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Is common behavior considered moral? The role of perceived others' motives in moral norm inferences and motivation about environmental behavior☆

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ABSTRACT

The present research examines how inferences about moral norms from descriptive norms change by perceptions of others' motives in the context of environmental behavior. When individuals think that many others engage in an environmental behavior (e.g., water and energy conservation) for prosocial (vs. proself) motives, they infer moralization about the behavior in a given context. They infer stronger injunctive norms about the behavior and expect others to experience moral outrage at violation of the moral standard (e.g., wasting water and energy). The moral norm perceptions predict people's motivation to engage in environmental behavior themselves. We further show that expected guilt and shame if not engaging in normative behavior explain the effects of prosocial-motivated (vs. proself-motivated) norms. Together, perceived motives behind descriptive norms change people's inferences about moral implications of normative behavior and their motivation to engage in normative behavior.

There is now broad consensus that human activities are a major contributor to environmental issues—like climate change—that pose a serious threat to the sustainability of natural and human systems. Thus, changing human behaviors towards making more sustainable choices will have significant impact on slowing down, if not reversing, harms to the environment (Stern, 2011; Swim et al., 2011). Notably, there is now much evidence for the powerful influence that social norms have on environmental decisions and behaviors (Cialdini & Jacobson, 2021; Constantino et al., 2022; Miller & Prentice, 2016).

People's perceptions about social norms arise from subjective assumptions and beliefs about normative behaviors occurring in their social environment (Cialdini & Goldstein, 2004; Morris et al., 2015) and can broadly be categorized into two types. Whereas *descriptive norms* are characterized by a person's perception of what most others do (i.e., what is common), *injunctive norms* are characterized by a person's perception of what most others approve and disapprove of (i.e., what is moral) (Cialdini et al., 1991). Critically, although research has demonstrated that descriptive and injunctive norms involve different functions and goals (Jacobson et al., 2011), both kinds of norms are not always readily distinguishable in people's minds. Recent evidence shows that people associate common behaviors with moral behaviors (i.e., form a common-moral association in norm perceptions) and consequently, infer injunctive norms from descriptive norms and vice versa (Eriksson et al., 2015; Lindström et al., 2018).

The present research aims to advance an understanding of the common-moral association in norm perceptions. We propose that perceptions of other people's motives (or perceived others' motives) for engaging in normative (i.e., common) behavior modulate the extent to which moral norms are inferred from descriptive norms. Specifically, when people perceive many others to engage in a behavior for *prosocial* or other-oriented (vs. *proself* or self-interested) motives, they infer stronger moral norms about the behavior (i.e., view it as an injunctive norm). That is, individuals use why others engage in a normative behavior as a cue for inferring a moral meaning attached to the behavior. In this paper, we investigate these moral norm inferences from descriptive norms as well as their motivational implications for one's own behaviors in the timely context of environmental behavior.

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1. Normative influence: Descriptive norms and injunctive norms

Norms embody the rules and standards that are shared and understood by most (if not all) members in a group or society and align social behaviors with these standards (Chiu et al., 2010; Cialdini & Trost, 1998). In line with the social and group-living nature of our species, much of human behavior is influenced by people's perceptions of—and desire to conform with—such norms (Morris et al., 2015). Related to the present research, social norms significantly affect and predict a wide range of environmental-related behaviors (Schultz et al., 2007; Geiger & Swim, 2016; see Cialdini & Jacobson, 2021 for review). Accordingly, interventions aimed at promoting environmentally-friendly decisions and behaviors have often leveraged on the powerful influence of social norms (Goldstein et al., 2008; Schultz et al., 2007; Sparkman & Walton, 2017).

In social norms research, a key theoretical distinction has been made between descriptive norms and injunctive norms (Cialdini et al., 1991). These two types of norms serve different functions and involve different psychological processes. Descriptive norms refer to what most others commonly do. Such norms offer helpful guidance about the behaviors that are likely to be adaptive and effective in a given context. As a corollary, descriptive norms are particularly influential in novel and uncertain situations (Sherif, 1936; Tesser et al., 1983). In contrast, injunctive norms represent what most others approve or disapprove of. Thus, injunctive norms specify moral standards (i.e., what ought to be done) within a given context. These moral norms exert powerful influence because violating them is likely to lead to social sanctions or punishment (Henrich et al., 2006; Molho et al., 2020).

While much research has noted the conceptual and empirical distinctions between descriptive and injunctive norms, these norms may not be as distinct as assumed, at least in people's minds. The tendency for people to infer *what ought to be* from *what is* has been widely observed and is famously termed the *is-ought fallacy* or *naturalistic fallacy* (Hume, 1951), where values are attached based on prevalence in the world. Theories suggest that this is why people often too readily consider uncommon practices, such as atheism and homosexuality, as undesirable and immoral (Teehan & diCarlo, 2004; van den Bos, 2011). Importantly, recent research further shows that a similar inference applies to perceiving the intersubjective reality in one's social environment—perceiving what is considered moral among others (i.e., injunctive norms) from what is common among others (i.e., descriptive norms) (Chiu et al., 2010). This tendency for individuals to perceive a convergence between descriptive norms and injunctive norms is known as the *common-moral association* in norm perceptions. For example, when participants were provided with a list of behaviors presented either as common or as moral, they inferred stronger injunctive norms around the behavior when it was presented as common while they inferred stronger descriptive norms when the behavior was presented as moral (Eriksson et al., 2015).

2. Role of Perceived Motives in Moral Inferences from Descriptive Norms

While descriptive norms and injunctive norms are tightly cognitively associated with each other in general, researchers have discussed possible cases in which the automatic process of inferring injunctive norms from descriptive norms is influenced by various factors. For example, Eriksson and Strimling (2015) suggested that uncertainty acts as a moderating factor, with the common-moral association occurring more strongly when people are genuinely uncertain about injunctive norms (see also Gelfand & Harrington, 2015 for a relevant discussion). Despite the theoretical discussion on such moderating factors, little empirical research has been conducted to identify the factors affecting the common-moral association in norm perceptions. In the present research, we examined *perceived others' motives* as a novel moderator, proposing that the extent to which people infer moral norms from descriptive norms depends on the perceived motives of those who engage in these common behaviors (i.e., descriptive norms). Given that pro-environmental behaviors can engender a variety of benefits (e.g., social, emotional, financial benefits) for individuals, groups, and society in general, people may also have varying perceptions about why others engage in such behaviors. In turn, the attributions that people make about the causes of others' behaviors can profoundly impact construals of others and, more broadly, social reality (Carlson et al., 2022; Menon et al., 1999; Ross et al., 1977).

We predict that people infer stronger moral norms about environmental behavior when they perceive that many others engage in environmental behavior for prosocial (vs. proself) motives. This prediction is informed by research on moralization processes: the process through which a behavior attains a moral meaning in a group or society. A previously morally neutral behavior becomes morally virtuous (or contemptuous) one when people recognize and care about its consequences as having significant positive (or negative) impact on others and broader society (Rozin, 1999). Thus, these recognition of and concerns about social impact are a key trigger of moralization of a behavior; this is especially the case in developed Western societies, where a behavior's capacity for benefitting or harming others is a critical basis for moral judgment (Haidt, 2007; Schein & Gray, 2015). Consider smoking as an example. Cigarette smoking has become a moral issue as people start to be concerned about serious harmful effects of secondhand smoke. When a behavior is moralized, people's decisions to engage in the behavior tend to no longer be solely dependent on its consequences for oneself, but also its consequences on others. From this perspective, we reason that when individuals perceive others to engage in a certain behavior for prosocial (vs. proself) motives, they infer that broader society or the group must have recognized and strongly care about the behavior's positive social impact (or the negative impact of not performing the behavior). Consequently, people infer that moral values are attached to such behaviors and that injunctive expectations have been formed.

3. Implications for one's own pro-environmental behavior

The present research also examines how descriptive norms with distinct (prosocial vs. proself) motives affect people's motivation to engage in pro-environmental behaviors. To the extent that prosocial- (vs. proself-) motivated descriptive norms strengthen perceptions of such norms as injunctive ones, we predict that descriptive norms driven by prosocial (vs. proself) motives increase one's motivation to engage in pro-environmental actions (Bhanot, 2021; De Groot et al., 2013).

While the increased perceptions of injunctive norms can directly affect one's environmental motivation, we further examine potential psychological processes that may link perceived injunctive norms and environmental motivation (i.e., mediators that explain why perceived injunctive norms lead to environmental motivation). We do so by focusing on guilt and shame—self-conscious emotions that people feel when they find themselves violating moral standards (Tangney, 1999; Tracy & Robins, 2004). Both guilt and shame are experienced when people attribute their actions against moral norms to internal factors. However, while guilt involves attributions to transient actions or states, shame involves attributions to stable and global self (Tangney & Dearing, 2002). Importantly, these self-conscious emotions play a significant role in driving people to behave in socially and morally appropriate ways (Tracy & Robins, 2004). They do so by operating as critical feedback on social and moral acceptability (Tangney et al., 2007).

Therefore, we posit that when people perceive stronger injunctive norms about environmental behavior from prosocial- (vs. proself-) motivated norms, they may anticipate experiencing negative self-conscious emotions like guilt and shame if they violate these injunctive norms. These anticipated negative emotions may drive people to regulate their behaviors to be more consistent with the injunctive norms (i.e., behaving in an environmentally friendly manner). Indeed, both anticipated guilt and shame have been found to be significant predictors

of pro-environmental behaviors (Onwezen et al., 2014 for anticipated guilt; Amatulli et al., 2019 for anticipated shame). Thus, we examine anticipated guilt and shame (over one's non-conformity to an injunctive norm) as hypothesized mediators that may explain the link between perceived injunctive norms and motivation to engage in environmental behavior.

