induce substantial differences in behavioral intention regardless of the reference groups. Nonetheless, the pattern of the effect of these messages was dependent on how participants perceived the groups depicted in the messages. Trending norms messages were more influential than low descriptive norms messages when the reference group is perceived as in-group and similar to oneself. On the contrary, low descriptive norms messages were more influential than trending norms messages when the reference group is perceived as out-group and dissimilar to him/herself and a rival. This finding can be understood in the context of dysfunctional rival effect. Several studies showed how rivalry can lead to antisocial and negative behaviors especially among sport fans such as aggression toward and discrimination against rivals (Cobbs, Sparks, & Tyler, 2017; Havard, Wann, & Ryan, 2017). Based on social identity approach, it has been theorized that such phenomena are the manifestations of in-group bias and out-group rejections (Cobbs, Martinez del Campo del Castillo, Tyler, & Ditter, 2019), which is prominent with heightened in-group identification in an intergroup competition context. This may be the case for the current study.

Although the current research was situated as a research collaboration project between two universities, there is a possibility that participants might surmise that the study was an intergroup competition. This study purposefully limited the participants to students in one university and used a rival university as an out-group to induce group identity. In fact, a substantial difference in perceived group identification between participants in high and low

group identity conditions was evidenced. Given that rivalry itself is a competitive concept, the mere presence of the rival university (the rival university's name and logo were presented in the study introduction for all participants) might cause misconceptions about the study. In addition, because trending norms messages lead to greater anticipated future prevalence perceptions than low descriptive norms messages, people may be more likely to have negative attitudes or perceptions regarding an increasingly prevalent behavior than a low prevalent behavior in a rival out-group. Consequently, it is possible that participants showed less intention to conform to a trending behavior than a low prevalent behavior in the rival university. Notably, the current research measured rivalry effect as a potential covariate using items modified from prior studies; however, a strong association with the behavioral intention was not evidenced. A future study with another set of items for measuring rivalry is encouraged to better understand how rivalry interacts with trending norms messages.

Without passing through the mediator, there was no difference in behavioral intention among the participants who received different types of norms messages (i.e., trending norms vs. low descriptive norms vs. high descriptive norms). In addition, in some cases, even stronger intention was reported among the participants who received low descriptive norms messages than those who received high descriptive norms messages, which is inconsistent with social norms theories. This may be due to social desirability bias, when considering the current study contexts and method. In other words, because pro-environmental behaviors are socially favorable, and because the current study used self-reported behavioral intention as a proxy measure of behavior, the reported perceived descriptive norms and behavioral intention could be consistently inflated across the norms conditions. If the current research had adopted lab- or field-based experiments and focused on actual behavior as an outcome variable (e.g., turning off

lights when leaving an empty room), a significant difference among the norms conditions could have been evidenced.

In addition to the main theoretical foci of the current research, several motivators and barriers for engaging in pro-environmental behaviors were also identified using informal thematic analysis. Specifically, environmental attitudes/beliefs and habitual reasons were the most prevalent themes. The current research measured relevant perceptions and concepts as potential covariates (e.g., attitude toward the behavior, existing pro-environmental behavior, etc.) and included these variables in the main analyses to statistically control their effect. Caution should be taken with the generalization of the study findings due to the non-probability sampling method; nonetheless, future research on pro-environmental behaviors may benefit from considering the influence of these motivators and barriers on the theoretical relationship of interest.

The current research tested part of the TNSB predictions. The effect of perceived descriptive norms on behavioral intention was dependent on perceived group identification, but not on perceived similarity, in the two experimental contexts. While this finding may be in line with TNSB literature that has shown inconsistent findings regarding the moderating role of group identity, it is possible that other group-related perceptions matter more than perceived similarity to the effect of descriptive norms on pro-environmental behavior/behavioral intention. For example, given that a positive, socially desirable behavior is widely prevalent, one's aspiration to emulate the reference group's behavior (i.e., perceived aspiration; Rimal & Real, 2005) may be more influential than his/her perception of how intellectually similar the person and the other group members are. In addition, because a given positive prevalent behavior can possibly enhance the image of the group one belongs to, the extent to which a person values

group goals over individual goals (i.e., group orientation, Lapinski et al., 2007) may be also highly relevant to the effect of descriptive norms on behavior.

Another prediction of TNSB, the moderating effect of perceived societal injunctive norms, was not evidenced across the experimental contexts. This finding may be due to the recent trend that pro-environmental behaviors are generally considered socially desirable. Indeed, the reported perceived societal injunctive norms were overall high[18] and had smaller standard deviation compared to the other study variables (e.g., perceived descriptive norms M = 4.74, SD = 1.39). Thus, it is possible that there was not much covariation between the predictors. Although the interaction term was not statistically significant, the nature of the relationship was consistent with the theory's prediction: the influence of perceived descriptive norms on behavior (collapsed) became stronger as perceived injunctive norms increased, and people who perceived stronger injunctive norms were more susceptible to prevalence perceptions than those who perceived weaker injunctive norms. A significant interaction effect could have been evidenced if the study had involved more controversial pro-environmental behavior (e.g., meat consumption reduction).

The current research has numerous practical implications. The significant mediation effects across the two behavior contexts suggest that the influence of trending norms messages on behavioral intention via perceived future descriptive norms is robust, especially when it is compared with low descriptive norms messages. Therefore, communication campaign designers who are trying to bring positive social change when social norms are dysfunctional (e.g., a PDA) should consider using a trending norms message if there is an ongoing increasing trend of positive behavior. When considering the importance of perceived future descriptive norms for

[18] A one-sample t-test showed that the mean score for perceived societal injunctive norms (M = 5.03, SD = .95) was significantly higher than the scale midpoint, M_{diff} = 1.03, $t(418) = 22.33$, $p < .001$, 95% CI = .94 to 1.13.

the trending norms message effect, communication campaign designers may want to incorporate additional messages to induce greater anticipated prevalence in the future (e.g., "this trend is expected to continue in the future").

The robust indirect effect of trending norms also has practical implications in prioritization, when several health or environmental issues co-exist in a given group or community. In addition to conventional criteria and/or defined processes that help influence the decision-making process, communication campaign designers may also need to see if a negative and undesirable behavior is increasingly prevalent. This type of behavior may need to be addressed early, before the community members perceive the increasing trend. Nonetheless, caution should be taken when designing trending norms messages, because the message effect is dependent on how a recipient perceives the reference group in the message. It is strongly recommended that a rival out-group's trend not be used in the message, because it may result in adverse outcomes.

In sum, the current research systematically explains the process by which messages about a numerical minority (i.e., positive deviants) influence people's behavioral intention through anticipated prevalence perceptions, when the messages contain increasing trend information. The current study provides evidence of the robust indirect effect of trending norms messages on the intention to engage in pro-environmental behavior via perceived future descriptive norms, especially when it is compared with low descriptive norms messages. In addition, this research also shows that the messages effects on behavioral intention are dependent on how the reference group is perceived by the message recipients. When the reference group is perceived as an in-group and similar to oneself, trending norms messages are more influential than low descriptive norms messages; on the other hand, when the reference group is perceived as an out-group and

dissimilar to oneself, low descriptive norms messages are more influential than trending norms messages. Communication interventions with trending norms messages may be a promising way to bring positive social change when norms are dysfunctional, if there is an ongoing increasing trend in recommended behavior in the group of interest.

LIMITATIONS

The current research is not without limitations. One may argue that the effect of trending norms evidenced in the current research may be due to a mere exposure to experimental stimuli, because the current research did not have a control group. This study did not involve a control group because the comparison between trending norms messages and low/high descriptive norms messages was the main focus. In addition, the current research tried to minimize the effect of extraneous factors by random assignment, measuring potential confounders theorized and evidenced in previous literature, statistically identifying optimal covariates, and including the selected covariates in the analyses. Replicating the current research with a control group may be a meaningful future direction for a better understanding of the effect of trending norms messages.

One may also argue that this study has the limited ability to detect the duration of the message effects (Lewis & Neighbors, 2006). Notably, participants were exposed to a single message and their perceptions were measured once, immediately after the message exposure. However, trending norms research is still at its early stage; indeed, the effect of trending norms messages on normative perceptions had rarely been reported. Thus, even the investigation of short-term effects of trending norms messages is considered worthwhile and has numerous theoretical and practical implications. A meta-analysis shows that the effect of norms manipulations on behavior/behavioral intention vary per the number of message exposures and the assessment timing (Rhodes, Shulman, & McClaran, 2020). For example, the effect of descriptive norms manipulations (a single exposure) on behavioral intention is stronger when it is measured in a delayed follow-up session compared to when it is measured immediately after the message exposure. It is possible that the effect of trending norms messages can also vary

based on the number of message exposures, study duration, session timing, etc. Given that the lack of longitudinal study design is one of the shortcomings of social norms research in communication literature (Shulman et al., 2017), replicating this study with a different experimental design (e.g., longitudinal designs with multiple sessions) is strongly encouraged for future research.

It is still unclear how other individual characteristics or contextual factors (Chung & Rimal, 2016) may interact with the effect of trending norms messages on behavior/behavioral intention. The current research was intended to investigate the moderating role of group identity, and thus other potential confounders (e.g., innovativeness and perceived societal injunctive norms) were measured and controlled to test the focal relationship of interest. However, when considering the nature of trending norms, early adopters (Rogers, 1962) and those who fear missing out may be more willing to engage in trending behaviors than others. Similarly, a person who plays an opinion leading role in a given network or community is more likely to conform to trending norms than others. It will be both theoretically and practically meaningful if future research investigates the effect of other potential moderators on the relationship between the trending norms messages and behavior/behavioral intention.

