

Stop Sending Me Messages!: the Negative Impact of Persuasive Messages on Green Transportation

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Abstract

Persuasive information and communication technology has been used to persuade people to choose fuel-efficient transportation (i.e., green transportation), for example, by sending messages to the public. Many factors may influence the effect of such messages. In this exploratory we report a social experiment, in which participants received persuasive messages from social and non-social approaches. To our surprise, results seem to show a negative impact on green transportation, meaning participants receiving the messages used less green transportation modes. This suggests that messages may not be as an effective way to persuade the public as many organizations' practice assumes and other persuasive techniques such as real-time feedback and awareness raising techniques may be needed in causing the desired changes.

Keywords: green transportation; message sending; persuasive messages; persuasive information and communication technology

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1 Introduction and related work

Persuasive information and communication technology (ICT) has been used in various domains such as health care, lifestyle, and environmental conservation (Kimura and Nakajima 2011). Researchers in sustainable HCI are concerned with persuasive technology to reduce the material effects of technology and to be more environmental friendly (DiSalvo, Sengers et al. 2010). For example, researchers developed mobile apps to provide feedbacks on driving behavior to reduce fuel consumption (Froehlich, Dillahunt et al. 2009, Tulusan, Staake et al. 2012). Shiraishi, Washio et al. (2009) examined the individual, social and economic incentives in reducing CO₂ emissions and found that using bus, train or bicycle instead of car yield the most CO₂ footprint reduction. Thus, it is important to persuade people to drive less and take the public transportation. Many factors may influence the "greener" consumption behaviors such as consumer values, norms, and habits (Peattie 2010).

China has surpassed US in 2008 to become the world's largest country in CO₂ emissions (United Nations 2015). There has been growing awareness and concern with air pollution especially in metropolitan areas such as Beijing. Among other persuasive techniques, social platforms have been used as a persuasive tool to promote socially responsible behaviors (Fogg, Grudin et al. 2003, Khaled, Barr et al. 2006). Social influence theory has defined informational social influence as the "influence to accept information obtained from another as evidence about reality" (Deutsch 1955). Sending messages as a major way of communication has been widely used among Chinese government and NGOs to promote desired awareness and behavior change. Research found several factors related to the messages such as source credibility and argument quality influence the behavioral intentions (Li 2013).

In this poster, we report an exploratory study that investigates several modes of sending persuasive messages through social and non-social means. We aim to examine the effectiveness of social and non-social messages in causing attitude and behavior changes in choosing green transportation. In the rest of the abstract, we will describe the methods, present the results and conclude and discuss main findings and future research.

2 Methods

We conducted a social experiment in which the participants received persuasive messages in different conditions. We used an experiment design to examine the impact of 2 factors on the behaviors and attitudes of the public on choosing mode of transportation. We recruited 40 participants who are family/close friends, co-workers, or acquaintances of 4 seed participants. All participants lived in Beijing, China. Table 1 shows the experiment design and the distribution of participants.

Table 1. Experiment Design

	Social		Non-social
	Family/close friends	Co-workers	
Fact	6	9	6
Advice/calling for action	6	6	7

Since air quality may also influence the mode of transportation, we made sure the messages were sent to half of the participants on days when air quality is good (AQI <= 100) and to the rest when air quality is not good (AQI > 100) according to Beijing Municipal Environmental Monitoring Center.

All 40 participants were asked to complete 2 questionnaires, one at the beginning of the study and one at the end of the study to assess their attitude toward green transportation and transportation behaviors. Messages were sent to the participants through social means (by our seed participants) or non-social means (by subscribing to an official WeChat account we created, “GreenTransportation NGO”). For participants in the “social” groups, the seed participants sent the messages directly. Figure 1 shows the screenshots of the participants receiving and checking a message from the official source.

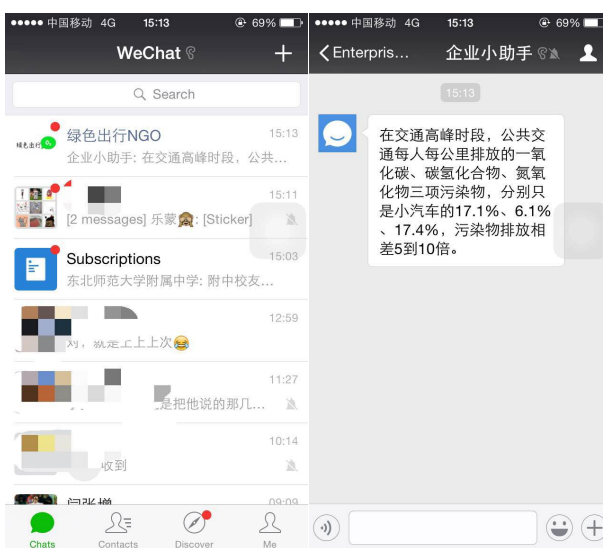


Figure 1. Screenshots of participants receiving (left) and checking (right) a message on Wechat

The two types of messages are carefully designed and phrased and have been given to seed participants in advance. There are 5 factual messages and 5 messages of advice or calling for action. Table 2 shows examples of the different types of messages:

Table 2. Example Messages

	Example Message
Fact	In the rush hours, public transportation only emits 17.1% CO, 6.1% hydrocarbon and 17.4% nitrogen oxides per person per mile of what cars emits. Cars emit 5 to 10 times more pollution than the public transportation. (text from example in Figure 1)
Advice/calling for action	We share the same city and air. In order to protect the blue sky, please choose the green transportation!