4. Present research

The present research examines how perceptions of others' motives (or perceived others' motives) for engaging in descriptive norms modulate inferences of moral norms about pro-environmental behavior and subsequent motivation to engage in pro-environmental behavior. Across four studies, we provide participants with descriptive norms about pro-environmental behaviors and, critically, present information about different motivations behind the norms—to benefit oneself (i.e., proself motives) or to benefit society (i.e., prosocial motives)—and examine their influence on injunctive norm inferences (Studies 1 and 3) as well as inferences of others' reactions relevant to moral norms (Study 2). Moreover, we examine the influence of descriptive norms with distinct motives on one's own motivation for behaving pro-environmentally (Studies 3 and 4) and focus on anticipated guilt and shame as potential psychological mechanisms (Study 4). We hypothesize that when people encounter prosocial- (vs. proself-) motivated descriptive norms about an environmental behavior, they infer stronger moral norms about the environmental behavior. These inferences of moral norms would lead to greater motivation to engage in the environmental behavior because people anticipate experiencing negative self-conscious emotions (i.e., guilt and shame) if they do not conform to the moral norms about the pro-environmental behavior.

Although proself motives can involve various forms of self-benefits, such as material, emotional, and social benefits (Carlson & Zaki, 2018), our focus in the present research is primarily on financial benefits as a specific case of proself motives (except in Study 3). Our choice to employ financial motives aligns with findings elsewhere (e.g., Carlson & Zaki, 2018) showing that motives to gain material benefits are perceived as more purely self-centered (i.e., proself) than motives for other types of self-benefits.

We report how sample size was determined, all data exclusions, all manipulations, and all measures relevant to our key hypothesis. The materials and the data from all the studies are publicly available at the Open Science Framework: https://osf.io/s235k. Bivariate correlations among the key measured variables across the studies are reported in Supplemental Materials.

5. Study 1

Study 1 sought to demonstrate the following basic effect: that when prosocial (vs. pro-self) motives are attached to descriptive norms about pro-environmental behaviors, people perceive stronger injunctive norms about these behaviors. We provided participants with descriptions that a relatively high proportion of Americans (70 %) were engaging in water and energy conservation for ostensibly different motives (proself vs. prosocial) and measured participants' perceptions of injunctive norms about water and energy conservation. Moreover, we included a baseline condition in which participants were given no information about the normative (pro-environmental) behaviors of people in the U.S. In doing so, we aimed to establish if, relative to the baseline condition, proself motives reduced perceptions of injunctive norms, prosocial motives increased perceptions of injunctive norms, or both.

5.1. Participants

We assumed a small-to-medium effect size ($d \sim 0.30$) of the key condition difference (i.e., prosocial-motivated vs. proself-motivated norms) in injunctive norms. Since there was no prior research using the same manipulation used in Study 1, we inferred the effect size from other research using text-based manipulations on self-reported outcomes (e.g., Eom et al., 2021). We sought to recruit approximately 200 per condition; thus, 600 participants in total for Study 1 (which had 3 conditions). 606 U.S. participants were recruited on Amazon MTurk.[1] After excluding participants who failed our attention check items,[2] the final samples used for analyses included 585 participants (240 males, 344 females, and 1 other; $M_{age} = 37.29$, $SD_{age} = 12.30$; 73.3 % Whites). This sample size provided 80 % power to detect an effect size of $d \sim 0.30$ with $\alpha = 0.05$ (two-tailed).

5.2. Measures and materials

5.2.1. Social norm manipulation

Participants were given written information on descriptive norms about water and energy conservation in the U.S. Depending on the condition (proself vs. prosocial), others were described as trying to conserve water and energy to get financial benefits[3] or to save the environment for humanity. It read:

> Recent research from the US Department of Energy (DOE) has shown that 70 % of Americans make an effort to reduce water and energy usage in daily lives in order *to save on their utility bills (*vs. *to save the environmental for humanity)*. That means that 7 in 10 people use less water and energy *to save money (*vs. *to save the environment and others' lives)* than they otherwise would.

We opted to use 70 % to indicate that conservation efforts were prevalent enough to be perceived as a descriptive norm within society (adapted from Sparkman & Walton, 2019). Participants were randomly assigned into the two conditions above, or an additional baseline condition in which participants read no social norm information and just answered injunctive norm items ($n_{\text{proself}} = 190$, $n_{\text{prosocial}} = 192$, $n_{\text{baseline}} = 203$).

5.2.2. Injunctive norms

Two items were used to measure perceived injunctive norms: (1) U.S. citizens think that people ought to save water and energy; and (2) U.S. citizens think that people are obligated to save water and energy (1 = *not at all* to 6 = *extremely*). We generated a composite by averaging the scores across the two items ($M = 4.29$, $SD = 0.94$; $r(583) = 0.49$, $p < .001$).

5.3. Results

A one-way ANOVA found a significant condition difference in perceived injunctive norms about water and energy conservation, $F(2, 582) = 14.00$, $p < .001$, $f = 0.22$. Participants inferred stronger injunctive norms in the prosocial condition ($M = 4.58$, $SD = 0.84$) than in the baseline condition ($M = 4.14$, $SD = 0.97$), $M_{prosocial\text{-}baseline} = 0.44$, $p < .001$, $d = 0.48$, or in the proself condition ($M = 4.16$, $SD = 0.94$).

[1] For data collection of the studies in the present research (except for Study 3 using Prolific), we recruited MTurkers in the U.S. through CloudResearch (https://www.cloudresearch.com/).

[2] Study 1used two attention checks. After reading about descriptive norms about conservation behavior in the U.S., participants indicated (1) the percentage of people in the U.S. (i.e., 70 %) and (2) the primary motive of others' conservation behavior as described in the social norm information.

[3] Our decision to focus on financial benefits in the water and energy conservation serves ecological validity. We ran a pilot in which we simply asked participants to write why they thought Americans made an effort to reduce water and energy usage. 49.5 % participants ($n = 193$) stated financial reasons (e.g., to save money, to reduce their utility bills) and 43.3 % ($n = 169$) participants stated environmental reasons (e.g., to protect the environment, to save resources for future generations) as a primary motive. None of the participants mentioned other self-benefits, such as emotional or social benefits.

$M_{prosocial\text{-}proself} = 0.42$, $p < .001$, $d = 0.47$. Participants did not differ in their inference of injunctive norms between the proself condition and the baseline condition, $M_{proself\text{-}baseline} = 0.03$, $p = .990$, $d = 0.02$ (see Fig. 1). These post-hoc comparisons were performed by using the Sidak adjustment.

5.4. Discussion

Overall, we found evidence that people inferred stronger injunctive norms when they thought that others engaged in conservation behavior for prosocial (vs. proself) reasons. By including a baseline condition (a no-norm condition capturing the base level of injunctive norm perceptions), we showed that prosocial-motivated (but not proself-motivated) descriptive norms made a significant difference, relative to the baseline. That there was no difference in injunctive norms between the baseline and the proself condition suggests that perceiving proself motives in descriptive norms significantly attenuates the common-moral association in norm perceptions as participants who received proself-motivated descriptive norms inferred injunctive norms similarly to those who received no descriptive norms at all. The common-moral association may not hold when people perceive descriptive norms as driven by self-interest.

6. Study 2

In Study 2, we examined inferences of others' more concrete reactions relevant to moral norms—how participants expected others to react to violations of and conformity to norms. We examined two outcomes: perceived others' (1) negative moral emotions (i.e., anger and disgust) at wasting water and energy and (2) moral perceptions of a person engaging in conservation behavior. To the extent that prosocial-motivated descriptive norms increase perceived moral norms, when many others are thought to engage in conservation behavior for prosocial motives (vs. proself motives) in a society, people may expect others to experience negative moral emotions (i.e., anger and disgust) about wasteful behavior (violations of moral norms) and, conversely, perceive a person conserving water and energy (conformity to moral norms) as more morally sound.

6.1. Participants

Consistent with Study 1, which detected significant effects of the motive manipulation, we aimed to collect 200 participants per condition for a between-subjects experiment with two conditions (proself vs. prosocial). 401 participants in the U.S. completed our study. Five participants failed an attention check item that asked participants to identify the primary motive of water and energy conservation as described in the manipulation and were excluded. As a result, 396 participants were included in the analysis (172 males, 223 females, and 1 other; $M_{age} = 39.97$, $SD_{age} = 12.27$; 75.8 % Whites). This sample size provided 80 % power to detect an effect size of $d \sim 0.28$ with $\alpha = 0.05$ (two-tailed).

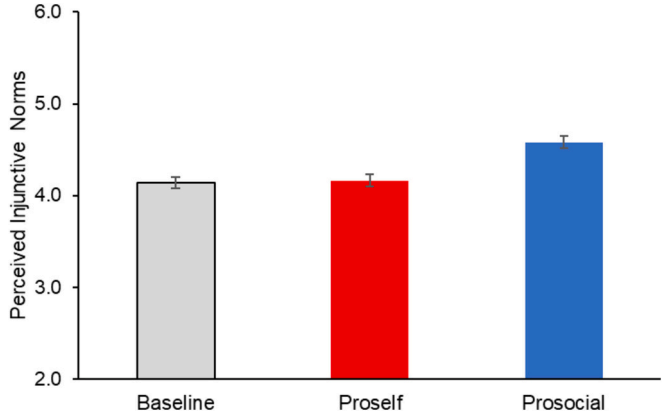

Fig. 1. Perceived injunctive norms about water and energy conservation in the baseline, proself motive, and prosocial motive conditions in Study 1.
Note. Error bars indicate standard errors of the means (SEM).

6.2. Measures and materials

6.2.1. Social norm manipulation

In Study 2, we used descriptive norms in a hypothetical society in which participants did not have any existing knowledge or experiences. Participants were given written information on descriptive norms about water and energy conservation efforts in a hypothetical society A. It read:

> Many people in Society A make an effort to reduce water and energy usage in daily lives. The primary reason why they conserve water and energy is *to benefit themselves: to save on their utility bills* (vs. *to benefit society: to save the environment for humanity)*. That is, many people in Society A try to use less water and energy to *save money* (vs. *to save the environment and others' lives)*.

