The effect of marketing messages on the motivation to reduce private car use in different segments

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ABSTRACT

This study explores marketing messages promoting sustainable transport and reported motivation to reduce private car use within different segments. A stated preference survey targeting a sample of 1300 residents in Sweden was conducted, and exploratory factor analysis was used to identify underlying dimensions of a set of 19 marketing messages. Self-efficacy and collective efficacy were defined as latent factors, and the latter was found to be a better motivator for all segments. For the most car-advocating segment, however, the factors (both self- and collective efficacy) was unsuccessful in inducing any reported motivation to reduce private car use. Assimilation bias seems to influence the respondent's interpretation of marketing messages.

1. Introduction

Transport systems in many cities today face challenges related to congestion and air pollution. Furthermore, the global transport sector accounts for 25% of CO_2 emissions from fuel combustion and contributes most to global warming after electricity and heat production (IEA, 2018). In order to meet emission reduction targets for the transport sector, a variety of measures within vehicle efficiency, alternative fuels, and behavioural changes are needed (IPCC, 2014; Stanley et al., 2011).

Although there have been, for some time now, a wide agreement among transport professionals that private car use needs to decrease in order to reduce the negative externalities from transport (Schwanen et al., 2011), little has been accomplished in this field (Banister, 2008). Despite encouragement and economic incentives to replace car trips with sustainable transport modes, research and practice have found a substantial resistance from people to reduce car use (Innocenti et al., 2013; Lattarulo et al., 2018). There is an evident perception-gap between what ought to be done to reach transport climate goals, and the commitment toward these goals from key actors within society (Cohen et al., 2016; Gössling et al., 2018). On the one hand, governments fear to introduce regulation forcing pro-environmental behaviour on people due to the risk of losing precious political capital (Ockwell et al., 2009). On the other hand, demanding individual responsibility ignores the social and structural conditions that prevent people from acting (Andersson et al., 2020).

One strategy used by cities and municipalities has been to conduct campaigns that encourage voluntary travel behaviour change and facilitates support for car-restricting policies. Such campaigns have been applied in several European cities with positive outcomes (reductions in private car use of around 10%) (Banister, 2008). In Sweden, persuasive messages are often included as part of the campaigns. An example is the bicycle campaign launched by the city of Malmö that used the message 'inga löjliga bilresor' (no ridiculous car trips) to influence social norms related to driving. However, these types of messages are not common in non-Scandinavian countries, which may represent an unused potential for use in transport demand management contexts. Further, studies on the effect of such messages are relatively uncommon in transport research, although with some exceptions (e.g. Beale and Bonsall, 2007; Hess and Bitterman, 2016). For example, Mir et al. (2016) found that communicating the consequences of air pollution could provoke individuals to act more environmentally friendly and influence the intention to use more sustainable modes of transport. Likewise, some studies have explored the effect of different framing interventions, such as CO_2 valence framing (Avineri and Waygood, 2013; Waygood and Avineri, 2018), and fiscal versus environmental messages (Cohen-Blankshtain, 2008).

To increase the efficiency of campaigns, market segmentation has been identified as a tool to enable target-specific information and

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Table 1
Description of segments (from Semanjski and Gautama (2016)).

	Segment	Short description
High-car accessibility	Devoted drivers	Do not intend to reduce car use and think successful people drive. They do not use public transportation, nor cycling, and think walking is too slow. They are not motivated by fitness and have a very low moral obligation to the environment.
	Image improvers	Like to drive, see the car as a way of self-expression and do not want to cut down car use. They do not use public transportation but see cycling as a way of expressing themselves and a good way to keep fit. They have neutral or moderate environmental attitudes.
	Malcontent motorists	They do not like to drive and find it stressful. They have moderately strong intention to reduce car use but are not motivated to increase the use of public transport, although they prefer it more than cycling. They walk but do not see any advantage to walking, except for fitness. They have a small level of environmental consciousness.
	Active aspirers	Have a high moral obligation to the environment and are highly motivated to use active transport modes, predominantly cycling, as they believe that it is quick and provides freedom and fitness. They are not public transport users and see problems with using it.
	Practical travellers	They use a car only when necessary as they think that it reduces the quality of life. They prefer cycling to the use of public transportation and would walk when it seems more practical. They are not motivated by climate change and see local pollution and congestion as issues. They are highly educated and above-average part-time working.
Low-car accessibility	Car contemplators	They do not use a car, have the highest proportion of non-driving licence owners, but would like to as they see cars as status symbols. They see many problems with public transportation use and find it, the same as cycling, stressful. They believe walking is healthy and have a neutral or moderate attitude towards the environment.
	Public transport dependents	They think people should be allowed to use cars and would like to see less congestion (they consider more roads as an appropriate solution). They use public transport, although they perceive it to be slow. They do not cycle but would like to walk more for fitness. They are not motivated by the environment and are the least likely to start driving.
	Car-free choosers	They think that cars lead to unhealthy lifestyles and do not like to drive. They prefer cycling as they feel a high moral obligation to the environment. Alternatively, they will choose public transport, which they do not consider stressful nor problematic, and walking. They are more likely to be women.

incentives to groups that are more susceptible for its meaning (Andersson et al., 2018; Haustein and Hunecke, 2013). Although the use of market segmentation to promote sustainable transport has increased significantly in recent years (Li et al., 2013; Poortinga and Darnton, 2016; Thøgersen, 2018), few studies have investigated how marketing messages related to sustainable transport are received among different segments (Cheng et al., 2011; Hess and Bitterman, 2016).

