Pushing or Pulling? The Influence of Policy Type on Social Norm Perceptions for Sustainable Transportation Policies

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Master Thesis - Environmental Psychology

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Abstract

Perceptions of social norms—informal rules in society describing what is commonly done or (dis)approved—are crucial drivers of sustainable behaviors. Previous studies have shown that institutional signals, such as a new policy, can change social norm perceptions. However, the role of policy type in this process has not yet been investigated. The current study aimed to replicate the signaling effect of policies and examine the role of policy type (push vs. pull policies) in this process. Specifically, it was hypothesized that push policies would send a stronger signal than pull policies and result in greater changes in social norm perceptions. In a pre-registered, online experiment ($N = 277$) policy type (push vs. pull) of sustainable transportation policies by the Municipality of Groningen was manipulated. The results showed that policies influenced injunctive norm perceptions toward the government but had no significant effect on other social norm perceptions. Additionally, no significant differences were found between push and pull policies in terms of their impact on social norm perceptions. Exploratory analyses revealed that pull policies are perceived as more acceptable than push policies. Furthermore, they are more seen as a gain than push policies, which in turn increases social norm perceptions. The study highlights how policies can signal what the government (dis)approves of. Findings and implications are critically discussed.

Keywords: environmental psychology, social norm perceptions, institutional signals

Word count: 7473

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Sustainable Transportation Policies

To address the climate crisis, it is crucial to make changes in all areas of life, including the transportation sector (IPCC, 2023). This sector accounted for 21.3% of all CO_2 emissions in the European Union in 2021 (Statista, 2023a) and is the only sector where CO_2 emissions have increased since 1990 (Statista, 2023b). In addition to the need to reduce emissions in response to the climate crisis, sustainable transportation (walking, biking and public transportation) has several other positive effects. Studies have demonstrated that sustainable transportation reduces pollution in cities (Pojani & Stead, 2015), accidents and fatalities (Gößling, 2020), as well as noise levels (Profillidis et al., 2018). Furthermore, it requires less public space (Nello-Deakin, 2019), which is becoming increasingly contested in urban areas (Petzer et al., 2021). By making transportation more sustainable this has even a social component as these negative consequences especially affect vulnerable groups such as the poor, children and elderly (Hull, 2008). In recent years, policy makers have identified social norm perceptions as a potential means of social and ecological change (Tankard & Paluck, 2016) such as making transportation more sustainable. Additionally, studies have shown that social norm perceptions can be influenced by decisions, such as policies, made by public institutions (e.g., Eisner et al., 2020). The objective of this study is to delve deeper into the process of changing social norm perceptions in the transportation sector through governmental policies, with a specific focus on the previously overlooked role of policy type in this process.

Literature Review

Social norms

Social norms play a significant role in influencing individuals' transportation choices such as taking public transport instead of a car (Zhang et al., 2015; Bamberg et al., 2007; Manca et al., 2022). Social norms are informal rules that dictate how people behave in society (Cialdini & Goldstein, 2004). They can be further categorized into descriptive, injunctive, and dynamic norms (Campbell et al., 2023). Descriptive social norms describe how most people behave in a specific context (Cialdini, 2007). For example, it is common for people to use their cars for commuting. Injunctive norms describe how other people, or an institution thinks one should behave in a given context (Cialdini, 2003). For instance, the government thinks you should use public transportation for commuting. Dynamic norms, sometimes also referred to as trending norms (e.g., Cialdini & Jacobson, 2021), can be defined as describing changes in the prevalence of a behavior (Mortensen et al., 2017), such as an increase in the number of people who use bikes for commuting. People use norms as a reference point for their behavior because they are motivated to avoid social rejection, meet others' expectations, and seek esteem from others (Andrighetto et al., 2015). One important boundary condition for the influence of social norms on behavior is that the behavior is shown or promoted by people or an institution which is considered important by a person (Reynolds, 2018; Paluck et al., 2016).

Social Norm Perceptions

To change social norms, it is necessary to understand how people perceive norms, which is referred to as social norm perceptions (Tankard & Paluck, 2016). According to Tankard and Paluck (2016), one way in which social norm perceptions can change is through signals sent by institutions such as governments or courts. Institutions send signals when they take actions, for example a court ruling or implementing a new policy. One example to illustrate this process is the German Federal Constitutional Court's ruling that the German government is not doing

enough to protect its citizens from the climate crisis (Bundesverfassungsgericht, n.d.). Such a decision can potentially alter the perceptions of all three types of social norm perceptions. Firstly, the decision that the German government is not doing enough to address the climate crisis may result in a reduction in descriptive norm perceptions, because it indicates that currently Germany is taking insufficient action to halt the climate crisis. Secondly, the decision alters the perceptions of injunctive norms held by individuals towards both the institution sending the signal and other citizens. In this example, the court's decision indicates a desire by the court for increased climate action thereby strengthening the injunctive norm towards the institution. Injunctive norm perceptions towards other citizens may be altered as well since, in a democratic society, decisions taken by public institutions reflect the opinion of their citizens (Tankard & Paluck, 2017). Thirdly, decisions and subsequent societal discourse, such as through the media, can lead people to believe that climate change is becoming a more prominent issue. This can highlight a trend and thereby alter dynamic norm perceptions.

Investigating the process of social norm perception change is of great importance for three reasons. First, they represent a significant driver of behavioral change (Tankard & Paluck, 2017). Second, investigating the process of social norm perception change might help counter pluralistic ignorance, defined as "a shared misperception of how others think or behave" (Sparkman et al., 2022, p. 1). This misperception poses a significant barrier to the sustainability transition because people tend to underestimate for example others' support for sustainable policies, leading to inaction (Sparkman et al., 2022). Third, social norm perceptions seem to be relatively easier to change on a larger scale compared to other drivers of behavioral change, such as attitudes (Tankard & Paluck, 2016).

Previous Studies

There only have been a few studies investigating the signaling effect of institutional decisions on social norm perceptions. One study examined the impact of a supreme court ruling on same-sex marriage on social norm perceptions in the US. The results indicate that the court's decision to allow same-sex marriage heightens both the injunctive norm perception, that is, whether Americans approve of same-sex marriage, and the dynamic norm perception, that is, whether there is an increase in support (Tankard & Paluck, 2017). Similarly, another study examined the influence of a new law from the Swiss government on injunctive norm perceptions on same-sex parenting. The study revealed that a new law permitting same-sex parenting reduces the perceived disapproval of Swiss citizens towards same-sex marriage (Eisner et al., 2020). On the topic of sustainable transportation three studies have been conducted thus far that investigated the impact of financial incentives provided by institutions on social norm perceptions (Van der Werff et al., in preparation). The first two studies investigated the influence of a financial subsidy for electric vehicles, while the third study examined the impact of a financial grant for sustainable travel to a semester abroad on social norm perceptions. In studies one and two, it was shown that awareness of the subsidy resulted in increased perceptions of both injunctive norm perceptions of the government and dynamic norm perceptions, in the direction of the subsidy. Moreover, descriptive norms, whether people drive electric cars, were found to be weaker among those who were aware of the subsidy. In the third study, the same results were found for injunctive norm perceptions, with the exception that in this study, it was not the awareness of the subsidy that distinguished the study conditions, but rather the presence of a financial incentive (Van der Werff et al., in preparation).

While these studies show that institutional decisions can influence social norm perception, further investigation into the mechanisms of social norm perception change through

institutional decisions is needed. A first step are two studies by Constantino et al. (2021) and Syropoulos et al. (2024). Besides finding a signaling effect for descriptive norm perceptions, but not for injunctive norm perceptions, they showed that the signaling effect of an institutional decision on social norm perceptions can vary depending on the type (e.g., business, government, science, etc.), and on the perceived representativeness of the sending institution. However, the influence of policy type on the signaling effect of policies remains unexplored. This study aims to investigate whether different policy types show varying effects on social norm perceptions.

Policy Type

There are various ways to distinguish sustainability related policies (Ejelöv et al., 2022). One common distinction used in environmental psychology and transportation research is based on the level of coercion (e.g., Attari et al., 2009), categorizing policies as either push or pull policies. Push policies aim to discourage undesired behavior, or in other words, push people away from undesired behaviors. For example, to decrease the attractiveness of using cars by increasing parking fees in city centers. Contrary, pull policies aim to encourage desired behaviors or, in other words, to pull people towards desired behaviors. For example, to lower ticket prices for public transportation to make using it more attractive (De Groot & Schuitema, 2012). The categorization of push and pull policies will be employed in the present study.