CONCLUSION

Social norms research has shown the effect of perceived norms on various behaviors and how communication can affect normative perceptions. However, existing social norm theories provide limited insights for when and how a numerical minority can be influential. In addition, social norms theories do not explicate how changes in the number of people enacting a behavior might influence normative response. These theoretical gaps limit the applicability of social norms theories in practice, especially when norms are dysfunctional: a problematic behavior is widespread in a group or community, whereas a recommended behavior is conducted by a small portion of people in the group. Theorizing about trending norms can shed light on these issues. Findings showed that trending norms messages led to anticipated future prevalence of the behavior, which in turn motivated normative conformity. In addition, the effect of trending norms messages on behavioral intention was dependent on group identity. The current research has both theoretical and practical implications. Theoretically, it systematically elucidates how a low prevalence message indirectly motivate normative conformity, when the message has trending information. In addition, the current research also shows that the pattern of the trending norms message effect is different when the reference group is considered in-group similar and out-group dissimilar to oneself. Practically, the findings imply that designing communication campaigns with trending norms is one promising way to bring positive social change when traditional social norms theories and practices cannot be applied. However, caution should be taken because trending norms from a rival out-group can result in negative outcomes.

APPENDICES

APPENDIX A

Full version of measurement items

7-point Likert Scale
(1 = *Strongly Disagree*; 2 = *Moderately Disagree*; 3 = *Slightly Disagree*; 4 = *Neither Agree nor Disagree*; 5 = *Slightly Agree*; 6 = *Moderately Agree*; 7 = *Strongly Agree*)

*Item dropped to improve factor model fit.

Current Prevalence

1. Based on the campaign messages you just reviewed, according to the data source, what percentage of Spartans are unplugging their electronic devices when not in use? (Move the slide below to indicate the percentage)

Perceived Future descriptive norms: One year, Five year (Mortensen et al., 2019; Rimal & Real, 2005)

1. Next year* (Five years from now), I think an increasing number of Spartans (Wolverines) will unplug their electronic devices when not in use / bring their own bags for grocery shopping.
2. Next year (Five years from now*), I think it will become a more prevalent practice among Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.
3. Next year (Five years from now), I think unplugging electronic devices when not in use / bringing their own bags for grocery shopping will become increasingly common among Spartans (Wolverines) students.
4. Next year (Five years from now), I think there will be an increasing trend in Spartans (Wolverines) being likely to unplug electronic devices when not in use / bring their own bags for grocery shopping.
5. Next year (Five years from now), I think it will become more popular for Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.

- What percentage of Spartans (Wolverines) do you expect to be unplugging electronic devices / bring their own bags for grocery shopping a year from now (five years from now)? (Move the slide below to indicate the percentage)

Behavioral Intent (Ajzen, Joyce, Sheikh, Cote, 2011; Ajzen, 2015; Lapinski et al., 2007)

1. I am planning to make sure I unplug electronic devices when not in use / bring my own bags for grocery shopping.
2. I am planning to make sure I do not leave electronic devices plugged in when not in use / forget to bring my own bags for grocery shopping.*
3. Next time I leave my home, I will unplug electronic devices not in use / go for grocery shopping, I will bring my own bags.
4. I intend to unplug electronic devices when not in use / bring my own bags for grocery shopping.*

5. I am likely to unplug electronic devices when not in use / bring my own bags for grocery shopping.
6. I have decided to unplug electronic devices when not in use / bring my own bags for grocery shopping.*
7. I expect I will unplug electronic devices when not in use / bring my own bags for grocery shopping.

Barrier Question

1. In one or two sentences, please explain your response. What are the things that make you more or less willing to unplug electronic devices when not in use / bring your own bags for grocery shopping? (open-ended)

Perceived Trending Norms

Perceived descriptive norms (Rimal & Real, 2005)

1. I think most Spartans (Wolverines) unplug their electronic devices when not in use / bring their own bags for grocery shopping.*
2. I think it is a prevalent practice among Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.
3. I think unplugging electronic devices when not in use is common among Spartans (Wolverines) / bringing their own bags for grocery shopping.
4. I think it is popular for Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.

Perceived increasing trend (L) (Rimal & Real, 2005)

1. I think an increasing number of Spartans (Wolverines) unplug their electronic devices when not in use / bring their own bags for grocery shopping.
2. I think it has become a more prevalent practice among Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.
3. I think unplugging electronic devices when not in use / bringing their own bags for grocery shopping has become increasingly common among Spartans (Wolverines).
4. I think there is an increasing trend in Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.
5. I think it has become more popular for Spartans (Wolverines) to unplug electronic devices when not in use / bring their own bags for grocery shopping.*

Perceived increasing trend (B) (Robins et al., 2005; Wolf et al., 1991)

How would you describe the popularity of unplugging behavior among Spartans (Wolverines)? Is it… (7 point bi-polar; Not at all – Very much)

1. Increasing?
2. Ascending?*
3. Rising?
4. Escalating?
5. Going up?

Perceived Group Identity

Perceived group identification (David & Turner, 1996; Doosje et al., 1995; Terry & Hogg, 1996; Smith, et al., 2007)

1. I identify with other Spartans (Wolverines).*

2. I feel strong ties with Spartans (Wolverines).
3. I see myself belonging to MSU (U of M).
4. I see myself as a Spartan (Wolverine).
5. I am pleased to be a Spartan (Wolverine).

Perceived similarity **(**Rimal & Real, 2005)

I think most Spartans (Wolverines) are similar to me…

1. Intellectually
2. In the way they think
3. In their values
4. In their behaviors

Existing Pro-environmental Behavior (Ajzen, 2015; Ajzen et al., 2011)

Existing energy saving/plastic waste reduction behavior

1. I make an effort to conserve energy / reduce my plastic waste in my daily living.
2. Thinking back over the past few weeks, I have conserved a great deal of energy / reduced a great deal of plastic waste.

Existing pro-environmental behavior

How frequently did you perform each of the following behaviors? (Never – Very rarely – Rarely – Occasionally – Frequently – Very frequently – Always)

3. I walk, ride a bicycle, or take public transportation to work or school.*
4. I carpool with at least one other person to work or school.*
5. I wait until I have a full load before doing my laundry.*
6. When shopping, I ask for paper bags rather than plastic ones.*
7. I regularly read at least one environmental journal/magazine (hard-copy or online).*
8. I make sure to recycle regularly (e.g., glass bottles, paper, and plastic).*
9. I make a genuine effort to turn off electricity when not in use.*
10. I unplug electronic devices that I am not using.*
11. When shopping, I bring my own bags.*

Attitude toward Behavior (7 point bi-polar) (Ajzen, 2015; Ajzen et al., 2011)

For me, taking steps to conserve energy / reduce plastic waste is:

1. Unpleasant – Pleasant*
2. Dislike – Like*
3. Negative – Positive
4. Undesirable – Desirable
5. Unwise – Wise
6. Bad – Good

Attitude toward Campaign (bi-polar) (Alhabash et al., 2015; Choi et al., 2001)

For me, the campaign messages I just reviewed were:

1. Negative – Positive
2. Bad – Good
3. Unfavorable – Favorable
4. Dislikeable – Likeable
5. Unenjoyable – Enjoyable*
6. Unpleasant – Pleasant

7. Unappealing – Appealing
8. Uninteresting – Interesting*
9. Awful – Nice

Perceived Societal Injunctive Norms (Lapinski, Anderson, et al., 2013; Park & Smith, 2007)

1. A majority of people in the United States approve of unplugging their electronic devices when not in use / bringing their own bags for grocery shopping.
2. A majority of people in the United States endorse unplugging their electronic devices when not in use / bringing their own bags for grocery shopping.
3. A majority of people in the United States support that individuals unplug their electronic devices when not in use / bring their own bags for grocery shopping.
4. Unplugging my electronic devices when not in use / bringing my bags for grocery shopping is something that most people think I should do.
5. Most people may judge me based on whether or not I unplug my electronic devices when not in use / bring my own bags for grocery shopping.*
6. I feel like most people would think less of me if I did not unplug my electronic devices when not in use / bring my own bags for grocery shopping.*

Rivalry Effect (James & Eisenberg, 2004; Smith & Schwarz, 2003; Smith et al., 2007)

1. I would tell a U of M student why their university is inferior to MSU.
2. If I were to hear a U of M student criticize something about MSU, I would tell the U of M student why he or she is wrong.*
3. I would be willing to tell a U of M student why MSU is a better university.
4. I feel warm (favorable) when I think of MSU.*
5. I feel cold (unfavorable) when I think of U of M.

Believability (Lapinski et al., 2013)

1. The campaign messages I just reviewed were believable.

Innovativeness (Hurt, Joseph, & Cook, 1977)

1. I enjoy trying out new ideas.*
2. I seek out new ways to do things.*
3. I am generally cautious about accepting new ideas. (reverse-coded)
4. I rarely trust new ideas until I can see whether the vast majority of people around me accept them. (reverse-coded)
5. I feel that I am an influential member of my group.
6. I am aware that I am usually one of the last people in my group to accept something new. (reverse-coded)
7. I am reluctant about adopting new ways of doing things until I see them working for people around me. (reverse-coded)
8. I am receptive to new ideas.*

Political Orientation (Anderson, 2017; Sparkman & Walton, 2017)

How would you describe your political orientation? (Very liberal – Very conservative)

Demographics

1. Are you an MSU student? (Yes, No, Other)
2. Are you a U of M student? (Yes, No, Other)
3. Are you a resident in Michigan? (Yes, No, Other)
4. What is your age? (numbers only; open-ended)
5. What is your gender?
    a. Male
    b. Female
    c. Other
6. How would you describe your racial background?
    a. White
    b. Black or African American
    c. American Indian or Alaska Native
    d. Asian
    e. Native Hawaiian or Other Pacific Islander
    f. Other
    g. Prefer not to answer
7. What is your employment status?
    a. Employed – Full time
    b. Employed – Part time
    c. Self-employed
    d. Student (not employed)
    e. Not employed
    f. Other
8. About how much money did you personally make working last year? (Amount before taxes and other deductions from wages, salary, tips, bonuses from all jobs) (actual number) (open-ended)
9. Do your parents or someone else provide you with financial support for living expenses?
    a. Yes
    b. No
    c. Other
10. What is your highest level of educational attainment?
    a. Less than high school
    b. High school graduate
    c. Some college, no degree
    d. Associate's degree, occupational
    e. Associate's degree, academic
    f. Bachelor's degree
    g. Master's degree
    h. Professional degree
    i. Doctoral degree
11. What is your housing type?
    a. Residence hall
    b. Apartment
    c. House
    d. Other
12. Do you own or rent?

a. Own
b. Rent
c. Other

13. Do you pay for your electricity (recycling, waste disposal, and trash removal services)?
    a. Yes
    b. No
    c. Don't know
    d. Other (e.g., someone else pays)
14. If you know, how much on average do you pay monthly for your electricity (the services)? (open-ended)

APPENDIX B

Tables

Table 1.

