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Identity and travel behaviour: A cross-sectional study on commute mode choice and intention to change.

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Abstract

Introduction: Social and self-identities have been conceptualised to prevent travel behaviour change, as threats to one's identity may cause resistance to change. This study focuses on the role of social, transport, place, and self-identities on commute mode choice and intention to change mode choice.

Method: Data were collected in June 2015 in Utrecht, the Netherlands. Invitations to participate were distributed by mail using data from the municipality, resulting in 1,062 adult participants.

The outcome measures were the transport mode shares based on a 14-day travel-to-and-from-work record of trips (i) involving any car use, (ii) involving any bicycling, (iii) involving any walking, and (iv) involving any public transport use. The second series of outcome measures concerned the willingness to change the amount of car use, bicycle use and walking, determined by the question 'to what extent do you intend to change the use of ...?'. Identity was measured on a seven-point disagree/agree scale for 17 items by asking to what extent the respondent 'sees him/herself as ...'. Separate multinomial regression models were estimated stepwise adjusting for socioeconomic and transport characteristics.

Results: Multiple identity items were associated with the use of all commute modes. In the maximally adjusted models, identities associated with the respective modes remained significant. For example, whether someone identified themselves with being a cyclist corresponded with higher likelihood of cycling occasionally (relative risk ratio (RRR): 1.84; 95% confidence interval (CI): 1.47–2.30), or always to work (RRR: 2.86; 95%CI: 2.16–3.79). In addition, we found that a family-oriented identity was negatively associated with occasional commuting by car, and a 'sporty' identity was negatively associated with always cycling to work.

Transport identities were also associated with stated intentions to change as were several social, place, and self-identities. Identifying with being a car driver decreased the likelihood of intending to reduce car use, but it increased the likelihood of intending to increase car use, as did identifying with being career-oriented. Individuals that identified with being a cyclist were less likely to have an intention to reduce bicycle use, whereas countryside-lovers had greater intentions of increasing cycling. Individuals that identified themselves as pedestrians had a lower intention of decreasing their walking levels, and a higher intention of increasing them, as did those who identified themselves as being family-oriented.

Discussion: The results confirm limited previous findings that identifying with users of a transport mode corresponds with its use. Nevertheless, questions around causality remain. The intention to change mode choice was associated with several identities, including transport-related identities, place-related identities, social/family-related identities, and self-identities. Future research should focus on the associations between identity and actual behaviour change to further our understanding of the effect of identity on travel behaviour.

Keywords

Identity, mode choice, intention to change, behaviour change

Highlights

- It has been hypothesised that identities may prevent travel behaviour change;
- We investigated the role of identity on (the intention to change) mode choice;
- Transport identities were associated with the mode choice and its frequency of use;
- Transport, social, place & self-identities were associated with intention to change;
- This study contributes to more sustainable and healthy transport systems.

1 Introduction

Car travel causes several societal problems: it creates spatial barriers; it may prevent social interactions; it is linked to reductions in physical activity; it causes noise and air pollution; and it may, therefore, have a negative effect on public health. In urban areas, these problems may be amplified, as congestion is more prevalent. Reducing these problems can be achieved by reducing the impact of transport (e.g., noise barriers) or reducing the negative output of transport (e.g., cleaner transport). More effective, however, is changing individual behaviour, as this has potentially larger effects and removes the necessity for reductions in impact or output of the car-based transport system. Changing individual mode choice has been a primary focus of policies (e.g., encouraging a change from car travel to journeys by bicycle, by public transport or on foot). Countless behaviour change initiatives, including commercials and policies, have been launched, but most have failed thus far.

Perhaps one reason for this ineffectiveness of such measures is that research providing insights into travel behaviour rely on few theories. Conventional research on travel behaviour is based on utility theories, assuming that individuals make conscious decisions based on the evaluation of the alternatives in terms of cost, time and effort (e.g., Van Acker et al., 2013). However, these hard factors fail to explain why individuals in similar situations and with corresponding socioeconomic characteristics make different choices (Heinen et al., 2011). In the last decade, so-called 'soft factors' have received increased attention as a predictor of travel behaviour change. The theory of planned behaviour and the role of attitudes in particular have been the focus of much attention (e.g., Kamruzzaman et al., 2015; Busch-Geertsema & Lanzendorf, 2015; Van et al., 2015; Van Acker et al., 2010; Cao et al., 2009; Schwanen & Mokhtarian, 2005; Heinen et al., 2011). However, several other theories and constructs may have greater potential to explain behaviour and effectuate change.

One potential promising construct is personal identity. Identity has been found to be associated with pro-environmental behaviour (e.g., Van der Werff et al., 2013; Mannetti et al., 2004). It has also been indicated that habit, which has been repeatedly connected to predicting travel behaviour and travel behaviour change, may be an expression of identity (Verplanken and Orbell, 2003). In some studies, identity has

been shown to explain more variation in behaviour than frequently used theories on behaviour change, including the theory of planned behaviour (Whitmarsh & O'Neill, 2010; Fekadu & Kraft, 2001). However, the connection between identity and travel behaviour is not well established (Anable et al., 2006). Although this statement is not particularly recent, only a few studies on the influence of identity on travel behaviour have been conducted since then.

The few existing recent studies have corroborated the suggested association between identity and travel behaviour. For example, Murtagh et al. (2012a) showed that identities were significantly associated with mode choice and that different identities prevailed for different types of journeys. Lois et al. (2015) tested the theory of planned behaviour on behavioural intention about commuting by bicycle using stages of change adding social identity and concluded that including social identity—identifying as a cyclist—improved explanations of bicycle commuting.

Whereas recent studies seem to support the proposed association between identity and (changes in) travel behaviour, empirical evidence to support the assertion of this relationship is still limited. Moreover, existing studies have shortcomings themselves. One main shortcoming is that existing studies generally consider only a small number of identity items, whereas individuals are known to have multiple. In addition—and perhaps the greatest shortcoming—the majority of studies investigate the association with existing travel behaviour, whereas it has also been suggested that identities could prevent behaviour change.

This study will contribute to this debate with a focus on the influence of identity on mode choice as well as on intention to change this mode choice considering a wide range of identity items, including items relating to transport, place, social, and self-identity. In this paper, first an overview of literature will be discussed, which will end with a fuller presentation of the existing research gaps. This is followed with a description of our methods and results of the analyses. In the final sections, these results are discussed.

2 Literature review

Identity has received relatively limited attention in the scientific literature on travel behaviour and other concepts and theories have prevailed in this scientific area. Identity was determined to be a promising concept for explaining travel behaviour a few years ago (Anable et al., 2006). More recently, the role of identity has been also been conceptualised by Murtagh et al. (2012b) as an impediment to behavioural change with the assumption that a threat to one's identity may cause resistance to change.

Below, we discuss the limited existing research on identity and travel behaviour. At the end of this section, we present the main shortcomings that were derived from this overview.

Identity theory

In the literature, several research strands exist on identity. Stryker and Burke (2000) indicate that the word 'identity' is used in three ways. The first use refers to the a people's culture, and is hardly distinguishable from identity and ethnicity. The second use of 'identity' is linked to the thinking of Tajfel and Turner (1986) and theorises identity as *social identity*, which indicates an identification with a group or social category. Following this line of reasoning, a person does not have a single identity, but several identities that correspond with several group memberships, which could be either physical or internalised identities that are part of the larger sense linking the self to culture and social structure (Stryker & Burke, 2000; Stryker, 1987). Examples of social identity are: being a mother, being female, being a student, etc. Third, the term 'identity' has been used to the meaning individuals attach to themselves, and is sometimes referred to as *self-identity*. Self-identity is not specifically related to a role an individual plays, but emphasises the meanings an individual attaches to different views of themselves. An example of this kind of identity is being environmentally friendly.

Identity salience is one way identities can be placed in a hierarchy. "This hierarchical organization of identities is defined by the probabilities of each of the various identities being brought into play in a given situation. Alternatively, it is defined by the

probabilities each of the identities have of being invoked across a variety of situations. The location of an identity in this hierarchy is, by definition, its salience" (p. 206) (Stryker & Serpe, 1982). Commitment to an identity affects identity salience, and the greater the commitment premised on an identity, the more salient an identity.

Identity and environmental behaviour

The role of identity on environmentally friendly behaviour has received attention in several studies. This research is often only indirectly related to travel behaviour. However, if identity is important for (other) environmental behaviours, this would provide an impetus to also investigate the role of identity on travel behaviour, given the environmental consequences of travel.

For example, Van der Werff et al. (2013) investigated the role self-identity plays on meat consumption and tested whether self-identity could be strengthened focussing on environmental self-identity and pro-environmental behaviour. They collected data with questionnaires in the Netherlands in 2010 and 2011, resulting in 468 participants in the first wave, of which 355 respondents also participated in a follow-up survey. Identity was measured by three questions: 'I am the type of person that acts environmentally friendly', 'I see myself as an environmentally friendly person' and 'acting environmentally friendly is an important part of who I am'. The intention to change in this study was the intention to eat less meat. Their findings showed that the strength of environmental self-identity increased when individuals were reminded by past pro-environmental behaviour and therefore concluded that pro-environmental behaviour can be promoted by reminding individuals of past pro-environmental actions.

Three studies linked identity to recycling behaviour. Mannetti et al. (2004) investigated personal identity along the constructs of the Theory of Planned Behaviour (Ajzen, 1991). Based on a structural equations model of 230 individuals in Italy, they concluded that personal identity explained the intention to recycle. Nigbur et al. (2010) also extended the theory of planned behaviour with additional concepts, including self-identity to predict kerbside recycling. Five-hundred-twenty-seven individuals filled in a questionnaire in the United Kingdom (UK). Self-identity predicted intentions and

behaviour directly, and these findings were replicated with self-reported recycling behaviours of 264 participants in another study. Terry et al. (1999) investigated the effect of self-identity and social identity constructs on the intention for household recycling. For this purpose, 143 residents in Brisbane, Australia were surveyed. Intention was measured by 'I intend to engage in household recycling during the next fortnight' on a seven-point scale. Three items measured self-identity: 'to engage in household recycling is an important part of who I am', 'I am not the type of person oriented to engage in household recycling' and 'I would feel a loss if were forced to give up household recycling'. They also recognised the importance of identity and revealed that self-identity had an indirect relationship with self-reported recycling behaviour over intention.

More directly related to travel behaviour were studies that investigated the influence of identity on pro-environmental behaviour in terms of holiday travel. Dickinson, Lumsdon and Robbins (2011) explored the relationship between mode choices, experience, environment, and environmental concerns by means of in-depth interviews with self-identified slow travellers, and indicate that there is much more scope to explore travel identity on tourism. Their research explored the importance of the environmental implications of tourism and showed that for some interviewees, environmental considerations acted as a driver for their slow travel, as well as many other life choices, whereas for others, these environmental considerations may have affected their mode choice, but did not directly affected their tourism choice. This implies that the context of a decision may be important as only some participants presented a consistent storyline binding their identity to environmental concerns both at home and as a tourist. Hibbert et al. (2013) investigated why individuals may act sustainably at home, but not when on a holiday. They explored travel histories of 24 participants recruited in Dorset, UK, all British and over 25 years of age. Using a narrative approach, they found that identity was an important determinant of travel decisions, sometimes even outweighing costs or environmental issues and that many individuals developed a sense of pride from either their own travelling or that of direct family members. Also McDonald et al., (2015) investigated why some individuals that consider themselves as 'green' still fly, and applied cognitive dissonance theory to investigate why identities do not match behaviour. They revealed four strategies: not

changing behaviour, but justifying it; reducing flying; changing other behaviour to compensate flying; and stopping flying all together.

These aforementioned studies revealed that identity has a relationship with pro-environmental behaviour. Mode choice may be similarly affected, given the impact of car travel on the environment and the presence of environmentally friendly alternatives. The next paragraphs will focus on studies that focus on travel behaviour specifically.