Research on push and pull policies has identified several differences between the two types of policies. Push policies have been shown to be less accepted and less supported (Dietz et al., 2007; Schuitema et al., 2011), are perceived as more effective (Steg, 2019), and are perceived to reduce freedom more (Eriksson et al., 2006) compared to pull policies. In light of the observed discrepancies between push and pull policies, the question can be raised, whether push and pull policies might also differ in their signaling effect on social norm perceptions.

Prospect Theory and Policy Type

To answer this question, the insights of prospect theory may be of value. Prospect theory suggests that individuals perceive the impact of a potential loss as greater than that of an equivalent gain (Kahneman & Tversky, 1979). Applying prospect theory to policy perception, means that individuals should respond stronger to policies that are perceived as a potential loss compared to a gain. In line with previous research showing that push policies are seen as reducing freedom more than pull policies (Eriksson et al., 2006), it is hypothesized that individuals perceive push policies as more of a loss compared to pull policies. Consequently, push policies should send a stronger signal and, through the perceived gain/loss of these policies, change social norm perceptions more than pull policies. An example to illustrate this reasoning is that a push policy to reduce car parking spaces may be perceived as a loss, while a pull policy to build more bike parking racks might be perceived as a gain.

The Current Study

The current study has two primary objectives. The first objective is to replicate the signaling effect of policies on social norm perceptions. Secondly, in light of the lack of research investigating the impact of policy type on the signaling effect, the study aims to assess the influence of policy type (push vs. pull) on social norm perceptions. A three-group experimental design was employed in the context of sustainable transportation in the Municipality of Groningen. One group was presented with push policies ("push group"), one group with pull policies ("pull group") and a third group not presented with any policies acted as a control group. Moreover, the potential role of perceived loss/gain as a mediator underlying a difference between push and pull policies and other relevant variables, namely future behavior intentions, environmental self-identity, policy acceptance, identity leadership, and need for structure, were

subjected to exploratory investigation with the objective of further investigating the process of social norm perception change through institutional signals.

Hypotheses

Based on previous studies by Van der Werff et al. (in preparation), the following first hypothesis is proposed: The presentation of sustainable transportation policies will lead to higher injunctive norm perceptions toward the government of the Municipality of Groningen (H1a) and its residents (H1b), as well as higher dynamic norm perceptions (H1c), but lower descriptive norm perceptions (H1d) compared to a control group that is not exposed to any policies.

Drawing on prospect theory the following second hypothesis is proposed: The effect of push policies on injunctive norm perceptions toward the government of the Municipality Groningen (H2a), other people living in Groningen (H2b), dynamic norm perceptions (H2c), and descriptive norm perceptions (H2d) will be even stronger than the effect of pull policies.

In addressing these hypotheses, the present study expands the literature on the signaling effect of institutions actions on social norm perceptions in three ways. Firstly, it is the first study to investigate the influence of policy type on the signaling effect of policies. Secondly, the experimental design, which includes a control group, contributes to the limited evidence from experimental studies. And thirdly, by investigating multiple policies the study is the first one to investigate more than a single policy or court ruling.

Method

The study was pre-registered on April 13, 2024, through the Open Science Framework (https://osf.io/xvubw/) and employed an online-based questionnaire experiment using a between-subjects design with three groups. Two experimental groups distinguished based on the factor policy type, and a control group. The main dependent variables are social norm perceptions

including, injunctive norms of the government and the population, dynamic norms and descriptive norms.

Participants

Participants for the present study were recruited through social media advertisements, the University of Groningen's SONA recruitment system for first-year psychology students, and direct invitations to people on the street. Participants were able to either fill out the questionnaire in Dutch or English to ensure that language was not a barrier to participation. Participants recruited through the SONA system were compensated with 0.3 course credits for their participation. Prior to the study, a power analysis was conducted using G*Power (Faul et al., 2007) showing that 432 participants were required to achieve 80% power, with the objective of identifying a small effect ($f = 0.15$) as found in previous studies (Van der Werff et al., in preparation). Due to time and resource limitations, the intended number of participants was not reached. A total of 363 individuals started to fill out the online questionnaire. Participants had to be excluded, as they did not consent to have their data used for analyses ($N = 5$), did terminate the study before the end ($N = 51$), were younger than 18 years old ($N = 3$) or did fail the attention check ($N = 47$). Thus, a total of 277 participants (188 women, 83 men, 4 other, 2 did not wish to answer; $M_{age} = 21.60$; $SD_{age} = 6.01$) were included in the analyses. 129 completed the questionnaire in English, and 148 completed it in Dutch. Participants who completed the questionnaire in Dutch did not significantly differ from the English sample in terms of gender $\chi^2(3, N = 277) = 1.54$, $p = 0.674$, and age $t(275) = 0.36$, $p = 0.717$). Also, no significant differences were observed between the three groups of the study regarding gender $\chi^2(6, N = 277) = 5.46$, $p = .478$ and age $F(2, 173.026) = 0.89$, $p = .412$.

Experimental procedure

Study participants were provided with a link to the online questionnaire in Qualtrics (Qualtrics, 2005), which could be completed on a computer, tablet, or smartphone. The study consisted of three phases: an introduction to the study, the manipulation of the independent variable, and the measurement of the dependent variables. In the introduction phase of the study, participants were asked to indicate the language in which they wished to complete the questionnaire. Once a language had been selected, participants were presented with an information sheet about the study and were asked to consent to participate and to allow the use of their data. Following this, participants were randomly assigned to one of the three groups and were all presented with a brief text about sustainable transportation. The continue button was only made available after a 30-second interval, with the intention of ensuring that participants read the text carefully. In the subsequent phase, the experimental manipulation was implemented. The experimental groups were provided with transportation policies, namely push and pull policies, respectively, from the Municipality of Groningen. The control group was not provided with any additional information. Again, participants were only permitted to continue the study after 30 seconds. In the third phase, all groups were asked to express their opinions on statements measuring social norm perceptions, exploratory variables and provide some demographic data.

Materials and Measures

The materials used in this study included an information sheet about the study (Appendix A), a general text on sustainable transportation (Appendix B), push and pull transportation policies from the Municipality of Groningen (Appendix C), and questionnaires measuring the dependent variables, exploratory variables, and demographic data (Appendix D).

General Text About Sustainable Transportation

The general text about sustainable transportation consisted of five sentences describing sustainable transportation in an easy way. The text was included in the study to ensure that the topic of sustainable transportation was salient to all three groups, rather than solely to the experimental groups, who received policies on that topic. Making sustainable transportation salient to all groups was essential to isolate an signaling effect of policies from an effect of making the topic of sustainable transportation salient.

Transportation Policies

Both experimental groups received eight transportation policies from the Municipality of Groningen, based on the urban mobility plan "Groningen well on the way" (Gemeente Groningen, 2021). Each policy in the push group was carefully matched with a corresponding policy in the pull group to ensure that differences in policy type, rather than content, could be isolated as the experimental manipulation. The push group received a list of eight policies aimed at making car use less attractive (e.g., "The Municipality of Groningen will reduce car parking spaces in the city to make car use less attractive.)". The pull group received a list of eight policies aimed at making sustainable transportation more attractive (e.g., "The Municipality of Groningen will build and improve bike parking spaces to make bike use more attractive.").

Social Norm Perceptions

Social norm perceptions regarding transportation in the Municipality of Groningen were measured using ten statements on which participants had to express their opinion using 7-Point Likert Scales ranging from 1 (*strongly agree*) to 7 (*strongly disagree*). Social norm perceptions that were measured included descriptive norm perceptions (e.g., "The majority of inhabitants of Groningen use a car frequently."), injunctive norm perceptions of the government (e.g., "The

Municipality of Groningen disapproves of frequent car use.") and the population (e.g., "The majority of inhabitants of Groningen disapprove of frequent car use."), and dynamic norm perceptions (e.g., "Less and less inhabitants of Groningen use a car frequently."). Additionally, an attention check item was shuffled between the statements on which participants were asked to select 1 (*strongly disagree*). Statements were shuffled randomly to avoid order effects.