Thus, the overall purpose of this study is to gain a better insight into how messages and segmentation can be used to promote sustainable transportation. More specifically, the aim is to evaluate how marketing messages that have been used to promote sustainable transport influence segments reported motivation to reduce private car use. A further aim is to identify underlying dimensions that affect the interpretation of such messages in order to understand how sustainable transport can be promoted more effectively.

2. Literature review

2.1. Transport-related segmentation

Local authorities with constrained budgets need evidence on which specific groups of car users are more inclined to change travel habits, in order to help them introduce policies that have a significant impact on car use (Ali et al., 2018). In Europe, MaxSumo is one example of a segmentation-model that has been used within mobility management-campaigns (Hiselius, 2014; Van Acker et al., 2013). Max-Sumo segment populations based on behaviour change stages inspired by The Transtheoretical Model (TTM) (Prochaska and Diclemente, 1986; Prochaska and DiClemente, 1983). Several segmentation studies have used stated preference surveys based on attitudes, for instance towards mobility, health, and climate change (see for example Anable, 2005; Prillwitz and Barr, 2011; Li et al., 2013; Poortinga and Darnton, 2016; Thøgersen, 2018). Another example is the European project SEGMENT, in which a tool for consumer market segmentation was developed based on the Theory of Planned Behaviour. SEGMENT was created to increase the efficiency of mobility management-campaigns that aim to persuade people into changing travel behaviour and adopt more energy-efficient forms of transport (Anable and Wright, 2013). Semanjski and Gautama (2016) took this model further when they successfully mapped the segments in crowdsourced mobility data, collected via smartphones. This could enable the delivery of personalised messages to individuals belonging to specific segments (Andersson et al., 2018).

2.2. Marketing pro-environmental behaviours

Messages promoting pro-environmental behaviours have typically been researched in relation to environmental, health, and economic benefits (Avineri and Waygood, 2013; Bolderdijk et al., 2013; Loureiro and Veloso, 2017; Nisbet and Gick, 2008; Steinhorst and Klöckner, 2017). Campaigners have used the same dimensions when framing messages promoting sustainable transport in Sweden (Hiselius and Rosqvist, 2015). Acting environmentally friendly can boost an individuals' status, and have been shown to impact peoples' behaviour (Milinski et al., 2006), particularly when altruistic behaviour of conservation could be exposed to social networks and affect ones' reputation (Griskevicius et al., 2010; Steg et al., 2014). Earlier research outside the transport domain has compared the outcome of environmental and economic messages for promoting pro-environmental behaviour, concluding that messages emphasising the environment outperform economic messages in terms of inducing attitude and behaviour change (Bolderdijk et al., 2013; Steinhorst and Klöckner, 2017).

Marketing research has demonstrated that attitudes toward advertisement influence attitudes toward what is advertised (for a meta-analysis, see Brown and Stayman, 1992), meaning that effective advertisement can shape opinions about a brand, through brand cognition (consumers' perception of a brand) as well as brand recognition (consumers' ability to recognise a brand). Some researchers have suggested that the liking of an ad may be the best indicator of advertisement effectiveness (Haley and Baldinger, 2000). However, the response to a persuasive message is related to both emotional and evaluative dimensions of pre-communication attitudes, which also play a role in determining attitudes to what is advertised (Abou-Zeid and Ben-Akiva, 2012; Petty and Cacioppo, 1986). If people find persuasive messages to align with their attitudes and behaviours, they are more

Table 2
Comparison of demographic characteristics between the segments.

	High-car accessibility					Low-car accessibility		
	1. Devoted Drivers 15%	2. Image Improvers 25%	3. Malcontent Motorists 15%	4. Active Aspirers 11%	5. Practical Travellers 17%	6. Car Contemplators 2%	7. PT Dependents 4%	8. Car-free Choosers 11%
Women	41%[8]	44%[8]	44%[8]	56%	47%[8]	45%	59%	65%[1,2,3,5]
18-30	16%[8]	18%[8]	22%[8]	19%[8]	20%[8]	42%	38%	44%[1,2,3,4,5]
31-50	36%	37%	33%	38%	39%	32%	25%	35%
51-65	25%	30%[8]	23%	26%	21%	26%	25%	13%[2]
>65	23%[6,8]	14%[6]	23%[6,8]	17%[6]	21%[6,8]	0%[1,2,3,4,5,8]	12%	8%[1,3,5,6]
Kid(s) at home	29%[6,7]	36%[6,7,8]	27%[7]	35%[6,7,8]	38%[6,7,8]	10%[1,2,4,5]	10%[1,2,3,4,5]	17%[2,4,5]
Married/live with a partner	69%[8]	74%[7,8]	64%	71%[8]	73%[7,8]	55%	43%[2,5]	46%[1,2,4,5]
Elementary	26%[4,5,8]	18%	17%	12%[1]	13%[1]	20%	12%	11%[1]
Upper secondary	33%[4,5]	31%[4,5]	20%	18%[1,2]	19%[1,2]	23%	37%	26%
University degree	41%[3,4,5,8]	51%[4,5]	63%[1]	70%[1,2]	68%[1,2]	57%	51%	63%[1]
Studying	3%[4,7,8]	6%[8]	8%[8]	12%[1,8]	10%[8]	29%	27%[1]	28%[1,2,3,4,5]
Working	63%	69%[8]	59%	63%	63%	58%	55%	54%[2]
Retired	24%[6,8]	15%[6]	24%[6,8]	19%[6]	21%[6,8]	0%[1,2,3,4,5,8]	14%	9%[1,3,5,6]
Main city	50%[5,7,8]	56%[5,7,8]	64%[8]	58%[7,8]	72%[1,2]	60%	82%[1,2,4]	84%[1,2,3,4]
>5000 inhabitants	17%	14%	16%	15%	15%	33%	14%	14%
<5000 inhabitants	33%[5,6,7,8]	30%[5,6,7,8]	20%[7,8]	27%[5,6,7,8]	13%[1,2,4,8]	7%[1,2,4]	4%[1,2,3,4]	3%[1,2,3,4,5]
Drivers' license	99%[6,7,8]	98%[6,7,8]	94%[6,7,8]	94%[6,7,8]	97%[6,7,8]	61%[1,2,3,4,5]	64%[1,2,3,4,5]	66%[1,2,3,4,5]
Access car	97%[3,4,5,6,7,8]	97%[3,4,5,6,7,8]	86%[1,2,6,7,8]	87%[1,2,6,7,8]	89%[1,2,6,7,8]	36%[1,2,3,4,5]	31%[1,2,3,4,5]	22%[1,2,3,4,5]
Access bike and/or e-bike	66%[2,4,5,8]	94%[1,3,7]	72%[2,4,5,8]	95%[1,3,7]	96%[1,3,7]	82%	53%[2,4,5,8]	91%[1,3,7]
Access bus and/or rail stop within 500 m	71%[7,8]	75%[7,8]	82%[8]	80%[7,8]	83%[8]	91%	95%[1,2,4]	98%[1,2,3,4,5]