Identity and travel behaviour

Given the strong focus on pro-environmental behaviour, it may come as no surprise that in the field of travel behaviour, green travel modes—walking and especially cycling—received some attention as well. For example, Steinbach et al. (2011) explored whether the role of identity and identifying as a cyclists shaped the decision to cycle. To this end, interviews were conducted in London, UK with 78 individuals. Cycling in London was uncommon, and, as a possible consequence, individuals who cycled were more likely to potentially identify him/herself as cyclists. Women seemed to have greater difficulties with the stereotype of being a cyclist, possibly as being in conflict with other expectations that arise with being a woman. Gatersleben and Haddad (2010) investigated the difference in views of cyclists and non-cyclists in England and determined whether these views were associated to bicycle behaviour and intention to cycle. They conducted a survey (n=244) and identified four stereotypes towards cyclists: responsible, lifestyle, commuter and happy-go-lucky. Their analysis showed that cyclists and non-cyclists held different stereotypes for cyclists. Moreover, having cycled in the past and having the intention to cycle were positively associated with perceptions that the typical cyclist is a commuter or happy-go-lucky cyclist. These studies imply that cycling activity may be related to a strong cycling identity.

Whereas other studies have focussed on car ownership and use, the focus of Axsen, et al. (2013) was on social influence and preference formation towards pro-environmental technology generally and electric vehicles specifically, with attention paid to the importance of vehicles on a person's identity. Based on 21 semi-structured

interviews in the UK, they showed that social interaction may not only affect an individual's perception of electric vehicles, but also their own identity. For example, some respondents indicated that 'a car represents what I can achieve'. Musselwhite et al. (2014) also hinted at this role for cars by indicating that younger drivers are more likely to embrace the symbolic role of the car. Their study was on risky behaviour by means of focus groups (n=228). Focus groups were also used by Line et al. (2010) to reveal future travel behaviours of 11–18-year-olds. They found that next to practical benefits of cars, including freedom, and pleasure, many young people also believed a car would provide them with the identity of being an adult, an image of success and the respect of those already driving. Thus identity appeared to be linked to a positive attitude towards car ownership and driving. Similar findings appeared in studies on adults. Kent (2014) investigated the role of the car as a time-saving tool. They conducted semi-structured, in-depth interviews with 15 car drivers who would have had similar or shorter commute times by alternative modes. They found that despite the fact that car travel did not result in time savings, it remained appealing as it was flexible, offered autonomy and provided the sensory experience of being in a cocoon. Mann and Abraham (2006) conducted 18 semi-structured interviews with university car-user employees to reveal affective responses in transport mode choice. They concluded that car ownership to many was simply a given: it was a necessity for day-to-day use and for many participants the car seemed to be part of their identity. Another study on car use, but looking at a wider set of identities (Deutsch et al., 2013) investigated the role played by sense of place, two malls in Santa Barbara, California, USA on travel behaviour by using structural equations modelling (SEM) on survey data (n=719) collected in Santa Barbara (CA, USA). Place identity was one of these constructs and was measured by the following responses: 'reflects the type of person I am', 'says little about me', 'makes me feel I can be myself', and 'good reflection of my identity', which were combined into one factor score. The use of a car was associated with higher place identity. This indicates that place identity may predict mode choice.

Few studies have looked at the wider relationship between identity and mode choice in general. One study by Guell et al. (2012) examined the social context of commuting. They conducted 49 semi-structured interviews and 18 photo-elicitation interviews in

Cambridgeshire, UK and they revealed that participants showed ambiguities in their identities as commuters. They concluded that it seems to be difficult to ascribe clear commuter roles to individuals. Murtagh et al. (2010) quantitatively and qualitatively investigated the influence of salient identities on mode choice using a survey (n=267) among working parents in the UK. Travel mode was calculated by car mode share (number of trips by car divided by all trips). The researchers considered social identities (parent, spouse, family member, friend, worker and gender) as well as transport identities (driver, public transport user, cyclists and walker). They found that different identities prevailed for different types of journeys and that car use was embedded with social identities. For example, the identity of being a parent was associated with the mode choice to work, and being a worker was associated with car use to school. Other studies have tested the influence of identity quantitatively and often revealed associations with travel behaviour. Lois et al. (2015) tested the theory of planned behaviour on behavioural intention about commuting by bicycle using stages of change and added social identity. Five-hundred-ninety-five non-cycling commuters in Spain participated in a telephone survey. Social identity was measured with statement such as 'I identify myself as a cyclist', 'I can envision myself as a cyclist' and 'I think I have something in common with cyclists' on a seven-point scale ranging from strongly disagree to strongly agree. The stage of change were measured by 'I have never thought about cycling', 'I have never commuted by bicycle, but sometimes I consider it', and 'I sometimes commute by bicycle and I am seriously thinking about doing it more regularly'. They concluded that including social identity improved explanations of bicycle commuting. Moreover they reported that there was a strong link between identifying as a cyclist and perceived self-efficacy with respect to cycling.

Murtagh et al. (2012a) investigated the importance of identity on mode choice. To this end, 248 UK parents who owned a car and were living in both urban and rural areas filled out an Internet survey. They considered 7 identities: motorist, pedestrian, public transport user, cyclists (all transport identities), parent, worker and member of the local community (all social role identities). These were measured by 'how important to you is ... in defining who you are?' Travel mode choice was measured by asking the number of journeys of each type by the mode travelled the longest distance in one trip. This was multiplied by the usual number of journeys. Car, public transport and walking

were considered and they looked at work commute, school and other journeys. A stronger identity as a motorist corresponded with higher levels of use by car to work and other journeys, and was negatively associated with travelling by public transport to work and walking for other journeys. Identifying with being a motorist was not associated with mode choice for escorting a child to school, but other identities were. Identifying with being a parent increased the likelihood of walking children to school as was the identity of being a member of the local community for using public transport. A stronger identity as a user of public transport was positively associated with public transport use for all trip purposes, and negatively associated with commuting to work by car. Identifying as a worker was positively related to driving to school, and negatively associated with walking to school. This study is important as it shows that multiple identities may prevail, and that the type of identity that prevails may differ on the use of the transport mode.

Identity and changing travel behaviour

Some evidence suggested that identities may prevent a reduction of car use. Gardner and Abraham (2007) conducted 19 semi-structured interviews with regular car commuters in England. They showed that if respondents identified with being a motorist, any travel demand management (such as congestion charges) were met with negativity. Some participants also held other identities, such as identifying with being a resident, with being a pedestrian or with being public transport user and as such they could reflect more positively on policies that may restrict car use (in some areas). However, Whitmarsh and O'Neill (2010) found no significant association with reducing car use. They investigated self-identity on pro-environmental behaviours using a postal survey (n=551). Self-identity was measured by four items: 'I think of myself as an environmentally friendly consumer', 'I think of myself as someone who is very concerned with environmental issues', 'I would be embarrassed to be seen as having an environmentally friendly lifestyle' and 'I would not want my family and friends to think of me as someone who is concerned about environmental issues' on a five-point scale. They considered transport actions among other behaviours, including using the car less (e.g., seeking alternatives for short trips (< 3 miles/5 km)). They also included a measure of current frequency of use: 'how often do you personally use a car or van to travel either as a driver or a passenger'. Identity was not significantly associated

with reducing car use (in fact, it had slightly negative associations). A reason for this may be that the research was not focussed on travel behaviour.

Murtagh et al. (2012b) also investigated the role of self-identity to resistance of change controlling for past behaviour in 295 working parents. Resistance to change was measured as the inverse of intention to change as presented by 8 vignettes. Identity threat was measured in each vignette by 'it undermines my self-worth', 'it makes me feel less competent', 'I would need to change who I am' and 'it makes me feel less unique as a person' rated on a six-point scale. Identity centrality was measured by 'being a motorist/parent is important to who I am.' Half of the participants were presented with the parent variant, whereas the other half with the motorist variant, and all were presented with four scenarios that presented a threat to their identity, and four that were considered neutral. These results indicated that a threat towards someone's identity – in particular the salience of this identity – indeed may inhibit the willingness to change.

Research gaps and research focus

The above overview of existing research shows that whereas identity (both social, place, transport, and self-identity) has been recognised as a potential important predictor of behaviour as well as a deterrent to behavioural change, there is relatively limited scientific research available that investigates the relationship between identity and travel behaviour. Existing studies on pro-environmental behaviour and travel behaviour suggest that transport-related identities, self-identity and social identities sometimes prevail and influence our behaviour. Less evidence is available on the intention to change behaviour. The overview also revealed that only few identities have so far been considered in studies on travel behaviour and given that individuals have multiple identities, the role of different identities should be explored. Finally, it also appears that existing studies are geographically concentrated (i.e., mainly in the UK).

This study builds on this previous work and investigates the association between a large number of identity items with current mode choice and with the intention to change this mode choice. It adds to the existing research by considering four modes of transport (car, bicycle, walk, and public transport) opposed to existing studies, which

predominantly focus on one mode of transport. Given that transport identities, place identities, social identities, and self-identities have been found to predict behaviour, this study considers these with an additional focus on place identities, and includes more identity items than most existing studies that focus on mode choice. Most importantly, this study does not only focus on the existing behaviour, but also on the intention to change this behaviour.

3 Method

3.1 Setting and Data collection

Data were collected in June 2015 in Utrecht (approximate 335,000 inhabitants), the Netherlands. Utrecht is the fourth largest city in the Netherlands, and is home to a university and other higher education institutions. The city is centrally located in the Netherlands and Utrecht Central station is the main station in the country's train network.

Questionnaire data were collected by post in 2015, intended as the first part of a natural experimental study of the opening of a new (secondary) railway station in 2017. Municipality data were used to randomly approach individuals over 18 years of age and living in several areas of the city. Twenty-thousand requests to participate in an online survey were sent by regular mail. No reminders were sent. To avoid biasing recruitment and responses, the study was presented to participants as a study on travel behaviour change and the aim of evaluating the intervention and other predictors of behaviour and behavioural change, such as identity, were not made explicit to the potential respondents. One-thousand-sixty-two individuals finished the online survey.

3.2 Outcomes

The outcome measures were the proportions of the use of a mode based on a 14-day travel-to-and-from-work record of trips. For this study, we calculated the share of trips (i) involving any car use, (ii) involving any bicycling, (iii) involving any walking and (iv) involving any public transport use. For these analyses, we grouped these percentages into three groups of use: never, sometimes (using this mode on some days, but not every day) and always. Therefore, if an individual travelled using a combination of train and bicycle on every trip, they would be considered someone that is always using the

bicycle for (part of the) commute trip and always using the train for (part of the) commute trip.

The second outcome measure was the willingness to change. This was asked by 'to what extent do you intend to increase or decrease the use of the following modes (in the coming years)?'. We measured this willingness on a seven-point scale for three modes: car, bicycle and walking.

3.3 Predictors

Identity was measured with two questions. Respondents were asked (in Dutch) to indicate on a seven-point disagree/agree scale for 17 items to what extent respondents agreed with the statement 'I see myself as ...'. We considered the following items: 'Dutch', 'an inhabitant of Utrecht', 'a city dweller', 'a countryside-lover', 'a parent (father/mother)', 'a partner/spouse', 'dedicated to my family', 'identifying with my gender', 'environmentally friendly', 'healthy', 'sporty', 'career-oriented', 'innovative', 'a cyclist', 'a car driver', 'a pedestrian', and 'a public transport user'. These items were selected based on the literature review, which suggested that transport identities, place identity, social identities and self-identity may be associated with travel behaviour.