Exploratory Variables

For exploratory purposes a number of variables were assessed. Future behavior intentions were measured using seven items. Participants were asked to indicate on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*) how often they will engage in a behavior. The topics covered were future transportation behavior (e.g., "How often are you planning to use a car in the next 6 months?"), future general sustainability behavior (e.g., "How often are you planning to act more sustainably in general in the next 6 months?"), and future sustainability food consumption, energy usage, and collective behavior (e.g., How often are you planning to use energy more sustainably, such as saving energy or using energy from renewable sources in the next 6 months?"). One item ("How (un)acceptable do you find governmental policies to promote sustainable behaviors:"), employing a 7-point Likert scale ranging from 1 (*fully unacceptable*) to 7 (*fully acceptable*), was utilized to assess the acceptability of sustainable policies. Additionally assessed were: four items measuring gain/loss perception of sustainable transportation policies (e.g., "The Sustainable transportation policies of the Municipality of Groningen, will positively affect me."), three items measuring environmental self-identity (e.g., "I see myself as a pro-environmental person."), four items measuring identity leadership (e.g., "The Municipality of Groningen is representative of inhabitants of Groningen."), one item measuring identification with inhabitants of Groningen ("I identify with the inhabitants of Groningen."), and one item

measuring the need for structure in life ("I enjoy having a clear and structured mode of life.").

All measures were based on 7-point Likert scales ranging from 1 (*strongly agree*) to 7 (*strongly*

disagree). To investigate the sample used in this study participants were asked to provide their

age and gender. All items and their respective sources can be found in Appendix D.

Results

The collected data was analyzed using Jamovi (The Jamovi Project, 2024). As a first step

of the analysis, item correlations and scale reliabilities were assessed to determine if the items

could be combined into scales as intended. A scale was constructed if the Pearson r correlation

between two items was > .50, and for scales with more than two items, if Cronbach's α and

McDonald's Ω were > .70. All scales were constructed as intended (see Table 1). Interestingly,

items assessing perceptions of sustainable transportation norms did not show significant negative

correlations with items assessing perceptions of corresponding unsustainable transportation

norms. This may be because sustainable and unsustainable transportation are not viewed as

opposing each other, but rather as distinct categories. Therefore, perceptions of sustainable and

unsustainable norms were analyzed separately.

Table 1

Correlations and Scale Reliabilities for Constructed Scales

Scale	Correlation/Reliability		
	Pearson correlation r	Cronbach's α	McDonald's Ω
Dynamic sus.	.72		
Dynamic unsus.	.52		
Perceived gain/loss		.91	.91
Environmental self-identity		.89	.91
Identity leadership		.78	.79

Note. sus. = sustainable, unsus. = unsustainable; correlations were calculated for scales with 2 items and reliability was assessed for scales with > 2 items

Hypothesis Testing

In the initial analysis, the two primary hypotheses were evaluated to test whether the three groups (push vs. pull vs. control) differed in their social norm perceptions. Table 2 presents the means and standard deviations for all social norm perceptions. To test the first hypothesis, that is, whether the push and pull group presented with transportation policies differed significantly in their social norms perceptions from the control group not presented with transportation policies, a Multivariate Analysis of Variance (MANOVA) was conducted. The MANOVA yielded a non-significant result, $F (16, 534) = 1.58$, $p = .069$. Due to a significant result from a Shapiro-Wilk test (W = 0.93, p < .001), indicating a non-normal data distribution, univariate tests were conducted using the nonparametric Kruskal-Wallis test.

Table 2

Means (Standard Deviations) for Sustainable Transportation Social Norm Perceptions

Social norm perception	Group		
	Push	Pull	Control
Descriptive sus.	5.69 (1.06)	5.74 (1.03)	5.51 (1.17)
Descriptive unsus.	3.40 (1.36)	3.41 (1.34)	3.29 (1.29)
Injunctive sus. gov.	6.14 (1.06)	6.22 (0.91)	5.87 (0.99)
Injunctive unsus. gov.	5.22 (1.38)	5.30 (1.23)	4.59 (1.24)
Injunctive sus. pop.	5.58 (1.01)	5.72 (0.84)	5.61 (0.96)
Injunctive unsus. pop.	4.07 (1.21)	4.28 (1.22)	4.06 (1.06)
Dynamic sus.	5.48 (0.95)	5.52 (0.89)	5.32 (0.93)
Dynamic unsus.	4.82 (0.93)	4.76 (1.04)	4.69 (1.03)

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

The results of the Kruskal-Wallis tests (see Table 3) show significant differences between groups in terms of injunctive norm perceptions of the government on the topic of sustainable and unsustainable transportation. Effect sizes (ε^2) indicate a small effect size for sustainable transportation and a moderate effect size for unsustainable transportation. No significant differences between the groups were identified for the other social norm perceptions.

Table 3

Results of the Kruskal Wallis Tests Between Policy Type and Social Norm Perceptions

Social Norm perception				
	χ^2	df	p	ε
Descriptive sus.	1.66	2	.436	.006
Descriptive unsus.	0.46	2	.796	.002
Injunctive sus. gov.	9.80	2	.007*	.036
Injunctive unsus. gov.	19.44	2	<.001*	.070
Injunctive sus. pop.	0.63	2	.730	.002
Injunctive unsus. pop.	2.24	2	.327	.008
Dynamic sus.	2.77	2	.250	.010
Dynamic unsus.	0.72	2	.697	.003

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

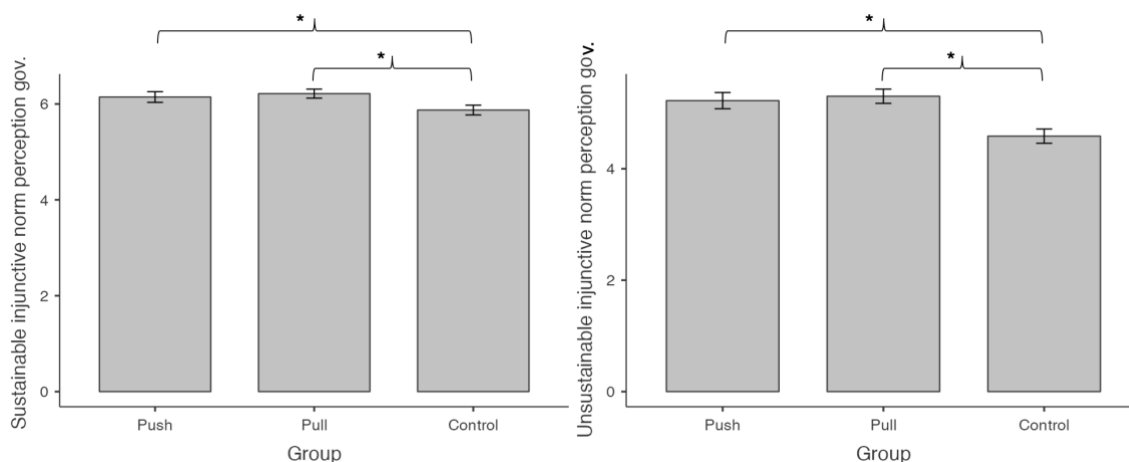* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

Pairwise Dwass-Steel-Critchlow-Fligner comparisons were conducted to assess individual differences between the three groups. The results demonstrate that, in accordance with the first hypothesis, participants in the push group and the pull group perceived significantly higher approval of sustainable transportation ($W = -3.56$, $p = .032$; $W = -4.10$, $p = .010$) as well as higher disapproval of unsustainable transportation ($W = -5.04$, $p < .001$; $W = -5.69$, $p < .001$) by the government compared to the control group (Figure 1). No significant differences were identified between the push and pull group and the control group with regard to other social norm perceptions. All pairwise comparisons can be found in Table E1 of Appendix E.

Consequently, from hypothesis 1 only sub-hypothesis 1a can be confirmed. Rerunning all

analyses with participants who failed the attention check item yielded the same results, except

for the comparison between the push and control group for sustainable injunctive norm

perceptions of the government, which became non-significant (W = -3.28, p = .053).

To examine the second hypothesis, namely whether the groups presented with

transportation policies differed significantly in their social norm perceptions, with the push group

exhibiting more extreme social norm perceptions than the pull group, the Dwass-Steel-

Critchlow-Fligner comparisons (see Table E1, Appendix E) between the push and the pull group

were examined. Results revealed that no significant differences between the two groups were

found for any of the social norm perceptions. Therefore, from hypothesis 2 none of the sub

hypotheses can be confirmed. Upon rerunning all analyses with participants who failed the

attention check item, no changes in the results were observed.

Figure 1

Bar Plots Displaying Social Norm Perceptions Scores Among Groups

Note. gov. = government, Error bars represent 95% confidence intervals

* = p < .05 after Bonferroni-Holm correction for multiple comparisons

Exploratory Analyses

After testing the hypotheses, a number of exploratory analyses were conducted to investigate the process of social norm perception change further. Future behavior intentions were investigated to see if being made aware of policies also influences behavior intentions. Policy acceptance was assessed to determine if policy type affects policy acceptance and if policy acceptance plays a role in the process of social norm perception change through institutional signals. Perceived gain/loss of policies was examined because it was suspected to underlie differences in the signaling effect of policies for different policy types. Environmental self-identity was evaluated to determine if the level of environmental self-identity influences the signaling effect on a sustainability related topic. Identity leadership and identification with inhabitants of Groningen were assessed to investigate if perceptions of the government and the population play a role in the process of social norm perception change. And finally, need for structure was investigated as a potentially influential variable for the relation between norm perceptions of the government and the population.