Participants were randomly assigned into either proself ($n = 195$) or prosocial ($n = 201$) condition.

6.2.2. Negative moral emotions

Participants indicated their perceptions of the extent to which people in Society A would feel emotions related to anger (anger, infuriation, and outrage) and disgust (disgust, repulsion, sickness, and grossed out) when they saw someone wasting water and energy (1 = *not at all* to 5 = *very much*) (adapted from Gutierrez & Giner-Sorolla, 2007). We created composites of anger ($M = 3.13$, $SD = 1.33$; $\alpha = 0.95$) and disgust ($M = 2.68$, $SD = 1.14$; $\alpha = 0.89$) by averaging the scores of the respective items.

6.2.3. Perceptions of morality (and Competence)

Participants indicated their expectations for how a person making a great effort to reduce water and energy usage would be perceived in Society A. Given that morality and competence represent two key dimensions in social perceptions, in addition to morality, we also measured competence as a comparison trait to provide discriminant validity for morality (Wojciszke, 2005; Wojciszke et al., 1998). In a society where others are perceived to engage in conservation behaviors for prosocial (vs. proself) motives, people are more likely to infer that those in the society perceive a person conserving water and energy as more moral; by contrast, we expect this positive impact may be less pronounced for ratings of the competence dimension. Including competence would enable us to examine whether people's inference of a pro-environmental person being perceived as positively is unique or pronounced on morality, not just on any positive traits. Participants rated a person making efforts to reduce water and energy use on 16 traits: 8 items related to morality (e.g., generous, helpful, and honest) and 8 items related to competence (clever, competent, and creative) (1 = *not at all* to 7 = *extremely*). Trait items were from Wojciszke et al. (1998). We generated composites of morality ($M = 5.20$, $SD = 1.39$; $\alpha = 0.94$) and competence ($M = 5.45$, $SD = 1.06$; $\alpha = 0.90$) by averaging the scores of the respective items.

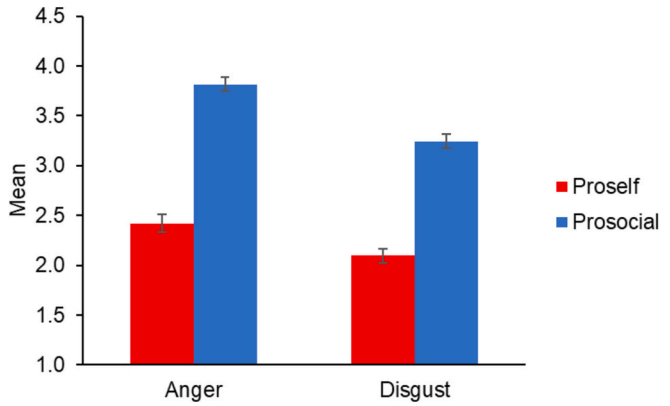

Fig. 2. Expected negative moral emotions among people in Society A at water and energy wasting behavior in the proself and prosocial motive conditions in Study 2.
Note. Error bars indicate standard errors of the means (SEM).

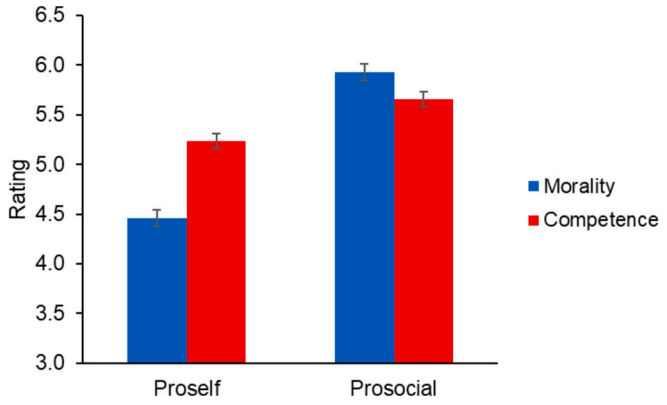

Fig. 3. Expected morality and competence perceptions of a person who conserves water and energy in Society A in the proself and prosocial motive conditions in Study 2.
Note. Error bars indicate standard errors of the means (SEM).

6.3. Results

6.3.1. Negative moral emotions

Using independent samples *t*-tests,[4] we compared participants' expectations of anger and disgust that people in Society A would feel about a person who wasted water and energy between the proself and prosocial conditions. More than in the proself condition, participants in the prosocial condition expected people in Society A to feel angry at someone who wasted water and energy, ($M_{\text{prosocial}} = 3.82$, $SD = 1.02$; $M_{\text{proself}} = 2.42$, $SD = 1{,}24$), $t(394) = -12.32$, $p < .001$, $d = 1.23$. Likewise, more than in the proself condition, participants in the prosocial condition expected people in Society A to feel disgust at someone who wasted water and energy, ($M_{\text{prosocial}} = 3.25$, $SD = 0.99$; $M_{\text{proself}} = 2.10$, $SD = 0.98$), $t(394) = -11.58$, $p < .001$, $d = 1.17$ (See Fig. 2).

6.3.2. Perceptions of morality and competence

We examined participants' inferences of morality and competence about someone in Society A who engaged in water and energy conservation between the proself and prosocial conditions. A 2 (condition: proself vs. prosocial) X 2 (type of traits: morality vs. competence) mixed-ANOVA was performed on participants' ratings. There was a significant main effect of condition such that the overall ratings on traits were higher in the prosocial condition ($M = 5.79$, $SD = 0.91$) than in the proself condition ($M = 4.85$, $SD = 1.28$), $F(1, 394) = 84.99$, $p < .001$, $f = 0.46$. The main effect of type of traits was also significant such that ratings for competence ($M = 5.45$, $SD = 1.06$) were higher than for morality ($M = 5.20$, $SD = 1.39$), $F(1, 394) = 32.28$, $p < .001$, $f = 0.29$.

Importantly, these main effects were qualified by a significant interaction between condition and type of traits, $F(1, 394) = 140.01$, $p < .001$, $f = 0.60$ (See Fig. 3). Participants inferred that a person engaging in conservation behavior would be perceived as more moral by people in Society A in the prosocial condition ($M = 5.93$, $SD = 0.85$) than in the proself condition ($M = 4.46$, $SD = 1.43$), $F(1, 394) = 154.69$, $p < .001$, $d = 1.25$. Although participants also inferred that a person engaging in water and energy conservation efforts would be perceived as more competent in Society A in the prosocial condition ($M = 5.66$, $SD = 0.96$) than in the proself condition ($M = 5.23$, $SD = 1.13$), this difference was smaller than for the morality inference, $F(1, 394) = 16.20$, $p < .001$, $d = 0.41$.

Viewed differently, in the prosocial condition, participants inferred that a person engaging in conservation behavior would be perceived as moral ($M = 5.93$, $SD = 0.85$) more than competent ($M = 5.66$, $SD = 0.96$) in Society A, $F(1, 394) = 19.21$, $p < .001$, $d = 0.30$. In contrast, in the proself condition, participants inferred that a person engaging in conservation efforts would be perceived as competent ($M = 5.23$, $SD = 1.13$) more than moral ($M = 4.46$, $SD = 1.43$) in Society A, $F(1, 394) = 151.09$, $p < .001$, $d = 0.60$.

6.4. Discussion

Study 2 extended Study 1 by looking at expectations of others' reactions to violations of and conformity to descriptive norms that were driven by distinct motives. Participants expected others to experience more negative moral emotions about someone who did not conserve (or wasted) water and energy when the prevalence of water and energy conservation behaviors was motivated by prosocial (vs. proself) motives. Participants also expected others to perceive someone who makes efforts to conserve water and energy as more moral when the prevalence of conservation behaviors was driven by prosocial (vs. proself) motives. These findings corroborate the idea that people infer varying levels of moral norms when they perceive normative behavior to be motivated by different aims; specifically, our findings indicate that depending on the perceived motive of descriptive norms, people expect norm-consistent or -inconsistent behaviors to elicit noticeably different morality-related reactions and evaluations.

7. Study 3

Study 3 extended the earlier studies in important ways. First, we employed a factorial design in which both descriptive norms and perceived motives were manipulated. Although Study 1 included a baseline condition that provided a meaningful reference point, it did not include any normative information. This condition represented a neutral status in which participants responded based on their own assumptions about descriptive norms and motives without any additional information provided. Therefore, the observed effects were driven by highlighting high descriptive norms along with different motives, and descriptive norms were not independently manipulated. In contrast, in Study 3, by directly manipulating both descriptive norms and motives, we examined how perceived injunctive norms change according to the different levels (from low to high) of descriptive norms when distinct (proself vs. prosocial) motives are highlighted. Thus, we took a 3

[4] We conducted *t*-tests rather than a mixed-ANOVA for moral emotions because we did not hypothesize an interaction between condition (proself vs. prosocial) and emotions (anger vs. disgust). Unexpectedly, a mixed-ANOVA showed a significant interaction between condition and emotions, $F(1, 394) = 11.15$, $p = .001$. Although participants in the prosocial condition expected those in Society A to feel greater negative emotions for both anger and disgust than participants in the proself condition, the difference between the prosocial and proself condition was larger for anger than disgust.

(descriptive norms: low, medium, and high) x 2 (motives: proself and prosocial) between-subject design.

Second, Study 3 examined behavioral intentions as a downstream consequence. Given the significant influence of injunctive norms on environmental behavior (Bhanot, 2021; De Groot et al., 2013), we hypothesized that when people perceive stronger injunctive norms from descriptive norms motivated by prosocial (vs. proself) motives, they would express stronger intentions to behave in ways consistent with the norms. Taken together, we examined a moderated mediation model in which perceived motives moderate the effect of descriptive norms on injunctive norms, which in turn significantly predicts behavioral intentions (i.e., first-stage moderated mediation, Hayes, 2015). We predicted that the positive effect of descriptive norms on injunctive norms would be stronger when people perceived prosocial motives (vs. proself motives) of others and that injunctive norms would positively predict behavioral intentions.

