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**The role of normative prompts and norm support cues in promoting light-switching
behavior: A field study**

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Abstract

Positive descriptive norm cues, as well as injunctive norm messages, can enhance the occurrence of turning off the lights in unoccupied rooms. However, the impact of descriptive norm messages as well as the role of congruent or conflicting normative cues have not yet been verified in this particular context. Two field experiments compared the effectiveness of three experimental prompts (injunctive norm vs. descriptive norm vs. request only) on behavioral measures (Study 1, $N = 710$; Study 2, $N = 1,792$) of light-switching behavior. Both studies revealed that in men's restrooms, an injunctive norm prompt produced higher compliance rates. In Study 2, the influence of a descriptive norm prompt depended on the occurrence of congruent or conflicting cues in men's restrooms, while in women's restrooms, both types of normative messages generated equal rates of compliance independently of norm-conflicting cues. The presented examination adds to the focus theory of normative conduct.

Keywords: Prompts; Descriptive norms; Injunctive norms; Energy conservation; Pro-environmental behavior

1. Introduction

There is no doubt that the biggest contributor to environmental pollution and degradation is human action (Anderegg, Prall, Harold, & Schneider, 2010; Cook et al., 2016). And while it is not possible for each person to directly influence, for example, a government's environmental policy, it is always possible for individuals to adopt small-scale proenvironmental behaviors (Gardner & Stern, 2008). This leaves strategists and program managers with a great opportunity (but a difficult task) to craft effective social marketing campaigns that can drive changes in societies.

Environmental psychology has generated and evaluated multiple tools that can serve in various domains, such as recycling, litter control and energy or water conservation (Abrahamse & Steg, 2013; Osbaldiston & Schott, 2012; Schultz, 2014; Steg & Vlek, 2009). Each one of over 200 types of pro-environmental behaviors (Kurusu, 2016) is associated with various psychological costs and barriers that counteract their adoption (Gifford, 2011; Kollmuss & Agyeman, 2002). This dictates that interventions should decrease barriers and increase the benefits of performing a selected behavior (Schultz, 2014), and therefore be fitted to a particular behavior type (McKenzie-Mohr, 2000). This article will focus on one particular strategy that is aimed at shaping simple pro-environmental behaviors, i.e., turning off the lights when leaving a room, termed “prompts” in environmental psychology (Geller, Winett, & Everett, 1982; Osbaldiston & Schott, 2012).

1.1. Prompting conservative behavior

In general, prompt is referred to visual (e.g. anti-litter sign) or auditory (e.g. fasten seatbelt alert) antecedent stimulus that designate desirable target behaviors (Geller et al., 1982). Moreover, prompt may serve as an aid that reminds a recipient about the execution of a target activity which might otherwise (i.e. when the prompt is absent) be forgotten (McKenzie-Mohr,

2000). As a commonly-used strategy in environmental psychology (Lehman & Geller, 2005; Meis & Kashima, 2017; Osbaldiston & Schott, 2012), prompts have been found to be effective in changing simple behaviors, such as littering (e.g., Brown, Ham, & Hughes, 2010; Geller et al., 1982), recycling (e.g., Werner, White, Byerly, & Stoll, 2009; Wichmann et al., 2017), water usage (e.g., Aronson & O'Leary, 1982; Kurz, Donaghue, & Walker, 2005), or turning off lights in unoccupied rooms (e.g., Luyben, 1980; Sussman & Gifford, 2012; Winett, 1978). Prompts may be displayed through a wide range of communication medium, however it seems that they are most commonly used in the form of written messages such as pamphlets or various signage (e.g., door hangers, footprint stickers or eco-labels on consumer goods, public signs), of which the latter is more common in public spaces.

Signage serves as an elementary tool of behavioral control in societies across a wide range of domains, starting with wayfinding, on through to warnings, and ending with regulations on anti-social or pro-social behaviors. The recent theoretical explanation highlights that in the first step, the comprehension of signs leads to formulating a psychological representation of the category of actions (already possessed by individuals) that, in the second step, is acted upon (or not) as a result of the decision process (Meis & Kashima, 2017). The role of sign comprehension corresponds with extensive findings from field experiments showing that effective prompts are those displayed in proximity to the place where the target behavior is to be performed and that explicitly convey its message (Geller et al., 1982; Laughery, 2006; Shell, 2009; Wogalter, Conzola, & Smith-Jackson, 2002; Wogalter, Kalsher, & Rashid, 1999). On the other hand, the decision to act according to sign content is highly dependent on the manner and form of the message that is displayed (Dwyer, Leeming, Cobern, Porter, & Jackson, 1993; Geller et al., 1982).

For example, using simple pro-ecological messages has been proven to be less effective when compared to using messages that refer to social norms (e.g., De Groot, Abrahamse, &

Jones, 2013; Goldstein, Cialdini, & Griskevicius, 2008; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). Overall, normative information is considered to be a highly-effective type of environmental appeal (Cialdini, 2003) typically implemented by signs (Richter, Thøgersen, & Klöckner, 2018), and therefore will be thoroughly addressed in the presented research.

1. 2. The influence of social norms

According to the focus theory of normative conduct (Cialdini, Reno, & Kallgren, 1990), directing an individual's attention to descriptive or injunctive norms can lead to change in behavior, since these norms serve as crucial motivators of social conduct. Descriptive norms communicate how other people should behave in a given context, thereby determining what behavior is most accurate or effective, depending on the place and the situation. Injunctive norms describe behaviors commonly approved or disapproved of in a given group or society, thereby determining how or how not to behave, regardless of place or situation (Cialdini, Kallgren, & Reno, 1991). Empirical validation has revealed that descriptive norms are cognitively associated with intrapersonal goals of accuracy or efficiency, whereas injunctive norms are cognitively associated with interpersonal goals of social approval (Jacobson, Mortensen, & Cialdini, 2011). Moreover, the focus on these two types of normative information may result from either observing another person's behavior; noticing regulatory information in the form of written messages (prompts); or dispositional factors in the form of an individual's personal norms (Jacobson et al., 2011; Nolan et al., 2008).

As a tool, social norms have successfully promoted sustainability in domains such as towel use by hotel guests (Schultz, Khazian, & Zaleski, 2008), water usage (Richetin, Perugini, Mondini, & Hurling, 2014), household energy consumption (Allcott, 2011; Nolan et al., 2008; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007, 2018), littering (Reno et al., 1993), plastic bag usage (De Groot et al., 2013), recycling (Schultz, 1999) and vehicle use (Kormos,

Gifford, & Brown, 2015). However, not all studies unequivocally confirm the effectiveness of normative messages (see Bohner & Schlüter, 2014; Mair & BerginSeers, 2010). For example, in two field experiments on descriptive norms as a means to increase hotel guests' towel reuse conducted in German hotels Bohner and Schlüter (2014) found that both standard message appealing to environmental concerns and descriptive norm messages increased reuse rates compared to a no-message baseline. However, descriptive norm messages were not more effective than the standard message. Therefore, despite extensive literature, researchers stress the need for a further examination into the interplay between descriptive and injunctive norms (Eriksson, Strimling, & Coultas, 2015; Göckeritz et al., 2010; Smith et al., 2012) as well as the relationship between norm-conflict and actual behavior (McDonald, Fielding, & Louis, 2013).