Future Behavior Intentions

As a first step sustainability related behavior intentions were investigated. Means and standard deviations of future behavior intentions can be found in Table 4. Once again as a first step a MANOVA was conducted, showing no significant result $F (14, 536) = 0.78$, $p = .691$). Univariate tests were conducted using the Kruskal-Wallis test, since the multivariate normality assumption was once again violated ($W = 0.86$, $p < .001$). Results of the univariate tests can be found in Table E2 in Appendix E. None of the differences in behavior intentions reached significance.

Table 4

*Means (Standard Deviations) for Sustainability Related Future Behavior Intentions.*

Future Behavior Intention	Group		
	Push	Pull	Control
Sustainable transportation	6.17 (0.86)	6.24 (0.73)	6.14 (0.90)
Unsustainable transportation	2.73 (1.34)	2.64 (1.33)	2.71 (1.32)
General sustainability	4.93 (1.18)	4.82 (1.06)	4.51 (1.28)
General unsustainability	2.83 (1.28)	2.83 (1.20)	2.69 (1.17)
Sustainable eating	4.44 (1.90)	4.59 (1.77)	4.02 (1.98)
Sustainable energy usage	4.57 (1.35)	4.52 (1.10)	4.27 (1.43)
Sustainable collective behavior	2.84 (1.45)	2.80 (1.36)	2.55 (1.59)

Policy Acceptance

The next variable to be investigated was the acceptance of sustainable policies. A conducted Kruskal-Wallis yielded a significant result $\chi^2(2, N=277) = 9.72$, $p = .008$, $\varepsilon^2 = .035$ with a small effect size. A pairwise Dwass-Steel-Critchlow-Fligner comparison revealed that the pull group ($M = 5.65$, $SD = 1.26$) exhibited greater acceptance of sustainable policies ($W = 4.29$, $p = .007$) than the push group ($M = 4.97$, $SD = 1.56$). See Figure 2. No other pairwise comparison was found to be statistically significant.

Figure 2

Bar Plot Displaying Acceptance of Sustainable Transportation Policies Among Groups
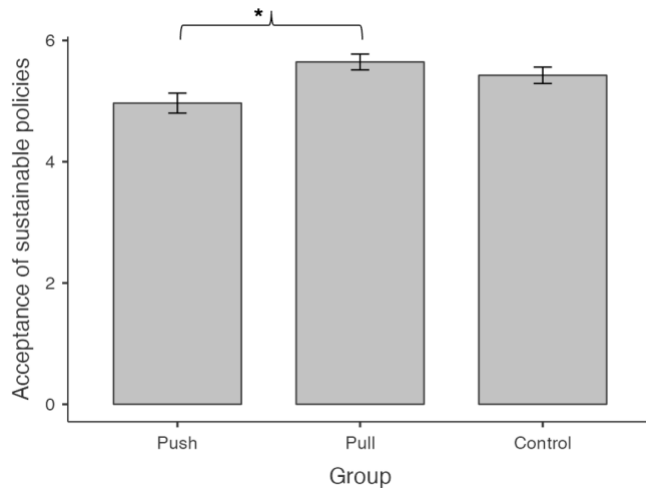
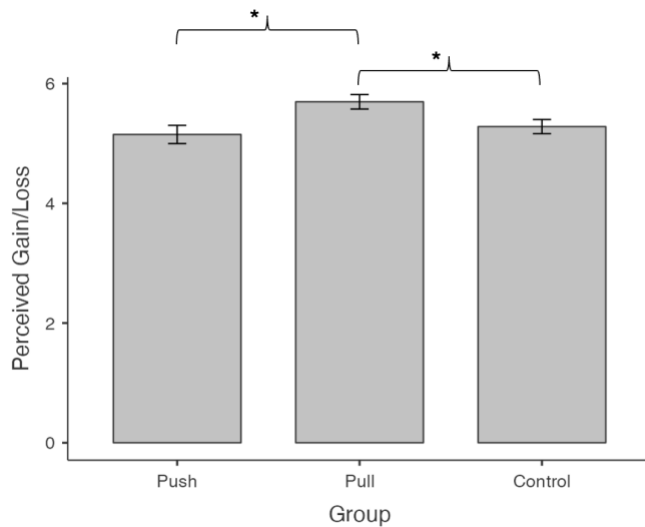*Note*. Error bars represent 95% confidence intervals

* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

Perceived gain/loss

Next perceived gain/loss of sustainable transportation policies was investigated. A conducted Kruskal-Wallis test yielded a significant result $\chi^2(2, N = 277) = 9.25$, $p = .010$, $\varepsilon^2 = .034$ with a small effect size. Pairwise Dwass-Steel-Critchlow-Fligner comparisons revealed that participants in the pull group ($M = 5.70$, $SD = 1.17$) perceived sustainable transportation policies more as a gain than participants in the push group ($M = 5.15$, $SD = 1.44$) ($W = 3.65$, $p = .027$) and participants in the control group ($M = 5.28$, $SD = 1.15$) ($W = -3.77$, $p = .021$) (see Figure 3). No significant difference was found between the push and the control group. It is noteworthy that all groups perceived the policies more as a gain than a loss, as the mean for all three groups was above the midpoint of the scale (4). Consequently, it makes more sense to speak of varying degrees of gain perceptions rather than contrasting gain and loss perceptions.

Figure 3

Bar Plot Displaying Perceived Gain/Loss of Sustainable Transportation Policies Among Groups

*Note*. Error bars represent 95% confidence intervals

$* = p < .05$ after Bonferroni-Holm correction for multiple comparisons

Mediation Analyses

After testing differences between the groups on a number of variables, mediation analyses were performed to get further insights into the relationship between policy type and social norm perceptions. A first mediation tested the underlying assumption of hypothesis 2 that push and pull policies differ in their perceived gain/loss and that this difference influences social norm perceptions. A generalized linear mediation model using the jAMM module (Gallucci, 2020) was employed to conduct the mediation analysis. The analysis considered policy type (push vs. pull) as the independent variable, perceived gain/loss as the mediator, and social norm perceptions as the dependent variables (see Figure 4). Participants in the control group were excluded from analyses with perceived gain/loss because they were not presented with any policies, making it hard to link their gain/loss perceptions to specific policies.

Figure 4

Mediation Model Illustrating the Relationship Between Policy Type, Perceived Gain/Loss of

Sustainable Transportation Policies, and Social Norm Perceptions
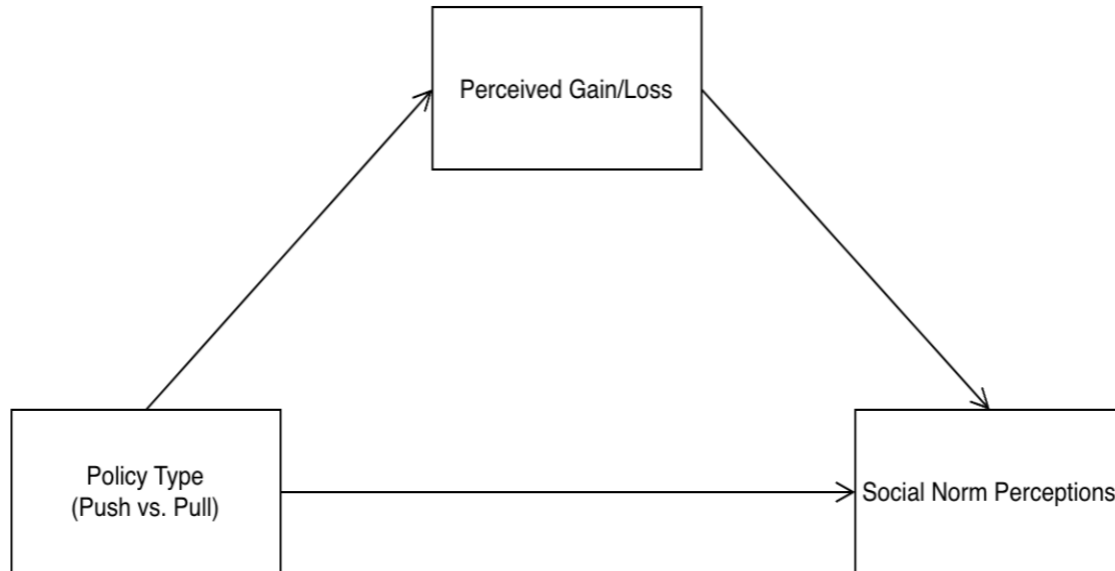
Results of the analysis (see Table 5) show that the relationship between policy type and perceived gain/loss of transportation policies is significant (a-path). Specifically, pull policies are more perceived as a gain than push policies. They also show that the relationship between perceived gain/loss and all social norm perceptions, is significant (b-path) in a sense that higher gain perceptions lead to higher norm perception. An exception is the unsustainable descriptive norm perception, where higher gain perceptions lead to a lower score. Additionally, the total effect of policy type on social norm perceptions is non-significant for all social norm perceptions (c-path) as well as the direct effect of policy type on social norm perceptions, when controlling for perceived loss/gain (c'-path). Finally, none of the indirect effects as a whole is significant (a*b-path). Important to note here is that before the Bonferroni-Holm correction all indirect effects, except for injunctive unsustainable norm perception of the government, were significant.