Lastly, Study 3 aimed to increase generalizability of our findings with two changes: (1) while the earlier studies focused on water and energy conservation behaviors, Study 3 examined carpooling in an organizational context. (2) While the earlier studies only examined financial benefits for self-oriented motives, Study 3 made proself motives more inclusive by mentioning various self-benefits relevant to carpooling including informational and social benefits.

7.1. Participants

The hypothesized moderated mediation model includes two key effects: (1) an interaction between descriptive norms and motives on perceived injunctive norms and (2) a main effect of injunctive norms on behavioral intentions. Since the sizes of interaction effects are generally smaller than the main effects (Sommet et al., 2023), we aimed to collect participants large enough to be able to detect the interaction between descriptive norms and motives on injunctive norms (i.e., moderation of the first path in mediation). We opened a study seeking approximately 1500 participants on Prolific, with 1501 participants completing our study. 91 participants failed our attention check items,[5] leaving a final sample size of 1410 participants (606 males, 773 females, 31 other; M_{age} = 36.01 years, SD_{age} = 11.26 years; 67.3 % Whites). This sample size provided 80 % power to detect a small-sized effect ($d \sim 0.20$) with $\alpha = 0.05$ (two-tailed) (Sommet et al., 2023).

7.2. Measures and materials

7.2.1. Manipulation

Study 3 took a 3 (descriptive norms: low, medium, and high) x 2 (motives: proself and prosocial) between-subjects design. Participants were given descriptions of a company (i.e., Company A). It included basic information about the company, but importantly, the descriptions differed by the conditions in terms of how common carpooling among colleagues was (low norm: one colleague, medium norm: a handful of colleagues, and high norm: a lot of colleagues). Additionally, the primary motives of carpooling among colleagues were described either as self-oriented (proself condition), such as saving money and building a social network, or as other-oriented (prosocial condition), such as helping the environment and caring about future generations. It read:

> You have recently joined a company, taking up a new position there. Let's call it Company A. This company is a leading retailer with an extensive network. It offers a wide range of products, including clothing, electronics, home goods, and accessories. You are working in the marketing department. You found that the company's location is not easily accessible through public transport, so you have started to commute by driving your personal car. As you settle into your new role, you have found *one colleague in your department who carpools (low descriptive norm condition)* vs. *that a handful of colleagues in your department are carpooling together (medium descriptive norm condition)* vs. *that a lot of people in your department are carpooling together (high descriptive norm condition)* to commute between work and home. *This person mentioned almost no one carpools in the department, but they do so for several main reasons (low norm condition)* vs. *When you talked to them about why they were carpooling, they mentioned several main reasons (medium and high norm condition)*, such as *saving money on fuel, building a social network, and gaining useful information about the company and the department (proself condition)* vs. *such as helping others and society, protecting the environment, and caring about future generations (prosocial condition)*.

7.2.2. Injunctive norms

Four items were used to measure perceived injunctive norms about carpooling. We adapted the two-item measure of injunctive norms used in Study 1 and included two additional items to increase the reliability of the measure. The items are as follows: (1) Most employees in the marketing department at Company A think that people ought to carpool rather than driving a personal car to commute, (2) Most employees in the marketing department at Company A think that people are morally obligated to carpool (rather than driving a personal car) when they commute, (3) Most employees in the marketing department at Company A think that carpooling is a morally right thing that everyone should do, and (4) Most employees in the marketing department at Company A morally disapprove of someone who drives a personal car to commute (1 = *strongly disagree* to 5 = *strongly agree*). A composite average score of the four items was created ($M = 2.61$, $SD = 1.00$, $\alpha = 0.86$).

7.2.3. Behavioral intentions

Participants answered three items to indicate their intentions to carpool: (1) How likely would you be to carpool with other colleagues when you commute? (1 = *extremely unlikely* to 7 = *extremely likely*), (2) I will be carpooling with other coworkers rather than driving my car, and (3) I will join the carpooling group in the department rather than driving my car (for the last two items, 1 = *strongly disagree* to 7 = *strongly agree*). We created a composite by averaging the scores of the three items ($M = 4.61$, $SD = 1.69$, $\alpha = 0.97$).

7.2.4. Manipulation check

To ensure that the manipulation was valid, we included manipulation check items at the end of the study as follows: For descriptive norms, "What percentage of people in the marketing department at Company A do you think are carpooling when they commute? (open-ended, participants put their estimate of a percentage)" and for perceived motives, "Why do those who carpool in the marketing department at *Company A* do it? Which reasons are more important between self-oriented reasons and other-oriented reasons? (*1= entirely self-oriented reasons (e.g., saving money, building a social network, and getting useful information) to 5= entirely other-oriented reasons (e.g., helping others and society, protecting the environment, and caring about future generations)*)."

Results from ANOVAs showed that both the descriptive norm and perceived motive manipulations were effective as intended. For perceived descriptive norms, there was a significant main effect of descriptive norms, $F(2, 1404) = 1170.52$, $p < .001$. Participants in the low norm condition ($M = 12.36$, $SD = 15.57$) perceived that a lower percentage of people were carpooling than those in the medium norm condition ($M = 33.71$, $SD = 21.53$), $p < .001$, or those in the high norm

[5] Study 3 included three attention check items. After reading the provided information about an organization, participants answered: (1) What products does Company A NOT offer? (2) How many people in the marketing department at Company A are carpooling? (3) Which of the following is NOT a reason why people in the marketing department at Company A are carpooling? Those who provided any answer inconsistent with the information provided were excluded.

condition ($M = 67.54$, $SD = 14.98$), $p < .001$. There was a significant difference between the medium norm and the high norm conditions, too, $p < .001$. The main effect of motives ($p = .438$) or the interaction between descriptive norms and motives ($p = .302$) was not significant.

For the perceived motive manipulation, there was a significant main effect of motives, $F(1, 1403) = 3004.91$, $p < .001$. Participants in the proself condition ($M = 1.73$, $SD = 0.98$) perceived that colleagues in Company A were more likely to carpool for self-oriented, compared to other-oriented, reasons than those in the prosocial condition ($M = 4.44$, $SD = 0.88$), $p < .001$. The main effect of descriptive norms ($p = .342$) or the interaction between descriptive norms and motives ($p = .472$) was not significant.

7.3. Results

First, we examined the interactions between descriptive norms and motives on perceived injunctive norms and behavioral intentions, separately.

7.3.1. Perceived injunctive norms

A 3 (descriptive norms: low, medium, and high) x 2 (motives: proself and prosocial) ANOVA was performed on perceived injunctive norms. There was a significant main effect of descriptive norms, $F(2, 1404) = 257.53$, $p < .001$, $f = 0.61$. People in the low norm condition ($M = 1.98$, $SD = 0.83$) inferred weaker injunctive norms than those in the medium norm condition ($M = 2.67$, $SD = 0.85$), $p < .001$, $d = -0.82$, or those in the high norm condition ($M = 3.16$, $SD = 0.93$), $p < .001$, $d = -1.34$. Participants in the medium norm condition also reported weaker injunctive norms than those in the high norm condition, $p < .001$, $d = -0.55$. The main effect of motives was also significant, $F(1, 1404) = 180.15$, $p < .001$, $f = 0.36$. People in the prosocial condition ($M = 2.90$, $SD = 1.05$) inferred stronger injunctive norms than those in the proself condition ($M = 2.32$, $SD = 0.85$), $d = 0.61$.

Importantly, there was a significant interaction between descriptive norms and motives, $F(2, 1404) = 45.22$, $p < .001$, $f = 0.25$. The simple effect of descriptive norms increasing perceived injunctive norms was greater in the prosocial condition, $F(2, 1404) = 261.19$, $p < .001$, $f = 0.61$, than in the proself condition, $F(2, 1404) = 45.54$, $p < .001$, $f = 0.25$. Specifically, the difference in perceived injunctive norms between the proself ($M = 1.92$, $SD = 0.80$) and the prosocial condition ($M = 2.04$, $SD = 0.86$) was not significant in the low norm condition, $p = .115$, $d = 0.14$, but was significant in the medium norm condition ($M = 2.42$, $SD = 0.81$ in the proself condition; $M = 2.92$, $SD = 0.82$ in the prosocial condition), $p < .001$, $d = 0.61$, and the high norm condition ($M = 2.61$, $SD = 0.80$ in the proself condition; $M = 3.71$, $SD = 0.71$ in the prosocial condition), $p < .001$, $d = 1.45$, with a bigger effect in the high norm condition. These patterns showed that the positive effects of descriptive norms on perceived injunctive norms increase more strongly in the prosocial condition, compared to the proself condition (see Fig. 4).

7.3.2. Behavioral intentions

A 3 (descriptive norms: low, medium, and high) x 2 (motives: proself and prosocial) ANOVA was performed on intentions to carpool. There was a significant main effect of descriptive norms, $F(2, 1404) = 11.38$, $p < .001$, $f = 0.13$. People in the low norm condition ($M = 4.35$, $SD = 1.72$) reported weaker intentions to carpool than those in the high norm condition ($M = 4.87$, $SD = 1.62$), $p < .001$, $d = -0.31$. The level of carpool intentions in the medium norm condition ($M = 4.61$, $SD = 1.71$) was placed in the middle between the other two conditions, significantly lower than in the high norm condition, $p = .041$, $d = -0.16$, but not significantly different from the low norm condition, $p = .061$, $d = 0.15$.

The main effect of motives or the interaction between descriptive norms and motives was not significant, main effect of motives: $F(1, 1404) = 0.50$, $p = .479$, $f = 0.02$; interaction: $F(2, 1404) = 2.22$, $p = .109$, $f = 0.05$. Therefore, while motives moderated the effect of descriptive norms on injunctive norms as shown earlier, they did not directly moderate the effect of descriptive norms on behavioral intentions to carpool.