Everyday situations may present conflicting (negative norm-support) or congruent (positive norm-support) cues, leading to differences in the influence of activated descriptive or injunctive norms (same norm inhibition effect vs. positive same-norm effect; Keizer, Lindenberg, & Steg, 2011). For example, watching someone throwing litter in a trash bin (positive descriptive norm-support cue) in an already littered setting (negative descriptive norm-support cue) may not restrain an individual from littering, in contrast to a similar situation in an environment where there is no litter (Reno, Cialdini & Kallgren, 1993). Moreover, descriptive norm cues that address the common occurrence of norm-violating behavior may lead to even higher rates of occurrence (boomerang effect; Richter et al., 2018; Winter 2006). However, people not only can be de-motivated by descriptive norm conflict, but norm-conflict can encourage people to take action. McDonald et al. (2013) demonstrated that conflict between descriptive norms is associated with increased perceived effectiveness of pro-environmental activities for those with positive environmental attitudes to the issue and reduced perceived effectiveness for those with moderate attitudes.

It should be noted that while the influence of descriptive norms is particularly susceptible to the occurrence of conflicting cues, the influence of injunctive norms has been found to be relatively stable (Kallgren, Reno, & Cialdini, 2000; Reno et al., 1993) and therefore more effective in generating pro-environmental behaviors (Bator, Tabanico, Walton, & Schultz, 2014; Cialdini et al., 2006). Furthermore, normviolating behaviors resulting from descriptive norms can be limited by providing positive injunctive norm-support cues (Allcott, 2011; Schultz et al., 2007). As explained by goal-framing theory (Lindenberg & Steg, 2007), focusing on norms refers not only to norm type but also to normsupport cues; hence, the appearance of norm-violating behavior in a given situation may weaken conformity to other norms and rules (Keizer, Lindenberg, & Steg, 2008, 2011). Therefore, it is not surprising that a greater effect can be achieved from normative influence when descriptive and injunctive norms are aligned and congruent (Bergquist & Nilsson, 2018; Cialdini et al., 2006; Smith et al., 2012).

1. 3. The present research and hypotheses

Among multiple energy-saving behaviors, one of the simplest that can have a significant impact (when adopted by multiple individuals) is turning off the lights in unoccupied rooms (Garg & Bansal, 2000). Interestingly, this behavior is also perceived as one of the most effective actions that individuals can do to conserve energy in their households (Attari, DeKay, Davidson, & De Bruin, 2010). However, it is worth pointing out that the problem of leaving the lights on (upon exiting) occurs most frequently in public spaces visited only occasionally, such as restrooms (Bordass & Leaman, 1997; Richman, Dittmer, & Keller, 1996). Some researchers suggest it is the role of the individual's low level of personal responsibility for controlling the lights in public places that explains this fact (Dwyer, Maki, & Rothman, 2015; Pigg, Eilers, & Reed, 1996). Considering that descriptive normative beliefs are a strong predictor of behavior for individuals with low personal involvement (Göckeritz et al., 2010), it could be assumed that

switching lights on or off is heavily norm-dependent, and therefore serves as an adequate target for testing the effectiveness of normative prompts.

In fact, the influence of descriptive norms has been empirically shown to facilitate, as well as inhibit, switching the lights off in public restrooms (Dwyer et al., 2015; Oceja & Berenguer, 2009). Entering an unoccupied room in which lights are switched on impedes the occurrence of turning the light off, since the descriptive norm cue (resulting from observation) states that it is not common behavior in this particular situation (Dwyer et al., 2015). At the same time, it was found that when the light status is off when entering the room (positive descriptive norm-support cue), users tend to adjust their behavior correspondingly (Dwyer et al., 2015; Oceja & Berenguer, 2009). Building on these findings, we hypothesized (H₁) that the light OFF status upon entrance (positive descriptive norm cue resulting from observation) will lead to a higher occurrence of energy conservation behavior compared to the light ON status upon entrance (negative descriptive norm cue resulting from observation).

The inhibitive role of negative descriptive norm cues, as well as the occurrence of environmentally damaging actions, may be dampened by prompts, particularly when they communicate injunctive norms that focus on desirable, pro-environmental behavior (Bergquist & Nilsson, 2016). However, to our knowledge there was no research that tested the influence of descriptive norm messages on light-switching behavior. While filling this empirical gap, we hypothesized (H₂) that prompts will lead to higher occurrence rates of pro-environmental behavior compared to a baseline or no-prompt condition (Geller et al., 1982), and their effectiveness will depend on the message content. Injunctive norms will lead to higher compliance rates compared to descriptive norms (Reno et al., 1993), whereas both types of normative information will be more effective than non-normative message prompts (Nolan et al., 2008).

Previous field studies have analyzed the role of congruent or conflicting normative cues within only one type of data source, for example, by comparing conflicting cues resulting from observation (e.g., Reno et al., 1993) or written messages (Schultz et al., 2007). We find this to be an oversight, since normative cues can be presented simultaneously by different types of sources in natural settings. We hypothesized (H₃) that normative prompts will produce higher compliance rates when they are aligned with congruent cues (i.e., lights off), in contrast to a situation where norm-conflicting cues (i.e., lights on) occur, which will particularly dampen the influence of the descriptive norm prompt (Cialdini et al., 2006; Göckeritz et al., 2010).

Overall, the aim of the study was to compare the effectiveness of injunctive and descriptive norms, conveyed by prompts that encourage turning off the light when leaving a room (written source of social norms), in a setting which presented either congruent (light off before entrance) or conflicting (light on before entrance) norm-support cues (observable source of social norms). In order to verify our hypotheses, we conducted two field experiments that allowed us to acquire behavioral data indicating the actual influence of the experimental prompts created on the occurrence of energy-saving behaviors. Due to structural boundaries, the first experiment was carried out on a male sample. In the second experiment we were able to include samples from both genders. We preceded these experiments with a preliminary study, which served to prepare the stimuli (prompts) and perform an inspection as to whether the signs we created were equivalent in terms of vividness and reactance elicitation. Each study was approved by the ethics committee.¹

2. Preliminary study of created prompts

Communicating descriptive, injunctive or non-normative information in a message forces the use of different wording (Jacobson et al., 2011) and therefore may impact a sign's

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vividness (Frantz, Rhoades, & Lehto, 2005) and its emotional charge (Winter, Sagarin, Rhoads, Barrett, & Cialdini, 2000). In terms of vividness, researchers usually address the role of attractiveness, readability and comprehension of signs as elementary factors that impact a sign's effectiveness (Frantz et al., 2005; Meis & Kashima, 2017). On the other hand, the control of a sign's emotion elicitation may prevent reactance effects, which may be induced by negative wording (Bergquist & Nilsson, 2016; Sussman & Gifford, 2012). Therefore, in order to ensure that the impact of created prompts in subsequent field experiments would solely result from the use of normative or non-normative information, this study aimed to exclude the possible differences in the emotional elicitation and visual perception of signs (prompts). The independent variable was sign type 3 (request-only vs. descriptive norm vs. injunctive norm) while the dependent variables were the sign's: 1) vividness; and 2) reactance.