Table 5

Path Estimates for a Mediation Between Policy Type and Social Norm Perceptions Using

Perceived Gain/Loss as a Mediator

Social norm perception	Path estimate				
	a-path	b-path	c-path	c'-path	a*b-path
Descriptive sus.	0.55*	0.22*	0.05	-0.07	0.12
Descriptive unsus.	0.55*	-0.21*	0.01	0.13	-0.12
Injunctive sus. gov.	0.55*	0.17*	0.07	-0.02	0.09
Injunctive unsus. gov.	0.55*	0.17*	0.08	-0.01	0.09
Injunctive sus. pop.	0.55*	0.27*	0.14	-0.00	0.15
Injunctive unsus. pop.	0.55*	0.21*	0.21	0.10	0.11
Dynamic sus.	0.55*	0.19*	0.03	-0.07	0.10
Dynamic unsus.	0.55*	0.19*	-0.05	-0.16	0.10

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

After testing perceived gain/loss as a mediator, policy acceptance was also tested to assess whether the observed difference in policy acceptance might be relevant to the process of social norm perception change through institutional signals. Testing policy acceptance as a mediator for the relationship between policy type and social norm perceptions yielded similar results to those obtained with perceived gain/loss as a mediator. Important to note is that perceived gain/loss is strongly correlated with policy acceptance $r(181) = 0.62, p < .001$. Results of the mediation analyses with policy acceptance can be found in Table E3 in Appendix E.

Moderation analyses

After investigating mediators in the process of social norm perception change other variables were tested as moderators in this process. Environmental self-identity was tested as the first moderator to examine its influence on the relationship between policy type and perceived gain/loss of sustainable transportation policies (see Figure 6). This is because people who see themselves as more pro-environmentally might perceive sustainable policies differently from people who see themselves as less pro-environmentally.

Figure 6

*Moderation Model with Environmental Self Identity as a Moderator*
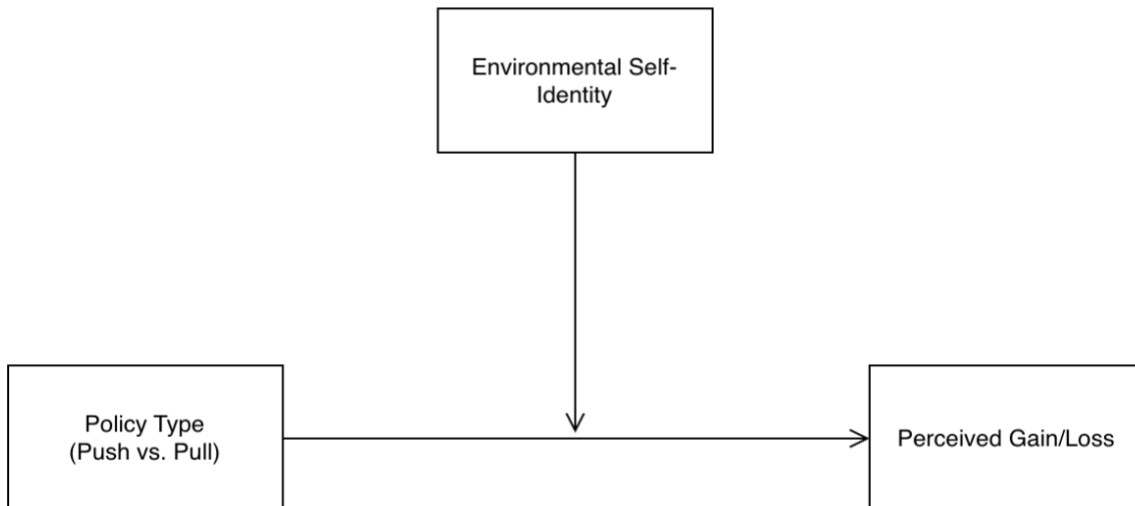
To test the moderation a generalized linear model with a gamma distribution using the GAMLj module (Gallucci, 2019) was used since this distribution is less influenced by the violation of normality which is present in the data. Results of the moderation analysis show a significant moderation effect of environmental self-identity on the relationship between policy type (push vs. pull) and perceived gain/loss $\chi^2(1, N = 183) = 16.16, p < .001$. A simple effect

analysis indicates that the impact of policy type on perceived gain/loss of transportation policies is statistically significant for participants with low (*Mean - 1 SD*) $\chi^2(1, N = 183) = 26.53$, $p < .001$ and average (*Mean*) $\chi^2(1, N = 183) = 6.76$, $p = .010$, but not significant for individuals with high environmental self-identity (*Mean + 1 SD*) $\chi^2(1, N = 183) = 0.73$, $p = .396$. Therefore, the results indicate that individuals with high environmental self-identity perceive push and pull policies equally in terms of gain/loss. In contrast, those with low environmental self-identity perceive push policies as less of a gain compared to pull policies (see Figure 7). Results of other tested moderations not yielding significant results can be found in Tables E4-E7 in Appendix E.

Figure 7

Moderation Plot of Environmental Self-Identity on the Relationship Between Policy Type (Push vs. Pull) and Perceived Gain/Loss of Sustainable Transportation Policies
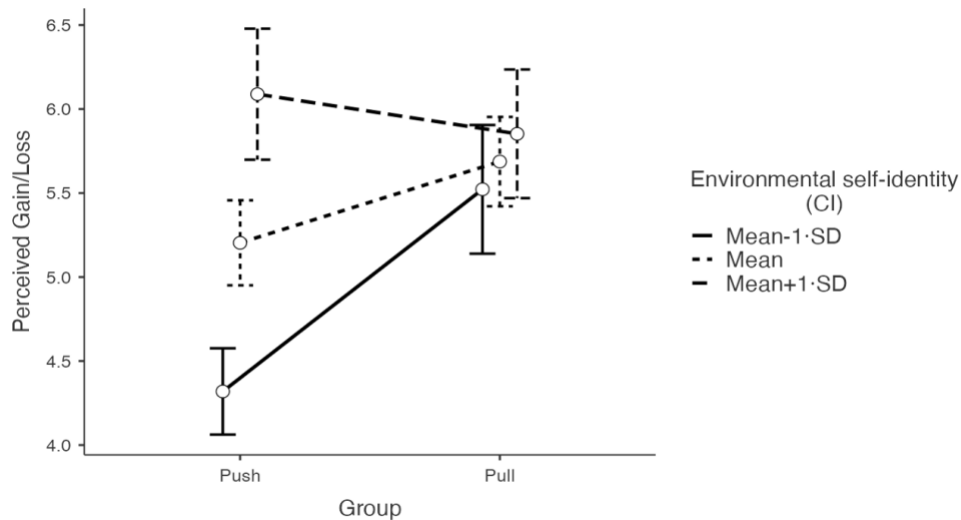
Note. A higher score on perceived gain/loss indicates higher gain perceptions, while a lower score indicates higher loss perceptions. Error bars represent 95% confidence intervals.

Discussion

The objective of this study was to replicate the previously identified signaling effect of policies on social norm perceptions (Van der Werff et al., in preparation, Tankard & Paluck, 2017, Eisner et al., 2020) in the context of sustainable transportation and to determine whether the signaling effect varies depending on the policy type. Furthermore, exploratory research was conducted to identify mediators and moderators explaining why and how different types of policies may influence social norm perceptions.