Therefore, we investigated four place identities related to (Dutch, Utrecht, city dweller, and countryside lover) that may be potentially important to the respondent, as well as investigated four mode-related identities (bicyclist, car driver, pedestrian, and public transport user). The existing literature also suggested that a social identity—identifying with being a parent—and two self-identities—being environmentally friendly and being career-oriented—may affect (travel) behaviour. Based on comments when testing the questionnaire and on our own expectations, we included three additional social/family-related identities (partner/spouse, gender, and family), and three identities related to self-identity (being 'healthy', 'sporty', and 'innovative', in addition to being environmentally friendly and being career-oriented).

Secondly, we also asked whether the respondents could indicate how important the same items were, 'for who they are' on a five-point scale ranging from 'very

unimportant' to 'very important'. The respondents were offered the possibility to indicate that they considered this question too difficult to answer, which was suggested when testing the questionnaire. A significant proportion of our respondents, varying by item, selected this option.

Given the large number of individuals who did not score the second identity question, we conducted our primary analyses with the scores on the first identity question only, and performed sensitivity analyses (see section 3.5) with the sum score of both identity questions. We tested the internal consistency of the two questions and found the following Cronbach's alphas for the respective items: Dutch (0.49), from Utrecht (0.61), city dweller (0.62), countryside-lover (0.67), parent (father/mother) (0.85), partner/spouse (0.77), dedicated to their family (0.80), identifying with their gender (0.61), environmentally friendly (0.23), healthy (0.38), sporty (0.76), career-oriented (0.16), innovative (0.70), cyclists (0.66), car driver (0.72), pedestrian (0.60), public transport user (0.68). The varying internal consistencies supported the decision to conduct the main analyses with the first identity question. Moreover, to explore whether the number of identity items could be reduced, a factor analysis was conducted that showed, as expected, limited possibilities for data reduction.

3.4 Covariates

The following covariates were considered in our analysis: gender, age, education level, income, being a student, living alone, car availability, bicycle availability, presence of children in the household, being Dutch, BMI and commute distance (Table 1). Several additional variables were measured but were not considered for the final models given their correlations with other independent variables: living with family, living with others (not family), working and being in the possession of a driving licence.

Table 1: Overview of variables

	n	%	mean	st.dev
Share of trips involving car	882		31.08	40.87
Share of trips made involving bicycle	882		61.14	43.13
Share of trips made involving walking	882		23.82	38.49
Share of trips involving public transport	882		23.77	38.43
Share of trips involving car	Did not use at all	461	52.3	
	Used sometimes	248	28.1	
	Used all the time	173	19.6	

Share of trips made involving bicycle	Did not use at all	232	26.3	
	Used sometimes	268	30.4	
	Used all the time	382	43.3	
Share of trips made involving walking	Did not use at all	572	64.9	
	Used sometimes	181	20.5	
	Used all the time	129	14.6	
Share of trips involving public transport	Did not use at all	563	63.8	
	Used sometimes	188	21.3	
	Used all the time	131	14.9	
Intention to change car use	Decrease	228	21.5	
	No change	517	46.7	
	Increase	317	29.9	
Intention to change bicycle use	Decrease	60	5.7	
	No change	453	42.7	
	Increase	549	51.7	
Intention to change levels of walking	Decrease	56	5.3	
	No change	548	51.6	
	Increase	458	43.1	
Identity	Dutch	1030	2.41	1.36
	Utrecht	1050	1.20	1.68
	Urban	1036	1.41	1.54
	Countryside-lover	1027	0.19	1.66
	Parent	1037	-0.92	2.71
	Partner	1038	0.21	2.64
	Family-oriented	1035	0.43	2.38
	Gender	1037	1.52	1.58
	Environmentally friendly	1049	1.21	1.28
	Healthy	1049	1.45	1.24
	Sporty	1047	0.85	1.51
	Career-oriented	1048	0.12	1.72
	Innovative	1043	0.54	1.36
	Bicyclists	1050	1.69	1.60
	Car driver	1032	0.03	2.09
	Pedestrian	1038	1.09	1.41
	Public transport users	1040	0.55	1.95
Identity Sum-score	Dutch	949	9.99	2.03
	Utrecht	986	8.69	2.43
	Urban	969	9.08	2.22
	Countryside-lover	947	7.16	2.44
	Parent	789	6.24	4.35
	Partner	852	8.10	3.89
	Family-oriented	833	8.08	3.68
	Gender	917	9.35	2.31
	Environmentally friendly	977	8.56	1.63
	Healthy	954	9.79	1.61
	Sporty	969	8.32	2.41
	Career-oriented	986	7.76	1.91
	Innovative	971	7.87	2.12
	Bicyclists	962	9.50	2.43
	Car driver	966	6.87	3.10
	Pedestrian	952	8.39	2.22
	Public transport users	959	7.63	2.84
Age		1047	40.89	13.99
Sex	Male	366	34.7	
	Female	689	65.3	
Dutch	Yes	956	8.0	
	No	83	92.0	
Received higher education	Yes	643	82.7	
	No	135	17.4	
Children at home	Yes	218	20.6	
	No	842	79.4	

Living alone	Yes	373	35.1
	No	689	64.9
Student	Yes	152	14.3
	No	910	85.7
Working	Yes	755	71.1
	No	307	28.9
Holding a driver licence	Yes	894	85.3
	No	154	14.7
Car availability	Yes, always	471	44.7
	Yes, mostly	130	12.4
	Yes, sometimes	192	18.2
	No, never	260	24.7
Bicycle availability	Yes, always	998	94.7
	Yes, mostly	14	1.3
	Yes, sometimes	9	0.9
	No, never	33	3.1
Pre-tax personal income	Not answered	153	14.7
	Less than half normal wage (< €17,000 a year)	207	19.9
	Between half and normal wage (€17,300–34,600)	261	25.1
	Between normal and twice normal wage (€34,600–69,200)	344	33.1
	More than twice normal wage (> €69,200)	75	7.2

3.5 Statistical methods

Separate multinomial regression models were estimated to test the association between identity and commute mode choice as well as the association between identity and willingness to change transport mode use. Only the identities to specific transport modes were included (e.g., identifying with being a cyclists for the analysis on whether an individual commuted by bicycle and for the analyses whether the individual intended to change their levels of cycling). We progressively adjusted the models by initially (1) estimating the effect of identity on the outcome variable, followed by (2) adding age and gender, (3) adding other sociodemographic variables and (4) finally including all covariates.

Each identity item was separately tested on each outcome variable. If $p < 0.05$ in the unadjusted models, the item was moved forward to the adjusted models. Each covariate was tested independently on every outcome variable and only adjusted for if $p < 0.25$ in the unadjusted models, except for age and gender, which were always included.

We conducted several sensitivity tests for the mode choice analyses, including (1) conducting the analyses and steps above with the sum-scores of all items of the two

identity questions, (2) the maximally adjusted models but only considering the use of a mode if a trip was exclusively made by this mode of transport, (3) the maximally adjusted model excluding education level to increase the number of cases (education level had many missing values), (4) the maximally adjusted model including the number of commute trips, and (5) the maximally adjusted models excluding all respondents with fewer than six commute trips. For the intention to change, we conducted sensitivity analyses 1, 3, 4 and 5.

4 Results

Below we present the results of the multivariate regression models. For each analysis, we first discuss the results from the maximally adjusted model followed by a discussion of the sensitivity test and covariates.

4.1 The association between identity and mode choice

Car use

Eight identity items were moved forward to the maximally adjusted models: being a parent, being a partner, environmentally friendly, healthy, sporty, career-oriented, innovative, and being a car driver (Table 2 and Appendix 1). In the fully adjusted model, only two identities remained significant. Identifying with being a car driver predicted sometimes using the car for (part of) the commute trip (relative risk ratio (RRR): 1.31; 95% Confidence Interval (95% CI): 1.15–1.49) as well as always using the car for (part of) the commute trip (RRR: 2.08; 95% CI: 1.70–2.54). This indicates that an individual who rated their own identity as a car driver one-point higher than someone else on the seven-point scale was 30% more likely to occasionally commute (part of the trip) by car and more than twice as likely to always commute (part of the trip) by car. The second significant identity item was identifying oneself with being family-oriented. This identity item was negatively associated with driving (at least part of the journey) to work on some days (RRR: 0.82; 95% CI: 0.67–1.00). This indicates that those who see themselves as family-oriented were less likely to sometimes use the car for commuting.

The sensitivity analyses yielded similar results. Focussing on the significant findings of the maximally adjusted models, the test revealed that identifying with being a car

user remained a strong predictor of occasionally using a car and using the car in all commute trips. The other RRRs were also almost identical in the sensitivity tests.

Several covariates predicted the use of the car. Never having or only sometimes having a car available (instead of always) decreased the likelihood to use a car for commuting, both sometimes and always. Individuals who have a longer commute were more likely to always commute by car, whereas individuals who had a child at home were less likely.

Table 2: Association between identity and car use

Use car sometimes		RRR	95% CI
Identity	Parent	1.04	[0.924,1.175]
	Partner	0.99	[0.907,1.087]
	Family-oriented	0.82*	[0.668,0.995]
	Healthy	0.99	[0.791,1.247]
	Sporty	1.08	[0.906,1.295]
	Career-oriented	1.08	[0.928,1.264]
	Innovative	1.07	[0.893,1.280]
	Car driver	1.31***	[1.153,1.488]
Use car always			
Identity	Parent	1.08	[0.922,1.255]
	Partner	1.04	[0.927,1.174]
	Family-oriented	0.83	[0.638,1.069]
	Healthy	0.89	[0.670,1.185]
	Sporty	0.93	[0.740,1.177]
	Career-oriented	1.04	[0.857,1.270]
	Innovative	1.00	[0.795,1.251]
	Car driver	2.08***	[1.700,2.538]
N		771	
pseudo R-sq		0.31	

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, income, being a student, car availability, bicycle availability, presence of children in the household, being Dutch, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

Bicycle use

Five identity items were significant in the unadjusted models and, therefore, included in the maximally adjusted models: environmentally friendly, healthy, sporty, career-oriented, and being a cyclist (Table 3 and Appendix 2). In the maximally adjusted model, only two identity items remained significant. Identifying with being a cyclist predicted sometimes using the bicycle for (part of) the commute trip (RRR: 1.84; 95%

CI: 1.47–2.30) as well as always using the bicycle for (part of) the commute trip (RRR: 2.86; 95% CI: 2.16–3.79). In other words, individuals that identify themselves as cyclists were per point increase on the identity item almost twice as likely to sometimes use a bicycle and almost three times as likely to always use a bicycle in a commute trip. Surprisingly, identifying as being sporty decreased the likelihood of always using a bicycle for at least part of their commute (RRR: 0.69; 95% CI: 0.53–0.90).

The sensitivity analyses mainly confirmed our findings. Identifying with being a cyclist remained significantly positively associated with bicycle use. Identifying with being sporty also continued to predict cycling, but had a less strong association with cycling the entire journey occasionally to work.

Having a car occasionally available (compared to always) increased the chance to occasionally use the bicycle for commuting purposes. Being a student, working and having a bicycle available increased the likelihood that someone always used the bicycle for (part of) their commute journey.

Table 3: Association between identity and bicycle use

Use bicycle sometimes		RRR	95% CI
Identity	Environmentally friendly	0.93	[0.717,1.192]
	Healthy	0.92	[0.682,1.244]
	Sporty	0.87	[0.684,1.117]
	Career-oriented	1.13	[0.937,1.351]
	Bicyclists	1.84***	[1.472,2.300]
Use bicycle always			
Identity	Environmentally friendly	1.00	[0.757,1.310]
	Healthy	1.11	[0.787,1.552]
	Sporty	0.69**	[0.535,0.902]
	Career-oriented	1.02	[0.842,1.234]
	Bicyclists	2.86***	[2.160,3.789]
N		579	
pseudo R-sq		0.26	

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, education level, income, being a student, car availability, bicycle availability, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

Walking

Six identity items were significant in the unadjusted models and carried forward to the maximally adjusted model—countryside-loving, healthy, sporty, career-oriented, innovative and being a pedestrian—but only identifying with being a pedestrian remained significant in the maximally adjusted model (Table 4 and Appendix 3). Individuals who identified as a pedestrian were 50% more likely to always include walking as part of their commute journey (RRR: 1.46, 95% CI: 1.18–1.80).