The minimum number of participants required was determined by an a priori power analysis using the software G*Power 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009). This analysis indicated that a sample size of 251 would be sufficient to detect a medium effect ($f = 0.25$) with a power of .95 and an $\alpha = 0.05$. The study was conducted online with the use of a research panel (Flow Research Center). We gathered responses from 321 participants (187 women and 134 men; $M_{\text{age}} = 23.69$; $SD_{\text{age}} = 4.65$).

2. 1. Materials and procedure

In a between-subject design, the procedure consisted of three parts. Firstly, after reading the instructions and filling out information about age and gender, respondents were presented with one of the three prompts that were randomly assigned to each participant. Prompts included an explicit request (originally written in Polish) “Turn off the light when leaving the restroom” (located on the top part) and a picture presenting a pictogram of a lightbulb with a green leaf (in the middle). Differences between signs concentrated on the bottom part, in which

the following content was presented according to the experimental condition: 1) “In this room, cleaning work is carried out every working day” for the request-only condition; 2) “It is commonly approved that the light should be turned off when leaving a restroom” for the injunctive norm condition; and 3) “The vast majority of people turn off the light when leaving a restroom” for the descriptive norm condition (see Appendix 1 for originally created prompts in polish language). Incorporating a neutral message in the request-only condition was due to the need to counterbalance the quantity of written information between messages, in order to exclude quantity as a factor (Cole, Hammond, & McCool, 1996). The text used on the signs was printed in a 30-point, sanserif typeface font called “Lato”. The choice of wording was based on the theoretical definition of each norm type (Cialdini et al., 1991; Jacobson et al., 2011).

After being exposed to one of the three experimental signs, participants rated them on a scale of vividness (Cronbach’s $\alpha = 0.78$), which consisted of three items. With the use of 10-point scales (0 - not at all; 10 - very much), participants indicated to what extent they found a particular sign to be: 1) attractive; 2) readable; and 3) comprehensible. The choice of each item that was included and the use of the scale was based on guidelines about sign evaluation from other researchers (Meis & Kashima, 2017; Frantz et al., 2005).

The last three items (10-point scales) were used to rate signs on a reactance scale (Cronbach’s $\alpha = 0.71$). Scale use and its items were based on findings from previous research on persuasive communication (Dillard & Shen, 2005). Participants indicated the extent to which they found that each sign evoked in them: 1) irritation; 2) anger; 3) rage.

2. 2. Results and discussion

Due to the measurement of conceptually distinct dependent variables (vividness and reactance), two subsequent two-way analysis of variance tests were conducted with a between-

subject design: 3 (sign type: request only vs. injunctive norm vs. descriptive norm) x 2 (gender: men vs. women).

Results from the first analysis (dependent variable: vividness) indicated a nonsignificant main effect of sign type [$F(2, 315) = 0.24, p = .81, \eta^2 = .001$] and nonsignificant interaction between sign type and gender [$F(2, 315) = 1.17, p = .84, \eta^2 = .001$]. A significant main effect of gender [$F(1, 315) = 6.82, p = .01, \eta^2 = .02$] was that women rated the signs as being more vivid ($M = 7.49$) than men ($M = 6.89$).

The second analysis (dependent variable: reactance) revealed a nonsignificant main effect of sign type [$F(2, 315) = 0.36, p = .69, \eta^2 = .002$] as well as a nonsignificant interaction between sign type and gender [$F(2, 315) = 2.54, p = .08, \eta^2 = .02$]. As with the first analysis, a significant main effect of gender occurred [$F(2, 315) = 4.15, p = .04, \eta^2 = .02$], which showed that men gave higher ratings on the reactance scale ($M = 1.38$) than women ($M = 1.12$).

The fact that women rated the signs more favorably than men may result from the vast evidence showing that women tend to rate more highly on environmental attitudes than men (e.g., Zelezny, Chua, & Aldrich, 2000). At the same time, gender did not interact with sign type. Due to the marginal effect sizes, and the fact that we did not control individuals' environmental attitudes, these interpretations should be made with great caution. Most importantly, the presented results reveal that the prompts prepared are balanced in terms of vividness and emotional charge. Therefore, we may assume that any differences that might occur in the following field experiments could be attributed (with greater confidence) to the normative appeal type itself and other factors, independently of the visual aspect of the signs.

3. Study 1

The aim of Study 1 was to evaluate the effectiveness of three designed signs in a field setting. The independent variable was sign type 4 (control - no sign vs. request-only vs.

descriptive norm vs. injunctive norm) while the dependent variable was a sign's effectiveness, measured by the occurrence of energy conservative behavior registered (turning on or off the lights when leaving the restroom).

The light-switching behaviors of 710 male students were registered during their visit in two single-stall restrooms at one of the university buildings. Participants' gender identification was based on the restroom type visited. Demographic data was not obtained due to nature of the field experiment.

3. 1. Materials and procedure

Two single-stall restrooms in the university building were used to conduct an experiment. Both restrooms were windowless and had an identical architectural layout, consisting of three room parts and three separate manual light switches (for each room part) located next to each door (there were no motion-activated light switches). The main door led to the first room part, in which a sink, mirror and trash bin were located. In the second part, there was a urinal placed on the left side, and an entrance door to a single-stall toilet on the right side (third room part). Single stalls were equipped with only one toilet and light source, serving as a proper test site for our study from which we have collected data (see Appendix 2).

We used the three signs that were designed and tested in the preliminary study. Prompts were printed in A4 format and laminated, to increase their durability. During the study, signs were placed on the inside of the door (at eye level) of the single-stall toilet using double-sided tape.