Items in superscript indicate which means are significantly different from each other (ANOVA Post Hoc analysis (Tamhane's T2) searching for differences among all combinations of groups ($p < 0.05$)).

likely to accept the message, which in turn increase the likelihood of the message being considered and part of the receivers' attitude-construct (Petty and Cacioppo, 1986), also referred to as assimilation bias (Lord et al., 1979; Whitmarsh, 2011). A study that investigated marketing for public transport found that the impact of marketing crucially depends on the attitudes and beliefs of individual consumers (Beale and Bonsall, 2007). It is, therefore, reasonable to assume that people will respond differently to a given marketing message depending on their structure of attitudes and behaviours.

The goal of any marketing effort is to influence peoples' attitudes to stimulate corresponding behaviours. For several decades, researchers have attempted to explain the attitude-behaviour relationship (see for example Ajzen, 1991; Ajzen and Fishbein, 1970), and it has been established that attitudes have an impact on behaviour, as long as the individuals have the possibility to perform the predicted behaviour (Kim and Hunter, 1993). The magnitude of this relationship depends on several factors. According to a meta-analysis by Glasman and Albarracín (2006), attitudes correlate with behaviour more strongly when they are easy to recall (accessible), and stable over time. For that reason, direct experience (such as trials), which increase accessibility to the attitude object, predict future behaviour more strongly. The authors also found that the attitude-behaviour relation was strongest when attitudes were confident, information was relevant, and when information about the attitude object was one-rather than two-sided. Research also suggests that advertisement repetition systematically can influence attitude-behaviour consistency and that repeated ad exposures can be just as predictive of subsequent behaviour as direct experiences (Berger and Mitchell, 1989). Despite the significant advertisement-attitude-behaviour relationship, it is important to recognise the limitations of this chain in changing persistent behaviours. This has been evident in the case of environmental issues, especially travel behaviour, where a pro-environmental attitude does not guarantee pro-environmental behaviour, resulting in the 'attitude-behaviour gap' (Geng et al., 2016; Polk, 2004).

3. Methods and data

The data collection consisted of a web survey, which included questions about demographics, accessibility, segmentation, and marketing messages. Exploratory factor analysis and significance tests were conducted to analyse the results. The following sections present more details about the survey, the marketing messages, the model used for segmentation, and the statistical analyses.

3.1. Web survey

A web-based stated preference (SP) survey was designed to collect the data. SP methods are commonly used to analyse and predict human behaviours in hypothetical scenarios (Loureiro et al., 2003), and was chosen because it enabled us to explore the complex relationships between respondent's attitudes, segmentation profile, and cognitive motivation when exposed to marketing messages. These concepts would be extremely difficult to capture through a revealed preference study, particularly with adequate sample size.

The survey was conducted with the help of Swedish Kantar Sifos' probability-based internet panel consisting of approximately 100,000 inhabitants 16–79 years of age. The panel members are randomly recruited through nationally representative telephone surveys, and the panel is continuously filled with new members to prevent them from becoming survey 'experts'. The panel members are recruited by e-mail with a link to the questionnaire and if they choose not to participate, another panel member is contacted instead. Those who agree to participate receive compensation in the form of bonus points that can be redeemed for movie tickets or gift cards.

The sample was stratified to match the national conditions regarding gender and age, and analytical weights were used to adjust for potential skewness. These weights were used to compensate for the over-representation of respondents with higher education (the sample had 10% more highly educated participants than the Swedish average) and the underrepresentation of older respondents. The geographical scope was limited to seven out of the nine municipality groups according to the

Table 3

Marketing messages used in the study (n = 994). Theme abbreviations: \$ = economy, E = environment, H = health, S = status.