Demographic information of the study sample including number (N) and percentage (%) of participants representing each category

		N	%
Gender			
	Male	130	31.0
	Female	286	68.3
	Other	3	0.7
	Total	419	100
Race/Ethnicity			
	White	242	57.8
	Black or African American	58	13.8
	American Indian or Alaska Native	57	13.6
	Asian	49	11.7
	Other	7	1.7
	Prefer not to answer	6	1.4
	Total	419	100
Employment			
	Employed – Full time	7	1.7
	Employed – Part time	110	26.3
	Self-employed	87	20.8
	Student (not employed)	205	48.9
	Not employed	8	1.9
	Other	2	0.5
	Total	419	100

Table 1 (cont'd).

		N	*%*
Education			
	High school graduate	118	28.2
	Some college, no degree	254	60.6
	Associate's degree, occupational	1	0.2
	Associate's degree, academic	15	3.6
	Bachelor's degree	30	7.2
	Doctoral degree	1	0.2
	Total	419	100
Housing type			
	Residence hall	100	23.9
	Apartment	215	51.3
	House	96	22.9
	Other	8	1.9
	Total	419	100
Home ownership status			
	Own	106	25.3
	Rent	252	60.1
	Other	61	13.6
	Missing	4	1.0
	Total	419	100
Do you pay for your electricity or garbage disposal service?	Yes	175	41.8
	No	182	43.4
	Don't know	30	7.2
	Other	30	7.2
	Missing	2	0.5
	Total	419	100

Table 2.

Scale reliabilities and fit indices for measurement models

Variable	α	χ2 (*df*)	CFI	TLI	RMSEA [90% CI]	SRMR	# of items
Perceived future descriptive norms (1 year)	.88	1.08 (2)	1.00	1.00	.00 [.00, .08]	.01	4
Perceived future descriptive norms (5 years)	.87	1.20 (2)	1.00	1.00	.00 [.00, .08]	.01	4
Behavioral intention	.91	.56 (2)	1.00	1.00	.00 [.00, .07]	.00	4
Perceived descriptive norms	.91						3
Perceived increasing trend (L)	.88	1.37 (2)	1.00	1.00	.00 [.00, .09]	.01	4
Perceived increasing trend (B)	.85	3.94 (2)	1.00	.99	.05 [.00, .12]	.01	4
Perceived group identification	.95	7.69 (2)	1.00	.99	.08 [.03, .15]	.01	4
Perceived similarity	.85	7.18 (2)	.99	.98	.08 [.02, .14]	.02	4
Existing pro-environmental behavior	.68						2
Attitude toward behavior	.82	.00 (2)	1.00	1.00	.00 [.00, .00]	.00	4
Attitude toward campaign	.89	24.04 (14)	.99	.99	.04 [.01, .07]	.02	7
Perceived societal injunctive norms	.70	3.29 (2)	1.00	.99	.04 [.00, .11]	.02	4
Rivalry	.82						3
Innovativeness	.68	19.02 (5)	.97	.95	.08 [.05, .12]	.03	5

Note. α refers to Cronbach's alpha.

Table 3.

Zero-Order correlations, means (M), and standard deviations (SD) of measured variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Behavioral intention																			
2	Future DN (1year)	.37**																		
3	Future DN (5 years)	.29**	.59**																	
4	Descriptive norms	.35**	.42**	.18**																
5	Increasing trend (L)	.47**	.67**	.50**	.60**															
6	Increasing trend (B)	.37**	.56**	.44**	.52**	.68**														
7	Group identification	.16**	.09	-.02	.21**	.07	.10*													
8	Perceived similarity	.21**	.16**	.10*	.26**	.19**	.21**	.53**												
9	Exist. pro-env. bhvr.	.54**	.32**	.26**	.34**	.38**	.31**	.08	.16**											
10	Attitude (behavior)	.09	.08	.31**	-.32**	.05	-.07	-.22**	-.16**	.08										
11	Attitude (campaign)	.18**	.30**	.39**	-.06	.25**	.20**	-.09	.02	.24**	.55**									
12	Injunctive norms	.40**	.28**	.11*	.45**	.43**	.34**	.27**	.24**	.31**	-.12*	.08								
13	Rivalry	.09	.08	-.04	.37**	.19**	.20**	.21**	.16**	.07	-.34**	-.17**	.22**							
14	Innovativeness	.15**	.13**	.06	.17**	.19**	.19**	.16**	.16**	.20**	-.08	-.08	.18**	.07						
15	Age	.17**	.10*	-.05	.29**	.18**	.17**	.12*	.12*	.14**	-.25**	-.15**	.21**	.16**	.21**					
16	Income	.20**	.13*	-.15**	.54**	.27**	.31**	.34**	.27**	.21**	-.56**	-.33**	.39**	.44**	.37**	.51**				
17	Monthly bill	.10	.02	.01	.12	.06	.04	.19**	.04	.05	-.01	-.01	.02	.08	.18**	.07	.07			
18	Political orientation	-.03	.01	-.10*	.15**	-.02	.07	.10*	.04	.00	-.30**	-.13**	.12*	.12*	-.10*	.08	.24**	-.03		
19	Believability	.21**	.30**	.28**	.11*	.32**	.24**	.06	.16**	.23**	.20**	.33**	.21**	-.01	.16**	-.05	-.06	.03	-.11*	
	Low GI vs High GI	.03	-.01	-.06	-.04	-.10*	-.07	.65**	.25**	-.02	-.02	-.01	.10*	.07	-.04	.01	.00	.24**	-.01	-.01
	Low DN vs TN	-.02	.32**	.17**	.06	.24**	.22**	-.08	-.09	.00	.04	.14*	-.10	-.07	-.01	-.06	-.07	.02	-.03	-.01
	Low DN vs High DN	-.08	.16**	.09	.20**	.16**	.07	-.06	-.05	-.05	.06	.06	.00	.01	-.03	.00	-.07	.12	-.02	-.08
	High DN vs TN	.06	.18**	.08	-.15*	.07	.17**	-.02	-.05	.06	-.02	.07	-.10	-.09	.03	-.06	.00	-.10	-.01	.08
	Participation pool	.27**	.22**	.07	.36**	.32**	.23**	.21**	.16**	.30**	-.20**	-.13**	.23**	.20**	.28**	.42**	.52**	.11	-.02	.07
	M	5.16	5.29	5.67	4.74	5.11	5.13	4.79	5.06	5.07	6.15	5.85	5.03	4.58	4.73	20.69		28.53	3.72	5.57

Table 3 (cont'd).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SD	1.28	.99	.91	1.39	1.04	1.04	1.96	1.14	1.12	.82	.81	.95	1.45	.90	1.67		16.75	1.67	1.04

Note. * $p < .05$, ** $p < .01$. Future DN = Perceived Future Descriptive Norms; Increasing Trend (L) = Perceived Increasing Trend (Likert-type scaled items); Increasing Trend (B) = Perceived Increasing Trend (Bi-polar scaled items); Exist. pro-env. bhvr. = Existing Pro-environmental Behavior; Political orientation = 1 = Very liberal, 7 = Very conservative; Low GI vs High GI = Group Identity Conditions (0 = Low group identity, 1 = High group identity); Low DN vs TN = Norms Conditions (0 = Low descriptive norms, 1 = Trending norms); Low DN vs High DN = Norms Conditions (0 = Low descriptive norms, 1 = High descriptive norms); High DN vs TN = Norms Conditions (0 = High descriptive norms, 1 = Trending norms); Participation pool = Research Participation Pools (0 = Student-only pool, 1 = public pool); Income $M = 13916.67$, $SD = 10139.06$.

Table 4.

Pilot tests summary

	Norms manipulation	Group identity manipulation	Changes
Pilot 1 (N = 79)	Partially successful; a minuscule effect of norms manipulations on perceived increasing trend (Partial η^2 = .02)	Partially successful; a weak effect of group identity manipulations on perceived similarity (r = .07)	• The university for low group identity manipulations was changed from Rutgers to U of M. • A common task (i.e., describing three positive characteristics of typical MSU students) was added.
Pilot 2 (N = 51)	Partially successful; a stronger but non-significant effect of norms inductions on perceived increasing trend (Partial η^2 = .10)	Successful; a stronger effect of group identity manipulations on perceived similarity (r = .40)	• The time points depicted in the trending norms messages were increased from two to three. • A new set of items with a bi-polar scale for perceived increasing trend was developed.
Pilot 3 (N = 19)	A substantial difference in perceived increasing trend between low descriptive and trending norms conditions (r = .48 when the new set of bi-polar scaled items was used)		

Table 5.

Hypotheses testing summary; norms conditions (low descriptive norms vs. trending norms) were the independent variable; behavioral intention was the dependent variable.

	Test summary	Context		
			Mediator	
			Perceived future descriptive norms (1 year)	Perceived future descriptive norms (5 years)
H1	Mediation tests	Collapsed	O	O
		UNPLUG	X	O
		BYOB	O	X
			Moderator: Group identity conditions (low group identity vs. high group identity)	
H2	Moderation test	Collapsed	O (cross-over interaction)	
		UNPLUG	X	
		BYOB	O (cross-over interaction)	

Note. O refers to a significant mediation/moderation; X refers to a non-significant mediation/moderation.

Table 6.