In order to measure the occurrence of energy conservation behavior in the restrooms, we used a HOBOTM Occupancy/Light Data Logger, model UX90-005 (Onset Computer Corporation, <http://www.onsetcomp.com>) with additional fiber optic light pipe (UX90-LIGHT-PIPE-1). With its integrated light sensor (photocell), the logger collects information about the

frequencies of light status changes in the room. Additionally, the logger's motion sensor determines whether the room is occupied or unoccupied. It should be noted that this tool does not gather any audio-visual data (for details, refer to Onset Computer Corporation, 2018a). Overall, HOBO[®] loggers have been shown as a reliable tool for measuring light intensity and occupancy frequency (Ali, Zanzinger, Debose & Stephens, 2016; Popoola, Munda & Mpanda, 2015; Tetlow, Beaman, Elmualim & Couling, 2014; van Someren, Beaman & Shao, 2017). We used this logger in order to limit the constraints that usually occur with human observers (Sussman, 2016) and operationalize our measurement with precision.

Before the beginning of our experiment, the logger was set (via HOBOWare[®]) to log state changes for light and occupancy channels (event-dependent). The occupancy sensor's timeout value was set at 10 seconds (default) and the light sensor was auto-calibrated at the site (for details refer to Onset Computer Corporation, 2018b). The logger was mounted in hiding on the suspended ceiling in the single-stall toilet next to the light source, which was a fixture with an incandescent light bulb (see Appendix 1).

Data was gathered over 18 working days (Monday through Friday), between 10:00 a.m. and 5:00 p.m. each day. The choice of this time interval was based on the typical presence of students at the university (the usual hours for academic classes). On the first 6 days we gathered data for the control condition (no sign). After this time, further measurements were conducted for experimental conditions that were randomly assigned. In total, experimental conditions were measured for: 1) 3 days in "request-only" condition; 2) 4 days in "descriptive norm" condition; and 3) 5 days in "injunctive norm" condition. The differences between measurement days in each condition resulted from the need to balance samples for each condition. The experimenter visited the site each day at 7:00 a.m. (before logging started) in order to put up the logger and signs, and afterwards at 6:00 p.m. (after logging stopped) to take them down.

3. 2. Results and discussion

The occurrence of light-switching behavior was not different in a statistically significant way across measurement days under each of the four experimental conditions: 1) control-no sign $\chi^2 (5, N = 238) = 0.82; p = .97$; 2) request-only sign $\chi^2 (2, N = 142) = 1.75; p = .41$; 3) descriptive norm sign $\chi^2 (3, N = 160) = 0.81; p = .96$; and 4) injunctive norm sign $\chi^2 (4, N = 170) = 0.37; p = .98$. This allowed us to aggregate the data from each condition and conduct a comparison of the occurrence of light-switching behavior between two locations (restroom on the first and second floor), which also did not reveal any statistically significant differences under each experimental condition: 1) control – no sign $\chi^2 (1, N = 238) = 0.89; p = .77$; 2) request-only sign $\chi^2 (1, N = 142) = 0.17; p = .68$; 3) descriptive norm sign $\chi^2 (1, N = 160) = 0.00; p = 1.00$; and 4) injunctive norm sign $\chi^2 (1, N = 170) = 0.002; p = .97$.

To verify our hypotheses, logistic regression analysis was conducted to predict prompt effectiveness using light status upon entrance and sign type as predictors. The dependent variable – sign effectiveness – was equal to 1 if a participant turned off the light, and 0 if not. A post hoc power analyses were conducted using the software package G*Power 3.1 (Faul et al., 2009) with the sample size of 710. The recommended effect sizes (the overall odds ratio; *OOR*) used for this assessment were as follows: small (*OOR* = 1.25), medium (*OOR* = 1.86), and large (*OOR* = 2.61) (see Allen & Le, 2008). The alpha level used for this analysis was $p < .05$. The post hoc analyses revealed the statistical power for this study was .77 for detecting a small effect, whereas the power exceeded .99 for the detection of a moderate to large effect size. Thus, there was adequate power (i.e., power .80) at the moderate to large effect size level, and almost adequate statistical power at the small effect size level (Cohen, 1988). Table 1 shows the coefficients of the model.

Table 1.

Coefficients of the model built in Study 1.

	b	S.E.	Wald χ^2	p	Exp(b)	95% CI	
						LL	UL
Light status upon entrance	-0.32	1.06	0.09	.76	0.72	0.09	5.80
Sign			46.45	< .001			
Injunctive norm	2.19	0.33	42.60	< .001	8.99	4.64	17.37
Descriptive norm	1.34	0.35	14.52	< .001	3.85	1.92	7.69
Request-only	0.88	0.38	5.37	.02	2.42	1.15	5.09
Light status \times Sign			2.97	.39			
Constant	-2.67	0.27	93.66	< .001	0.07		

Note. CI = confidence interval for Exp(B); LL = lower limit; UL = upper limit. Interaction = Light status upon entrance \times Sign.

The results indicated that the model built reliably distinguished light-switching behavior - $\chi^2(8) = 56.96$; $p < .001$. Statistics of Cox and Snell ($R^2 = .077$) and Nagelkerke ($R^2 = .127$) revealed a low relationship between prediction and grouping, whereas overall prediction success was 78.7% (87.9% for leaving the light on when leaving and 35.5% for turning the light off). However, the Hosmer-Lemeshow test was highly nonsignificant, therefore showing a good fit of the model to the data - $\chi^2(7) = 0.00$; $p = 1.00$.

The Wald criterion demonstrated a nonsignificant contribution of light status upon entrance in contrast to sign type, which occurred as a significant factor. There was no significant interaction between the two predictors. The analysis of odds ratio (OR) for each sign type

condition (compared to control – no sign group) indicated that the possibility of lights being switched off was: 1) over two times more likely in the request-only sign condition; 2) over three times more likely in the descriptive norm sign condition; and 3) over eight times more likely in the injunctive norm sign condition. Further comparison between experimental signs was conducted with planned contrasts (see Figure 1), which revealed that the compliance rate was higher for signs with an injunctive norm compared to with request-only signs ($p < .001$; $OR = 3.71$; 95% CIs [1.96, 7.02]) or signs with a descriptive norm ($p = .004$; $OR = 2.33$; 95% CIs [1.32, 4.14]). There was no statistically significant difference between signs with a descriptive norm and request-only signs ($p = .17$; $OR = 1.59$; 95% CIs [0.81, 3.11]).