The present study yielded the following results: The signaling effect of policies was replicated only for injunctive norm perceptions of the government, indicating that people who were made aware of the policies perceive the government as more approving of sustainable transportation and more disapproving of unsustainable transportation compared to people who were not made aware of the policies, partly confirming hypothesis 1. No differences were found in social norm perceptions between those being made aware of push or pull policies, so hypothesis 2 was not supported. Exploratory analyses revealed that individuals perceive pull policies as more acceptable and more as a gain than push policies. Additionally, perceived gain/loss of sustainable transportation policies partly explains the relationship between policy type and social norm perceptions. That is, the higher the gain perceptions of policies are, the higher the social norm perceptions are mostly as well. Finally, environmental self-identity moderates the relationship between policy type and perceived gain/loss. Specifically, the weaker one's environmental self-identity the more people perceive push measures as a loss.

Social Norm Perceptions

The present study found that people who were made aware of policies to promote sustainable transportation were more likely to think that the government approves of sustainable transportation than people not made aware of these policies. However, no changes in descriptive

and dynamic norm perceptions and no differences in the extent to which people think the general

public approves of sustainable transportation were found. This partial support for the first

hypothesis can be attributed to several factors. One aspect is that injunctive norm perceptions of

the government are most directly influenced by policies of the government. Perceptions of what

the government approves or disapproves of are easier to change than social norm perceptions of

for example the population because the policies explicitly communicate the government's

opinion on the topic. In contrast, for other norm perceptions to change, individuals must conduct

inferences requiring additional steps. For example, the transfer of injunctive norm perceptions of

the government into those of the population requires an additional step: that what the government

(dis)approves of reflects what the population (dis)approves of (Tankard & Paluck, 2017).

Additional steps are also required in perceiving lower descriptive norm perceptions from being

made aware of policies by the government. Participants read the policies, recognize the

government's goals, and infer that if these policies are needed, the current state must not yet align

with these goals, leading to lower descriptive norm perceptions. The finding of the current study,

not showing lower descriptive norm perceptions of people being made aware of policies,

contrasts with findings from Van der Werff et al. (in preparation), who observed lower

descriptive norms among people aware of an electric vehicle subsidy compared to those

unaware. A possible explanation for this discrepancy is that Van der Werff et al. (in preparation)

focused specifically on subsidies, while the current study examined a broader range of policies.

Subsidies aim to promote behaviors that without them would occur less frequently (Cambridge

Dictionary, n.d.), and therefore point by definition toward a low prevalence of a behavior.

Conversely, policies can serve a lot of purposes and therefore not automatically point toward a

lower prevalence of a behavior. Consequently, awareness of a subsidy and its purpose might

more directly lead individuals to perceive a lower prevalence of the targeted behavior compared to the broader more abstract policies in the current study. Finally, dynamic norm perceptions are more difficult to change through a single intervention, as evidenced by the current study, because inferring whether something is becoming more (un)common based on reading once about policies is difficult. Rather, by its definition a dynamic is a process and difficult to be observed by a singular event, in this case an institutional signal (Merriam-Webster, n.d.). Furthermore, in the current study, dynamic norm perceptions were conceptualized in a descriptive manner, indicating that something is becoming more or less common to do. Another conceptualization, incorporating an injunctive aspect, meaning a change in what is becoming more or less approved, might be easier to influence. A practical implication of the finding that governmental policies can change injunctive norm perceptions of the government is that policymakers should be mindful of the signals their policies send. To ensure these signals align with their intended goals, policies should be designed and communicated strategically.

The second hypothesis, which posited that push policies have a stronger signaling effect than pull policies, was not supported. Contrary to expectations, although not statistically significant, participants in the pull group exhibited higher social norm perceptions than those in the push group for all but one social norm perception. An explanation for this finding might be that, as indicated by this study's exploratory results, pull policies are more accepted and perceived as gains compared to push policies. This could have led participants to perceive that the government and other citizens also evaluate pull policies more positively and practice it accordingly. This explanation might have negated the effects predicted by prospect theory and ultimately resulted in a more favorable perception of social norms for those being made aware of pull policies.

Exploratory research

The study did not find differences regarding sustainability-related behavior intentions between people who were made aware of the pull policies, the push policies or who were not made aware of policies at all. This finding is not surprising, given that most social norm perceptions, which precede behavior intentions (e.g., Glynn et al., 2009), showed no differences. Additionally, the sample primarily consisted of young people, who typically do not own cars (Oakil et al., 2016) and frequently use bicycles in Groningen. This may have led to ceiling effects for sustainable transportation behavior intentions (see Table 4). The finding that pull policies are more accepted than push policies aligns with previous research indicating that push policies are generally less accepted than pull policies (Steg, 2019).

The study did not confirm the underlying assumption of the second hypothesis that push policies produce more extreme social norm perceptions than pull policies due to different gain/loss perceptions. Instead, the findings mostly point towards the opposite direction, that pull policies produce more extreme social norm perceptions via gain/loss perceptions. The results first showed that as predicted pull policies are perceived more as a gain than push policies. Next it was anticipated that a lower score in gain/loss perceptions, indicating a loss, would lead to more extreme social norm perceptions. Contrary to this, the results, except for the unsustainable descriptive norm perception, showed that a higher score in gain/loss perceptions, indicating a gain, led to higher social norm perceptions. Therefore, the results suggest that the predictions by prospect theory (Kahneman & Tversky, 1979) mostly do not apply to social norm perception change through policy signals. Instead, it appears that perceived gain/loss explains part of the relationship between policy type and social norm perceptions, but contrary as anticipated leading to higher norm perceptions for pull policies. One reason why the predictions of prospect theory

might not apply is that even the push group perceived the policies as a gain rather than a loss, as indicated by the mean being above the midpoint of the scale.

Another finding from the exploratory analysis is that, although the effects of policy type on social norm perceptions through perceived gain/loss were significant, this did not lead to the relationships as a whole getting significant. Two theoretical explanations may account for this finding. First, the effects of policy type through perceived gain/loss may be too weak to translate into overall effects on social norm perceptions. The mediation analysis revealed that the strength of the effects through perceived gain/loss is relatively weak, with an average estimate of 0.11. An estimate of 0.11 indicates that a change of 1 unit in the independent variable results in a change of 0.11 units in the dependent variable, which can be considered as a relatively weak effect. Furthermore, although the effects through perceived gain/loss were found to be significant, when a Bonferroni-Holm correction for multiple comparisons was performed, the paths became non-significant, also indicating that the relationship is not very stable. Second, another variable, such as perceived regulation, may counteract the mediating effect of gain perceptions, which was identified in the present study as leading to higher social norm perceptions for pull policies. Since push policies are perceived as more regulatory than pull policies (Ejelöv et al., 2022), they might be viewed as more directive and normative than a non-regulatory approach of pull policies. This perception could cause push policies to have a stronger impact on altering social norm perceptions compared to pull policies, potentially canceling out the mediating effect of gain perceptions found in the present study.

Finally exploratory analysis showed that individuals with high environmental self-identity perceive both push and pull policies equally as a gain, whereas those with average and low environmental self-identity perceive push policies as less of a gain than pull policies. One

potential explanation is that individuals with lower environmental self-identity are more likely to use cars frequently. Consequently, they may be more adversely affected by push policies compared to those with higher environmental self-identity, who are likely to drive cars less. In this study, current car driving behavior was not assessed, but intentions to drive a car in the next six months were. It is likely that those who intend to drive a car in the next six months are also currently driving more frequently than those who do not. Supporting this explanation, environmental self-identity and car driving intentions were weakly negatively correlated $r(181) = -.14, p = .030$). However, when replacing environmental self-identity with car driving intentions as a moderator in the relationship between policy type and perceived gain/loss, no significant moderating effect was observed $\chi^2(1, N = 183) = 0.15, p = .697$. This suggests that car driving behavior alone does not fully explain the observed moderation effect.

Limitations & Future Research

It is important to acknowledge that the present study is subject to a number of limitations. One significant limitation is the sample, particularly in the context of sustainable transportation. Firstly, the sample size was not as large as intended, with only 280 participants, rather than the desired 432. A post hoc power analysis revealed that with an average found effect size of $f = .017$ for the relationship between policy type and social norm perceptions, the study had a power of only .42. This is problematic because lower power increases the likelihood of missing a present effect as well as finding significant results by chance (Doan, 2005). Another limitation of the sample was its lack of representativeness in terms of age. The participants in the study were significantly younger ($M_{age} = 21.60$) compared to the average age of Groningen citizens ($M_{age} = 38.00$) (Facts & Figures, 2024). Using a predominantly young sample presents particular challenges in the context of transportation. Most young people, especially in the bike-friendly

city of Groningen, typically do not own cars and primarily use bicycles for transportation. This is

problematic since social norm perceptions are strongly influenced by relevant peers (Tankard &

Paluck, 2016), and for young people, this likely means other young people. Consequently, social

norm perceptions in this study are likely to reflect the views of a young subgroup, albeit a

significant one in Groningen, rather than the broader population of Groningen. Future studies

should investigate sustainable transportation with a more representative sample to obtain a more

comprehensive understanding.