Marketing message	Theme	Mean	SD
1. We all must help to reduce our climate footprint. The result will be a sound environment that future generations also need!	E	3,73	1103
2. Those who mostly walk, cycle or ride transit are doing something good for the environment.	E	3,64	1085
3. Research shows that public transport users are walking on average four times more per day than do car drivers, therefore reducing the risk of acquiring severe non-communicable diseases.	H	3,60	1082
4. Those who cycle and go by public transport not only improve their health but also contribute positively to other people's health.	H	3,57	1079
5. Did you know that cyclists have a 52% lower risk of dying of heart disease and a 40% lower risk of dying from cancer?	H	3,53	1131
6. You save about 350 euro per month if you live without a car and instead go by public transport and even more so if you cycle or walk.	\$	3,37	1235
7. Bicycles run on fat and save you money. Cars run on money and make you fat!	H, \$	3,37	1272
8. If Sweden is to achieve its climate targets, then generally every third car trip must be replaced with more environmentally friendly alternatives.	E	3,36	1191
9. By cycling instead of taking the car to work, you save money and contribute to society at the same time! Try it!	\$	3,28	1164
10. The car traffic in Sweden induces a socio-economic loss above 10 billion euros in adverse health effects.	H	3,21	1165
11. In the government budget, support for investments in cycling infrastructure increased by 50 million euros in 2018.	\$	3,17	1184
12. If you want to improve your health, you should ride a bicycle instead of driving a car. If the distance is a problem, then an electric bike can be an option.	H	3,14	1194
13. Many Swedes use public transport to get to school or work every day. Thanks!	S	3,13	1184
14. It may seem inconvenient, but studies show that over 60% of those who test an electric bike continue to use it!	–	3,08	1080
15. The environmental impact per bus passenger is only 65% of the private car user in rural areas and 40% in urban areas.	E	3,04	1088
16. Beginning in 2018, you can get 25% of the cost subsidised by the government when purchasing a new electric bicycle.	\$	3,02	1279
17. The car used to be a status symbol, but today other values are more important, such as taking care of oneself and the environment. Such values are usually related to cycling or public transport.	S	2,95	1175
18. Few things today can be considered more modern and prestigious than commuting by bicycle.	S	2,62	1137
19. Swedish Olympic champion Björn Ferry has decided to be fossil-free in 2025. If he can do it you can!	S	2,59	1182

classification made by the Swedish Association of Local Authorities and Regions (2016). The two excluded municipality groups consist of rural municipalities where the population is less than 15,000 inhabitants in the largest urban area or where the commuting rate for work outside of the municipality is low (less than 30%).

From this panel, 1300 individuals 18–65 years that usually commute to school or work were recruited to participate. The questionnaire was fielded in February 2018. To ensure all analyses were based on the same individuals, an analytical sample was defined, including only individuals with valid information (i.e. no missing responses) for all variables used in the statistical analyses (n = 1185). Further, mischievous respondents (MRs) who knowingly make phoney responses meant to cheat the researcher, were removed by applying Hyman and Sierra (2012) distribution-free, sample-size-unconstrained, backwards-stepping MR algorithm. The lowest variance deletion rule was used to clean the data (Thøgersen, 2018). The respondents were considered

mischievous if the variance of their responses to the 19 message items was below 0.25 (16% of the sample). This reduced the analytical sample to 994 individuals.

The questionnaire involved four parts: 1) the sociodemographic characteristics of the respondents; 2) their accessibility to travel modes, driver's license, and their daily commuting trip length and modal choice; 3) attitudinal questions used for the segmentation, retrieved from Anable and Wright (2013); and 4) the marketing messages.

3.2. Marketing messages

The framework for the marketing messages was established through a literature review, including studies that used marketing messages to promote pro-environmental behaviours. Four themes were found, namely economic (Bolderdijk et al., 2013; Steinhorst and Klöckner, 2017); environmental (Avineri and Waygood, 2013; Hiselius and Rosqvist, 2015); health (Loureiro and Veloso, 2017; Nisbet and Gick, 2008); and status (Griskevicius et al., 2010; Milinski et al., 2006). The literature was supplemented with marketing material from campaigns previously carried out to promote sustainable transport in Sweden. Such material was found at regional public transport authorities, municipalities working with Mobility Management, train operators, and organisations supporting bicycling and public transport. 19 marketing messages were selected and some were adjusted to fit the themes of economy, environment, health, and status. The messages are presented in the result section (Table 3).

Respondents were asked to assess their level of motivation to decrease private car use on a five-point Likert scale, from 'very unmotivated to decrease my car use' to 'very motivated to decrease my car use', in line with the scale used by Waygood and Avineri (2018). Respondents that already had low or no car use had a slightly adjusted scale: 'very unmotivated to *keep* my low level of car use', and 'very motivated to *keep* my low level of car use'. Unfortunately, it was not possible to control for the fact that respondents were exposed repeatedly to messages promoting sustainable transport since that information was missing in the data material received from the provider of the internet panel. This could constitute an exposure bias and affect the validity of the responses. However, the marketing messages were randomised for all respondents; thus, if there would be an exposure bias, we can assume it not to affect the relative outcome between the messages.