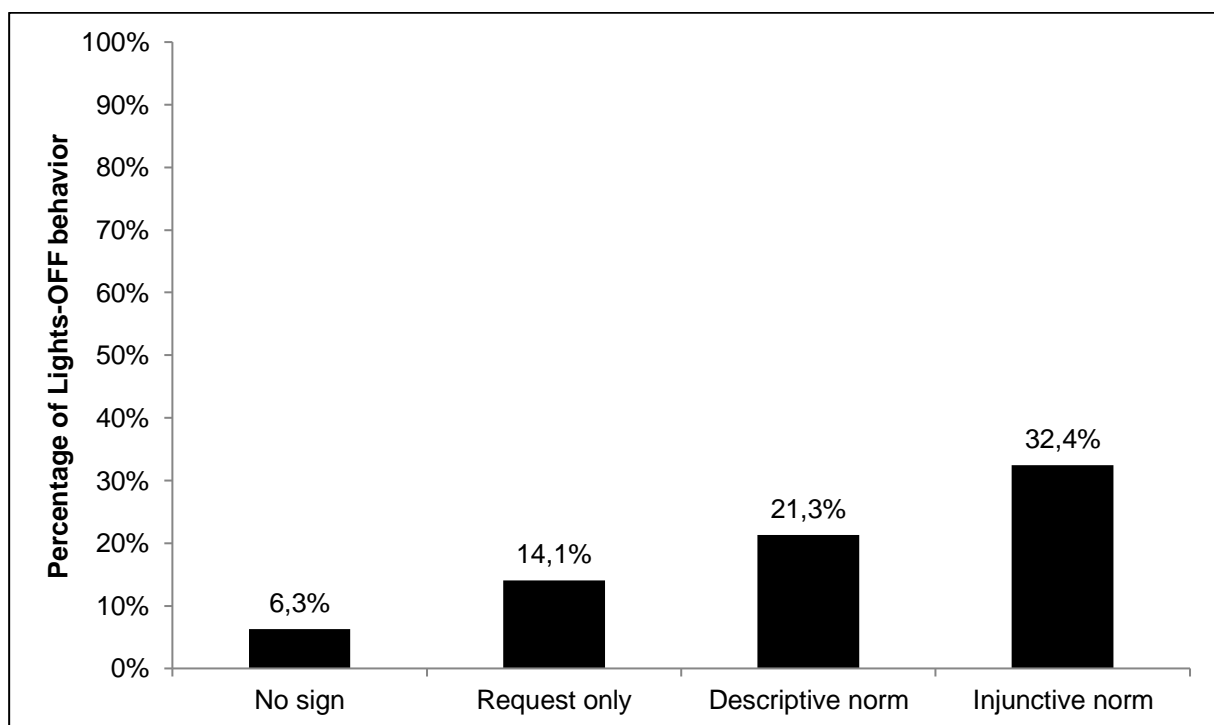


Figure 1. Percentage of participants who turned off the lights after leaving restroom in each experimental condition.

In contradiction to previous studies on light-switching behavior (Bergquist & Nilsson, 2016; Dwyer et al., 2015; Oceja & Berenguer, 2009), we did not confirm (H_1) the influence of a descriptive norm cue (light status) on the occurrence of conservative behavior. This may result from the fact that we did not manipulate the light status in order to artificially create a

descriptive norm cue (as previous researchers did), but instead we attempted to capture the natural occurrence of this factor. It would therefore seem that a larger sample size would be more appropriate for these purposes.

As expected, the experimental prompts led to a higher occurrence of energy conservation behaviors (i.e., in request-only sign 20 out of 142 males turned off the light; in descriptive norm sign 34 out of 160; and in injunctive norm sign 55 out of 170) compared to the baseline condition (i.e., out of 238 males, only 15 of them turned off the light). This result adds to the existing literature on the effectiveness of prompts as a means of fostering simple behaviors (Osbaldiston & Schott, 2012). Moreover, an injunctive norm sign produced the highest rates of compliance compared to other prompts, whereas there were no statistically significant differences between a descriptive norm and a request-only sign. Therefore, our second hypothesis was only partially confirmed. It could be assumed that lower compliance rates with a descriptive norm sign could result from the occurrence of norm-conflicting cues (Keizer et al., 2011; Reno et al., 1993); however, this should be further tested in field settings. Furthermore, due to architectural constraints (lack of a similar single-stall women's restroom), we were not able to compare the effectiveness of prompts between men and women. Furthermore, even though we have conducted the study on different days, it cannot be ruled out that some participants of the Study 1 being recorded in different conditions or in the same condition. This is a problem often found in field studies whose strengths lie in the ecological validity and the weaknesses in the difficulty of randomization and controlling all sorts of factors that might be of influence (Bator et al., 2013; Keizer, Lindenberg & Steg, 2014). Hence, we conducted a second study on different and more diverse sample.

4. Study 2

The aim of Study 2 was to replicate the findings from Study 1 by enhancing their external validity and gathering data from a female sample, which was not obtained earlier. We wanted to compare the occurrence of pro-environmental behavior between men and women, as women rate higher on environmental attitudes and act pro-environmentally more often than men (Arnocky & Stroink, 2010; Gifford & Nilsson, 2014; Zelezny et al., 2000), including in the case of turning off the lights (Dwyer et al., 2015). Moreover, we wanted to further examine if the influence of a naturally occurring descriptive norm (light status in the restroom upon entering) would influence the occurrence of energy conservation behaviors in different settings (which was not confirmed in Study 1). Reliance on naturally occurring congruent (i.e., lights off before entrance) or conflicting (i.e., lights on before entrance) normative cues was dictated by the need of verification whether these types of information may impact participants behavior in natural situation in similar extent as in previous research, which relied on manual manipulation of these cues (e.g., Dwyer et al., 2015). Independent and dependent variables were adopted from the previous study.

The light-switching behaviors of 1,792 customers (924 women and 868 men) at a DIY store located in Warsaw were registered during their visit to one of two single-stall restrooms. As in Study 1, participants' gender identification was based on the restroom type visited (men's or women's).

4. 1.Materials and procedure

Two single-stall restrooms (one for men and one for women) in the building of a DIY store located in Warsaw were used to conduct the experiment. Both restrooms were windowless and had an identical architectural layout, consisting of two room parts and two separate manual light switches located next to each door. The main door led to the first room part, in which a

sink, mirror, trash bin and the entrance door to a single stall were located. Single stalls were equipped with only a toilet and one light source in the middle of the ceiling from which we have gathered the data (see Appendix 2). We used the same set of signs and measurement setup (HOBO[®] Occupancy/Light Data Logger UX90-005) as in Study 1.

We gathered data from 21 working days (Monday through Friday), between 8:00 a.m. and 7:00 p.m. each day (usual hours with customers). The first 8 measurement days were conducted in the men's restroom (after choosing it randomly). For the first 5 days we gathered the baseline data (control – no sign condition) while on the following 3 days we gathered data using three experimental conditions (one sign per day, placed in random order on the inside of the door leading to a single-stall toilet). After this period, other baseline measurements were conducted in the women's restroom for 10 days and experimental measurements for 6 days (the longer period resulted from the fact that there were half the number of women as there were men visiting the DIY store in one day). The experimenter visited each site at 7:00 a.m. (before logging started) in order to set up the logger and at 8:00 p.m. (after logging stopped) in order to take down the logger and conduct a data readout.

4. 2. Results and discussion

The occurrence of light-switching behavior was not different in a statistically significant way across baseline measurement days in the women's restroom $\chi^2(9, N = 612) = 3.27; p = .95$ or in the men's restroom $\chi^2(4, N = 536) = 5.56; p = .23$.