The sensitivity analyses showed similar results, but some small changes were observable. The association between identifying as a pedestrian and walking to work every day as part of the journey remained significant in all analyses, but this identity did not predict walking the entire journey to work (sensitivity test 2). Moreover, three identities were significant in a sensitivity test, which may indicate there is an association that the maximally adjusted models did not reveal. Being a countryside-lover predicted walking to work if education level was excluded, identifying with being sporty was positively associated with always walking to work when only trips entirely made on foot were considered, and the sum-score for identifying with being from Utrecht was negatively associated with sometimes walking to work.

Several covariates were associated with the likelihood of walking to work. A longer commute distance slightly increased the chance that individuals walked (part of the trip) to work both sometimes and always. Compared to individuals who had always access to a car, those with less frequent access walked more. Finally, more educated individuals were more likely to always have a walking element in their commute journey.

Table 4: Association between identity and walking

Walking sometimes		RRR	95% CI
Identity	Countryside-lover	1.09	[0.945,1.256]
	Healthy	1.10	[0.833,1.452]
	Sporty	1.04	[0.853,1.265]
	Career-oriented	1.11	[0.940,1.316]
	Innovative	1.06	[0.879,1.286]
	Pedestrian	1.13	[0.950,1.336]
Walking always			
Identity	Countryside-lover	1.10	[0.932,1.295]
	Healthy	0.98	[0.737,1.297]
	Sporty	0.91	[0.736,1.114]
	Career-oriented	0.91	[0.758,1.095]
	Innovative	1.09	[0.879,1.341]
	Pedestrian	1.46***	[1.185,1.803]
N		568	
pseudo R-sq		0.12	

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, education level, car availability, bicycle availability, presence of children in the household, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

Public transport use

Only five identity items were significant in the unadjusted models and carried forward to the maximally adjusted models: identifying as someone from Utrecht, as a healthy person, as a sporty person, as being career-oriented and being a public transport user (Table 5 and Appendix 4). In the maximally adjusted models, only identifying with being a public transport user remained significant. Individuals who gave themselves a one-point higher score on this identity item were respectively 72% and three times more likely to sometimes (RRR: 1.72; 95%CI: 1.44–2.06) or always (RRR: 3.01; 95% CI: 2.20–4.11) use public transport as part of their commute to work.

The sensitivity analyses showed similar outcomes, but whereas some identity items were not significant in the maximally adjusted models, they sometimes were borderline significant in the sensitivity analyses. As with walking, identifying with being a public transport user was not significant if 'using public transport for the entire journey' was the dependent variable.

Several socio-demographic and economic variables also predicted the use of public transport. Individuals that sometimes used public transport had longer commute distances, had no full-time access to a car and were more likely to be Dutch. Individuals who used public transport on every commute trip were more likely to have irregular or no access to a car.

Table 5: Association between identity and public transport use

Use public transport sometimes		RRR	95% CI
Identity	Utrecht	0.87	[0.748,1.018]
	Parent	1.05	[0.888,1.231]
	Healthy	1.01	[0.747,1.355]
	Sporty	1.09	[0.878,1.362]
	Career-oriented	1.15	[0.970,1.371]
	Public transport users	1.72***	[1.439,2.057]
Use public transport always			
Identity	Utrecht	0.97	[0.791,1.192]
	Parent	0.92	[0.741,1.139]
	Healthy	1.01	[0.690,1.478]
	Sporty	0.78	[0.597,1.022]
	Career-oriented	0.95	[0.756,1.196]
	Public transport users	3.01***	[2.197,4.113]
N		564	
pseudo R-sq		0.36	

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, education level, income, car availability, bicycle availability, presence of children in the household, being Dutch, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

4.2 The association between identity and willingness to change

The following results were derived from the multinomial regression analyses that tested the associations between identity and intention to change the level of use of the car, the level of cycling and the level of walking. No intention to change was the reference category in all analyses.

Car use

Seven identity items were significant in the unadjusted models and were carried forward to the maximally adjusted models. Two items remained significant. Individuals

who identified themselves with being a car driver were less likely planning to reduce their car use (RRR: 0.84; 95% CI: 0.71–1.00) and were more likely to intend to increase their car use (RRR: 1.17; 95% CI: 1.00–1.36) (Table 6 and Appendix 5). Identifying with being career-oriented also increased the intention to increase driving (RRR: 1.24; 95% CI: 1.06–1.44). The patterns and values were similar in the sensitivity test, but these tests showed changes in significance of the identity items.

Having a higher income reduced and having a higher BMI increased the likelihood of intending to decrease car use. Individuals who did not have a full-time access to a car were more likely to state they were planning to increase their car use, whereas with an increase of age, this intention was reduced.

Table 6: Association between identity and intention to change level of car use

Intention to decrease		RRR	95% CI
Identity	Dutch	0.92	[0.771,1.096]
	Urban	0.86	[0.723,1.028]
	Parent	1.13	[0.974,1.306]
	Partner	0.91	[0.792,1.040]
	Environmentally friendly	1.05	[0.851,1.295]
	Career-oriented	1.01	[0.862,1.188]
	Car driver	0.84*	[0.711,1.000]
Intention to increase			
Identity	Dutch	1.13	[0.926,1.370]
	Urban	0.88	[0.745,1.035]
	Parent	1.08	[0.920,1.255]
	Partner	0.92	[0.819,1.029]
	Environmentally friendly	0.87	[0.724,1.038]
	Career-oriented	1.24**	[1.059,1.445]
	Car driver	1.17*	[1.003,1.359]
N		570	
pseudo R-sq		0.16	

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, education level, income, being a student, living alone, car availability, bicycle availability, presence of children in the household, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

Bicycle use

Individuals who identified themselves with being cyclists were less likely to intend to reduce their bicycle use (RRR: 0.50; 95% CI: 0.35–0.71) (Table 7 and Appendix 6). This means that with every one-point increase in the self-stated seven-point scale bicycle identity ranking, the chances of planning to decrease bicycle use were halved. Individuals who saw themselves as countryside-loving were on average more likely to planning increasing their cycling levels (RRR: 1.12; 95% CI: 1.01–1.25). Identifying with being Dutch, urban, healthy and sporty were included in the maximally adjusted model, but were no longer significantly associated with the intention to change the level of cycling. All sensitivity tests showed corresponding results.

Individuals of Dutch origin, as well as those employed were less likely to plan to decrease their cycling levels. More highly educated individuals, however, were less likely planning to increase their cycling levels.

Table 7: Association between identity and intention to change level of bicycle use

Intention to decrease		RRR	95% CI
Identity	Dutch	1.12	[0.779,1.603]
	Urban	1.29	[0.921,1.804]
	Countryside-lover	0.99	[0.730,1.341]
	Healthy	0.87	[0.573,1.316]
	Sporty	0.97	[0.695,1.349]
	Bicyclists	0.50***	[0.347,0.707]
Intention to increase			
Identity	Dutch	1.01	[0.860,1.189]
	Urban	0.98	[0.863,1.104]
	Countryside-lover	1.12*	[1.007,1.249]
	Healthy	0.89	[0.741,1.058]
	Sporty	1.01	[0.883,1.159]
	Bicyclists	1.12	[0.964,1.296]
N		670	
pseudo R-sq		0.11	

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, income, being a student, car availability, bicycle availability, presence of children in the household, being Dutch, BMI and working status.

*p < 0.05; **p < 0.01, ***p < 0.001.

Walking

Only four identity items were carried forward to the maximally adjusted models: identifying as being Dutch, being family-oriented, as a healthy person, and being a pedestrian (Table 8 and Appendix 7). Individuals who identified with being a pedestrian were less likely to have an intention to reduce their walking activity for transport (RRR: 0.64; 95% CI: 0.46–0.89), and were more likely to intend to increase walking (RRR: 1.33; 95% CI: 1.15–1.55). Moreover, individuals who saw themselves as family-oriented were more likely to intend to increase their walking levels (RRR: 1.14; 95% CI: 1.03–1.27), whereas those who saw themselves as healthy were less likely to do so (RRR: 0.83; 95% CI: 0.69–1.00).

The sensitivity test largely showed similar results. Identifying as a pedestrian was similarly important. However, identifying with being family-oriented was only sometimes positively associated with intention to increase walking and the same held true for identifying with being healthy in a negative way.

The analyses also showed that individuals who lived alone or who were more highly educated were less likely to intend reducing their walking levels. With an increase in BMI, the intention to increase walking was found to be larger, but having a child or being more highly educated decreased this intention.

Table 8: Association between identity and intention to change level of walking

Intention to decrease		RRR	95% CI
Identity	Dutch	0.85	[0.574,1.247]
	Family-oriented	1.01	[0.780,1.303]
	Healthy	1.14	[0.708,1.849]
	Pedestrian	0.64**	[0.458,0.886]
Intention to increase			
Identity	Dutch	1.02	[0.856,1.205]
	Family-oriented	1.14*	[1.025,1.270]
	Healthy	0.83*	[0.692,0.997]
	Pedestrian	1.33***	[1.151,1.547]
N		574	
pseudo R-sq		0.11	

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

The analyses are adjusted for gender, age, education level, income, being a student, living alone, car availability, bicycle availability, presence of children in the household, being Dutch, BMI, working status and commute distance.

*p < 0.05; **p < 0.01, ***p < 0.001.

5 Discussion

Principle findings and interpretation findings on mode choice

Our findings showed that several identity items were associated with mode choice. Identifying with the respective transport mode in particular increased the likelihood of using that mode. Previous research reported similar findings. However, some studies also indicated that additional social identity and self-identity items were associated with mode choice (Murtagh et al., 2012a), which our findings only corroborate to a limited extent: only one social identity and one self-identity showed significant associations. It is possible that these differences can be explained by the identity items considered or perhaps there is a location-specific influence of certain identity items, which may explain differences between countries.

Identifying with being a bicyclist and being a public transport user were more strongly associated with the use of these respective modes than identifying with being a car driver with car use. Identifying with being a pedestrian was the least associated with walking to work. This finding may be explained by the mode share in the Netherlands, where most journeys are made by car, followed by the bicycle and public transport (Statline, 2015) and the use of more 'fringe modes' may depend more strongly on identifying with being a user of such a mode.

The associations between identifying with a transport mode and its respective use increased with the frequency of use for all modes. For example, individuals who identified more strongly as a car driver (one point higher on the seven-point scale) were 30% more likely to occasionally commute (part of the trip) by car and more than twice as likely to always commute (part of the trip) by car. This may indicate that identity does not only explain mode choice for a single trip, but also the frequency of use.

Only one social identity was significant: being family-oriented decreased occasional commuting by car. A similar finding was reported by Murtagh et al. (2010), who concluded in their study that the identity centrality of being a parent (one of the three

social role identities next to being a worker (in our study considered a self-identity) and being a member of the local community (in our study considered a place identity) was associated with commute mode choice. This findings show that for commute mode choice, this social identity appears important, but other social role identities appear to have limited importance.

Despite that in the unadjusted models, there was always at least one of the place identity items significantly associated with mode choice, in the maximally adjusted models, these associations attenuated and became insignificant. This may indicate that other identity items, in particular transport identities, are most salient in mode choice. Only one self-identity was associated with mode choice: identifying with being sporty was negatively associated with always cycling to work.