Mediation analysis for the effect of trending norms messages (X) on behavioral intent (Y, collapsed across topics), compared to low descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.23***	Constant	3.43	.28	12.33	.00	2.88	3.98
			Low descriptive vs. Trending norms	.67	.11	6.22	.00	.46	.88
			Existing pro-environmental behavior	.25	.05	4.59	.00	.14	.35
			Housing type	.04	.13	.29	.77	-.22	.29
			Research participation pools	.36	.13	2.84	.00	.11	.61
X&M → Y	Behavioral intention	.35***	Constant	1.51	.40	3.81	.00	.73	2.28
			Low descriptive vs. Trending norms	-.20	.13	-1.55	.12	-.46	.06
			Future descriptive norms (1 year)	.27	.07	3.94	.00	.14	.41
			Existing pro-environmental behavior	.47	.06	7.34	.00	.34	.59
			Housing type	-.44	.15	-3.00	.00	-.73	-.15
			Research participation pools	.13	.15	.86	.39	-.16	.41
X → M → Y	(Indirect effect)			.18	.06			.07	.31
	Direct effect			-.20	.13	-1.55	.12	-.46	.06
	Total effect			-.02	.13	-.17	.87	-.27	.23

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 7.

Mediation analysis for the effect of trending norms messages (X) on behavioral intent (Y, collapsed across topics), compared to low descriptive norms messages, via perceived future descriptive norms in 5 years (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.10***	Constant	4.56	.27	16.71	.00	4.02	5.10
			Low descriptive vs. Trending norms	.30	.11	2.89	.00	.10	.51
			Existing pro-environmental behavior	.20	.05	3.74	.00	.09	.30
			Housing type	-.19	.13	-1.50	.14	-.44	.06
			Research participation pools	-.02	.12	-.16	.87	-.26	.22
X&M → Y	Behavioral intention	.35***	Constant	1.11	.45	2.48	.01	.23	2.00
			Low descriptive vs. Trending norms	-.11	.12	-.88	.38	-.35	.13
			Future descriptive norms (5 years)	.29	.07	4.14	.00	.15	.43
			Existing pro-environmental behavior	.48	.06	7.61	.00	.35	.60
			Housing type	-.37	.15	-2.56	.01	-.66	-.09
			Research participation pools	.23	.14	1.59	.11	-.05	.51
X → M → Y	(Indirect effect)			.09	.04			.02	.18
	Direct effect			-.11	.12	-.88	.38	-.35	.13
	Total effect			-.02	.13	-.17	.87	-.27	.23

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 8.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, UNPLUG), compared to low descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.34***	Constant	3.01	.39	7.62	.00	2.23	3.79
			Low descriptive vs. Trending norms	.99	.16	6.34	.00	.68	1.31
			Existing pro-environmental behavior	.26	.08	3.34	.00	.11	.42
			Research participation pools	.52	.18	2.92	.00	.17	.88
X&M → Y	Behavioral intention	.34***	Constant	1.63	.51	3.23	.00	.63	2.64
			Low descriptive vs. Trending norms	-.16	.19	-.82	.41	-.54	.22
			Future descriptive norms (1 year)	.16	.09	1.70	.09	-.03	.34
			Existing pro-environmental behavior	.53	.09	6.12	.00	.36	.70
			Research participation pools	.22	.20	1.09	.28	-.18	.61
X → M → Y	(Indirect effect)			.16	.11			-.07	.37
	Direct effect			-.16	.19	-.82	.41	-.54	.22
	Total effect			.00	.17	.01	.99	-.33	.34

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 9.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, UNPLUG), compared to low descriptive norms messages, via perceived future descriptive norms in 5 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.15***	Constant	4.11	.39	10.50	.00	3.33	4.88
			Low descriptive vs. Trending norms	.53	.16	3.39	.00	.22	.83
			Existing pro-environmental behavior	.19	.08	2.42	.02	.03	.34
			Research participation pools	.28	.18	1.56	.12	-.07	.63
X&M → Y	Behavioral intention	.40***	Constant	.66	.55	1.21	.23	-.42	1.75
			Low descriptive vs. Trending norms	-.18	.17	-1.10	.27	-.51	.15
			Future descriptive norms (5 years)	.35	.09	3.91	.00	.17	.53
			Existing pro-environmental behavior	.51	.08	6.22	.00	.35	.67
			Research participation pools	.20	.18	1.09	.28	-.16	.57
X → M → Y	(Indirect effect)			.19	.09			.03	.40
	Direct effect			-.18	.17	-1.10	.27	-.51	.15
	Total effect			.00	.17	.01	.99	-.33	.34

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 10.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, BYOB), compared to low descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.16***	Constant	3.84	.36	10.71	.00	3.13	4.55
			Low descriptive vs. Trending norms	.38	.14	2.64	.01	.09	.66
			Existing pro-environmental behavior	.24	.07	3.37	.00	.10	.38
			Housing type	-.08	.16	-.50	.61	-.41	.24
			Research participation pools	.17	.17	.98	.33	-.17	.51
X&M → Y	Behavioral intention	.36***	Constant	.98	.61	1.61	.11	-.22	2.18
			Low descriptive vs. Trending norms	-.19	.18	-1.06	.29	-.56	.17
			Future descriptive norms (1 year)	.39	.11	3.70	.00	.18	.60
			Existing pro-environmental behavior	.42	.09	4.54	.00	.24	.61
			Housing type	-.53	.20	-2.56	.01	-.93	-.12
			Research participation pools	.22	.22	1.00	.32	-.21	.64
X → M → Y	(Indirect effect)			.15	.07			.03	.30
	Direct effect			-.19	.18	-1.06	.29	-.56	.17
	Total effect			-.05	.19	-.24	.81	-.42	.33

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 11.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, BYOB), compared to low descriptive norms messages, via perceived future descriptive norms in 5 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.10**	Constant	4.76	.35	13.77	.00	4.08	5.45
			Low descriptive vs. Trending norms	.11	.14	.78	.44	-.17	.38
			Existing pro-environmental behavior	.24	.07	3.45	.00	.10	.38
			Housing type	-.12	.16	-.75	.45	-.43	.19
			Research participation pools	-.30	.17	-1.79	.08	-.63	.03
X&M → Y	Behavioral intention	.33***	Constant	1.14	.71	1.61	.11	-.26	2.54
			Low descriptive vs. Trending norms	-.08	.19	-.41	.68	-.44	.29
			Future descriptive norms (5 years)	.28	.11	2.51	.01	.06	.51
			Existing pro-environmental behavior	.45	.10	4.71	.00	.26	.64
			Housing type	-.52	.21	-2.49	.01	-.94	-.11
			Research participation pools	.37	.22	1.64	.10	-.08	.81
X → M → Y	(Indirect effect)			.03	.04			-.05	.13
	Direct effect			-.08	.19	-.41	.68	-.44	.29
	Total effect			-.05	.19	-.24	.81	-.42	.33

Note. ** $p < .01$, *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 12.

Means (M) and standard deviations (SD) for behavioral intention (collapsed) as a function of 2 (norms conditions: low descriptive norms vs. trending norms) × 2 (group identity conditions: low vs. high group identity) design

	Low Descriptive Norms		Trending Norms	
	Low Group Identity	High Group Identity	Low Group Identity	High Group Identity
N	66	74	67	71
M	5.28	5.19	5.06	5.32
SD	1.18	1.09	1.41	1.31
Adjusted *M*	5.33	5.13	5.05	5.35
SE	.13	.12	.13	.12
95% Confidence interval	5.08 to 5.58	4.89 to 5.37	4.80 to 5.30	5.11 to 5.59

Note. SE = Standard error.

Table 13.

Two-way ANCOVA results using behavioral intention (collapsed) as the dependent variable. The independent variables are norms conditions (low descriptive norms vs. trending norms) and group identity conditions (low group identity vs. high group identity)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	63.25	1	63.25	58.25	.00	.18
Existing pro-environmental behavior	79.47	1	79.47	73.19	.00	.21
Housing type	9.97	1	9.97	9.18	.00	.03
Research participation pool	2.26	1	2.26	2.08	.15	.01
Norms conditions	.07	1	.07	.06	.81	.00
Group identity conditions	.19	1	.19	.17	.68	.00
Norms conditions × Group identity conditions	4.39	1	4.39	4.04	.05	.02
Error	294.26	271	1.09			

Note. R^2 = .32 (Adjusted R^2 = .30). SS = Type III Sum of Squares; MS = Mean Square.

Table 14.

Means (M) and standard deviations (SD) for behavioral intention (UNPLUG) as a function of 2 (norms conditions: low descriptive norms vs. trending norms) × 2 (group identity conditions: low vs. high group identity) design

	Low Descriptive Norms		Trending Norms	
	Low Group Identity	High Group Identity	Low Group Identity	High Group Identity
N	32	32	36	34
M	5.01	5.52	5.22	5.20
SD	1.19	.92	1.21	1.33
Adjusted *M*	5.02	5.46	5.24	5.23
SE	.17	.17	.16	.17
95% Confidence interval	4.68 to 5.36	5.12 to 5.80	4.92 to 5.56	4.90 to 5.56

Note. SE = Standard error.

Table 15.

Two-way ANCOVA results using behavioral intention (UNPLUG) as the dependent variable. The independent variables are norms conditions (low descriptive norms vs. trending norms) and group identity conditions (low group identity vs. high group identity)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	25.83	1	25.83	27.47	.00	.18
Existing pro-environmental behavior	42.64	1	42.64	45.33	.00	.26
Research participation pool	2.50	1	2.50	2.66	.11	.02
Norms conditions	.00	1	.00	.00	.99	.00
Group identity conditions	1.52	1	1.52	1.61	.21	.01
Norms conditions × Group identity conditions	1.67	1	1.67	1.78	.19	.01
Error	120.39	128	.94			

Note. R^2 = .34 (Adjusted R^2 = .32). SS = Type III Sum of Squares; MS = Mean Square.

Table 16.