Similar to Study 1, a logistic regression analysis was conducted to predict prompt effectiveness using light status upon entrance and sign type as predictors. An additional predictor, restroom type (women's vs. men's), was entered into the model. The dependent variable, sign effectiveness, was equal to 1 if the participant turned off the light, and 0 if not. A post hoc power analyses were conducted using the software package G*Power 3.1 with the

sample size of 1792. The analyses revealed the statistical power for this study was .98 for detecting a small effect, whereas the power exceeded .99 for the detection of a moderate to large effect size. Thus, there was adequate power at every effect size level. Table 2 shows the coefficients of the model.

Table 2.

Coefficients of the model built in Study 2.

	b	S.E.	Wald χ^2	<i>p</i>	Exp(b)	95% CI	
						<i>LL</i>	<i>UL</i>
Restroom type	0.90	0.26	11.47	< .001	2.46	1.46	4.15
Light status upon entrance	1.95	0.46	17.88	< .001	7.05	2.85	17.42
Sign			53.53	< .001			
Injunctive norm	2.44	0.34	50.43	< .001	11.45	5.84	22.44
Descriptive norm	1.57	0.36	19.06	< .001	4.84	2.38	9.82
Request-only	0.95	0.40	5.68	.01	2.60	1.18	5.71
Restroom × Sign			2.05	.56			
Restroom × Light	-1.22	0.56	4.68	.03	0.29	0.09	0.89
Light × Sign			5.32	.15			
Restroom × Light × Sign			3.33	.34			
Constant	-3.13	0.22	197.29	< .001	0.04		

Note. Males were used as a reference category in restroom type variable; CI = confidence interval for Exp(B); LL = lower limit; UL = upper limit.

The results indicated that the model built reliably distinguished between light-switching behavior: $\chi^2 (15) = 251.03; p < .001$. Statistics of Cox and Snell ($R^2 = .131$) and Nagelkerke ($R^2 = .221$) revealed a medium-level relationship between prediction and grouping, whereas overall prediction success was 80.7% (86.2% for leaving the light on when leaving and 52.7% for turning the light off). The Hosmer-Lemeshow test was highly nonsignificant, therefore showing a good fit of the model to the data – $\chi^2 (4) < 0.001; p = 1$.

The Wald criterion demonstrated a significant contribution of restroom type, which revealed that women were more likely to switch off the light than men. This result is consistent with previous research, which distinctively underlined a higher rating on environmental attitudes and a more frequent occurrence of pro-environmental behavior among women than men (Arnocky & Stroink, 2010; Dwyer et al., 2015; Gifford & Nilsson, 2014; Zelezny et al., 2000). Furthermore, light status upon entrance was significant, showing that the likelihood of turning off the light was over seven times higher if participants entered the restroom with the light turned off (H_1 confirmed). Finally, a significant sign type predictor revealed that compared to the control group, the possibility of the lights being switched off was: 1) over two times more likely in the request-only sign condition; 2) over four times more likely in the descriptive norm sign condition; and 3) over eleven times more likely in the injunctive norm sign condition.

Further comparison between experimental signs was conducted with planned contrasts, which revealed that the compliance rate was higher for signs with an injunctive norm when compared to request-only and descriptive norm signs ($p < .001$; $OR = 4.40$; 95% CIs [1.91, 10.09] and $p = .02$; $OR = 2.36$; 95% CIs [1.11, 5.04], accordingly). There were no statistically significant differences between a descriptive norm and request-only signs ($p = .15$; $OR = 1.85$; 95% CIs [0.78, 4.38]). Until this point, we had partially replicated the findings from the first experiment and partially confirmed our second hypothesis about the impact of prompts.

Significant interaction between restroom type and light status upon entrance revealed, that males were over three times more likely to act proenvironmentally when they entered the restroom with turned off lights in comparison to females ($OR = 3.14$ after recalculating negative b value). There were no other significant interaction between predictors. However, we have formulated specific predictions (H_3) that normative prompts will produce higher compliance rates when they are aligned with congruent cues (i.e., lights off), in contrast to a situation where norm-conflicting cues (i.e., lights on) occur, which will particularly dampen the influence of the descriptive norm prompt. It is suggested that even if the effects are not statistically significant, conducting planned comparisons is justified as long as they are theoretically predicted (Bedeian & Mossholder, 1994; Rosenthal & Rosnow, 1985). Then, in order to verify the third hypothesis (Light \times Sign interaction), we have analyzed the influence of light status upon entrance under each experimental condition for each restroom type, separately (see Figure 2).

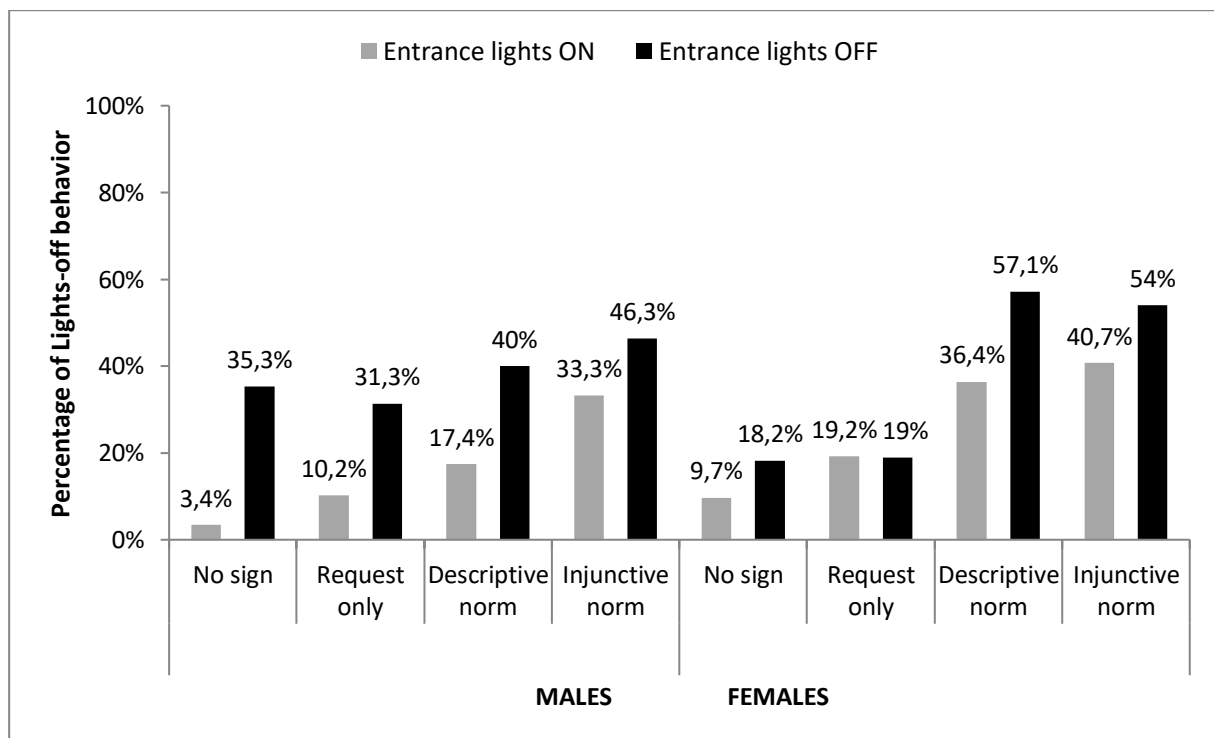


Figure 2. Percentage of males and females who turned off the lights after leaving restroom in each experimental condition, including the division into the light status upon entrance.