3.3. The SEGMENT-model

The SEGMENT-model consists of eight segments, five with high accessibility to a car and three with low accessibility. A description of each segment is provided in Table 1. By answering a set of 18 questions (see Appendix A), respondents are assigned to one of the segments. The authors behind the SEGMENT retrieved the 18 questions through discriminant analysis from more than 10,000 questions (Anable and Wright, 2013). The responses that people indicate to each item are weighted to determine the appropriate segment for them. For a full description of the segmentation procedure, see Anable and Wright (2013).

3.3.1. Demographic characteristics and modal split in the sample

The segments' socio-demographics and stated travel behaviours for school and work trips are presented in Table 2 and Fig. 1, respectively. These data reveal two things of particular interest for the study: First, the socio-demographics differ most between the two groups of segments with high and low accessibility to a car. The segments with low accessibility to a car (low-car group) are younger, have fewer kids living at home, and are studying more, indicating they are in an earlier life phase than the segments with high accessibility to a car (high-car group). Further, the low-car group drive less than the high-car group, suggesting a relationship between being young and driving less. However, this relationship does not predict what mode of transport replaces the car.
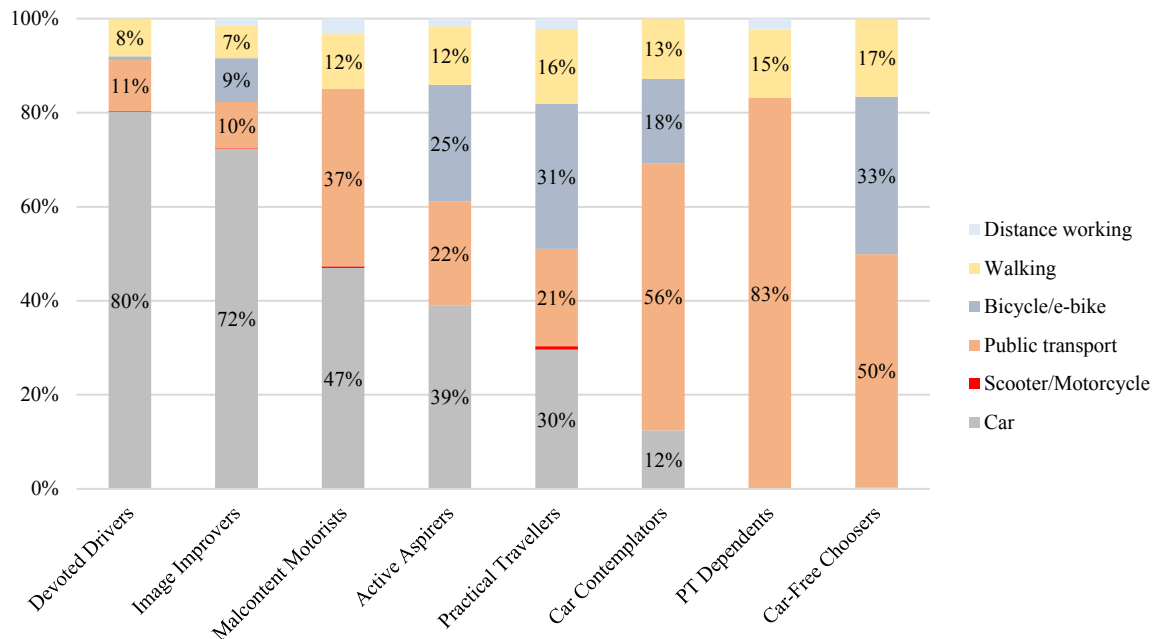
Fig. 1. Modal split of the segments school and work-journeys.

Secondly, within the high-car group, the relevance of socio-demographics to travel behaviour is low; modal choice differs significantly between high-car segments even though socio-demographics are similar. Although this is not a new discovery, it does indicate the important influence of attitudes on the choice of means of transport. Attitudes that can be influenced by marketing, as already discussed in section 2.2.

3.4. Statistical analyses

To investigate whether any common denominators unite the marketing messages, exploratory factor analysis was conducted. It is a statistical tool to identify a smaller number of 'underlying dimensions that are too subtle and complex to be easily observed and measured' (Cervero and Kockelman, 1997). Because EFA is exploratory, it suits well with an inductive research approach. The Kaiser-Meyer-Olkin measure confirmed the sampling adequacy for the analysis (KMO = 0.95), indicating that patterns of correlations are very compact, and so factor analysis should return distinct and reliable factors (Field, 2013).

A principal axis factor analysis was conducted on the 19 items with oblique rotation (Promax). Oblique rotation was chosen since we expected the factors to be correlated, which is not accounted for in orthogonal rotation that assumes factors to be independent (Pituch and Stevens, 2016). The correlation matrix with a two-factor solution supported this assumption, by revealing a reasonably large correlation between factor 1 and factor 2 (0.739) indicating that independence between factors cannot be assumed and that the oblique rotation probably provides a better representation of reality than an orthogonal rotation. This seems reasonable given that people who are more positive about reducing private car use would probably indicate a stronger motivation in general, regardless of the type of message exposed to them.

The factor loadings indicate the substantive importance of a given variable to a given factor and interpretation of loadings with an absolute value greater than 0.35 is considered appropriate (Field, 2013). The results from the EFA is presented in the results section (Table 4).