Means (M) and standard deviations (SD) for behavioral intention (BYOB) as a function of 2 (norms conditions: low descriptive norms vs. trending norms) × 2 (group identity conditions: low vs. high group identity) design; a significant difference was evidenced between the low descriptive and trending norms under the condition of low group identity

	Low Descriptive Norms		Trending Norms	
	Low Group Identity	High Group Identity	Low Group Identity	High Group Identity
N	34	42	31	37
M	5.54	4.93	4.86	5.44
SD	1.13	1.14	1.62	1.30
Adjusted *M*	5.59	4.91	4.80	5.48
SE	.19	.17	.20	.18
95% Confidence interval	5.22 to 5.96	4.58 to 5.24	4.41 to 5.18	5.13 to 5.83

Note. SE = Standard error.

Table 17.

Two-way ANCOVA results using behavioral intention (BYOB) as the dependent variable. The independent variables are norms conditions (low descriptive norms vs. trending norms) and group identity conditions (low group identity vs. high group identity)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	35.77	1	35.77	30.86	.00	.18
Existing pro-environmental behavior	39.11	1	39.11	33.74	.00	.20
Housing type	11.28	1	11.28	9.73	.00	.07
Research participation pools	1.62	1	1.62	1.40	.24	.01
Norms conditions	.44	1	.44	.38	.54	.00
Group identity conditions	.00	1	.00	.00	1.00	.00
Norms conditions × Group identity conditions	16.28	1	16.28	14.05	.00	.09
Error	158.79	137	1.16			

Note. R^2 = .36 (Adjusted R^2 = .33). SS = Type III Sum of Squares; MS = Mean Square.

Table 18.

Means (M) and standard deviations (SD) for behavioral intention (collapsed) among norms conditions

	Norms conditions		
	Trending norms	Low descriptive norms	High descriptive norms
N	138	140	141
M	5.20	5.23	5.05
SD	1.37	1.13	1.32
Adjusted *M*	5.18	5.20	5.09
SE	.09	.09	.09
95% Confidence interval	5.01 to 5.36	5.03 to 5.38	4.91 to 5.26

Note. SE = Standard error.

Table 19.

One-way ANCOVA results using behavioral intention (collapsed) as the dependent variable. The independent variables are norms conditions (trending norms vs. low descriptive norms vs. high descriptive norms)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	86.19	1	86.19	76.99	.00	.16
Existing pro-environmental behavior	144.48	1	144.48	129.07	.00	.24
Housing type	6.90	1	6.90	6.16	.01	.02
Research participation pools	7.00	1	7.00	6.26	.01	.02
Norms conditions	1.08	2	.54	.48	.62	.00
Error	462.33	413	1.12			

Note. R^2 = .32 (Adjusted R^2 = .31). SS = Type III Sum of Squares; MS = Mean Square.

Table 20.

Means (M) and standard deviations (SD) for behavioral intention (UNPLUG) among norms conditions

	Norms conditions		
	Trending norms	Low descriptive norms	High descriptive norms
N	70	64	73
M	5.21	5.27	5.28
SD	1.26	1.09	.91
Adjusted *M*	5.24	5.24	5.28
SE	.11	.12	.11
95% Confidence interval	5.02 to 5.45	5.02 to 5.47	5.06 to 5.49

Note. SE = Standard error.

Table 21.

One-way ANCOVA results using behavioral intention (UNPLUG) as the dependent variable. The independent variables are norms conditions (trending norms vs. low descriptive norms vs. high descriptive norms)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	61.19	1	61.19	71.52	.00	.26
Existing pro-environmental behavior	60.13	1	60.13	70.29	.00	.26
Research participation pools	2.33	1	2.33	2.73	.10	.01
Norms conditions	.07	2	.03	.04	.96	.00
Error	172.82	202	.86			

Note. R^2 = .29 (Adjusted R^2 = .28). SS = Type III Sum of Squares; MS = Mean Square.

Table 22.

Means (M) and standard deviations (SD) for behavioral intention (BYOB) among norms conditions

	Norms conditions		
	Trending norms	Low descriptive norms	High descriptive norms
N	68	76	68
M	5.18	5.20	4.80
SD	1.48	1.17	1.61
Adjusted *M*	5.13	5.18	4.88
SE	.14	.13	.14
95% Confidence interval	4.85 to 5.41	4.91 to 5.44	4.60 to 5.16

Note. SE = Standard error.

Table 23.

One-way ANCOVA results using behavioral intention (BYOB) as the dependent variable. The independent variables are norms conditions (trending norms vs. low descriptive norms vs. high descriptive norms)

	SS	*df*	MS	F	*p*	partial η^2
(Intercept)	30.64	1	30.64	22.61	.00	.10
Existing pro-environmental behavior	78.02	1	78.02	57.58	.00	.22
Housing type	8.03	1	8.03	5.92	.02	.03
Research participation pools	6.01	1	6.01	4.43	.04	.02
Norms conditions	3.60	2	1.80	1.33	.27	.01
Error	279.16	206	1.36			

Note. R^2 = .35 (Adjusted R^2 = .34). SS = Type III Sum of Squares; MS = Mean Square.

Table 24.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, collapsed across topics), compared to high descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.15***	Constant	3.93	.24	16.28	.00	3.46	4.41
			Low descriptive vs. Trending norms	.29	.10	2.95	.00	.10	.49
			Existing pro-environmental behavior	.23	.05	5.08	.00	.14	.33
			Housing type	.18	.12	1.49	.14	-.06	.41
			Research participation pools	.21	.11	1.83	.07	-.02	.43
X&M → Y	Behavioral intention	.39***	Constant	.37	.43	.86	.39	-.48	1.23
			Low descriptive vs. Trending norms	-.01	.13	-.11	.91	-.27	.24
			Future descriptive norms (1 year)	.38	.08	4.85	.00	.22	.53
			Existing pro-environmental behavior	.51	.06	8.14	.00	.39	.63
			Housing type	-.38	.15	-2.52	.01	-.68	-.08
			Research participation pools	.33	.15	2.28	.02	.05	.62
X → M → Y	(Indirect effect)			.11	.05			.03	.21
	Direct effect			-.01	.13	-.11	.91	-.27	.24
	Total effect			.10	.13	.72	.47	-.17	.36

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 25.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, collapsed across topics), compared to high descriptive norms messages, via perceived future descriptive norms in 5 years (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.09***	Constant	4.52	.25	18.16	.00	4.03	5.01
			Low descriptive vs. Trending norms	.12	.10	1.13	.26	-.09	.32
			Existing pro-environmental behavior	.23	.05	4.78	.00	.14	.32
			Housing type	.03	.12	.27	.79	-.21	.27
			Research participation pools	.00	.12	-.04	.97	-.23	.22
X&M → Y	Behavioral intention	.34***	Constant	1.04	.47	2.20	.03	.11	1.98
			Low descriptive vs. Trending norms	.07	.13	.57	.57	-.18	.33
			Future descriptive norms (5 years)	.18	.08	2.30	.02	.03	.33
			Existing pro-environmental behavior	.56	.06	8.67	.00	.43	.68
			Housing type	-.32	.16	-2.06	.04	-.63	-.01
			Research participation pools	.41	.15	2.75	.01	.12	.70
X → M → Y	(Indirect effect)			.02	.02			-.01	.07
	Direct effect			.07	.13	.57	.57	-.18	.33
	Total effect			.10	.13	.72	.47	-.17	.36

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 26.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, UNPLUG), compared to high descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.09**	Constant	4.64	.32	14.46	.00	4.01	5.27
			High descriptive vs. Trending norms	.42	.13	3.08	.00	.15	.68
			Existing pro-environmental behavior	.11	.06	1.88	.06	-.01	.23
			Research participation pools	.08	.15	.54	.59	-.21	.37
X&M → Y	Behavioral intention	.32***	Constant	1.51	.58	2.62	.01	.37	2.65
			High descriptive vs. Trending norms	-.14	.16	-.89	.38	-.45	.17
			Future descriptive norms (1 year)	.24	.10	2.46	.02	.05	.43
			Existing pro-environmental behavior	.47	.07	6.86	.00	.33	.60
			Research participation pools	.19	.17	1.15	.25	-.14	.52
X → M → Y	(Indirect effect)			.10	.06			.01	.24
	Direct effect			-.14	.16	-.89	.38	-.45	.17
	Total effect			-.04	.16	-.27	.79	-.35	.27

Note. ** $p < .01$, *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 27.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, UNPLUG), compared to high descriptive norms messages, via perceived future descriptive norms in 5 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.06*	Constant	4.81	.33	14.70	.00	4.16	5.46
			High descriptive vs. Trending norms	.10	.14	.73	.46	-.17	.37
			Existing pro-environmental behavior	.15	.06	2.53	.01	.03	.27
			Research participation pools	.12	.15	.82	.41	-.17	.42
X&M → Y	Behavioral intention	.31***	Constant	1.73	.59	2.94	.00	.56	2.89
			High descriptive vs. Trending norms	-.07	.15	-.39	.70	-.37	.24
			Future descriptive norms (5 years)	.18	.10	1.94	.06	.00	.37
			Existing pro-environmental behavior	.47	.07	6.72	.00	.33	.61
			Research participation pools	.19	.17	1.12	.27	-.14	.52
X → M → Y	(Indirect effect)			.02	.03			-.04	.07
	Direct effect			-.06	.15	-.39	.70	-.37	.24
	Total effect			-.04	.16	-.27	.79	-.35	.27

Note. * $p < .05$, *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 28.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, BYOB), compared to high descriptive norms messages, via perceived future descriptive norms in 1 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (1 year)	.25***	Constant	3.26	.35	9.26	.00	2.57	3.96
			High descriptive vs. Trending norms	.11	.15	.76	.45	-.18	.40
			Existing pro-environmental behavior	.39	.07	5.32	.00	.25	.54
			Housing type	.08	.17	.47	.64	-.26	.42
			Research participation pools	.18	.17	1.08	.28	-.15	.52
X&M → Y	Behavioral intention	.46***	Constant	-.36	.64	-.57	.57	-1.62	.90
			High descriptive vs. Trending norms	.20	.20	.97	.33	-.21	.60
			Future descriptive norms (1 year)	.46	.12	3.74	.00	.22	.70
			Existing pro-environmental behavior	.51	.11	4.42	.00	.28	.73
			Housing type	-.66	.24	-2.76	.01	-1.14	-.19
			Research participation pools	.51	.24	2.14	.03	.04	.99
X → M → Y	(Indirect effect)			.05	.07			-.07	.20
	Direct effect			.20	.20	.97	.33	-.21	.60
	Total effect			.25	.21	1.16	.25	-.17	.67

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 29.