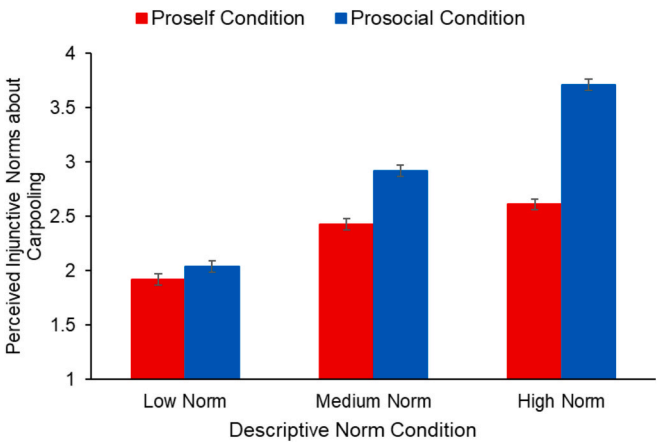

Fig. 4. Perceived injunctive norms as a function of the descriptive norm and perceived motive conditions in Study 3. There was a significant interaction.
Note. Error bars indicate standard errors of the means (SEM).

7.3.3. Moderated mediation

We examined the hypothesized moderated mediation model in which perceived motives moderate the effect of descriptive norms on injunctive norms about carpooling which predicts behavioral intentions to carpool. We used the SPSS PROCESS macro (model 7; Hayes, 2022). Conditions were dummy-coded. For descriptive norms, two dummy variables were created with the low norm condition as the criterion condition. The first dummy compared the low norm condition with the medium norm condition, and the second dummy compared the low norm condition with the high norm condition. For perceived motives, the proself condition was coded as 0 and the prosocial condition was coded as 1.

Consistent with the results from ANOVA earlier, results showed that perceived motives moderated the effects of descriptive norms on perceived injunctive norms. The effect of medium norm (vs. the low norm condition) was moderated by perceived motives, $b = 0.38$, $p < .001$. Specifically, the positive effect of medium norm (vs. the low norm condition) on injunctive norms was stronger in the prosocial motive condition, $b = 0.88$, $SE = 0.07$, $t(1404) = 11.95$, $p < .001$, 95 % CI of b [0.74, 1.03], $d = 1.05$, compared to the proself motive condition, $b = 0.50$, $SE = 0.07$, $t(1404) = 6.77$, $p < .001$, 95 % CI of b [0.36, 0.65], $d = 0.62$. The effect of high norm (vs. the low norm condition) was also moderated by perceived motives, $b = 0.98$, $p < .001$. Consistently, the positive effect of high norm (vs. the low norm condition) on injunctive norms was stronger in the prosocial condition, $b = 1.67$, $SE = 0.07$, $t(1404) = 22.85$, $p < .001$, 95 % CI of b [1.53, 1.82], $d = 2.12$, compared to the proself condition, $b = 0.69$, $SE = 0.07$, $t(1404) = 9.25$, $p < .001$, 95 % CI of b [0.54, 0.84], $d = 0.86$.

Moreover, perceived injunctive norms significantly predicted behavioral intentions to carpool; perceived injunctive norms were positively associated with intentions to carpool, $b = 0.19$, $p < .001$. Taken together, the moderated mediation effect was significant for both medium norm and high norm, $b = 0.07$, $SE = 0.03$, 95 % CI of b [0.02, 0.14] for medium norm; $b = 0.19$, $SE = 0.06$, 95 % CI of b [0.08, 0.30] for high norm. Specifically, the indirect effect of medium norm (vs. low norm) on carpool intentions through injunctive norms was stronger in the prosocial motive condition, $b = 0.17$, $SE = 0.05$, 95 % CI of b [0.07, 0.28], than in the proself motive condition, $b = 0.10$, $SE = 0.03$, 95 % CI of b [0.04, 0.16]. Similarly, the indirect effect of high norm (vs. low norm) on carpool intentions through injunctive norms was stronger in the prosocial motive condition, $b = 0.32$, $SE = 0.09$, 95 % CI of b [0.15, 0.50], than in the proself motive condition, $b = 0.13$, $SE = 0.04$, 95 % CI

of b [0.06, 0.22]. Fig. 5 visualizes the result for each key path, and comprehensive results from the moderated mediation analysis are reported in Table 1.

7.4. Discussion

Manipulating both descriptive norms and perceived motives, Study 3 provided additional evidence that perceptions of others' motives behind descriptive norms play a significant role in inferring moral norms from descriptive norms. Consistent with previous research (Eriksson et al., 2015; Lindström et al., 2018), participants perceived stronger injunctive norms when a behavior (i.e., carpooling) is more prevalent, but importantly, this inference significantly depended on perceived others' motives. Participants were more likely to infer stronger injunctive norms from a more common behavior when they perceived the behavior as driven by prosocial (vs. proself) motives. In short, perceived motives moderated the common-moral association in norm perceptions. In Study 3, we demonstrated such moderation of perceived motives in a different context—carpooling in an organization, enhancing the generalizability of our findings.

Moreover, taking a moderated mediation approach, we examined behavior intentions conceptualized as a downstream outcome. Although we did not find evidence that perceived motives directly moderated the effect of descriptive norms on carpooling intentions, the results supported the moderated mediation model in which perceived motives moderated the effect of descriptive norms on injunctive norms, which were positively associated with behavioral intentions to carpool.[6]

We note that in Study 3, there was a significant positive effect of descriptive norms not only in the prosocial condition but also in the proself motive condition. Given that multiple motives generally underlie behavior, especially for environmental behavior (Schultz, 2001), although the primary motives of others are perceived as self-centered in the proself condition, people may also assume the prosocial motives of others, albeit secondary, to some extent. If so, stronger descriptive norms with proself motives may also increase (though less strongly than norms with prosocial motives) injunctive norms, especially when compared with the situation of highly low descriptive norms (i.e., only one person who carpools in the department), as the absolute number of people with *secondary* prosocial motives increases. Future research is needed to test this possibility directly.

It may also be useful to consider this finding alongside Study 1, which compared the effects of different motives with a neutral condition where participants responded without normative information provided. Highlighting self-centered, in particular economic, motives with high descriptive norms did not change perceptions of injunctive norms, compared to the neutral baseline (Study 1). However, highlighting self-centered motives with high descriptive norms appeared to increase injunctive norms compared to when people perceived extremely low descriptive norms (Study 3), although the increasing effect is still weaker than when prosocial motives were highlighted.

8. Study 4

Study 4 extended the earlier studies in important ways. Study 3 found the indirect moderation effect of perceived motives on behavioral intentions with injunctive norms as a mediator. In Study 4, extending the model, we aimed to unpack the psychological processes that may connect injunctive norms to behavioral intentions. In doing so, we focused on self-conscious emotions: anticipated guilt and shame. These emotions operate as signals about whether one behaves in line with moral norms, leading the actor to adjust his or her behaviors (Tracy & Robins, 2004). Given the significant effects of descriptive norms with distinct motives on perceived moral and injunctive norms found in earlier studies, we suggest anticipated guilt and shame as potential mediators that explain the link between injunctive norms and behavioral intentions. Taken together, we propose and test a serial mediation model: differentially motivated descriptive norms predict perceptions of injunctive norms, which predicts anticipated guilt and shame in parallel, which, in turn, predicts behavioral intentions to engage in environmental behavior (see Fig. 6).

In addition, we included another meaningful comparison condition in which high descriptive norms are provided without any accompanying information about the motivation behind them (i.e., a norm-only condition). Together with the reference points used in Study 1 (i.e., a neutral, baseline condition without normative information provided) and Study 3 (i.e., extremely low descriptive norms), this provides another reference point that further helps us understand the nature of the effects of the motivations attached to norms. Given the prevalent usage of norm-based messages for attitudes and behavior change, having the norm-only condition as a comparison would also be practically valuable.

Lastly, Study 4 examined electric vehicle usage, another different behavior with great environmental impact, to establish the generalizability of our findings. Our hypotheses, analyses, and sampling method (and exclusion criterion) for Study 4 were preregistered, available on OSF at https://osf.io/49de2.

8.1. Participants

Because we tested a model with serial mediators and a downstream outcome, we expected the effect sizes of motive manipulation to be smaller for the mediators and downstream outcome than for the proximate mediator of injunctive norms perceptions (e.g., Van der Linden et al., 2019). We aimed to ensure sufficient power to detect small effect size differences between the two conditions ($d = 0.20$). As preregistered, we chose to recruit 500 participants per condition to boost the statistical power; thus, 1500 in total for our experiment with three conditions (i.e., prosocial, proself, and norm-only conditions). We opened a study on MTurk, with 1513 participants completing our study. 17 participants failed our attention check (the same one used in Study 2), leaving a final sample size of 1496 participants (802 males, 689 females, 5 other; M_{age} = 40.90 years, SD_{age} = 12.19 years; 77.0 % Whites). This sample size provided 80 % power to detect an effect size of $d \sim 0.18$ with $\alpha = 0.05$ (two-tailed).

8.2. Materials and measures

8.2.1. Social norm manipulation

We used the prompts about Society A employed in Study 2, but the prompts in Study 4 focused on descriptive norms about driving and using electric vehicles. It read:

> Many people in Society A drive electric vehicles. One can easily notice a lot of electric cars people drive on the street as well as in parking places in Society A. The primary reason why they drive electric vehicles is *to benefit themselves: to save money on fuel costs (to benefit society: to protect the environment and others' lives)*.

In addition, we included a condition describing descriptive norms in Society A for using electric vehicles, with no specific mention of motivations for doing so (i.e., norm-only condition). Participants were randomly assigned into either the norm-only condition (n = 498), prosocial condition (n = 503), or proself condition (n = 495).