4. Results

4.1. Reported motivation to reduce private car use when exposed to marketing messages

Descriptive statistics of the messages are presented in Table 3. The mean represents the reported motivation to decrease private car use (5 = very motivated), sorted in descending order. The results indicate that marketing messages appealing to intrinsic motivation, such as environmental and health issues, induce more motivation than messages related to extrinsic motivation, such as economy and status (mean values; environment 3.51, health 3.44, economy 3.27, and status 2.76). This finding goes in line with previous research that has compared the outcome of environmental- and economic messages for promoting pro-environmental behaviour (Bolderdijk et al., 2013; Steinhorst and Klöckner, 2017). However, the perception of messages is influenced by more than just the theme in question (e.g. health or status). Framing, for instance, can influence how people respond to equivalent descriptions of the same critical information (Waygood and Avineri, 2018). This is evident for the themes investigated here because reported motivation varies for items within the same theme, ranging from 0.69 for environmental messages to 0.35 for economic messages. Thus, in order to investigate associations to underlying variables, we now turn to the exploratory factor analysis.

4.2. Exploring latent variables through factor analysis

The EFA was performed to investigate whether any latent variables capture multiple marketing messages. An initial analysis was run to obtain eigenvalues for each factor in the data. Two factors had eigenvalues over Kaiser's criterion of 1 and in combination explained 50,49% of the variance. Table 4 shows the factor loadings after rotation.

The items that cluster on the same factor suggest that factor 1 represents personal health, financial benefits, convenience, and status. Overall, these items point toward the individual gaining utility from using sustainable transportation, and that one should act pro-environmentally for reasons related to self-interest. On the contrary, the items related to factor 2 seems to be related to concerns of the environment, health (both personal and societal), collective responsibility, and morality. Note that the theoretical themes found in the

Table 4

Results from exploratory factor analysis for the marketing messages (n = 994).

Item	Theme	Factor pattern matrix	
		1 (Self-efficacy)	2 (Collective efficacy)
If you want to improve your health, you should ride a bicycle instead of driving a car. If the distance is a problem, then an electric bike can be an option.	H	**.78**	-.06
It may seem inconvenient, but studies show that over 60% of those who test an electric bike continue to use it!	–	**.77**	-.16
By cycling instead of taking the car to work, you save money and contribute to society at the same time! Try it!	$	**.66**	.14
Bicycles run on fat and save you money. Cars run on money and make you fat!	H, $	**.6**	-.00
You save about 350 euro per month if you live without a car and instead go by public transport and even more so if you cycle or walk.	$	**.57**	.10
Did you know that cyclists have a 52% lower risk of dying of heart disease and a 40% lower risk of dying from cancer?	H	**.55**	.17
Beginning in 2018, you can get 25% of the cost subsidised by the government when purchasing a new electric bicycle.	$	**.54**	-.06
The car used to be a status symbol, but today other values are more important, such as taking care of oneself and the environment. Such values are usually related to cycling or public transport.	S	**.48**	.27
Few things today can be considered more modern and prestigious than commuting by bicycle.	S	**.45**	.16
In the government budget, support for investments in cycling infrastructure increased by 50 million euros in 2018.	$	**.43**	.26
Swedish Olympic champion Björn Ferry has decided to be fossil free in 2025. If he can do it you can!	S	**.37**	.21
We all must help to reduce our climate footprint. The result will be a sound environment that future generations also need!	E	-.11	**.84**
If Sweden is to achieve its climate targets, then generally every third car trip must be replaced with more environmentally friendly alternatives.	E	-.10	**.83**
Those who mostly walk, cycle or ride transit are doing something good for the environment.	E	-.03	**.77**
Those who cycle and go by public transport not only improve their health but also contribute positively to other people's health.	H	.13	**.66**
The car traffic in Sweden induces a socio-economic loss above 10 billion euros in adverse health effects.	H	.05	**.65**
The environmental impact per bus passenger is only 65% of the private car user in rural areas and 40% in urban areas.	E	.08	**.64**
Research shows that public transport users are walking on average four times more per day than do car drivers, therefore reducing the risk of acquiring severe non-communicable diseases.	H	.24	**.4**
Many Swedes use public transport to get to school or work every day. Thanks!	S	.29	**.36**
Eigenvalues		8,23	1,36
% of variance		43.33	7.16
Cronbach's α		.87	.88

Note: Factor loadings equal to or greater than 0.35 appear in bold.
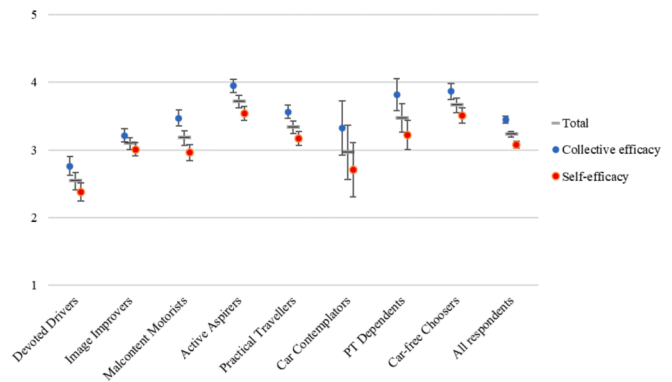

Fig. 2. Segments reported motivation to decrease private car use when exposed to marketing messages related to the latent factors of collective efficacy and self-efficacy. Means and 95% confidence intervals.