In the men's restroom, lights off versus lights on upon entrance led to a higher probability of energy conservation behavior in: the control condition ($p < .001$; $OR = 7.05$; 95% CIs [2.85, 17.42]); a request-only sign condition ($p = .03$; $OR = 4.00$; 95% CIs [1.15, 13.86]); and a descriptive norm sign condition ($p = .02$; $OR = 3.16$; 95% CIs [1.19, 8.36]) but not in an injunctive norm sign condition ($p = .18$; $OR = 1.72$; 95% CIs [0.77, 3.84]). In the women's restroom, lights off versus lights on upon entrance led to a more frequent energy conservation behavior in the control condition ($p = .03$; $OR = 2.06$; 95% CIs [1.08, 3.94]) and a descriptive norm sign condition ($p = .03$; $OR = 2.33$; 95% CIs [1.06, 5.13]). There were no statistically significant differences for a request-only sign ($p = .98$; $OR = 0.98$; 95% CIs [0.29, 3.36]) or an injunctive norm sign condition ($p = .18$; $OR = 1.72$; 95% CIs [0.80, 3.66]). In order to explore further, we have conducted additional contrasts between prompts, separated by the occurrence of conflicting or congruent cues.

When participants entered the men's restroom with light ON status (conflicting cue), an injunctive norm sign led to a higher compliance rate compared to control (no-sign) condition ($p < .001$; $OR = 11.45$; 95% CIs [5.84, 22.44]), a request-only sign ($p < .001$; $OR = 4.40$; 95% CIs [1.91, 10.09]), or a descriptive norm sign ($p = .03$; $OR = 2.37$; 95% CIs [1.11, 5.04]). A descriptive norm sign increased compliance rates in comparison to no-sign condition ($p < .001$; $OR = 4.84$; 95% CIs [2.38, 9.82]) but did not differ in a statistically significant way when compared to a request-only sign ($p = .15$; $OR = 1.85$; 95% CIs [0.78, 4.38]). In the women's restroom, both injunctive and descriptive norm signs led to a higher compliance rate when compared to a no-sign condition ($p < .001$; $OR = 6.37$; 95% CIs [3.52, 11.52] and $p < .001$; $OR = 5.31$; 95% CIs [2.85, 9.86], accordingly), or a request-only sign ($p = .01$; $OR = 2.88$; 95% CIs [1.33, 6.19] and $p = .03$; $OR = 2.40$; 95% CIs [1.09, 5.27], accordingly), but they did not differ in a statistically significant way from each other ($p = .63$; $OR = 1.20$; 95% CIs [0.56, 2.55]).

However, when the light status was OFF (congruent cue) upon entering the men's restroom, only injunctive norm sign led to higher compliance rate when compared to no-sign condition ($p = .04$; $OR = 2.81$; 95% CIs [1.03, 7.64]). Furthermore, there were no significant differences between any of the experimental prompts. In the women's restroom, there were no differences between the injunctive and descriptive norm signs ($p = .75$; $OR = 0.88$; 95% CIs [0.39, 1.94]), while both of them differed from control condition ($p < .001$; $OR = 5.28$; 95% CIs [2.36, 11.79] for injunctive norm; $p < .001$; $OR = 6.00$; 95% CIs [2.67, 13.48] for descriptive norm) and request-only sign ($p = .01$; $OR = 4.98$; 95% CIs [1.46, 16.94] for injunctive norm; $p = .01$; $OR = 5.66$; 95% CIs [1.66, 19.33] for descriptive norm).

These results partially confirm our prediction (H_3) that the influence of normative prompts is enhanced when congruent cues (light OFF status) occur but at the same time is reduced under conflicting cues (light ON status). However, this did not apply to an injunctive norm prompt, the influence of which was independently stable across situations. This trans-situational effect may account for the higher rate of influence of injunctive norms over descriptive norms (Reno et al., 1993).

5. General discussion

Across two field experiments, we have evaluated the impact of signs that promote energy conservation (turning off the lights). Our results correspond with extensive findings and evaluate the effectiveness of a prompting strategy to foster simple behaviors (Schultz, 2014). After summarizing past and present research (Bergquist & Nilsson, 2016; Luyben, 1980; Sussman & Gifford, 2012; Winett, 1977), it can be safely assumed that prompting is a valuable strategy for encouraging individuals to turn off lights in unoccupied spaces. However, it should be emphasized that using the proper appeal in a sign's message may result in a higher rate of compliance.

We assumed that signs conveying social norms would elicit higher rates of pro-environmental behavior compared to simple request prompts. The results from both field experiments have tested this assumption and have, therefore, reinforced the already existing notion of the effectiveness of normative appeals (Cialdini, 2003). However, in contrast to previous studies, we have also evaluated the role of congruent or conflicting normative cues on the impact of both injunctive as well as descriptive norm messages. Furthermore, we believe that this was the first attempt to compare the effectiveness of social norms conveyed via written messages (signs) under the occurrence of conflicting or congruent observational cues.

In general, our results suggest that aligning normative information (prompts) with positive observational norm cues increases their effectiveness (compared to the baseline and request-only conditions) more than when information and cues are in conflict. However, even in a conflict situation, the normative prompts significantly affected behavior! This is consistent with the results obtained by McDonald et al. (2013) and Smith and her collaborators (2012), and seem to contradict the findings of the experiments conducted by Oceja and Berenguer (Study 2; 2009) and Keizer, Lindenberg and Steg (Study 1; 2011). In their study on leaving lights on or off when exiting a public space (i.e. washrooms in the university building) Oceja and Berenguer (Study 2; 2009) manipulated descriptive norm cue (lights on or off when entering the washroom) and four stickers with persuasive messages. Specifically, their energy saving messages focused on: costs of wasting energy, common good from saving it, social disapproval and informing about correct behavior. They showed ineffectiveness of these messages when the information in the message was in conflict with descriptive norm made salient by the context. It should be emphasized, however, that none of their messages appealed to norms – descriptive or injunctive. Thus, the results of the Oceja and Berenguer' study are not the appropriate reference point for the interpretation of results obtained in our experiments.