[6] We ran another, pre-registered study that replicated the key findings from Study 3. Chronologically, this study was conducted before Study 3, using a simpler 2 (descriptive norms: low and high) X 2 (motives: proself and prosocial) between-subjects design. The medium and high norm conditions in Study 3 were used as the low and high norm conditions in this study. Study 3 was developed to examine more specific patterns of effects across different levels of descriptive norms, based on feedback from peer review. Detailed results for this additional study are reported in Supplemental Material (Study S1).

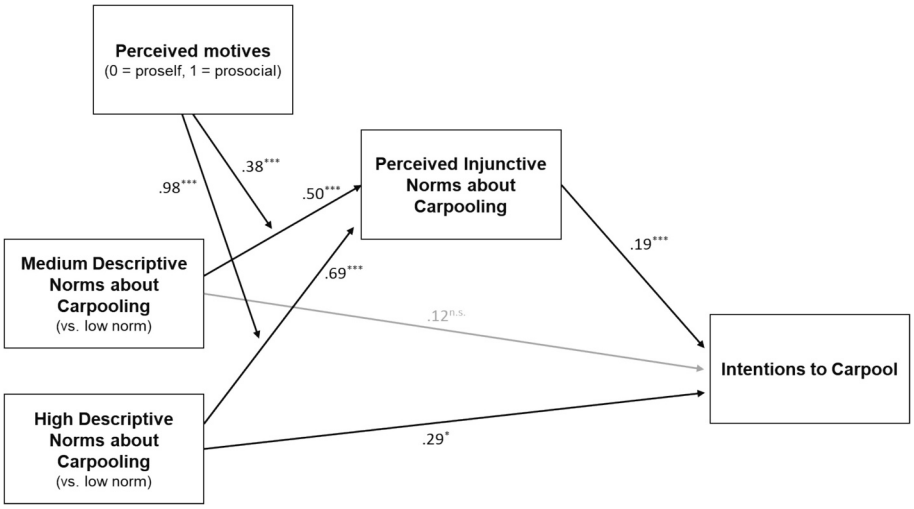

Fig. 5. Moderated mediation results in Study 3.
Note. Unstandardized path coefficients are shown. Black lines represent significant paths ($p < .05$), and the gray line represents the nonsignificant path ($p > .05$); *$p < .05$; ***$p < .001$.

Table 1
Multiple regression from the moderated mediation model examining whether perceived motives moderate the effect of descriptive norms on injunctive norms, which predicts behavioral intentions in Study 3.

	Model 1 outcome: Perceived injunctive norms about carpooling				Model 2 outcome: Behavioral intentions to carpool			
Variable	*b (SE)*	*p value*	*95 % CI*	*f*	*b*	*p value*	*95 % CI*	*f*
Intercept	1.92 (0.05)	< 0.001	[1.82, 2.02]		3.97 (0.13)	< 0.001	[3.72, 4.22]	
Medium norm (vs. low norm)	0.50 (0.07)	< 0.001	[0.36, 0.65]	0.18	0.12 (0.12)	0.304	[−0.11, 0.35]	0.03
High norm (vs. low norm)	0.69 (0.07)	< 0.001	[0.54, 0.84]	0.25	0.29 (0.13)	0.020	[0.05, 0.54]	0.06
Perceived motives	0.12 (0.07)	0.115	[−0.03, 0.26]	0.04				
Medium norm (vs. low norm) X perceived motives	0.38 (0.10)	< 0.001	[0.17, 0.58]	0.10				
High norm (vs. low norm) X perceived motives	0.98 (0.10)	< 0.001	[0.78, 1.19]	0.25				
Injunctive norms					0.19 (0.05)	< 0.001	[0.09, 0.29]	0.10

Note. Unstandardized coefficients are shown; the descriptive norm condition and perceived motive condition were dummy-coded. Two dummy variables were created for the descriptive norm conditions with the low norm condition as the criterion group (coded as 0). For perceived motives, the proself condition was coded as 0 and the prosocial condition was coded as 1.

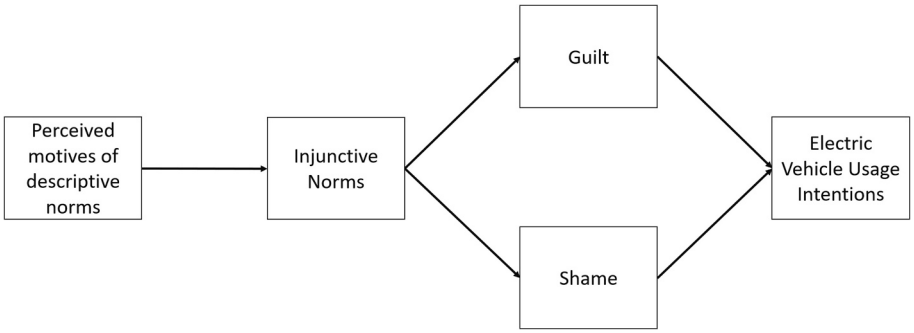

Fig. 6. Theorized serial mediation model for Study 4.

8.2.2. Perceptions of injunctive norms

We adapted the four-item measure of injunctive norms used in Study 3 (e.g., "The citizens of Society A think that driving an electric vehicle (rather than a conventional vehicle) is a morally right thing to do," "The citizens of Society A would disapprove of those who drive a conventional vehicle (rather than an electric vehicle)" (1 = *strongly disagree*, 5 = *strongly agree*)). A composite average score of the four items was created ($M = 3.73$, $SD = 0.94$, $\alpha = 0.86$).

8.2.3. Anticipated guilt and shame

Participants rated their anticipated level of guilt—the extent to which they would feel guilty, remorseful, or have a bad conscience—and shame—the extent to which they would feel embarrassed, ashamed, and humiliated—if they used a conventional (versus electric) vehicle in Society A (1 = *not at all* to 5 = *very much*) (adapted from Ferguson & Branscombe, 2010; Onwezen et al., 2014 for guilt and Amatulli et al., 2019 for shame). We created composites of anticipated guilt and shame by averaging ratings of corresponding emotions (guilt, $M = 2.55$, $SD = 1.35$, $\alpha = 0.95$; shame, $M = 2.52$, $SD = 1.33$, $\alpha = 0.95$).

8.2.4. Electric vehicle usage intentions

Finally, participants completed a three-item measure of environmental vehicle usage intentions (adapted from Barbarossa et al., 2015; Moons & De Pelsmacker, 2015). Assuming they were residents of Society A, participants answered to the following question/statements: (1) How likely would you be to drive an electric vehicle? (1 = *extremely unlikely* to 7 = *extremely likely*), (2) you would like to drive an electric car even though it costs more than a conventional car (1 = *strongly disagree* to 7 = *strongly agree*), and (3) you intend to purchase an electric car, when you do buy one (1 = *strongly disagree* to 7 = *strongly agree*). A composite average was formed from these items ($M = 5.13$, $SD = 1.51$, $\alpha = 0.95$).

8.3. Results

In line with our preregistered analyses plan, we conducted our analyses in two stages. First, we created two dummy variables (with the norm-only condition as the criterion condition coded as 0; thus, the first dummy compares the prosocial condition with the norm-only condition and the second dummy compares the proself condition with the norm-only condition) and regressed mediators and the outcome variable separately on these dummy variables (i.e., main effects of experimental conditions). Then, we tested our hypothesized serial mediation model.

8.3.1. Multiple regression analyses for main effects of conditions

Relative to the norm-only condition, participants in the prosocial condition perceived stronger injunctive norms about driving electric vehicles, $b = 0.45$, $p < .001$, and reported higher levels of both anticipated guilt, $b = 0.48$, $p < .001$, and shame, $b = 0.47$ $p < .001$, if they did not use electric vehicles in Society A. Moreover, those in the prosocial condition also had stronger intentions to use electric (versus conventional) vehicles, $b = 0.35$, $p < .001$.

In contrast, relative to the norm-only condition, participants in the proself condition perceived weaker injunctive norms, $b = -1.03$, $p < .001$, and reported lower levels of both anticipated guilt, $b = -0.84$, $p < .001$, and shame, $b = -0.72$, $p < .001$. Finally, participants in the proself condition had weaker intentions to use electric (versus conventional) vehicles, $b = -0.44$, $p < .001$. Fig. 7 presents the results based on descriptive statistics. Comprehensive results are reported in Table 2.

8.3.2. Mediation analyses

Next, we ran a serial mediation analysis using the SPSS PROCESS macro (model 81; Hayes, 2022). As in the regression analysis above, PROCESS created two dummy variables with the norm-only condition as the criterion condition; X1 compared the prosocial condition with the norm-only condition and X2 compared the proself condition with the norm-only condition. The results of serial mediation are presented in Fig. 8.

Relative to the norm-only condition, prosocial-motivated norms increased perceptions of injunctive norms about driving electric vehicles, $b = 0.45$, $p < .001$, but proself-motivated norms decreased perceptions of injunctive norms, $b = -1.03$, $p < .001$. Perceptions of injunctive norms were positively associated with participants' anticipated guilt, $b = 0.63$, $p < .001$, and shame, $b = 0.62$, $p < .001$. Finally, both anticipated guilt, $b = 0.43$, $p < .001$, and shame, $b = 0.26$, $p < .001$, were positively associated with electric vehicle usage intentions. Comprehensive regression results from the serial mediation analysis are reported in Table 3.