The sensitivity tests mostly confirmed the findings from the maximally adjusted models. This provides some evidence for the robustness of our models. Some differences were observed especially in models with a different outcome measure (i.e., using the mode for the entire trip instead if only part of trip).

Principle findings and interpretation findings on intention to change

With regards to the second research aim, we found that multiple identity items predicted the intention to change the mode of transport. For all modes (car, bicycle and walking), it was found that the more an individual identified with being a user of that mode, the more likely that individual resisted to decrease the use of that respective transport mode, indicated by a lower intention to reduce a mode. For car use and walking, these transport identities were also associated with an intention to increase the respective mode of travel. These findings build on the findings of Murtagh et al. (2012b) who concluded that a threat towards an individual's identity indeed may prevents willingness to change. Our findings, therefore, offer some support for this proposed hypothesis.

Additionally, other identity items were significantly associated with the intention to change, including two self-identity items—being career-oriented and being healthy. Individuals who identify with being healthy are less likely to increase cycling. This

finding is somewhat counterintuitive. One explanation may be that individuals with higher scores for identifying with being healthy are more likely to already be cycling regularly, and there is, therefore, limited opportunity to increase this further. Individuals, who are career-oriented, were more likely to intend to increase their car use. Car use is often perceived as a status symbol (Line et al., 2010), and as individuals who are career-oriented may also be more status-oriented, this may explain why car use is more appealing to individuals who are career-oriented.

Only one place identity and one social role identity showed a significant association in the maximally adjusted model. Namely, countryside lovers were more likely to intend to increase cycling and more family-oriented individuals showed a greater intention to increase walking. Both associations appear plausible, but it remains speculative why these exactly these identities prevailed. Those who identify as countryside lovers may potentially have a higher likelihood of intending to increase cycling as cycling allows for a greater appreciation of nature compared to most other modes.

Although not often significant in the maximally adjusted models (indicating other identities of covariates were more salient), we observed patterns in significant associations of particular identities in the unadjusted models. For the intention to change car use, all four identity types (place, transport, social-role, and self-identity) were associated with this intention. In contrast, for cycling, no social-role identity appeared to be important, whereas for walking, no self-identity was associated with the intention to change. Additionally, for bicycle use, social role identities were not associated with bicycle mode choice. This may imply that this type of identity is not important for this activity.

Similar to the mode choice analyses, it appears that transport identities are more salient than social-role identity, place identity, and self-identity. Therefore, changing the mode of transport may be considered a threat especially for those individuals who may not only use such modes, but also see themselves as users of that mode, i.e. identifying with being a user.

Strength and limitations

The key strengths of this study include the measurement of several identity items as well as multiple outcome measures of existing mode choice and intention to change mode choice. Nevertheless, this study has also several shortcomings. First, given the cross-sectional design, only associations and no causal relationships can be determined. This study contributes to the limited evidence on identity and travel behaviour change, and the next step is to test the influence of identity on actual behavioural change. Secondly, we did not test for the intention to change public transport use. Finally, the sample is not representative for the entire population of the city of Utrecht or the Netherlands and caution needs to be taken when transferred to another context.

6. Conclusion

This study confirmed existing studies that identities are associated with mode choice and more importantly that identities may prevent travel behaviour change. In particular, transport identities were important predictors of mode choice and intention to change. Additionally, social-role identities, self-identities and place identities were found to be associated with mode choice and intention to change this mode choice. Although these results are promising, additional research needs to be conducted to test whether identities are also associated with actual travel behaviour change, and whether identities are an independent predictor or perhaps act as a mediator for behaviour change. With these next steps, we may obtain the necessary knowledge to develop effective initiatives and policy to increase the sustainability, healthfulness and reliability of our transport system.

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Appendix 1: Association between identity and car use

		Maximally adjusted	sum score	UM car use	Without education	With number of trips	Restricted to number of trips > 6
Use car sometimes							
Identity	Parent	1.042 [0.924,1.175]	1.049 [0.935,1.177]	0.994 [0.876,1.127]	1.042 [0.924,1.175]	1.020 [0.903,1.153]	1.019 [0.899,1.155]
	Partner	0.993 [0.907,1.087]	1.007 [0.920,1.104]	0.990 [0.900,1.089]	0.993 [0.907,1.087]	0.995 [0.908,1.090]	0.992 [0.903,1.089]
	Environmentally friendly	0.815* [0.668,0.995]	0.921 [0.819,1.036]	0.824 [0.668,1.016]	0.815* [0.668,0.995]	0.826 [0.674,1.013]	0.747** [0.602,0.927]
	Healthy	0.993 [0.791,1.247]	0.934 [0.753,1.159]	1.001 [0.791,1.266]	0.993 [0.791,1.247]	0.961 [0.760,1.214]	1.001 [0.788,1.272]
	Sporty	1.083 [0.906,1.295]	1.134 [0.983,1.309]	1.049 [0.867,1.270]	1.083 [0.906,1.295]	1.083 [0.902,1.300]	1.124 [0.932,1.357]
	Career-oriented	1.083 [0.928,1.264]	0.985 [0.816,1.188]	1.113 [0.944,1.312]	1.083 [0.928,1.264]	1.084 [0.924,1.272]	1.105 [0.936,1.304]
	Innovative	1.069 [0.893,1.280]	1.063 [0.912,1.239]	1.014 [0.838,1.227]	1.069 [0.893,1.280]	1.069 [0.889,1.286]	1.116 [0.923,1.350]
	Car driver	1.310*** [1.153,1.488]	1.208** [1.079,1.353]	1.350*** [1.173,1.554]	1.310*** [1.153,1.488]	1.339*** [1.175,1.526]	1.340*** [1.171,1.534]
Sex (ref: male)		1.050 [0.682,1.615]	0.861 [0.497,1.493]	1.131 [0.721,1.773]	1.050 [0.682,1.615]	1.247 [0.798,1.949]	1.116 [0.712,1.750]
Age		0.984 [0.962,1.005]	0.969* [0.944,0.995]	0.994 [0.972,1.017]	0.984 [0.962,1.005]	0.992 [0.970,1.015]	0.989 [0.966,1.012]
Children at home (ref: no)	Yes	0.664 [0.338,1.306]	0.779 [0.350,1.735]	0.789 [0.388,1.602]	0.664 [0.338,1.306]	0.804 [0.401,1.612]	0.748 [0.371,1.509]
	Student (ref: no)	0.266* [0.074,0.961]	0.166* [0.0360,0.765]	0.193* [0.0443,0.844]	0.266* [0.0738,0.961]	0.375 [0.101,1.388]	0.301 [0.0762,1.188]
Dutch (ref: no)	Yes	0.818 [0.360,1.856]	1.314 [0.458,3.773]	0.704 [0.290,1.707]	0.818 [0.360,1.856]	0.876 [0.382,2.005]	1.004 [0.436,2.311]
	Working (ref: no)	0.608 [0.230,1.606]	0.420 [0.136,1.298]	0.354 [0.123,1.021]	0.608 [0.230,1.606]	0.475 [0.175,1.292]	0.476 [0.164,1.382]
Commute distance		1.008 [1.000,1.016]	1.011* [1.000,1.023]	1.002 [0.994,1.011]	1.008 [1.000,1.016]	1.009* [1.000,1.017]	1.010* [1.001,1.018]
Car availability (ref: yes, always)	Yes, mostly	0.670 [0.392,1.144]	0.681 [0.358,1.294]	0.633 [0.365,1.096]	0.670 [0.392,1.144]	0.701 [0.407,1.207]	0.674 [0.386,1.174]
	Yes, sometimes	0.287*** [0.159,0.517]	0.233*** [0.108,0.504]	0.289*** [0.151,0.553]	0.287*** [0.159,0.517]	0.301*** [0.165,0.549]	0.265*** [0.143,0.490]
	No, never	0.0876*** [0.038,0.203]	0.0628*** [0.021,0.189]	0.0272*** [0.006,0.124]	0.0876*** [0.0377,0.203]	0.0970*** [0.0412,0.228]	0.0793*** [0.0334,0.188]
Bicycle availability (ref: other availability)	Yes, always	0.574 [0.173,1.902]	0.467 [0.124,1.768]	0.484 [0.133,1.769]	0.574 [0.173,1.902]	0.681 [0.189,2.455]	0.795 [0.226,2.790]
	Personal income (ref: less than half normal wage)	0.709 [0.277,1.815]	0.724 [0.222,2.367]	0.719 [0.245,2.107]	0.709 [0.277,1.815]	0.603 [0.229,1.587]	0.598 [0.215,1.661]
	Between half and normal wage	0.729 [0.314,1.689]	0.647 [0.233,1.794]	0.968 [0.370,2.534]	0.729 [0.314,1.689]	0.652 [0.277,1.534]	0.666 [0.266,1.665]
	Between normal and twice normal wage	0.932 [0.405,2.145]	1.165 [0.425,3.195]	1.212 [0.474,3.100]	0.932 [0.405,2.145]	0.847 [0.363,1.978]	0.736 [0.294,1.839]
	More than twice normal wage	1.233 [0.428,3.549]	2.007 [0.562,7.160]	2.223 [0.717,6.892]	1.233 [0.428,3.549]	1.019 [0.345,3.013]	0.981 [0.313,3.076]
BMI		1.027 [0.963,1.097]	1.034 [0.949,1.127]	1.022 [0.954,1.094]	1.027 [0.963,1.097]	1.025 [0.959,1.095]	1.043 [0.972,1.118]
Number of trips						1.082*** [1.044,1.122]	
Use car always							
Identity	Parent	1.076 [0.922,1.255]	1.052 [0.909,1.219]	1.034 [0.885,1.208]	1.076 [0.922,1.255]	1.079 [0.919,1.266]	1.026 [0.861,1.222]
	Partner	1.043 [0.927,1.174]	0.998 [0.882,1.128]	1.012 [0.899,1.139]	1.043 [0.927,1.174]	1.028 [0.910,1.162]	1.012 [0.889,1.152]
	Environmentally friendly	0.826 [0.638,1.069]	1.008 [0.859,1.183]	0.888 [0.686,1.148]	0.826 [0.638,1.069]	0.832 [0.639,1.082]	0.674** [0.503,0.903]
	Healthy	0.891	0.740*	0.899	0.891	0.864	0.917