Keizer and his collaborators (2011) found that prohibition signs decrease norm-conforming behavior when negative norm-support cues are present in a setting. However, comparing their experiment with ours, there are some fundamental differences. First, their research focused on no-littering when our experiments focused on saving energy. Second, their study was conducted in the open space (alley in the city), while our research took place in restrooms in public buildings (DIY store and university). Third, they used prohibition signs, while the content of our signs referred directly to norms that encouraged performing desirable behavior. Prohibition signs are often placed in settings where the behavior - that is supposedly prohibited - frequently occurs in order to make the norm particularly salient. They do not inform about the commonality of behavior or (at least directly) about approval for it. Furthermore, prohibition signs refer to behaviors that should not be taken - the enforcement of which results in (more or less) specific sanctions. In our studies, the signs suggested a desirable behavior by recalling the norm (descriptive or injunctive), which if not implemented, would not result in any formal sanctions (as opposed to prohibition signs). These differences make it unjustifiable to directly compare the results of our research with the study of Keizer and his collaborators.

Consistent with the focus theory of normative conduct (Cialdini et al., 1990), we found that the occurrence of conflicting norm message (cue vs. prompt) has a particular impact on behavior when norm is of a descriptive nature, since the impact of injunctive norms was relatively independent of the occurrence of norm-support cues, therefore confirming the notion of their trans-situational influence (Reno et al., 1993). The results of our field experiments also suggest that the difference between injunctive and descriptive normative messages seems to be far more complex. Only when men encountered norm-conflicting cues (i.e., lights ON upon entrance while prompts encouraging turning off the light were mounted) did the injunctive norm message lead to a higher rate of compliance compared to a descriptive norm. However, this difference did not emerge when men were faced with norm-congruent cues. At the same time,

both normative types of information were similarly effective with the female sample. These results extend and revise the findings on the primacy of injunctive over descriptive norms (Cialdini et al., 2006), as well as shedding some light on possible future directions for researchers to follow. We would argue that a possible explanation for these results lies within the gender differences.

Women have been found to have a higher rating on environmental attitudes and act pro-environmentally more often than men (Arnocky & Stroink, 2010; Dwyer et al., 2015; Gifford & Nilsson, 2014; Zelezny et al., 2000). We have confirmed these findings in our second experiment. If we were to hypothetically assume that gender is a reliable indicator of environmental attitudes, we could argue (in line with previous studies – e.g., McDonald et al., 2013) that when faced with norm-conflicting cues, individuals with positive environmental attitudes (i.e., women) hold higher perceptions of the effectiveness of engaging in pro-environmental behaviors, which are associated with increased behavioral intentions (that may result in a behavioral act), in contrast to individuals with negative environmental attitudes (i.e., men). Therefore, while women would equally comply with injunctive and descriptive norms in norm-conflict situations, men would be less compliant with the descriptive norms in the same situations, since they are prone to norm-conflict. This prediction is strictly hypothetical, since it has not been evaluated in the presented studies.

5. 1. Limitations and future directions

The prediction mentioned above shows one of the limitations that were encountered in the presented experiments, as well as one of the directions that could be followed in future studies. The strengths of field studies lie in the ecological validity and the weaknesses in the difficulty of randomization and controlling all sorts of factors that might be of influence (Keizer et al., 2014). Random assignment of participants to experimental conditions was simply not

possible in public settings. Moreover, we did not (and could not) include a manipulation check. Hence, we cannot be sure that the participants in our experimental conditions actually saw our signs. However, the signs were printed in A4 format and placed on the inside of the door (at eye level) of the single-stall toilet, so they contrasted with the background and were clearly visible.

The lack of demographic data in the field experiments did not allow us to elaborate on the influence of dispositional factors on our findings, which would help in establishing the underlying processes of normative influence (Göckeritz et al., 2010). It seems that examining the role of environmental attitude on the influence of social norms could be a particularly interesting topic to pursue (McDonald et al., 2013). Even though our measurement in the preliminary study using the created prompt was theoretically justified (Meis & Kashima, 2017; Frantz et al., 2005), we propose that future research should employ measures additional to sign vividness and reactance elicitation (e.g., perceived sign effectiveness).

Due to the fact that we did not manually manipulate the occurrence of norm-support cues (i.e., switched lights on/off after each participant visiting the restroom) we were constrained from evaluating their role in Study 1. We aimed to overcome this obstacle in Study 2 by testing the naturally-occurring influence of light status on turning off the light upon exiting on bigger sample as well as in different place (DIY store). Although it can be accurately argued that a bigger sample size may not be the most reliable solution to this problem (when compared to conducting another study with manually controlled norm-support cues by resetting light status upon arrival of participants), we believe that at this point it was the only possibility that would not change the unobtrusive nature of the study (see Doliński, 2018; Keizer et al., 2013). This aspect was particularly crucial since, as discussed by previous researchers (e.g., Dwyer et al., 2015), noticing the confederate (which would manually reset light status after each participant) by participant can suggest a higher amount of traffic in a particular restroom and

therefore inhibit the occurrence of turning the lights off. However, future research may validate our findings in a more controlled environment (i.e., manual manipulation of descriptive cues). It should be noted that our experiments were carried out in single-stall restrooms. Additional experiments conducted in multiple-stall restrooms would serve as a valuable extension of our findings. Finally, it seems that it is crucial to incorporate behavioral data from both genders.

5. 2. Conclusions

At this point we would like to emphasize the role of the instruments that were used in data collection throughout our experiments. Due to the deployment of data loggers (HOBO[®] Occupancy/Light Data Logger, model UX90-005), we were able to gather substantial samples in a relatively short time. Moreover, we were not constrained by the typical observation method, which usually requires the constant presence of observers and resource use (Sussman, 2016). The use of this methodology significantly simplified the conduction of field experiments, limited possible human errors and allowed us to further replicate our findings.

Overall, the fact that we have conducted these field experiments has important implications for environmental psychology, which have been subject to excessive reliance on self-reports as measures of pro-environmental behavior (Giuliani & Scopelliti, 2009; Lange, Steinke & Dewitte, 2018; Steg & Vlek, 2009). Most importantly, we were able to gather reliable data (in the form of behavior occurrence rates), which surpasses self-reporting measures in predicting the effectiveness of interventions aimed at fostering sustainability (Kromos & Gifford, 2014). We believe that our findings broaden the scope of knowledge about prompting strategy with a particular focus on the use of social norms and may practically serve program planners when creating effective and pro-environmental social marketing campaigns.

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Appendix 1. Prompt designs

a) Request only sign



b) Descriptive norm sign



c) Injunctive norm sign



Appendix 2. Isometric projections of rooms used during the field experiments