Accordingly, prosocial-motivated descriptive norms (relative to the norm-only condition) had a positive indirect effect on electric vehicle usage intentions through perceptions of injunctive norms and, in turn, both anticipated guilt and shame (for the guilt pathway, $b = 0.12$, $SE = 0.02$, 95 % CI [0.09, 0.16]; for the shame pathway, $b = 0.07$, $SE = 0.01$, 95 % CI [0.05, 0.10]). In contrast, proself-motivated descriptive norms (relative to the norm-only condition) had a negative indirect effect on electric vehicle usage intentions through perceptions of injunctive norms and, in turn, both anticipated guilt and shame (for the guilt pathway, $b = -0.28$, $SE = 0.04$, 95 % CI [−0.35, −0.21]; for the shame

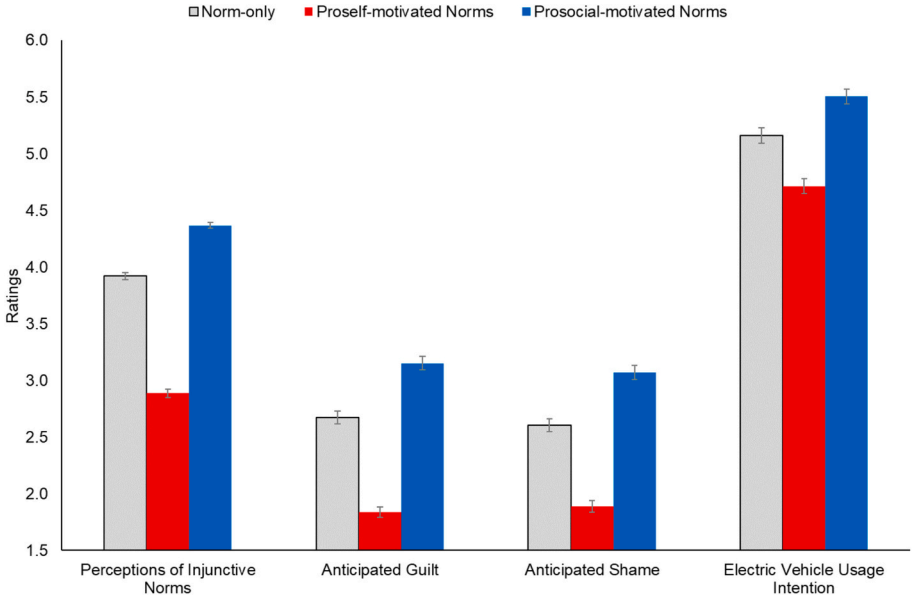

Fig. 7. Perceptions of injunctive norms, anticipated guilt and shame, and electric vehicle usage intentions in Society A across the norm-only, prosocial-motivated norms, and proself-motivated norms conditions in Study 4.
Note. Error bars indicate standard errors of the means (SEM).

Table 2
Multiple regression examining condition differences in key variables in Study 4.

Variable	Perceived injunctive norms				Anticipated guilt				Anticipated shame				Electric vehicle usage intentions			
	b (*SE*)	*p value*	*95 % CI*	*d*	*b* (*SE*)	*p value*	*95 % CI*	*d*	*b* (*SE*)	*p value*	*95 % CI*	*d*	*b* (*SE*)	*p value*	*95 % CI*	*d*
Intercept	3.92 (0.03)	<0 .001	[3.86, 3.98]		2.67 (0.06)	<0 .001	[2.56, 2.78]		2.60 (0.06)	<0 .001	[2.50, 2.71]		5.16 (0.07)	<0 .001	[5.03, 5.29]	
Prosocial-motivated norms (vs. norm-only)	0.45 (0.04)	<0 .001	[0.36, 0.53]	0.72	0.48 (0.08)	<0 .001	[0.33, 0.63]	0.36	0.47 (0.06)	<0 .001	[0.31, 0.62]	0.36	0.35 (0.09)	<0 .001	[0.16, 0.53]	0.23
Proself-motivated norms (vs. norm-only)	−1.03 (0.04)	<0 .001	[−1.12, −0.95]	−1.34	−0.84 (0.08)	<0 .001	[−0.99, −0.68]	−0.72	−0.72 (0.06)	<0 .001	[−0.87, −0.56]	−0.60	−0.44 (0.09)	<0 .001	[−0.63, −0.26]	−0.30

Note. Unstandardized coefficients are shown; the motive condition was dummy-coded. Two dummy variables were created with the norm-only condition as the criterion group (coded as 0).

pathway, $b = -0.16$, $SE = 0.03$, 95 % CI [−0.23, −0.11]). Therefore, the results supported our hypothesized mediation model.

9. Discussion

Consistent with the preceding studies, Study 4 found that descriptive norms increased perceptions of injunctive norms more strongly when they were motivated by prosocial (vs. proself) motives. Moreover, beyond their impact on perceptions of injunctive norms, descriptive norms with distinct motives also directly influenced subsequent behavioral intentions in Study 4. Those who received prosocial- (vs. proself-) motivated descriptive norms reported stronger intentions to use electric vehicles themselves. Therefore, considering Study 3, in which there was no direct moderation of motives on intentions to carpool, we have found some mixed results in terms of the effects of perceived motives directly on behavioral motivation. We revisit this issue in the general discussion.

Importantly, we examined psychological processes for why prosocial- (vs. proself-) motivated descriptive norms might lead to greater intentions to conform with normative behavior. Our findings suggest that self-conscious emotions—specifically, anticipated guilt and shame—play a significant role. Consistent with our theorized model, when descriptive norms about electric vehicle usage were perceived to be influenced by prosocial (vs. proself) reasons, people were more likely to perceive these norms as injunctive. These perceived injunctive norms were associated with anticipating greater feelings of guilt and shame if they failed to conform to such normative behaviors (i.e., not using electric vehicles). Lastly, these anticipated negative emotions were associated with stronger intentions to behave consistent with descriptive norms (i.e., using electric vehicles themselves).

Finally, Study 4 offered an advanced understanding of the effects of descriptive norms with different motives by including a meaningful comparison condition in which only descriptive norms were presented without information about motives. Across the variables measured, we consistently found positive effects of prosocial-motivated descriptive norms but negative effects of proself-motivated norms. These findings underscore the importance of perceived motives behind descriptive norms in norm effects; that is, perceived others' motives significantly affect how people perceive descriptive norms, as well as their emotional and motivational responses to these norms.

Note, however, that Study 1 did not find negative effects of proself-motivated norms, compared to the comparison condition in which no normative information was provided (i.e., baseline, no-norm condition). Instead, it found a similar level of injunctive norms between the proself-motivated norm and the no-norm condition. These patterns are not necessarily contradictory but are reasonable, given the differences in the comparison conditions between Study 1 and Study 4 and the previous research on common-moral association, which shows a significant increase in perceived injunctive norms by descriptive norms provided. Presumably, providing descriptive norms in the norm-only condition in Study 4 resulted in some increase in injunctive norms, compared to the baseline (no-norm condition) in Study 1. Future empirical research comparing these different conditions simultaneously would be useful for gaining a clearer understanding.

10. General discussion

10.1. Summary and implications

The present research examined how perceived others' motives behind descriptive norms affect perceptions of injunctive norms and motivation to engage in norm-consistent behavior in the timely context of pro-environmentalism. Across different behavioral domains including water and energy conservation, carpooling, and electric vehicle usage, we consistently found that people infer stronger moral, injunctive norms from descriptive norms when the descriptive norms are perceived to be

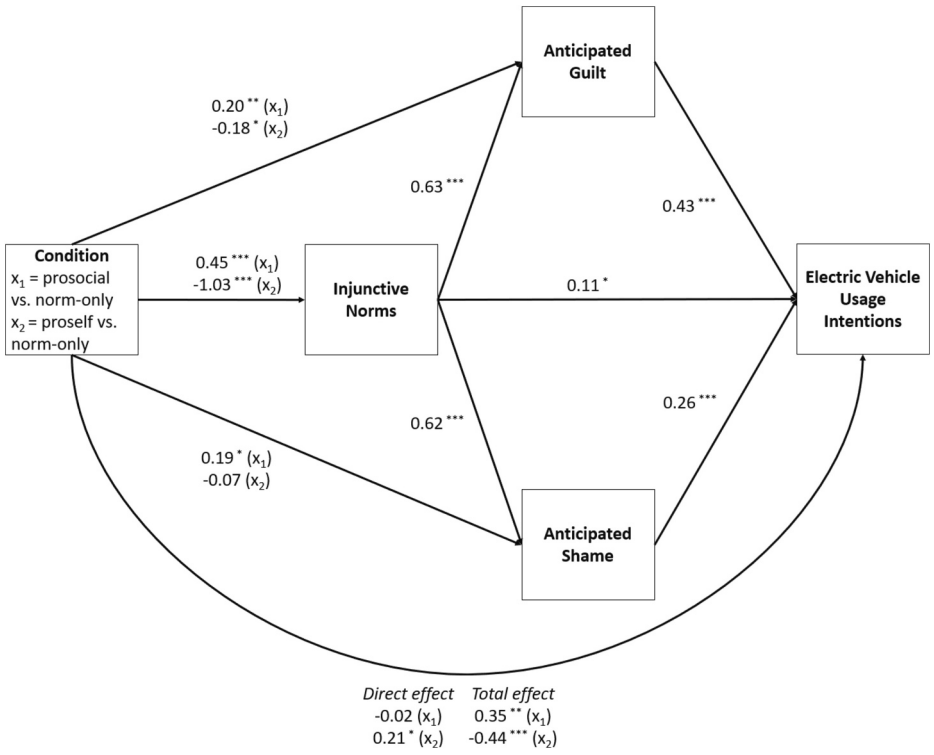

Fig. 8. Mediation model results in Study 4.
Note. Unstandardized path coefficients are shown. x_1 denotes effects of prosocial condition (vs. norm-only condition); x_2 denotes effects of proself condition (vs. norm-only condition). $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 3
Multiple regression from the serial mediation model in Study 4.