	Sporty	[0.670,1.185] 0.933	[0.566,0.967] 1.124	[0.675,1.196] 0.900	[0.670,1.185] 0.933	[0.646,1.156] 0.930	[0.663,1.269] 1.015
	Career-oriented	[0.740,1.177] 1.043	[0.937,1.349] 0.937	[0.714,1.135] 1.045	[0.740,1.177] 1.043	[0.731,1.182] 1.028	[0.785,1.313] 1.040
	Innovative	[0.857,1.270] 0.997	[0.741,1.184] 1.022	[0.856,1.276] 0.927	[0.857,1.270] 0.997	[0.841,1.256] 1.028	[0.828,1.307] 0.981
	Car driver	[0.795,1.251] 2.077***	[0.843,1.240] 1.605***	[0.739,1.163] 2.027***	[0.795,1.251] 2.077***	[0.815,1.296] 2.108***	[0.760,1.266] 2.532***
		[1.700,2.538]	[1.352,1.906]	[1.642,2.502]	[1.700,2.538]	[1.714,2.592]	[1.963,3.266]
Sex (ref: male)	Female	0.919 [0.531,1.591]	0.968 [0.476,1.969]	0.882 [0.512,1.522]	0.919 [0.531,1.591]	0.755 [0.427,1.335]	0.980 [0.536,1.789]
Age		0.979 [0.952,1.007]	0.972 [0.940,1.006]	0.977 [0.949,1.005]	0.979 [0.952,1.007]	0.972 [0.944,1.000]	0.988 [0.957,1.021]
Children at home (ref: no)	Yes	0.414* [0.174,0.989]	0.445 [0.160,1.236]	0.656 [0.274,1.567]	0.414* [0.174,0.989]	0.409 [0.167,1.005]	0.549 [0.206,1.465]
Student (ref: no)	Yes	1.842 [0.235,14.400]	0.341 [0.023,5.067]	0.854 [0.107,6.832]	1.842 [0.235,14.400]	1.380 [0.171,11.130]	1.036 [0.065,16.590]
Dutch (ref: no)	Yes	0.532 [0.186,1.522]	1.070 [0.266,4.310]	0.581 [0.200,1.687]	0.532 [0.186,1.522]	0.546 [0.190,1.571]	0.646 [0.204,2.041]
Working (ref: no)	Yes	1.495 [0.359,6.225]	1.869 [0.318,10.980]	0.726 [0.172,3.068]	1.495 [0.359,6.225]	1.625 [0.393,6.724]	1.339 [0.230,7.799]
Commute distance		1.024*** [1.014,1.035]	1.031*** [1.016,1.046]	1.018*** [1.008,1.029]	1.024*** [1.014,1.035]	1.025*** [1.015,1.036]	1.029*** [1.016,1.041]
Car availability (ref: yes, always)	Yes, mostly	0.165*** [0.074,0.376]	0.192*** [0.077,0.475]	0.185*** [0.081,0.424]	0.165*** [0.073,0.376]	0.151*** [0.065,0.349]	0.171*** [0.069,0.424]
	Yes, sometimes	0.009*** [0.001,0.080]	0.000 [0.,]	0.000 [0.,]	0.009*** [0.001,0.08]	0.007*** [0.001,0.067]	0.000 [0.,]
	No, never	0.030*** [0.006,0.153]	0.000 [0.,]	0.018*** [0.002,0.165]	0.030*** [0.006,0.153]	0.0248*** [0.005,0.133]	0.000 [0.,]
Bicycle availability (ref: other availability)	Yes, always	0.183* [0.047,0.717]	0.189* [0.042,0.862]	0.165** [0.042,0.646]	0.183* [0.047,0.717]	0.140** [0.033,0.591]	0.286 [0.066,1.235]
Personal income (ref: less than half normal wage)	Not answered	2.365 [0.550,10.170]	0.965 [0.159,5.863]	1.796 [0.398,8.095]	2.365 [0.550,10.170]	3.555 [0.777,16.270]	2.357 [0.330,16.860]
	Between half and normal wage	2.460 [0.636,9.519]	1.394 [0.294,6.605]	2.231 [0.552,9.022]	2.460 [0.636,9.519]	3.611 [0.864,15.090]	3.896 [0.609,24.930]
	Between normal and twice normal wage	1.927 [0.506,7.339]	1.482 [0.315,6.981]	1.911 [0.482,7.578]	1.927 [0.506,7.339]	2.522 [0.619,10.280]	1.928 [0.307,12.120]
	More than twice normal wage	2.096 [0.444,9.889]	1.904 [0.309,11.740]	2.539 [0.519,12.430]	2.096 [0.444,9.889]	3.064 [0.606,15.490]	2.240 [0.290,17.310]
BMI		1.039 [0.955,1.131]	1.015 [0.907,1.137]	1.020 [0.936,1.111]	1.039 [0.955,1.131]	1.023 [0.940,1.113]	1.089 [0.990,1.197]
Number of trips						0.938* [0.894,0.985]	
	N	771	507	771	771	771	701
	pseudo R-sq	0.31	0.33	0.32	0.31	0.34	0.33

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

UM: Unimodal. Trip entirely made by car.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 2: Association between identity and bicycle use

		Maximally adjusted	sum score	UM bicycle use	Without education	With number of trips	Restricted to number of trips > 6
Use bicycle sometimes							
Identity	Environmentally friendly	0.925 [0.717,1.192]	0.998 [0.789,1.263]	0.822 [0.657,1.028]	0.934 [0.757,1.154]	0.940 [0.721,1.226]	0.959 [0.725,1.268]
	Healthy	0.921 [0.682,1.244]	0.936 [0.745,1.176]	1.008 [0.762,1.333]	0.981 [0.771,1.248]	0.911 [0.659,1.260]	0.842 [0.605,1.172]
	Sporty	0.874 [0.684,1.117]	0.921 [0.790,1.073]	0.912 [0.742,1.122]	0.875 [0.716,1.069]	0.858 [0.660,1.115]	0.866 [0.661,1.134]
	Career-oriented	1.125 [0.937,1.351]	1.063 [0.860,1.315]	1.114 [0.944,1.315]	1.156 [0.995,1.344]	1.149 [0.945,1.396]	1.142 [0.929,1.404]
	Bicyclists	1.840*** [1.472,2.300]	1.506*** [1.294,1.752]	1.617*** [1.297,2.016]	1.701*** [1.433,2.020]	1.883*** [1.497,2.368]	1.954*** [1.533,2.490]
Sex (ref: male)	Female	1.182 [0.687,2.034]	0.903 [0.503,1.620]	1.217 [0.744,1.993]	1.372 [0.874,2.154]	1.740 [0.970,3.120]	1.200 [0.664,2.170]
Age		1.005 [0.979,1.031]	0.986 [0.959,1.013]	0.998 [0.975,1.021]	1.005 [0.984,1.027]	1.022 [0.994,1.051]	1.013 [0.984,1.043]
Student (ref: no)	Yes	1.531 [0.300,7.821]	1.090 [0.205,5.803]	0.552 [0.148,2.061]	0.834 [0.212,3.285]	2.599 [0.492,13.73]	1.385 [0.154,12.49]
Working (ref: no)	Yes	1.070 [0.309,3.708]	1.207 [0.330,4.408]	0.624 [0.206,1.895]	0.789 [0.299,2.083]	0.731 [0.214,2.497]	0.434 [0.0971,1.941]
Commute distance		0.994 [0.984,1.004]	0.995 [0.985,1.005]	0.958*** [0.947,0.969]	0.986** [0.978,0.995]	0.994 [0.984,1.004]	0.995 [0.984,1.006]
Car availability (ref: yes, always)	Yes, mostly	2.798* [1.276,6.137]	2.279* [1.017,5.105]	2.163* [1.053,4.441]	2.623** [1.349,5.100]	2.896* [1.259,6.659]	3.428** [1.433,8.204]
	Yes, sometimes	4.023** [1.480,10.93]	3.327* [1.202,9.210]	0.726 [0.369,1.428]	5.688*** [2.242,14.43]	4.150** [1.488,11.57]	5.502** [1.621,18.68]
	No, never	1.479 [0.593,3.689]	1.499 [0.560,4.011]	0.643 [0.314,1.314]	1.930 [0.872,4.272]	1.868 [0.720,4.843]	1.373 [0.479,3.939]
Bicycle availability (ref: other availability)	Yes, always	4.953* [1.017,24.12]	5.680* [1.021,31.60]	2.224 [0.524,9.439]	3.080 [0.980,9.685]	5.044 [0.965,26.37]	3.999 [0.668,23.93]
Received higher education (ref: no)	Yes	1.257 [0.580,2.723]	1.811 [0.811,4.041]	1.186 [0.565,2.492]		1.439 [0.651,3.183]	1.273 [0.550,2.947]
Personal income (before tax) (ref: less than half normal wage)	Not answered	0.857 [0.246,2.987]	1.119 [0.287,4.356]	1.090 [0.385,3.087]	0.933 [0.312,2.788]	0.692 [0.191,2.508]	0.792 [0.156,4.011]
	Between half and normal wage	0.678 [0.209,2.194]	0.452 [0.129,1.588]	0.490 [0.194,1.242]	0.640 [0.234,1.749]	0.549 [0.165,1.826]	0.514 [0.116,2.277]
	Between normal and twice normal wage	0.956 [0.298,3.067]	0.665 [0.191,2.318]	0.556 [0.219,1.410]	1.294 [0.474,3.533]	0.848 [0.256,2.803]	0.853 [0.188,3.869]
	More than twice normal wage	1.328 [0.342,5.157]	1.337 [0.304,5.871]	1.660 [0.519,5.311]	1.497 [0.469,4.774]	0.878 [0.215,3.584]	1.254 [0.228,6.879]
BMI		0.995 [0.915,1.082]	0.989 [0.905,1.080]	0.989 [0.919,1.065]	0.975 [0.910,1.044]	1.001 [0.918,1.091]	0.947 [0.862,1.041]
Number of trips						1.160*** [1.104,1.219]	
Use bicycle always							
Identity	Environmentally friendly	0.996 [0.757,1.310]	1.108 [0.860,1.428]	0.823 [0.627,1.080]	1.107 [0.879,1.396]	1.004 [0.761,1.326]	1.103 [0.809,1.503]
	Healthy	1.105 [0.787,1.552]	0.946 [0.738,1.211]	1.111 [0.795,1.552]	0.903 [0.690,1.182]	1.125 [0.793,1.597]	1.000 [0.685,1.462]
	Sporty	0.694** [0.535,0.902]	0.836* [0.712,0.981]	0.873 [0.685,1.113]	0.744** [0.601,0.922]	0.693** [0.530,0.907]	0.710* [0.531,0.949]
	Career-oriented	1.019 [0.842,1.234]	0.959 [0.765,1.202]	0.900 [0.745,1.087]	1.019 [0.868,1.195]	1.037 [0.853,1.261]	0.999 [0.804,1.242]
	Bicyclists	2.861*** [2.160,3.789]	1.841*** [1.541,2.199]	2.180*** [1.585,2.997]	2.487*** [2.014,3.071]	2.886*** [2.175,3.830]	2.771*** [2.054,3.737]
Sex (ref: male)	Female	1.218 [0.680,2.182]	1.013 [0.544,1.889]	1.424 [0.790,2.568]	1.263 [0.772,2.066]	1.456 [0.795,2.665]	1.249 [0.654,2.385]
Age		1.019 [0.991,1.047]	1.003 [0.975,1.032]	1.013 [0.986,1.039]	1.026* [1.002,1.049]	1.027 [0.998,1.057]	1.022 [0.991,1.055]
Student (ref: no)	Yes	6.239* [1.089,35.73]	4.547 [0.726,28.48]	3.392 [0.696,16.54]	3.924 [0.893,17.24]	8.343* [1.455,47.84]	3.065 [0.293,32.06]