literature and referred to in many campaigns (economic, environmental, health and status) did not emerge explicitly in the factor solution. Instead, we can see the items linked to economy and status cluster to factor 1 and items relating to the environment cluster to factor 2. The items relating to health is divided, clustering to both factor 1 and 2. Health-items in factor 1 are related to personal health gains from using sustainable transport, while health-items that load on factor 2 are more linked to societal gains, except for the statement: *Research shows that public transport users are walking on average four times more per day than do car drivers, therefore reducing the risk of acquiring severe non-communicable diseases.* However, this item has quite a low loading and is therefore of relatively little importance to the factor structure compared to the other items. The same goes for the one message relating to the status-theme that cluster to factor 2: *Many Swedes use public transport to get to school or work every day. Thanks!*

Generally, the factor solution suggests an intrinsic/extrinsic motivation structure (Deci et al., 1999) and self-transcendent/self-enhancement value system (Wesley Schultz, 2001). Intrinsic motivation and self-transcendent values tend to be linked to collective efficacy and pro-environmental behaviour. Extrinsic motivation and self-enhancement values, on the other hand, are more linked to self-efficacy and less pro-environmental behaviour (De Dominicis et al., 2017). As such, we will refer to factor 1 as 'self-efficacy' and factor 2 as 'collective efficacy', two concepts that have been researched within a wide spectrum of pro-environmental behaviours (Chen, 2015; Reese and Junge, 2017). Self-efficacy focuses explicitly on the efficacy expressed by an individual and is defined as 'the belief in ones' capabilities to organise and execute the courses of action required to manage prospective situations' (Bandura, 1995, p. 2), while the definition of collective efficacy goes as 'a groups' shared belief in its conjoint capabilities to organise and execute the courses of action required to produce given levels of attainments' (Bandura, 1997, p. 477).

4.3. Motivational effect of messages related to self-efficacy and collective efficacy

To analyse the effect of messages related to self-efficacy and collective efficacy on motivation to reduce driving, mean scales were calculated for each factor. The Cronbach α for the mean scales was 0.87 and 0.88, respectively, indicating good internal consistencies (Nunnally, 1994). Fig. 2 shows the segments reported motivation to reduce private car use when exposed to the messages, divided into the two factors. The mean response from all 19 messages is included as a representation of the general motivation to reduce private car use for each segment (referred to as total). The impact of the messages related to self-efficacy and collective efficacy can then be measured as deviations from the general motivation.

Table 5
Significance tests between and within the segments.

Nr	Segment	Total (T)		Collective efficacy (C)		Self-efficacy (S)		Sig.		
		M	SD	M	SD	M	SD	T–C	T–S	C–S
1	Devoted Drivers	2.54[3,4,5,6,7,8,9]	0.74	2.76[3,4,5,6,7,8,9]	0.81	2.38[3,4,5,6,7,8,9]	0.78	.000	.000	.000
2	Image Improvers	3.01[1,5,7,8]	0.71	3.21[1,5,6,7,8,9]	0.77	3.01[1,7,8]	0.75	.000	.168	.000
3	Malcontent Motorists	3.18[1,7,8]	0.67	3.47[1,7,8]	0.73	2.96[1,7,8]	0.72	.000	.000	.000
4	Active Aspirers	3.71[1,2,3,4,5,9]	0.53	3.95[1,3,4,5,9]	0.57	3.54[1,2,3,4,5,9]	0.59	.000	.000	.000
5	Practical Travellers	3.34[1,2,7,8]	0.63	3.56[1,2,7,8]	0.68	3.17[1,7,8]	0.7	.000	.000	.000
6	Car Contemplators	2.96[8]	0.81	3.32	0.87	2.71[8]	0.88	.004	.018	.006
7	PT Dependents	3.47[1]	0.6	3.82[1,2]	0.7	3.22[1]	0.65	.000	.000	.000
8	Car-free Choosers	3.66[1,3,4,5,9]	0.56	3.86[1,3,4,5,9]	0.62	3.51[1,3,4,5,9]	0.61	.000	.001	.000
9	All respondents	3.23[1,7,8]	0.74	3.45[1,3,7,8]	0.8	3.08[1,7,8]	0.78	.000	.000	.000

Items in superscript indicate which means are significantly different from each other (ANOVA Post Hoc analysis (Tamhane's T2) searching for differences among all combinations of groups ($p < 0.05$)). Differences between T, C, and S explored through paired-samples *t*-test.

The results show that all segments report significantly higher motivation for the collective efficacy compared to both the self-efficacy and the total (significance tests are presented in Table 5). The self-efficacy variable, on the other hand, generates significantly less motivation to reduce driving than the total variable for all segments except for Image Improvers, where no significant difference was found between self-efficacy and the total variable.

There are differences between the segments reported motivation to reduce private car use on a general level. In particular, the Devoted Drivers seem not to be motivated by messages related to either self-efficacy or collective efficacy. Car Contemplators are positive towards collective efficacy, but negative towards self-efficacy (although the margin of error for this segment makes it uncertain). The rest of the segments show an overall positive attitude to the marketing messages. This is also true for the segments that are relatively car-dependent, such as the Image Improvers and Malcontent Motorists. Segments who mostly travel by modes of transport other than the car (e.g. Car-Free Choosers and PT Dependents) report the highest motivation, together with Active Aspirers, the segment with the highest total mean value of all segments, even though a third of the respondents in this segment actually use the car for work and school journeys on a regular day. Four segments deviate from the rest (all respondents). Devoted Drivers report significantly lower motivation for collective efficacy and self-efficacy, while Car Free-Choosers and Active Aspirers report significantly higher motivation. Image Improvers report significantly lower motivation for collective efficacy than the general sample. These differences indicate that the respondents in each segment judged messages according to existing preconditions; thus, evaluations were made to maintain initial beliefs about sustainable transport, in line with the psychological principle of assimilation bias (Lord et al., 1979).