Another limitation of the study is that, even though the content of the push and pull

policies was carefully matched, the modes of transportation between the groups still differed.

Push policies described only policies for cars, while pull policies only included policies for

walking, biking, and public transport. This operationalization was chosen to utilize existing

policies, but to fully disentangle the effect of policy type, the mode of transportation should also

be the same across conditions.

From a practical perspective, future research could investigate whether a combination of

push and pull policies is more effective in changing social norms compared to implementing a

single policy type. Studies have found that combining both policy types can mitigate the negative

effects associated with each type, such as issues of acceptability (Banister, 2008). Therefore, the

question could be raised if a combination of push and pull policies could mitigate the negative

impacts each type may have on social norm perceptions. Additionally, future research could

further explore the signaling effect of various policy types, examining whether a different

distinction, such as regulatory versus market-based approaches, produces differing effects.

Conclusions

The aim of the current study was to investigate the process of social norm perception change through institutional signals. This research is crucial because institutional signals can alter social norm perceptions, which in turn are significant drivers of behavior and social change. A better understanding of this process can help public institutions comprehend how their actions influence people's perceptions of the institution and the broader population, aiding in the design and communication of policies that more effectively align with intended goals. The study's results indicate that policies can alter perceptions of what the government approves or disapproves of regarding sustainable transportation, though changes in other social norm perceptions were not observed. Additionally, the findings did not show significant differences in social norm perception changes between push and pull policies. Exploratory analyses revealed that gain/loss perceptions of policies and environmental self-identity play roles in the process of social norm perception change through institutional signals, but the study also underscores the complexity of this process. Future research should further investigate the role policy type plays in the context of social norm perception change through institutional signals and address limitations such as sample composition to enhance understanding and improve policy design.

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Appendix A

Information Sheet About the Study

INFORMATION ABOUT THE RESEARCH

Sustainable Transportation

Dear Participant, Thank you very much for considering participating in this study.

Why do I receive this information?

You have been invited to participate in this research because we are interested to see what motivates you to travel the way that you do.

The researchers are:

Marlon Wandernoth (Master student environmental Psychology, university of Groningen, m.j.m.wandernoth@student.rug.nl)

Lise Jans (Associate professor social-environmental psychology, university of Groningen, l.jans@rug.nl).

Torsten Masson (Associate professor psychology, university of Lüneburg, torsten.masson@uni-leipzig.de)

Ellen van der Werff (Associate professor environmental psychology, university of Groningen, ellen.van.der.werff@rug.nl).

Do I have to participate in this research?

Participation in the research is completely voluntary. However, your consent is needed. Therefore, we ask you to please read the following information carefully. If you have any doubts or questions (for example, because you do not understand something), please send an email to: m.j.m.wandernoth@student.rug.nl I will get back to you as soon as possible, and afterwards you can decide if you want to participate. If you decide not to participate, you do not need to explain why, and there will be no negative consequences for you. You always have this right, including after you have consented to participate in the research.

Why this research?

The aim of this study is to get more insight into perceptions of transportation behaviors in Groningen.

What do we ask of you during the research?

First, we will ask you for your consent to participate in the study. Afterwards you will be presented with an information text about transportation in the municipality of Groningen.

Afterwards you will be asked questions about how you perceive transportation policies, behaviors, and opinions in Groningen and your intentions for future transportation in Groningen. Finally, we will ask for some demographic information about age and gender. Filling out the questionnaire will take about 10 minutes. You will be randomly presented with one of three versions of this questionnaire.

What are the consequences of participation?

By participating in this research, you will help to provide more insight into the transportation opinions, perceptions and behavior of inhabitants of Groningen. We do not expect any negative consequences of participation.

How will we treat your data?

Most importantly, your data will be treated confidentially. Before the researchers analyze the data, your data will be anonymized. This means that we will exclude your SONA number (In case you are a psychology student from the University of Groningen) from the dataset to ensure that none of your answers to the questionnaire can be traced back to you. Furthermore, we will analyze the data on a group level. The data will be used for a Master thesis project, and scientific publication. Furthermore, the results will be shared with the university and possibly with interested stakeholders to provide insight into the transportation perceptions of inhabitants of Groningen. Besides, the data may be shared with other researchers for scientific purposes.

What else do you need to know?

You may always ask questions about the research: now, during the research, and after the end of the research. Besides, you have the right to request access, rectification and erasure of your personal data, if collected, until it is made anonymous. You can do so by emailing (m.j.m.wandernoth@student.rug.nl) one of the researchers involved before 30-04-2024. Afterwards, the data will be anonymized when the data collection is complete, and all students have received their SONA credits. Then, your data will be de-identified and it will no longer be possible to trace the responses to you. Do you have questions/concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl. Do you have questions or concerns regarding the handling of your personal data? You may also contact the University of Groningen Data Protection Officer: privacy@rug.nl. As a research participant, you have the right to a copy of this research information.

Appendix B

General Text on Sustainable Transportation

What is sustainable transportation?

Sustainable transportation means finding ways to travel that don't harm the environment or society. It includes things like walking, biking, and using public transportation. The idea is to use clean energy for vehicles and roads to reduce pollution and protect natural resources. The goal is to create a fair transportation system that works for everyone. Ways to make transportation more sustainable can be different, like technological innovations such as electric cars or encouraging people to change how they travel.

Appendix C

Policies Used as Experimental Manipulation

Push Policies

1. The Municipality of Groningen will reduce car parking spaces in the city to make car use less attractive.

2. The Municipality of Groningen will lengthen waiting times for cars at intersections to make car use less attractive.

3. The Municipality of Groningen will reduce car lanes in the city to make car use less attractive.

4. The Municipality of Groningen will increase barriers (e.g. reduce speed limits for cars) to make car use less attractive.

5. The Municipality of Groningen will disadvantage petrol and diesel cars when it comes to road use and parking.

6. The Municipality of Groningen will redesign streets to make them less attractive for car use.

7. The Municipality of Groningen will temporarily close certain roads around schools to discourage parents from bringing their kids to school by car.

8. The Municipality of Groningen will deprioritize cars on fast roads around certain public places such as shopping centers.

Pull Policies

1. The Municipality of Groningen will build and improve bike parking spaces to make bike use more attractive.

2. The Municipality of Groningen will shorten waiting times for pedestrians and cyclists at intersections to make bike use and walking more attractive.

3. The Municipality of Groningen will build and improve bike, pedestrian, and bus lanes to make these forms of transportation more attractive.

4. The Municipality of Groningen will remove barriers (e.g. big highways), to make bike use and walking more attractive.

5. The Municipality of Groningen will favor zero-emission vehicles and shared cars when it comes to road use and parking.

6. The Municipality of Groningen will redesign streets to make them more attractive for pedestrians and cyclists.

7. The Municipality of Groningen will make the surroundings of schools safer to encourage parents to bring their kids to school by bike, foot or public transport.

8. The Municipality of Groningen will favor pedestrians and cyclists on fast roads around certain public places such as shopping centers.

Appendix D

Items of the Questionnaire

Items measuring the dependent variables, exploratory variables, and demographic data and their

respective sources.

Social Norm Perceptions

Items to measure social norm perceptions were adapted from Van der Werff et al. (in

preparation).

The majority of inhabitants of Groningen use sustainable modes of transportation very frequently
(e.g., walking, using a bike, or public transport).

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The majority of inhabitants of Groningen use a car frequently.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Municipality of Groningen approves of very frequent use of sustainable modes of transportation (e.g., walking, using a bike, or public transport).

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Municipality of Groningen disapproves of frequent car use.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The majority of inhabitants of Groningen approve of very frequent use of sustainable transportation (e.g., walking, using a bike, or public transport).

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The majority of inhabitants of Groningen disapprove of frequent car use.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

An increasing number of inhabitants of Groningen use sustainable transportation (e.g., walking, using a bike, or public transport) very frequently.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

A decreasing number of inhabitants of Groningen use a car frequently.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

More and more inhabitants of Groningen use sustainable transportation (e.g., walking, using a bike, or public transport) very frequently.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Less and less inhabitants of Groningen use a car frequently.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Attention Check Item

The attention check item was adapted from Oppenheimer et al. (2009).