Working (ref: no)	Yes	5.028* [1.226,20.63]	6.208* [1.385,27.82]	2.689 [0.681,10.62]	4.639** [1.514,14.21]	4.940* [1.213,20.13]	2.060 [0.366,11.59]
Commute distance		0.991 [0.981,1.002]	0.989* [0.978,1.000]	0.867*** [0.833,0.903]	0.984*** [0.974,0.993]	0.990 [0.980,1.001]	0.990 [0.979,1.002]
Car availability (ref: yes, always)	Yes, mostly	2.879* [1.224,6.772]	2.170 [0.902,5.221]	1.809 [0.724,4.520]	3.256** [1.592,6.658]	2.965* [1.227,7.163]	3.740** [1.442,9.699]
	Yes, sometimes	17.030*** [6.248,46.42]	13.250*** [4.775,36.79]	1.047 [0.465,2.361]	26.670*** [10.48,67.86]	17.600*** [6.406,48.37]	27.140*** [7.881,93.46]
	No, never	9.008*** [3.753,21.62]	10.140*** [3.947,26.06]	1.336 [0.603,2.959]	12.32*** [5.750,26.38]	10.660*** [4.356,26.11]	11.200*** [4.066,30.83]
Bicycle availability (ref: other availability)	Yes, always	11.200** [1.782,70.35]	27.800** [3.379,228.7]	4.791 [0.445,51.62]	10.560** [2.264,49.24]	11.090* [1.725,71.32]	5.732 [0.719,45.70]
Received higher education (ref: no)	Yes	1.103 [0.486,2.503]	1.729 [0.738,4.049]	0.653 [0.296,1.443]		1.218 [0.537,2.765]	0.867 [0.351,2.145]
Personal income (before tax) (ref: less than half normal wage)	Not answered	1.027 [0.286,3.684]	1.350 [0.328,5.565]	2.082 [0.660,6.563]	0.865 [0.280,2.677]	0.864 [0.241,3.098]	0.768 [0.142,4.163]
	Between half and normal wage	0.655 [0.198,2.168]	0.408 [0.114,1.464]	0.445 [0.152,1.304]	0.661 [0.240,1.826]	0.549 [0.166,1.821]	0.398 [0.0858,1.844]
	Between normal and twice normal wage	0.893 [0.270,2.956]	0.606 [0.168,2.192]	0.876 [0.301,2.545]	0.787 [0.280,2.210]	0.789 [0.238,2.622]	0.731 [0.153,3.485]
	More than twice normal wage	0.705 [0.160,3.104]	0.758 [0.153,3.769]	1.101 [0.236,5.129]	0.594 [0.166,2.128]	0.547 [0.123,2.427]	0.723 [0.115,4.533]
BMI		0.948 [0.866,1.037]	0.909 [0.824,1.003]	0.969 [0.885,1.061]	0.907* [0.841,0.978]	0.954 [0.872,1.043]	0.872* [0.785,0.969]
Number of trips						1.071** [1.017,1.127]	
N		579	498	579	797	579	517
pseudo R-sq		0.26	0.25	0.29	0.26	0.30	0.28

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

UM: Unimodal. Trip entirely made by bicycle.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 3: Association between identity and walking

		Maximally adjusted	sum score	UM walking	Without education	With number of trips	Restricted to number of trips > 6
Walking sometimes							
Identity	Countryside-lover	1.089 [0.945,1.256]		0.872 [0.666,1.143]	1.079 [0.958,1.217]	1.069 [0.923,1.237]	1.084 [0.936,1.256]
	Healthy	1.100 [0.833,1.452]		0.817 [0.514,1.298]	1.157 [0.928,1.443]	1.095 [0.818,1.465]	1.045 [0.782,1.396]
	Sporty	1.039 [0.853,1.265]		1.345 [0.910,1.986]	1.013 [0.860,1.193]	1.005 [0.818,1.235]	1.030 [0.838,1.267]
	Career-oriented	1.112 [0.940,1.316]		1.177 [0.847,1.636]	1.070 [0.932,1.228]	1.098 [0.922,1.308]	1.083 [0.906,1.293]
	Innovative	1.063 [0.879,1.286]		0.857 [0.609,1.208]	1.070 [0.910,1.259]	1.044 [0.857,1.272]	1.109 [0.910,1.351]
	Pedestrian	1.126 [0.950,1.336]		0.874 [0.656,1.165]	1.147 [0.992,1.326]	1.162 [0.973,1.388]	1.124 [0.938,1.346]
	Identity (sum-score)						
	Utrecht		0.909 [0.819,1.009]				
	Environmentally friendly		1.035 [0.834,1.284]				
	Healthy		1.029 [0.833,1.272]				
	Sporty		1.011 [0.890,1.148]				
	Career-oriented		1.100 [0.907,1.334]				
	Pedestrian		1.066 [0.948,1.199]				
Sex (ref: male)	Female	0.901 [0.560,1.450]	0.738 [0.442,1.234]	0.642 [0.273,1.508]	1.020 [0.681,1.526]	1.120 [0.678,1.849]	0.874 [0.534,1.430]
Age		0.996 [0.977,1.016]	0.984 [0.963,1.006]	0.995 [0.962,1.029]	0.995 [0.979,1.011]	0.997 [0.976,1.018]	0.992 [0.971,1.013]
Children at home (ref: no)	Yes	0.732 [0.416,1.289]	0.995 [0.544,1.822]	0.290 [0.064,1.318]	0.749 [0.470,1.193]	0.856 [0.479,1.530]	0.738 [0.409,1.335]
Commute distance		1.026*** [1.017,1.035]	1.026*** [1.016,1.035]	0.985 [0.965,1.005]	1.024*** [1.016,1.032]	1.026*** [1.017,1.036]	1.026*** [1.016,1.036]
Car availability (ref: yes, always)	Yes, mostly	1.825 [0.918,3.627]	1.851 [0.906,3.780]	1.317 [0.384,4.513]	1.428 [0.793,2.571]	1.761 [0.873,3.552]	1.822 [0.907,3.662]
	Yes, sometimes	2.834*** [1.528,5.257]	3.049** [1.560,5.960]	0.370 [0.075,1.830]	2.797*** [1.657,4.723]	3.065*** [1.618,5.806]	2.548** [1.344,4.831]
	No, never	1.664 [0.888,3.120]	1.488 [0.746,2.966]	1.341 [0.485,3.714]	1.638 [0.970,2.765]	2.019* [1.051,3.879]	1.711 [0.891,3.286]
Bicycle availability (ref: other availability)	Yes, always	0.662 [0.200,2.194]	0.651 [0.191,2.221]	0.271 [0.067,1.096]	0.603 [0.241,1.508]	0.557 [0.163,1.903]	0.795 [0.229,2.760]
Received higher education (ref: no)	Yes	1.179 [0.588,2.365]	0.963 [0.459,2.018]	0.779 [0.265,2.288]		1.160 [0.568,2.369]	1.260 [0.624,2.546]
BMI	BMI	0.987 [0.914,1.066]	0.975 [0.895,1.062]	1.118 [0.987,1.267]	0.992 [0.930,1.057]	0.981 [0.904,1.064]	0.991 [0.914,1.074]
Number of trips						1.098*** [1.058,1.141]	
Walking always							
Identity	Countryside-lover	1.099 [0.932,1.295]		1.478 [0.560,3.906]	1.181* [1.024,1.363]	1.101 [0.933,1.298]	1.116 [0.929,1.341]
	Healthy	0.978 [0.737,1.297]		0.320 [0.078,1.316]	1.020 [0.800,1.300]	0.979 [0.738,1.300]	0.901 [0.660,1.230]
	Sporty	0.906 [0.736,1.114]		3.577* [1.131,11.310]	0.908 [0.753,1.094]	0.911 [0.741,1.120]	0.840 [0.671,1.052]
	Career-oriented	0.911 [0.758,1.095]		0.353 [0.093,1.341]	0.957 [0.816,1.122]	0.908 [0.755,1.092]	0.937 [0.763,1.150]
	Innovative	1.085 [0.879,1.341]		2.940 [0.878,9.847]	1.082 [0.899,1.301]	1.080 [0.873,1.335]	1.104 [0.878,1.389]
	Pedestrian	1.462*** [1.185,1.803]		1.000 [0.310,3.219]	1.445*** [1.199,1.742]	1.472*** [1.193,1.818]	1.594*** [1.253,2.027]
	Identity (sum-score)						
	Utrecht		0.906 [0.807,1.017]				

	Environmentally friendly		0.966 [0.765,1.220]				
	Healthy		0.946 [0.756,1.184]				
	Sporty		0.928 [0.810,1.063]				
	Career-oriented		1.035 [0.836,1.281]				
	Pedestrian		1.215** [1.058,1.395]				
Sex (ref: male)	Female	0.791 [0.463,1.351]	0.775 [0.433,1.388]	0.963 [0.082,11.260]	0.733 [0.461,1.166]	0.791 [0.460,1.359]	0.708 [0.395,1.270]
Age		1.007 [0.985,1.028]	1.010 [0.988,1.033]	1.191 [0.978,1.450]	1.001 [0.982,1.021]	1.007 [0.986,1.029]	1.005 [0.980,1.031]
Children at home (ref: no)	Yes	0.665 [0.333,1.325]	0.678 [0.319,1.439]	0.000 [0,.]	0.742 [0.419,1.315]	0.647 [0.322,1.298]	0.642 [0.299,1.376]
Commute distance		1.031*** [1.021,1.042]	1.029*** [1.018,1.039]	0.919 [0.825,1.025]	1.034*** [1.024,1.043]	1.031*** [1.021,1.042]	1.033*** [1.022,1.044]
Car availability (ref: yes, always)	Yes, mostly	2.858* [1.234,6.621]	2.165 [0.897,5.225]	0.000 [0,.]	2.432* [1.166,5.071]	2.879* [1.237,6.699]	2.547* [1.030,6.301]
	Yes, sometimes	6.702*** [3.302,13.600]	5.626*** [2.629,12.040]	1266.800* [1.153,1391816.800]	6.695*** [3.626,12.360]	6.891*** [3.388,14.020]	5.622*** [2.618,12.070]
	No, never	3.450*** [1.707,6.971]	3.076** [1.462,6.471]	128.500 [0.211,78395.200]	3.331*** [1.797,6.173]	3.522*** [1.733,7.156]	3.321** [1.540,7.159]
Bicycle availability (ref: other availability)	Yes, always	0.382 [0.124,1.178]	0.651 [0.189,2.243]	0.002 [<0.001,4.483]	0.520 [0.195,1.387]	0.380 [0.123,1.176]	0.711 [0.191,2.646]
Received higher education (ref: no)	Yes	2.802* [1.135,6.918]	2.043 [0.792,5.269]	0.201 [0.012,3.483]		2.878* [1.157,7.155]	4.370** [1.456,13.11]
BMI		1.031 [0.956,1.113]	1.011 [0.928,1.102]	1.306 [0.921,1.852]	1.018 [0.951,1.090]	1.034 [0.958,1.115]	1.044 [0.958,1.137]
Number of trips						1.003 [0.962,1.046]	
N		568	490	568	776	568	506
pseudo R-sq		0.12	0.12	0.26	0.11	0.15	0.13

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

UM: Unimodal. Trip entirely made on foot.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 4: Association between identity and public transport use