The study was conducted in July 2015. In total, 40 participants took part in the experiment. After receiving the messages, 31 participants completed the follow-up questionnaire. We compared the pre- and post-experiment results of the questionnaires to see if there is any attitude or behavior change in green transportation. We divided the transportation behaviors into three types: green (walking, biking including electric bikes, subway, or bus), semi-green (carpooling), and non-green (other).

3 Results

3.1 Attitude toward Green Transportation

We asked the participants to rate on a scale of 1-5 how much they agree with the statements. Table 3 shows the results. After receiving the messages, most of the attitude statements changed in the negative direction (marked in red), meaning the participants agree less with the positive statements about green transportation.

Table 3. Attitudes Results (n=31)

Attitudes	Mean (Initial)	Mean (Follow-up)
If conditions permit (e.g. plenty of time), I'd like to choose the green transportation.	4.29	3.70
My family and close friends support choosing the green transportation.	3.74	3.40
I'm inclined to choose the same transportation.	3.68	3.50
I can change my routine transportation modes at some level.	3.58	3.43
I should choose the green transportation regardless of others' decisions	3.52	3.47
My co-workers support choosing the green transportation.	3.52	3.37
I will consider the environmental influence when choosing the transportation mode.	3.06	3.07
Green transportation has little effect on improving the environment.	2.52	2.47

3.2 Transportation Pattern and Behavior Change

We asked the participants about their travel behaviors in the past 2 weeks, i.e., what mode of travel they used and how many times they travelled in each mode. Figure 2 shows the average number of travels in different travel modes.

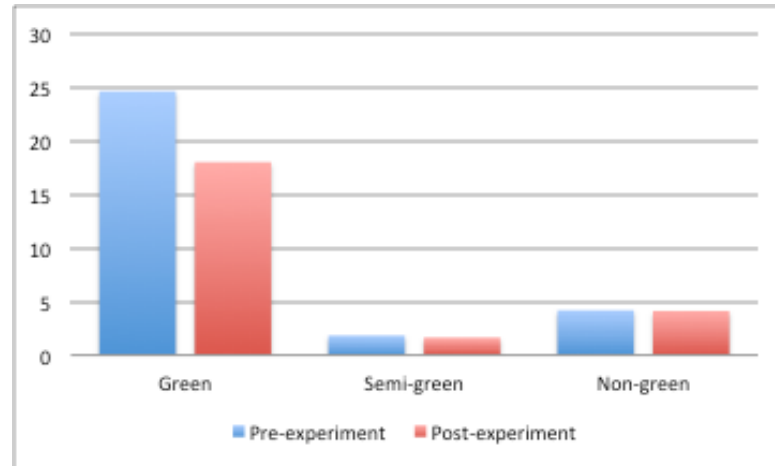


Figure 2: Average number of travels per person in each travel mode

We then examined the fact/advice and social/non-social groups. Table 4 summarizes the differences. A cell in green shows a positive change (increase in green and semi-green transportation or decrease in non-green transportation) whereas a cell in red shows a negative change.

Table 4. Green Transportation Statistics (Pre-experiment / Post-experiment Number of Travels, n=31)

Factor		Green	Semi-green	Non-green
Delivery means	Family/close friends	23.64 / 14.73	1.91 / 2.73	4.27 / 4.64
	Co-workers	26.36 / 15.91	0.18 / 0.27	3.91 / 4.00
	Non-social	23.78 / 24.67	3.78 / 2.00	4.44 / 3.67
Message type	Fact	26.56 / 20.00	1.50 / 1.83	3.56 / 2.94
	Advice/action	22.00 / 15.31	2.31 / 1.38	5.08 / 5.77

Overall, there is no significant statistical difference on the behaviors choosing different transportation before and after the experiment. Many participants used less green mode of travelling, and used slightly more semi-green transportations. In an effort to explain the negative effects, we asked the participants when they prefer green transportation and they do so when having enough time or the green transportation is convenient. Main reasons for participants not to choose public transportation include long waiting hours (77.4%), distance being too far from the stops (67.7%), and too many passengers (64.5%), and main reasons for not choosing walking and biking are weather conditions (71.0%), health reasons (48.4%) and distance being too far (35.5%).

Although we cannot claim conclusively that it is useless to change the behaviors and attitudes of choosing green transportation by sending messages, results of this exploratory study show that under most circumstances, message sending is not an effective persuasive technique. Furthermore, persuasive messages may have a negative effect.

4 Conclusion and Future Work

In this exploratory study, we found that trying to convince the public to choose green transportation by sending them text messages seemed to be ineffective. There may be other factors such as message frequency, sending time, different message presentation formats (multi-media and interactive) that influence the effective of messages. At the same time, the distance from place of departure to transit or place of destination, the timing of transportation and other factors may effect the results as well. Generally speaking, it seems that everyday travel modes may be difficult to change over a few messages and there is an urgent need for other persuasive technologies such as gamification and real-time feedback, especially with mobile devices (Kimura and Nakajima 2011). Other awareness raising techniques such as recording everyday travel modes and providing real-time feedback about whether they are "green" enough might receive better effect.

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