5. Discussion and conclusions

These findings contribute to increased knowledge regarding the promotion of sustainable transport in two important ways. First, by breaking down multiple marketing messages into the two latent factors of self-efficacy and collective efficacy, and then comparing the effect of these two factors on motivation to reduce driving, gave clear indications that collective efficacy messages are superior at encouraging the use of sustainable transport instead of driving; knowledge that can be used by travel managers, municipalities, train and bus companies, and other actors working with campaigns. Second, by demonstrating the differences in how marketing messages are received by various segments we could clearly see the effect of assimilation bias, highlighting the need for aligning communication to fit the attitudes and behaviours of a selected target audience.

Although scarce within the transport research (Dastjerdi et al. (2019) is one exception), previous studies in other domains have stressed the importance of collective efficacy to motivate individuals to act pro-environmentally (Chen, 2015; Reese and Junge, 2017). Particularly

encouraging are the results of Jugert et al. (2016), which showed that messages about collective efficacy increased perceptions of efficacy at the social *and* individual level, which in turn elevated personal intentions to act. If collective efficiency increases self-efficacy, it would be interesting to examine whether such communication can alleviate the notion of the 'social dilemma', where ones' efforts to tackle climate change may feel worthless by the inaction of others (Line et al., 2010). Furthermore, the fact that collective efficacy was almost exclusively related to environmental and health messages provides tentative support for addressing intrinsic values when promoting sustainable transport, a suggestion also put forward by authors conducting research on pro-environmental behaviour in other domains (Bolderdijk et al., 2013; Steinhorst and Klöckner, 2017).

In general, the findings suggest that people responded to the messages according to their pre-existing attitudes and behaviour, in line with assimilation bias. Therefore, we advocate further elaboration on segmentation and communication strategies to enable effective campaigns that target an audience susceptible to the idea of decreasing private car use. Clearly, it is not fruitful to convince Devoted Drivers to change transport mode with marketing since they oppose messages that promote sustainable transport. This goes in line with research stating that the will to change the means of transport is very low among 'persistent drivers' (Andersson, 2020; Beale and Bonsall, 2007; Lattarulo et al., 2018), suggesting that other measures are needed to influence this group. Instead, campaigns can be targeted at car-dependent segments that are open to alternatives, such as Image Improvers, Malcontent Motorists and Practical Travelers. Furthermore, it may be equally important to strengthen existing travel behaviour in younger segments already travelling by sustainable modes of transport, such as Car Contemplators, PT Dependents, and Car-Free Choosers, to increase the likelihood that they will continue to use sustainable modes of transport in later life stages.

There are some limitations to the present study. It is possible that higher community trust in Sweden made messages related to collective efficacy more appealing than would be the case in more individualistic societies with lower community trust, such as the United States. Thus, before these results can be generalised it is important to reproduce this kind of study in other countries. Future studies could seek to validate the factors retrieved from the EFA, as this is an exploratory method influenced by assumptions and interpretations. The SP method was used to collect data on individuals travel behaviour, accessibility, demographics, and motivation to decrease private car use when exposed to marketing messages. Revealed preferences, or a combination of SP and RP, would be preferable to validate the responses. It has, however, been demonstrated that stated preferences are a reasonably accurate guide to true underlying preferences and market behaviour (Lambooij et al., 2015; Loureiro et al., 2003; Wardman, 1988). Finally, though we used randomised order of messages and repeated measurements (several marketing messages within one theme-specific frame) this method entails a risk of social desirability bias that could influence the results

([Mcfadden et al., 2005](#)).

Declaration of competing interestCOI

The authors declare that there have been no conflicts of interest concerning this article.

CRediT authorship contribution statement

Alfred Andersson: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review & editing.

Lena Winslott Hiselius: Funding acquisition, Conceptualization, Methodology, Supervision. **Emeli Adell:** Conceptualization, Methodology, Supervision.

Acknowledgements

Appendix A

The questionnaire used for segmentation according to the SEGMENT-model.

Question	Scale
Q1: Have you driven a car or van in the past 12 months?	Yes; no
If Q1 = yes	
Q2: For most journeys, I would rather use the car than any other form of transport	strongly disagree; disagree; neither/nor; agree; strongly agree
Q3: I like to drive just for the fun of it	
Q4: I am not interested in reducing my car use	
Q5: Driving gives me a way to express myself	
If Q1 = no	
Q6: How likely are you to drive in the next 12 months?	very unlikely; quite unlikely; neither/nor; fairly likely; very likely
All	
Q7: I am not the kind of person who rides a bicycle	strongly disagree; disagree; neither/nor; agree; strongly agree
Q8: I feel I should cycle more to keep fit	
Q9: I find cycling stressful	
Q10: Cycling can be the quickest way to travel around	
Q11: I like travelling by bicycle	
Q12: I am not the kind of person that likes to walk a lot	
Q13: I feel I should walk more to keep fit	
Q14: I like travelling by walking	
Q15: I am not the kind of person to use the bus	
Q16: In general, I would rather cycle than use the bus	
Q17: I feel a moral obligation to reduce my emissions of greenhouse gases	
Q18: People should be allowed to use their cars as much as they like	

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