Mediation analysis for the effect of trending norms messages (X) on behavior (Y, BYOB), compared to high descriptive norms messages, via perceived future descriptive norms in 5 year (M)

Model	Outcome	R^2	Predictor	Coefficient	SE	t	*p*	LLCI	ULCI
X → M	Future descriptive norms (5 years)	.15***	Constant	4.08	.37	10.94	.00	3.34	4.82
			High descriptive vs. Trending norms	.08	.15	.54	.59	-.22	.39
			Existing pro-environmental behavior	.36	.08	4.53	.00	.20	.51
			Housing type	.08	.18	.43	.67	-.28	.44
			Research participation pools	-.24	.18	-1.31	.19	-.59	.12
X&M → Y	Behavioral intention	.41***	Constant	.40	.71	.56	.58	-1.01	1.81
			High descriptive vs. Trending norms	.23	.21	1.10	.27	-.19	.66
			Future descriptive norms (5 years)	.18	.12	1.50	.14	-.06	.42
			Existing pro-environmental behavior	.62	.12	5.34	.00	.39	.85
			Housing type	-.64	.25	-2.55	.01	-1.13	-.14
			Research participation pools	.64	.25	2.55	.01	.14	1.14
X → M → Y	(Indirect effect)			.02	.04			-.04	.11
	Direct effect			.23	.21	1.10	.27	-.19	.66
	Total effect			.25	.21	1.16	.25	-.17	.67

Note. *** $p < .001$; Coefficients are unstandardized; LLCI = Lower level confidence interval (95%); ULCI = Upper level confidence interval (95%).

Table 30.

Percent estimation analysis summary

Context	Norms condition	Baseline	1-year estimation (M)	Difference from the baseline	5-year estimation (M)	Difference from 1-year estimation	Difference from the baseline
Collapsed	Trending norms	30	43.92	13.92	63.65	19.73	33.65
	Low descriptive norms	30	43.30	13.30	61.51	18.21	31.51
	High descriptive norms	65	70.49	5.49	80.42	9.93	15.42
UNPLUG	Trending norms	30	43.13	13.13	61.09	17.96	31.09
	Low descriptive norms	30	42.08	12.08	58.28	16.20	28.28
	High descriptive norms	65	69.67	4.67	79.18	9.51	14.18
BYOB	Trending norms	30	44.74	14.74	66.29	21.55	36.29
	Low descriptive norms	30	44.33	14.33	64.22	19.89	34.22
	High descriptive norms	65	71.37	6.37	81.75	10.38	16.75

Table 31.

Generated codes for thematic analysis and identified themes

Raw codes	N	%	Theme
Environment	90	24.39	Environmental attitudes and beliefs
Forget	54	14.63	Habits
Hassle	38	10.30	Inconvenience
Economic	32	8.67	Economic reasons
Habit (used to)	23	6.23	Habits
Depends on electronics	18	4.88	Situational reasons
Difficult to plan ahead	16	4.34	Inconvenience
Trend	12	3.25	Prevalence perceptions
Prevalence	10	2.71	Prevalence perceptions
Need for plastic bags	10	2.71	Economic reasons
Low response efficacy	8	2.17	Environmental attitudes and beliefs
Requirement	8	2.17	Economic reasons
Michigan law	4	1.08	Economic reasons
Family culture (used to)	4	1.08	Habits
Depends on the amount of grocery	4	1.08	Situational reasons
Safety (fire hazards)	4	1.08	Safety
Cost of buying reusable bags	4	1.08	Economic reasons
Habit (not used to)	4	1.08	Habits
Group identity	4	1.08	Group identity
Campaign	3	0.81	
High response efficacy	2	0.54	
Self-efficacy	2	0.54	
Don't have reusable bags	2	0.54	
Don't shop often	2	0.54	
Feels good	2	0.54	
Family culture (not used to)	2	0.54	
Good for electronics	2	0.54	
Depends on the time (short trip, break, etc.)	1	0.27	
If bags are easily accessible	1	0.27	
No interest	1	0.27	

Table 31 (cont'd).

Raw codes	N	%	Theme
Depends on occasions	1	0.27	
Exemplary	1	0.27	
Total	369	100	

Note. Codes appeared less than four times (i.e., less than 1% of total cases) were considered minor and therefore disregarded.

Table 32.

TNSB testing summary; two-way ANCOVA (norms conditions: low descriptive norms vs. high descriptive norms × group identity conditions: low group identity vs. high group identity) and regression tests results

	Interaction tests			
Context	Norms conditions × Group identity conditions	Perceived descriptive norms × Perceived group identification	Perceived descriptive norms × Perceived similarity	Perceived descriptive norms × Perceived injunctive norms
Collapsed	X	X	X	X
UNPLUG	X	O (pattern not consistent)	X	X
BYOB	O (pattern not consistent)	O (cross-over interaction)	X	X

Note. O refers to a significant moderation; X refers to a non-significant interaction.

APPENDIX C

Figures

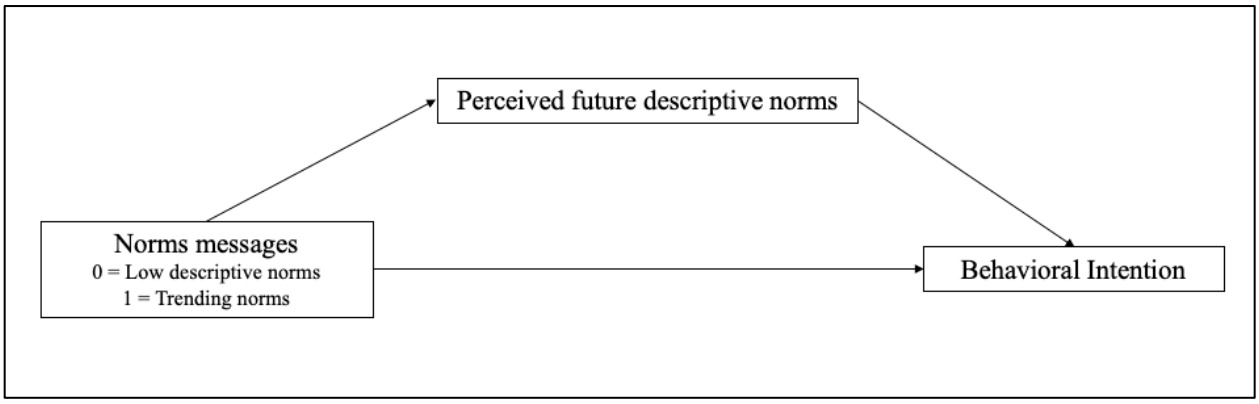

Figure 1. The hypothesized mediation effect of trending norms messages on behavioral intention through perceived future descriptive norms (H1).

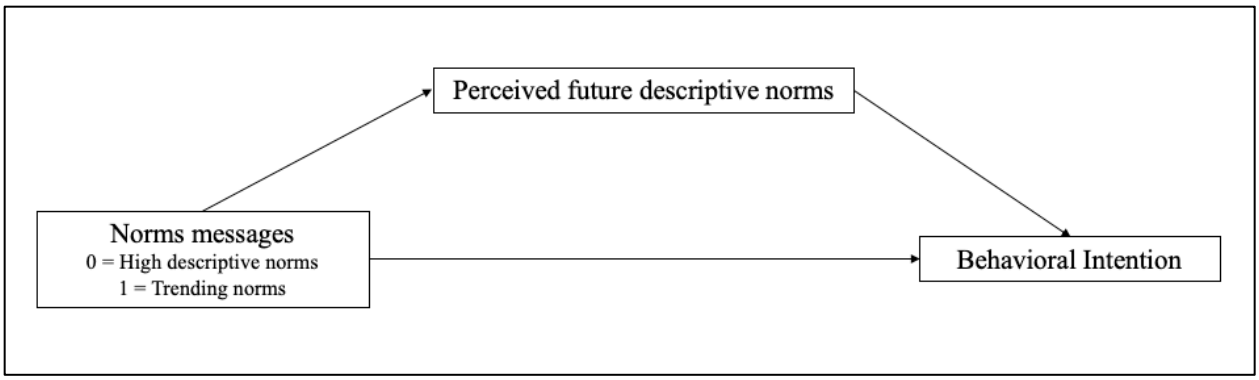

Figure 2. The proposed mediation effect of trending norms messages on behavioral intention through perceived future descriptive norms (RQ2).