This is an attention check. Please select 1 (strongly disagree) for this item to show that you pay attention

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Future Behavior Intentions

Items measuring future behavior intentions were adapted from Van der Werff et al. (in

preparation).

How often are you planning to use sustainable transportation (e.g., walking, using a bike, or public transport) in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to use a car in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to act more sustainably in general in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to act less sustainably in general in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to eat more sustainably, such as reducing your meat consumption and switching to more plant-based products, in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to use energy more sustainably, such as saving energy or using energy from renewable sources in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

How often are you planning to engage in collective behaviors to support the topic of sustainability such as participating in demonstrations or signing petitions in the next 6 months?

○ Never

○ Very rarely

○ Rarely

○ Sometimes

○ Often

○ Very often

○ Always

Acceptability of Sustainable Policies

The item to measure acceptability of sustainable policies was adapted from Liu et al. (2019).

How (un)acceptable do you find governmental policies to promote sustainable behaviors:

○ Fully unacceptable

○ Very unacceptable

○ somewhat unacceptable

○ Neither acceptable nor unacceptable

○ somewhat acceptable

○ Very acceptable

○ Fully acceptable

Perceived Gain/Loss of Sustainable Transportation Policies

Items measuring perceived gain/loss of sustainable transportation policies were adapted from

Çelik & Rasoolimanesh (2021).

The Sustainable transportation policies of the Municipality of Groningen, will positively affect me.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Sustainable transportation policies of the Municipality of Groningen, feel like a gain for me.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The following two items were reversed to combine them with perceived gain into a single scale.

The Sustainable transportation policies of the Municipality of Groningen, feel like a loss for me.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Sustainable transportation policies of the Municipality of Groningen, will negatively affect me.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Environmental Self-Identity

Items measuring environmental self-identity were taken from Van der Werff et al. (2013).

I see myself as a pro-environmental person

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

I am the type of person who engages in pro-environmental behavior

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Acting environmentally friendly is an important part of who I am

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Identity Leadership

Items measuring identity leadership were adapted from Steffens et al. (2014).

The Municipality of Groningen is representative of inhabitants of Groningen.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Municipality of Groningen creates a sense of cohesion within inhabitants of Groningen.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Municipality of Groningen promotes the interests of inhabitants of Groningen.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

The Municipality of Groningen creates policies which are useful for inhabitants of Groningen.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Identification With the Inhabitants of Groningen

The item measuring identification with the inhabitants of Groningen was taken from Postmes et

al. (2012).

I identify with the inhabitants of Groningen.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

Need for Structure

The item measuring need for structure was taken from Thompson et al. (2013).

I enjoy having a clear and structured mode of life.

○ Strongly disagree

○ Disagree

○ Somewhat disagree

○ Neither agree nor disagree

○ Somewhat agree

○ Agree

○ Strongly agree

I identify as:

○ Man

○ Woman

○ other

○ do not wish to answer

How old are you?

_____

Appendix E

Table E1

Test Statistic and P-values for Pairwise Dwass-Steel-Critchlow-Fligner Comparisons

Social norm perception	Pairwise comparison		
	Push vs. Pull	Push vs. Control	Pull vs. Control
Descriptive sus.	W = 0.39, p = .959	W = -1.34, p = .611	W = -1.73, p = .440
Descriptive unsus.	W = 0.36, p = .965	W = -0.52, p = .928	W = -0.98, p = .768
Injunctive sus. gov.	W = 0.14, p = .994	W = -3.56, p = .032*	W = -4.10, p = .010*
Injunctive unsus. gov.	W = 0.27, p = .981	W = -5.04, p = .001*	W = -5.69, p < .001*
Injunctive sus. pop.	W = 1.00, p = .758	W = 0.10, p = .997	W = -0.94, p = .786
Injunctive unsus. pop.	W = 1.62, p = .488	W = -0.31, p = .974	W = -1.99, p = .338
Dynamic. sus.	W = 0.00, p = 1.000	W = -1.93, p = .362	W = -2.14, p = .286
Dynamic. unsus.	W = -0.27, p = .981	W = -1.14, p = .700	W = -0.89, p = .805

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population.

* = p < .05 after Bonferroni-Holm correction for multiple comparisons

Table E2

*Test Statistic (*Chi-squared)*, Degrees of Freedom, P-values and Effect Sizes (Epsilon-squared) of the Kruskal Wallis Tests for Behavior Intentions*

Social norm perception				
	χ^2	df	p	ε^2
Sustainable transportation	0.32	2	.853	0.001
Unsustainable transportation	0.27	2	.876	0.001
General sustainability	5.69	2	.058	0.021
General unsustainability	0.56	2	.757	0.002
Sustainable eating	3.89	2	.143	0.014
Sustainable energy usage	2.36	2	.307	0.009
Sustainable collective behavior	3.848	2	.146	0.014

Note. * = p < .05 after Bonferroni-Holm correction for multiple comparisons

Table E3

Path Estimates for a Mediation Between Policy Type and Social Norm Perceptions Using Policy Acceptance as a Mediator

Social norm perception					
	a-path	b-path	c-path	c'-path	a*b-path
Descriptive sus.	0.68*	0.15*	0.05	-0.05	0.10
Descriptive unsus.	0.68*	-0.13	0.01	0.07	-0.09
Injunctive sus gov	0.68*	0.12	0.07	-0.02	0.08
Injunctive unsus. gov.	0.68*	0.13	0.08	-0.01	0.09
Injunctive sus. pop.	0.68*	0.15*	0.14	0.04	0.10
Injunctive unsus. pop.	0.68*	0.21*	0.21	0.07	0.14
Dynamic sus.	0.68*	0.17*	0.03	-0.08	0.11
Dynamic unsus.	0.68*	0.15*	-0.05	-0.16	0.10

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

* = p < .05 after Bonferroni-Holm correction for multiple comparisons

Table E4

Estimates for Different Moderators Between Policy Type and Social Norm Perceptions

Social norm perception	Moderator		
	Identity leadership	Id. inh. Groningen	Need for structure
Descriptive sus.	-0.13	0.06	-0.19
Descriptive unsus.	0.02	0.27	0.06
Injunctive sus. gov.	0.15	0.13	0.06
Injunctive unsus. gov.	0.28	0.02	0.24
Injunctive sus. pop.	-0.09	0.01	-0.31*
Injunctive unsus. pop.	0.02	0.28	0.13
Dynamic. sus.	-0.13	0.20	-0.20
Dynamic. unsus.	-0.03	0.26	0.16

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population, Id. = Identification, inh. = inhabitants

* = p < .05 after Bonferroni-Holm correction for multiple comparisons

Table E5

Estimates for Different Moderators Between Perceived Gain/Loss and Social Norm Perception

Social norm perception	Moderator	
	Identity leadership	Environmental self-identity
Descriptive sus.	-0.01	0.03
Descriptive unsus.	0.05	0.03
Injunctive sus. gov.	0.06	0.08
Injunctive unsus. gov.	0.27*	0.12*
Injunctive sus. pop.	0.08	0.04
Injunctive unsus. pop.	0.09	-0.06
Dynamic. sus.	0.07	0.05
Dynamic. unsus.	0.02	0.03

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

Table E6

Estimates for Need for Structure as a Moderator Between Injunctive Norm Perceptions of the Government and the Population

Social norm perception		
	Injunctive sus. pop.	Injunctive unsus. pop.
Injunctive sus. gov.	0.06	0.01
Injunctive unsus. gov.	0.01	-0.03

Note. sus. = sustainable, unsus. = unsustainable, gov. = government, pop. = population

* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

Table E7

Estimates for Identification With Inhabitants of Groningen as a Moderator Between Population Norm Perceptions and Transportation Behavior Intentions

Social norm perception	Transportation behavior intentions	
	Sus. trans.	Unsus. trans.
Injunctive sus. pop.	0.06	-0.06
Injunctive unsus. pop.	-0.012	0.06

Note. sus. = sustainable, unsus. = unsustainable, pop. = population

* = $p < .05$ after Bonferroni-Holm correction for multiple comparisons

Declaration of Independence

I hereby affirm that the written assignment at hand is my own written work and that I have used no other sources and aids other than those indicated. All passages, which are quoted from publications or paraphrased from these sources, are indicated as such, i.e., cited, attributed. In line with guidelines by the university artificial intelligence programs namely ChatGPT and DeeplWrite only have been used to improve spelling, grammar and formulations.

M. Wandernoth

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Marlon Wandernoth July 5th, 2024