	Perceived injunctive norms				Anticipated guilt				Anticipated shame				Electric vehicle usage intentions			
Variable	*b* (*SE*)	*p* value	95 % CI	*f*	*b* (*SE*)	*p* value	95 % CI	*f*	*b* (*SE*)	*p* value	95 % CI	*f*	*b* (*SE*)	*p* value	95 % CI	*f*
Intercept	3.92 (0.03)	<0 .001	[3.86, 3.98]		0.19 (0.18)	0.268	[−0.15, 0.54]		0.17 (0.18)	0.334	[−0.18, 0.52]		2.93 (0.18)	<0 .001	[2.57, 3.29]	
Prosocial-motivated norms (vs. norm-only)	0.45 (0.04)	<0 .001	[0.36, 0.53]	0.26	0.20 (0.08)	0.009	[0.05, 0.34]	0.07	0.19 (0.08)	0.013	[0.04, 0.34]	0.06	−0.02 (0.08)	0.756	[−0.18, 0.13]	0.01
Proself-motivated norms (vs. norm-only)	−1.03 (0.04)	<0 .001	[−1.12, −0.95]	0.60	−0.18 (0.09)	0.034	[−0.35, −0.01]	0.05	−0.07 (0.09)	0.394	[−0.24, 0.10]	0.02	0.21 (0.09)	0.023	[0.03, 0.38]	0.06
Injunctive norms					0.63 (0.04)	<0 .001	[0.55, 0.72]	0.38	0.62 (0.04)	<0 .001	[0.54, 0.70]	0.37	0.11 (0.05)	0.026	[0.01, 0.20]	0.06
Anticipated guilt													0.43 (0.05)	<0 .001	[0.32, 0.53]	0.21
Anticipated shame													0.26 (0.05)	<0 .001	[0.16, 0.36]	0.13

Note. Unstandardized coefficients are shown; the motive condition was dummy-coded. Two dummy variables were created with the norm-only condition as the criterion group (coded as 0).

driven by prosocial (vs. proself) motives. Specifically, when participants received information that others engaged in environmental behaviors to help other people and society (i.e., for prosocial reasons) rather than to seek one's own benefits (i.e., for proself reasons), they were more likely to infer stronger injunctive norms about the environmental behaviors and expected others to be enraged by norm-inconsistent behaviors (e.g., wastes of water and energy) and to perceive those who engage in norm-consistent behaviors (e.g., conserving water and energy) as moral. These findings extend recent research on the perceived association between descriptive norms and injunctive norms (Eriksson et al., 2015; Lindström et al., 2018). We identify perceived others' motives as a key factor that determines the extent to which people infer moral meanings from descriptive norms.

Moreover, we showed that self-conscious emotions were a key psychological mechanism that may lead injunctive norms to behavioral intentions. In Study 4, when people perceived stronger injunctive norms about using electric vehicles from prosocial- (vs. proself-) motivated norms, they expected experiencing stronger negative emotions, such as guilt and shame, if they engaged in norm-inconsistent behavior (i.e., using a conventional car). And these emotions were associated with

motivation to behave in line with norms. Our finding supports the view that anticipatory self-conscious emotions play a significant role for people to regulate their behaviors to be socially and morally appropriate (Tangney et al., 2007; Tracy & Robins, 2004).

It is also worth noting that the results were somewhat mixed in terms of the effect of differently motivated descriptive norms directly on behavioral motivation. In Study 4, when participants received prosocial-(proself-) motivated norms about electric vehicle usage, they not only perceived stronger injunctive norms but also reported stronger motivation to use electric vehicles themselves. In contrast, in Study 3, when people reported their intentions to carpool with coworkers in a workplace context, perceived motives did not directly moderate the effect of descriptive norms on carpool intentions. Due to the multiple differences between the two studies, pinpointing the exact reasons is challenging. Perhaps, the effect on behavioral motivation varies across contexts. In some contexts where people's self-oriented needs are prominent, norms driven by proself motives may more powerfully drive people to engage in normative behaviors. In those contexts, people may not want to miss out on the benefits that others are enjoying, thereby attenuating the positive effects of prosocial-motivated descriptive norms via injunctive norms (Rucker et al., 2011). Workplaces, the context used in Study 3, may be a kind of context with salient self-oriented mindsets. Future work focusing on behavioral change should unpack these complex forces determining behavioral motivation.

Given that messages based on descriptive norms are widely used for attitudes and behavior change in various domains, these findings have significant practical implications. When organizational leaders, activists, and policy makers employ normative appeals, actively communicating the prosocial motives of others in normative messages may help instill moral values into pro-environmental behaviors and other societally beneficial behaviors, thereby fostering the perceptions of social approval of those behaviors. In addition, even if norms with distinct motives may not make a dramatic difference on the behavior directly referred to in the norms (as observed in the differing effects on behavioral motivation in Studies 3 and 4), they may differ in their broader impact. For example, people may infer from descriptive norms with prosocial motives a societal trend towards moralization of pro-environmental behaviors. If so, the effect of prosocial-motivated norms in encouraging pro-environmental behaviors may spill over into other environmental behaviors.

Studies have found that highlighting self-benefits can backfire in prosocial domains, as attaching self-benefits alters the meaning of the behavior (Georgeac & Rattan, 2023; Kim et al., 2021). This is consistent with Study 4, which showed that people reported lower intentions to use electric vehicles when exposed to norms with proself motives, compared to the norm-only condition. However, such potential backfire effects need to be interpreted with consideration of the comparison criteria. For example, highlighting the prevalence of a behavior with proself motives did not necessarily decrease perceived injunctive norms when compared with the neutral condition in Study 1 and even increased injunctive norms (albeit more weakly than norms with prosocial motives) when compared with extremely low descriptive norms in Study 3. Future research should more directly examine the potential backfire effects of proself motives, as well as the boundary conditions for the effectiveness of proself-motivated and prosocial-motivated norms on attitudes and behavioral change (White & Peloza, 2009). It is also an intriguing possibility that presenting both motives together may have greater persuasiveness in encouraging pro-environmental behaviors, as it could mitigate any negative effects of proself motives often observed when proself motives are presented alone.

10.2. Limitations and future questions

We note limitations as well as unanswered questions for future research. First, in most of our studies, the context was hypothetical. Having a hypothetical context allowed us to test hypotheses clearly, independent of any influence from participants' pre-existing knowledge or experience regarding specific contexts. However, this methodological decision may have resulted in particularly strong effects, as norms can exert powerful influence in novel and unfamiliar contexts (Sherif, 1936; Tesser et al., 1983). Nevertheless, we argue that our findings are still of significant relevance in real-world contexts. As societies become globalized and afford higher levels of mobility, individuals increasingly encounter decision-making opportunities in situations where their knowledge of the relevant social and cultural norms is limited. Consider, for example, travelers who frequently visit new places. The examples do not need to go that far. Closer to home, people come across many unfamiliar situations in their daily lives (e.g., new jobs, brand-new restaurants, shopping centers). Thus, strategies highlighting prosocial motives (or at least preventing people from assuming proself motives) can be incorporated into various real-life situations for promoting moral norms about societally beneficial behaviors. As recent years have shown, novel and unfamiliar contexts can also impose themselves on entire societies (e.g., pandemics) at a moment's notice.

Second, this research examined only Americans' responses, and thus, future research should expand the scope of the sample and explore any possible cultural differences. Considering the greater sensitivity to social information—particularly, information associated with social approval—in collectivistic cultures (Eom et al., 2016; Ishii et al., 2011), people with collectivistic cultural backgrounds may be more sensitive to others' motives. Thus, it is possible that the effects of proself-motivated versus prosocial-motivated descriptive norms are more pronounced among collectivists than individualists.

Relatedly, cultures may also differ in how they generally perceive others' motives. For example, in individualistic cultures, people may be more likely to expect others to be driven by self-interest than those in collectivistic cultures (Miller, 1999). If this is the case, prosocial-motivated norms may have a more powerful impact, altering the default perceptions of others' motives in individualistic cultures, whereas proself-motivated norms are more impactful in collectivistic cultures. A growing body of research has documented significant cultural variation in the ways individuals respond to sustainability issues and engage in environmental decisions and actions (Eom et al., 2019; Pearson et al., 2021; Tam & Milfont, 2020). More research using diverse cultural samples is needed not only for theoretical purposes but also for practical applications of the current findings in diverse populations.

Third, caution should be exercised when making causal interpretations from our mediation results in Studies 3 and 4. The mediators in the studies (i.e., injunctive norms and emotions) were not directly manipulated (Pirlott & MacKinnon, 2016). The relationships between the variables may unfold in a different order from the presented mediation models, such that injunctive norms or emotions may work as consequences of behavioral intentions, or the relationships may even be bidirectional. We posit that behavioral motivation may occur at a later stage in psychological processes compared to perceived norms and emotions. Our results, indicating that the effect size of the manipulation was smaller for variables placed later in our mediation models, are consistent with this proposition. However, future research employing experimental manipulations of the mediators (Spencer et al., 2005) would be valuable in establishing the causal directionality of the model in the present research.

Finally, although the present research broadly categorized motives into proself and prosocial, there are diverse types within both categories. For example, proself motives can be centered on different benefits, including financial, emotional, and social rewards (Carlson & Zaki, 2018). The present research primarily focused on financial rewards except in Study 3 in which we included a broader range of self-benefits to increase generalizability. However, since Study 3 still involved financial benefits, it remains unclear whether the observed effects were primarily driven by financial motives. Prosocial motives can also vary in terms of who the beneficiaries are; individuals may be motivated to benefit others in their local social environment (e.g., friends or

colleagues), the broader society, the world, future generations, or even non-humans. Systematic investigations into the influence of various types of proself and prosocial motives underlying descriptive norms would be a fruitful direction for future research.

Open practices

The materials, data, and codes from all the studies are publicly available at the Open Science Framework: https://osf.io/s235k/. The pre-registrations for Studies 4 and S1 are available at https://osf.io/49de2 (Study 4) and https://osf.io/kxycz (Study S1).

Author notes

The materials and the data from all the studies are publicly available at the Open Science Framework: https://osf.io/s235k

Study 4 and Study S1 were preregistered. Our hypotheses, analyses, and sampling method (and exclusion criterion) for Studies 4 and S1 are available on OSF at:

https://osf.io/49de2 (Study 4).

https://osf.io/kxycz (Study S1).

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CRediT authorship contribution statement

Kimin Eom: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Bryan K.C. Choy:** Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2024.104684.

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