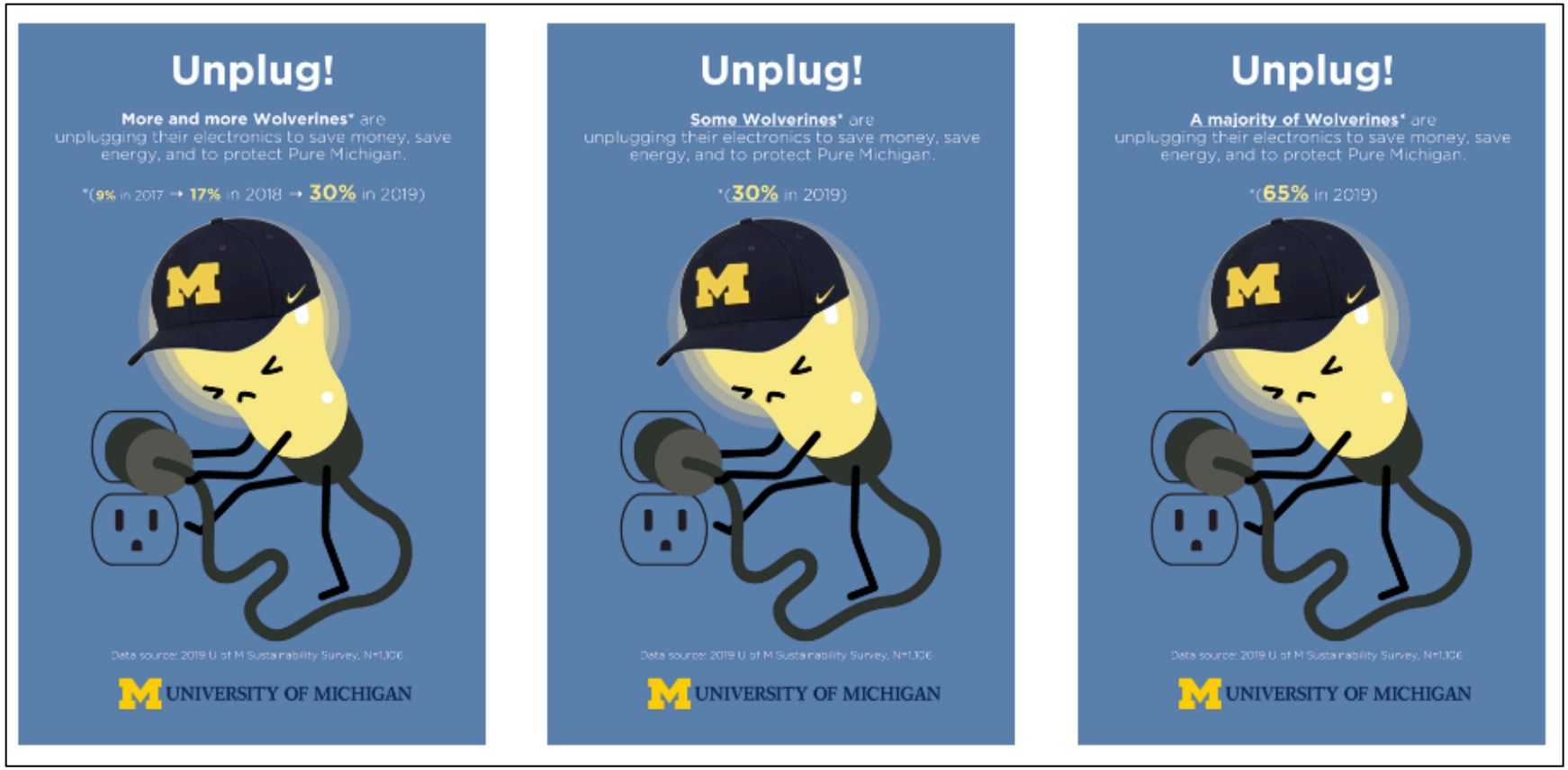

Figure 3. Norms messages for low group identity conditions (UNPLUG); trending norms, low descriptive norms, high descriptive norms, respectively.

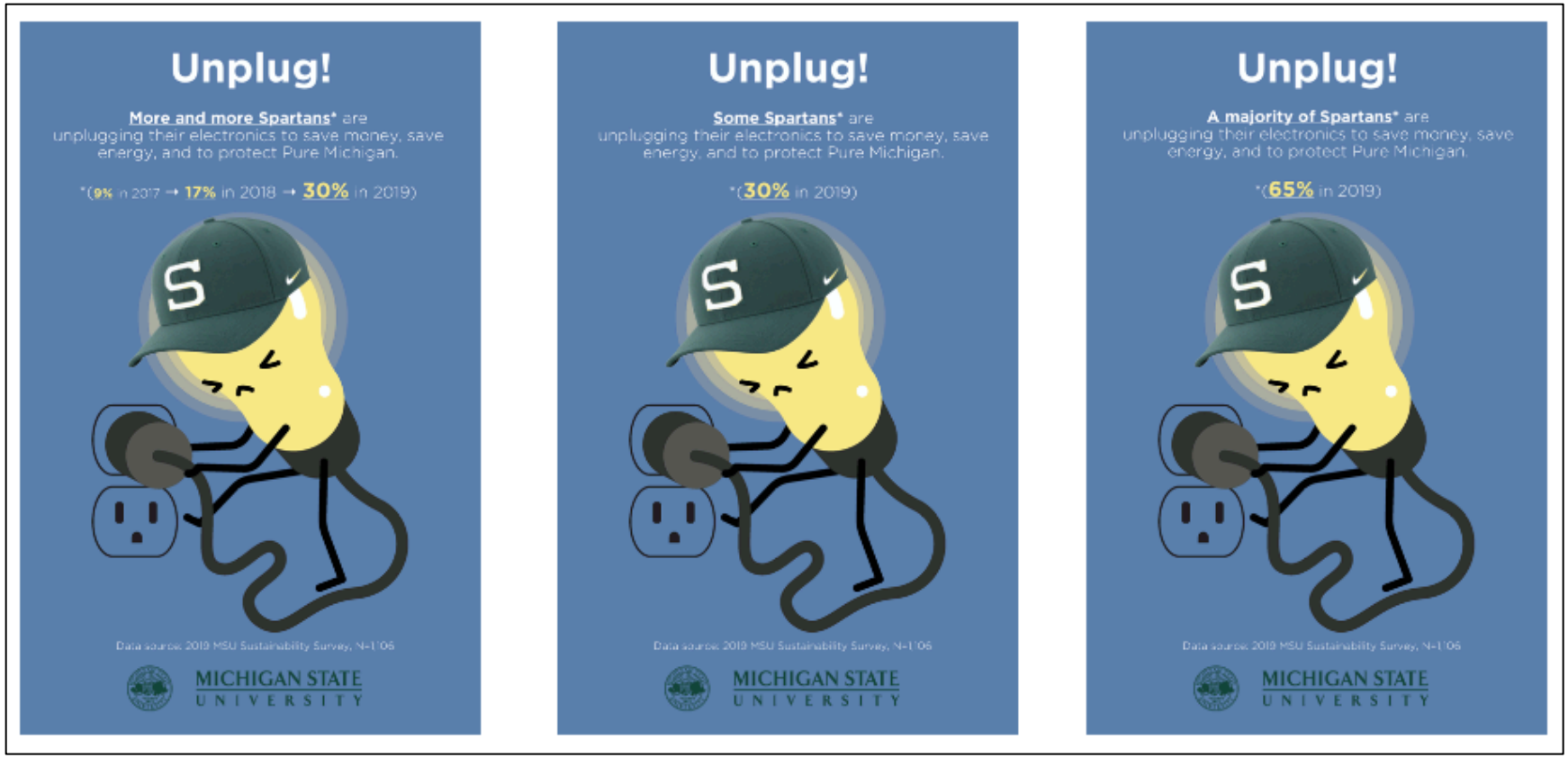

Figure 4. Norms messages for high group identity conditions (UNPLUG); trending norms, low descriptive norms, high descriptive norms, respectively.

Figure 5. Norms messages for low group identity conditions (BYOB); trending norms, low descriptive norms, high descriptive norms, respectively.

Figure 6. Norms messages for high group identity conditions (BYOB); trending norms, low descriptive norms, high descriptive norms, respectively.

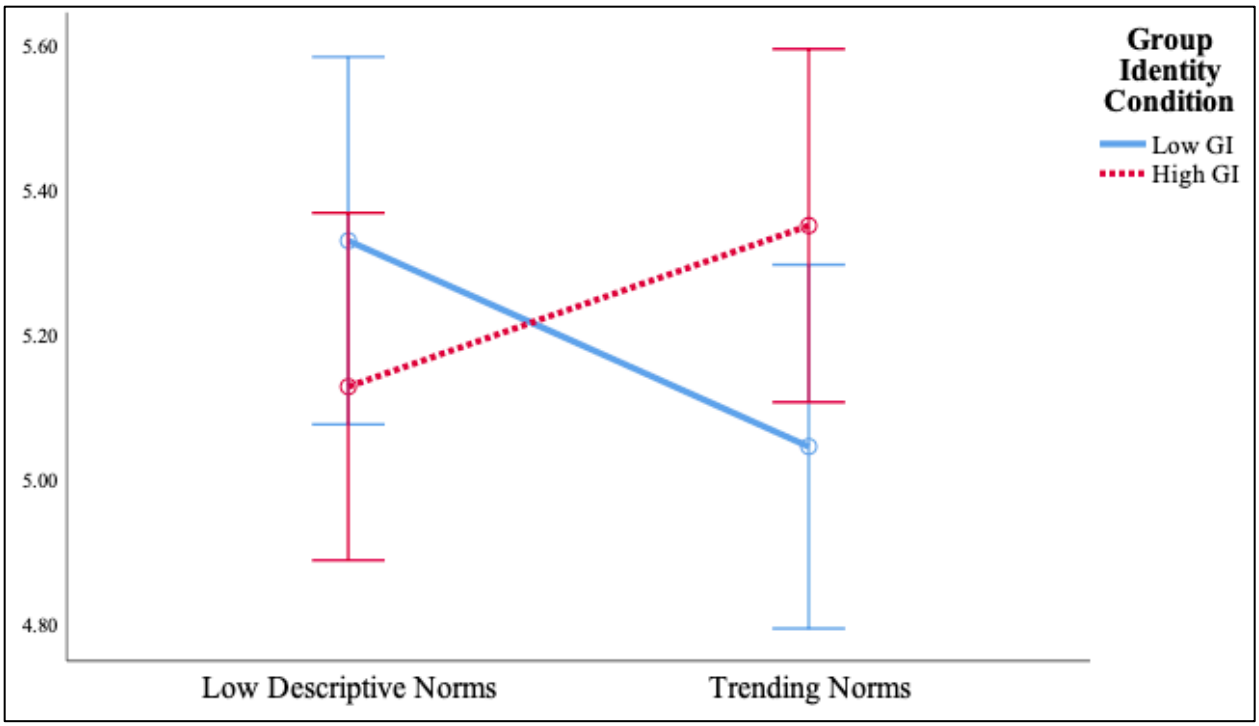

Figure 7. Interaction between norms conditions (low descriptive vs. trending norms) and group identity conditions (low vs. high group identity) on behavioral intention (collapsed). Y axis indicates the adjusted means. Error bars indicate the 95% confidence interval of each mean.

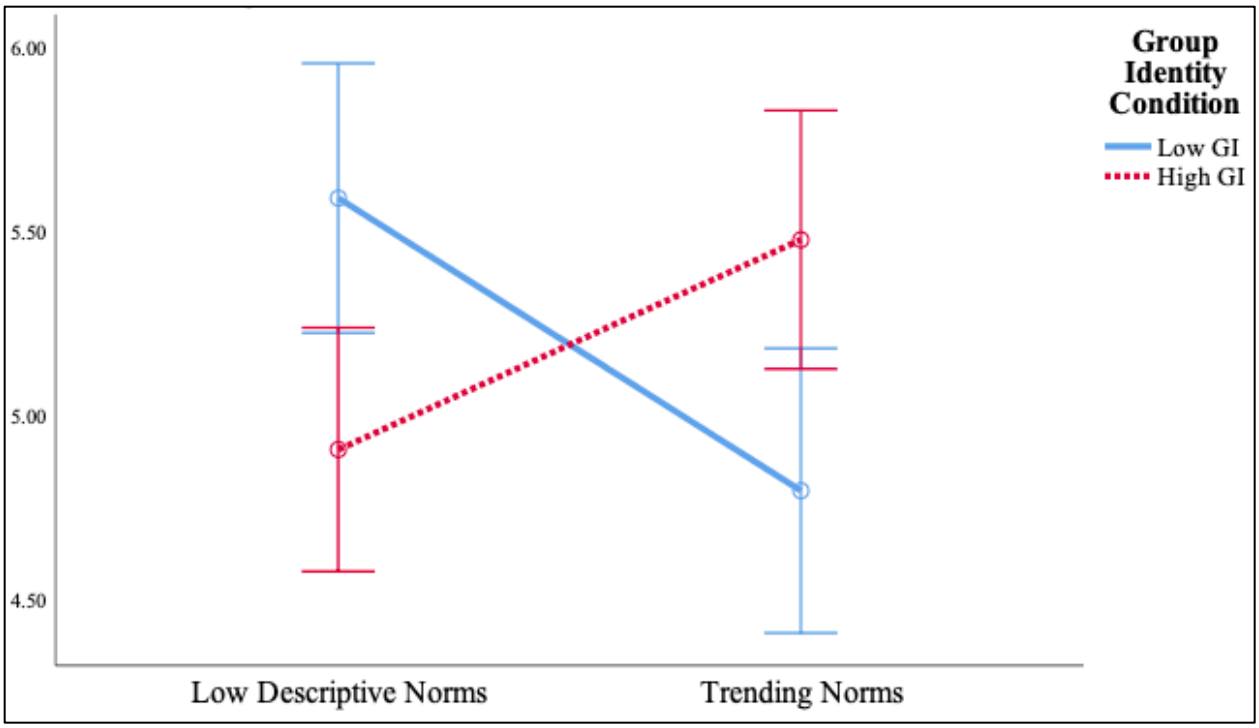

Figure 8. Interaction between norms conditions (low descriptive vs. trending norms) and group identity conditions (low vs. high group identity) on behavioral intention (BYOB). Y axis indicates the adjusted means. Error bars indicate the 95% confidence interval of each mean.

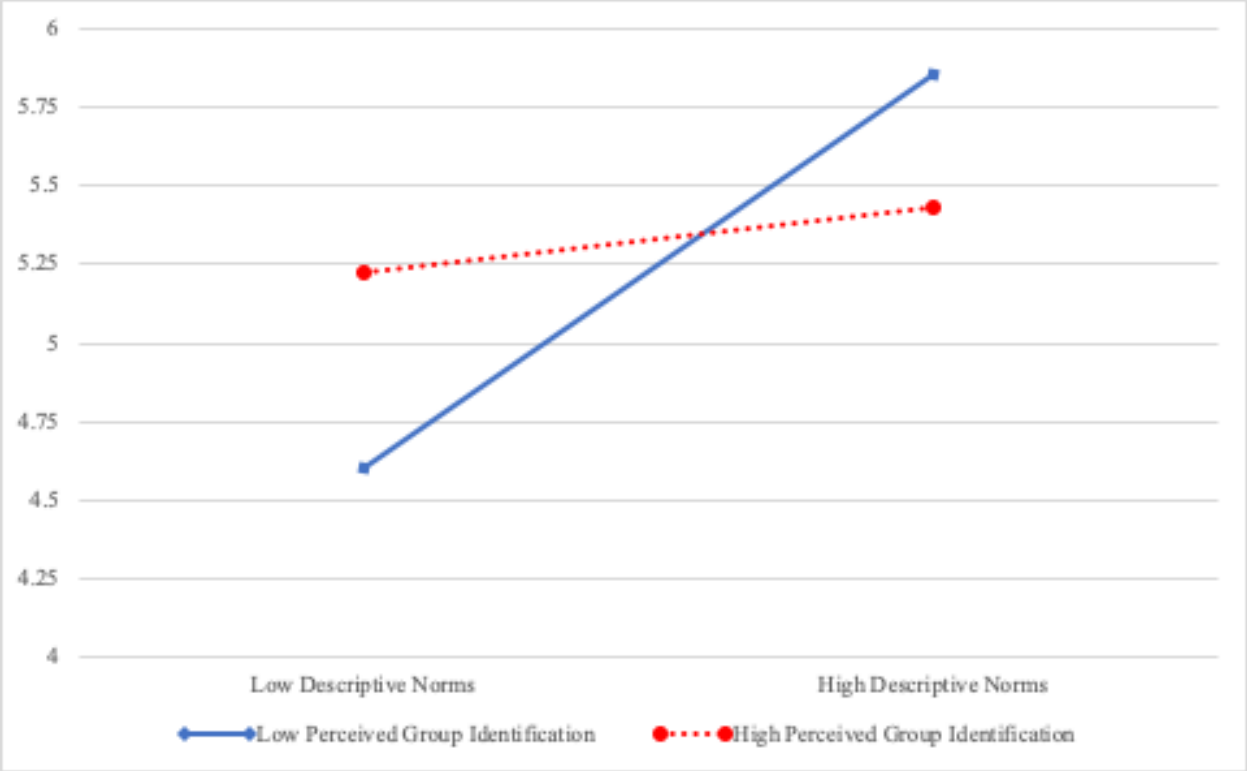

Figure 9. Interaction between perceived descriptive norms and perceived group identification on behavioral intention to unplug electronics when not in use. Y axis indicates the reported intention on a 7-point Likert scale (higher scores indicate greater intention); Low = $M - 1SD$; High = $M + 1SD$.

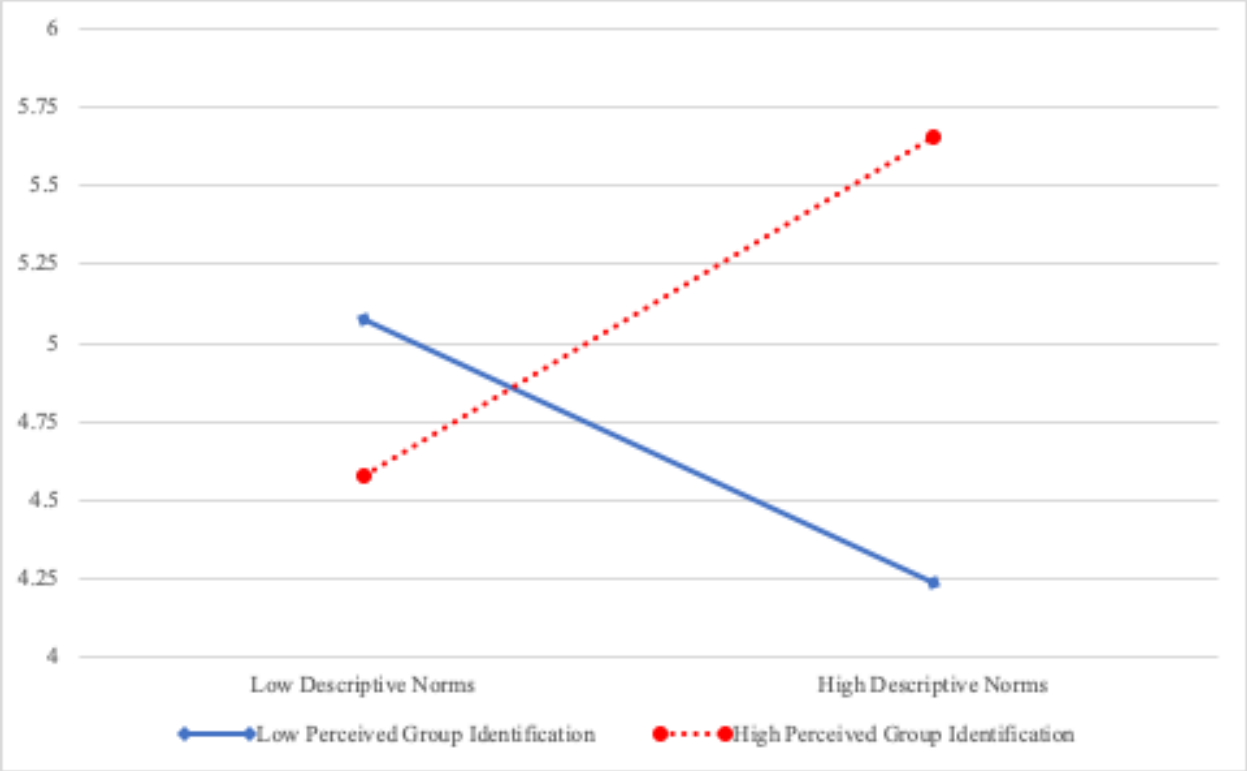

Figure 10. Interaction between perceived descriptive norms and perceived group identification on behavioral intention to bring one's own bags for grocery shopping. Y axis indicates the reported intention on a 7-point Likert scale (higher scores indicate greater intention); Low = M – 1SD; High = M + 1SD.

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