		Maximally adjusted	sum score	UM pt use	Without education	With number of trips	Restricted to number of trips > 6
Use public transport sometimes							
Identity	Utrecht	0.872 [0.748,1.018]	0.920 [0.807,1.049]	0.890 [0.661,1.197]	0.867* [0.767,0.980]	0.868 [0.741,1.017]	0.842* [0.710,0.997]
	Parent	1.046 [0.888,1.231]	0.958 [0.843,1.090]	0.987 [0.691,1.410]	0.982 [0.869,1.109]	1.021 [0.863,1.208]	1.105 [0.926,1.319]
	Environmentally friendly (sum score only)		1.031 [0.781,1.363]				
	Healthy	1.006 [0.747,1.355]	0.949 [0.717,1.255]	0.572 [0.326,1.002]	1.146 [0.904,1.453]	0.978 [0.718,1.333]	0.951 [0.688,1.316]
	Sporty	1.094 [0.878,1.362]	1.062 [0.899,1.255]	2.236** [1.283,3.899]	1.014 [0.846,1.215]	1.079 [0.858,1.356]	1.105 [0.865,1.410]
	Career-oriented	1.153 [0.970,1.371]	0.993 [0.778,1.268]	0.715 [0.487,1.051]	1.181* [1.023,1.362]	1.164 [0.971,1.395]	1.171 [0.957,1.434]
	Public transport users	1.721*** [1.439,2.057]	1.352*** [1.175,1.557]	1.172 [0.819,1.679]	1.722*** [1.489,1.992]	1.779*** [1.478,2.141]	1.797*** [1.475,2.189]
Sex (ref: male)	Female	0.862 [0.505,1.469]	0.836 [0.434,1.610]	2.092 [0.605,7.235]	1.054 [0.674,1.649]	1.036 [0.594,1.807]	0.778 [0.435,1.393]
Age		0.986 [0.961,1.011]	0.981 [0.953,1.010]	0.970 [0.919,1.025]	0.993 [0.974,1.013]	0.993 [0.966,1.020]	0.983 [0.952,1.015]
Children at home (ref: no)	Yes	0.400 [0.152,1.051]	0.804 [0.265,2.440]	0.000 [0.]	0.758 [0.360,1.594]	0.573 [0.212,1.554]	0.302* [0.107,0.852]
Dutch (ref: no)	Yes	3.441* [1.142,10.37]	8.388** [1.675,42.02]	1.875 [0.208,16.88]	2.309 [0.958,5.567]	3.817* [1.212,12.02]	2.949 [0.929,9.366]
Working (ref: no)	Yes	1.906 [0.801,4.537]	1.428 [0.487,4.185]	0.210 [0.035,1.257]	1.437 [0.722,2.862]	1.057 [0.416,2.685]	1.387 [0.538,3.578]
Commute distance		1.047*** [1.033,1.061]	1.049*** [1.031,1.067]	0.980 [0.952,1.008]	1.038*** [1.027,1.049]	1.048*** [1.034,1.062]	1.053*** [1.038,1.069]
Car availability (ref: yes, always)	Yes, mostly	3.346** [1.474,7.598]	5.705*** [2.071,15.72]	4.305* [1.010,18.36]	2.832** [1.469,5.458]	3.157** [1.369,7.281]	3.909** [1.623,9.416]
	Yes, sometimes	3.832*** [1.738,8.449]	4.866** [1.788,13.24]	0.000 [0.]	3.842*** [2.011,7.340]	3.674** [1.633,8.268]	4.108** [1.724,9.788]
	No, never	2.442* [1.086,5.494]	4.303** [1.541,12.01]	1.041 [0.235,4.612]	2.474** [1.285,4.765]	2.513* [1.086,5.811]	2.167 [0.887,5.292]
Bicycle availability (ref: other availability)	Yes, always	1.081 [0.249,4.684]	1.548 [0.298,8.047]	0.518 [0.048,5.640]	1.051 [0.335,3.301]	1.029 [0.218,4.854]	2.083 [0.420,10.33]
Received higher education (ref: no)	Yes	1.737 [0.725,4.165]	2.360 [0.753,7.401]	2.322 [0.378,14.27]		1.798 [0.732,4.417]	1.756 [0.701,4.399]
Personal income (before tax) (ref: less than half normal wage)	Not answered	0.669 [0.246,1.821]	0.725 [0.191,2.750]	1.393 [0.179,10.86]	0.894 [0.386,2.073]	0.597 [0.211,1.693]	0.594 [0.191,1.846]
	Between half and normal wage	0.733 [0.279,1.927]	1.397 [0.429,4.546]	3.216 [0.422,24.53]	0.776 [0.360,1.674]	0.659 [0.245,1.774]	0.559 [0.197,1.590]
	Between normal and twice normal wage	0.731 [0.282,1.895]	1.195 [0.360,3.968]	2.631 [0.300,23.11]	1.046 [0.475,2.300]	0.679 [0.256,1.796]	0.603 [0.215,1.693]
	More than twice normal wage	0.953 [0.273,3.331]	1.496 [0.323,6.936]	13.040 [0.790,215.1]	0.946 [0.322,2.784]	0.781 [0.217,2.815]	0.687 [0.174,2.719]
BMI		0.953 [0.874,1.039]	0.931 [0.830,1.044]	0.882 [0.738,1.054]	0.979 [0.913,1.050]	0.939 [0.858,1.028]	0.967 [0.879,1.064]
Number of trips						1.104*** [1.055,1.154]	
Use public transport always							
Identity	Utrecht	0.971 [0.791,1.192]	1.024 [0.847,1.237]	306.400 [0.]	0.968 [0.815,1.151]	0.971 [0.790,1.195]	0.924 [0.729,1.170]
	Parent	0.918 [0.741,1.139]	0.880 [0.734,1.056]	2.335 [0.]	0.942 [0.792,1.121]	0.951 [0.764,1.186]	0.978 [0.774,1.237]
	Environmentally friendly (Sumscore only)		0.865 [0.594,1.261]				
	Healthy	1.010 [0.690,1.478]	0.909 [0.613,1.347]	0.000 [0.]	1.056 [0.765,1.457]	1.023 [0.695,1.507]	0.987 [0.634,1.535]
	Sporty	0.781	0.912	0.190	0.781*	0.799	0.701*

	Career-oriented	[0.597,1.022] 0.951 [0.756,1.196]	[0.726,1.146] 1.036 [0.724,1.481]	[0.,] 0.002 [0.,]	[0.618,0.987] 0.989 [0.815,1.199]	[0.610,1.048] 0.937 [0.746,1.177]	[0.512,0.959] 1.041 [0.793,1.365]
	Public transport users	3.006*** [2.197,4.113]	1.804*** [1.415,2.299]	41.690 [0.,]	3.219*** [2.450,4.228]	2.893*** [2.123,3.942]	3.717*** [2.549,5.421]
Sex (ref: male)	Female	1.223 [0.582,2.570]	1.608 [0.601,4.301]	0.033 [0.,]	1.213 [0.646,2.280]	1.033 [0.483,2.212]	0.964 [0.421,2.208]
Age		0.994 [0.962,1.028]	0.988 [0.947,1.030]	1.774 [0.,]	0.987 [0.959,1.016]	0.990 [0.958,1.024]	1.003 [0.961,1.047]
Children at home (ref: no)	Yes	0.615 [0.173,2.192]	0.593 [0.117,3.004]	27.780 [0.,]	1.168 [0.415,3.287]	0.416 [0.109,1.590]	0.336 [0.080,1.407]
Dutch (ref: no)	Yes	1.410 [0.449,4.427]	1.485 [0.339,6.499]	0.088 [0.,]	1.280 [0.441,3.716]	1.261 [0.404,3.932]	0.794 [0.215,2.924]
Working (ref: no)	Yes	2.281 [0.687,7.574]	1.653 [0.330,8.290]	504777.000 [0.,]	2.200 [0.803,6.026]	2.745 [0.758,9.938]	2.207 [0.478,10.19]
Commute distance		1.076*** [1.059,1.094]	1.085*** [1.062,1.109]	0.951 [1.870e-148, 4.831e+147]	1.069*** [1.055,1.084]	1.079*** [1.061,1.097]	1.083*** [1.064,1.104]
Car availability (ref: yes, always)	Yes, mostly	5.609** [1.671,18.83]	16.800*** [3.509,80.47]	1236.200 [0.,]	3.339* [1.174,9.498]	6.370** [1.837,22.09]	6.430** [1.628,25.40]
	Yes, sometimes	14.460*** [4.783,43.69]	22.130*** [4.962,98.68]	21625e+6 [0.,]	14.370*** [5.691,36.28]	16.720*** [5.425,51.51]	16.980*** [4.898,58.85]
	No, never	13.670*** [4.539,41.16]	31.030*** [6.769,142.2]	44846e+11 [0.,]	11.310*** [4.476,28.58]	14.070*** [4.634,42.74]	11.100*** [3.202,38.47]
Bicycle availability (ref: other availability)	Yes, always	0.395 [0.0830,1.884]	0.728 [0.115,4.620]	32472e+9 [0.,]	0.556 [0.147,2.110]	0.410 [0.081,2.088]	1.747 [0.238,12.82]
Received higher education (ref: no)	Yes	2.961 [0.810,10.83]	3.060 [0.538,17.40]	99.610 [0.,]		3.413 [0.912,12.77]	2.537 [0.583,11.04]
Personal income (ref: less than half normal wage)	Not answered	1.618 [0.393,6.660]	2.436 [0.338,17.58]	54888e+8 [0.,]	1.158 [0.339,3.956]	1.852 [0.428,8.017]	0.968 [0.144,6.496]
	Between half and normal wage	1.608 [0.440,5.879]	3.162 [0.555,18.02]	29178e10 [0.,]	1.340 [0.463,3.883]	2.100 [0.543,8.119]	1.155 [0.246,5.413]
	Between normal and twice normal wage	2.606 [0.700,9.696]	5.628 [0.963,32.89]	45089e16 [0.,]	2.903 [0.953,8.844]	3.518 [0.890,13.91]	2.346 [0.474,11.61]
	More than twice normal wage	2.948 [0.497,17.49]	3.439 [0.308,38.46]	56322e11 [0.,]	3.174 [0.668,15.08]	3.552 [0.557,22.66]	1.821 [0.216,15.32]
BMI		0.951 [0.854,1.060]	0.919 [0.786,1.075]	0.502 [0.,]	0.926 [0.843,1.016]	0.958 [0.857,1.071]	0.979 [0.861,1.113]
Number of trips						0.941 [0.884,1.003]	
	N	564	379	564	778	564	504
	pseudo R-sq	0.36	0.38	0.40	0.34	0.40	0.40

Multinomial logistic regression with 'not using the car' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

UM: Unimodal. Trip entirely made by public transport.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 5: Association between identity and intention to change level of car use

		Maximally adjusted	sum score	Without education	With number of trips	Restricted to number of trips > 6
Intention to decrease						
Identity	Dutch	0.919 [0.771,1.096]		0.886 [0.772,1.018]	0.921 [0.772,1.099]	0.945 [0.779,1.146]
	Urban	0.862 [0.723,1.028]		0.908 [0.793,1.040]	0.859 [0.720,1.024]	0.906 [0.744,1.105]
	Parent	1.128 [0.974,1.306]		1.154* [1.031,1.290]	1.121 [0.967,1.300]	1.121 [0.957,1.315]
	Partner	0.907 [0.792,1.040]		0.904 [0.815,1.003]	0.912 [0.796,1.046]	0.905 [0.780,1.050]
	Environmentally friendly	1.049 [0.851,1.295]		1.112 [0.941,1.316]	1.045 [0.846,1.290]	1.027 [0.812,1.299]
	Career-oriented	1.012 [0.862,1.188]		1.033 [0.908,1.176]	1.010 [0.859,1.186]	0.976 [0.814,1.171]
	Car driver	0.843* [0.711,1.000]		0.866* [0.760,0.987]	0.847 [0.714,1.005]	0.829 [0.687,1.001]
Identity (sum-score)						
	Urban		0.922 [0.797,1.067]			
	Parent		1.067 [0.945,1.204]			
	Partner		0.941 [0.839,1.056]			
	Healthy		0.799 [0.637,1.001]			
	Career-oriented		1.006 [0.828,1.221]			
	Innovative		1.095 [0.928,1.291]			
	Car driver		0.848* [0.736,0.976]			
Sex (ref: male)	Female	0.908 [0.532,1.551]	0.899 [0.454,1.782]	0.901 [0.589,1.379]	0.956 [0.554,1.650]	0.974 [0.544,1.742]
Age		0.985 [0.960,1.011]	0.991 [0.962,1.021]	0.990 [0.970,1.010]	0.987 [0.962,1.014]	0.986 [0.957,1.016]
Children at home (ref: no)	Yes	0.451 [0.193,1.050]	0.529 [0.192,1.454]	0.567 [0.296,1.084]	0.490 [0.206,1.164]	0.482 [0.190,1.219]
Living alone (ref: no)	Yes	0.515 [0.243,1.093]	0.515 [0.196,1.349]	0.724 [0.404,1.297]	0.527 [0.248,1.122]	0.557 [0.244,1.272]
Student (ref: no)	Yes	0.232 [0.052,1.047]	0.599 [0.087,4.107]	0.242* [0.0715,0.821]	0.255 [0.056,1.164]	0.074* [0.010,0.562]
Working (ref: no)	Yes	0.793 [0.283,2.224]	1.303 [0.324,5.242]	0.419* [0.187,0.940]	0.745 [0.264,2.108]	0.500 [0.150,1.663]
Commute distance		0.998 [0.988,1.007]	0.990 [0.976,1.003]	0.997 [0.989,1.005]	0.997 [0.988,1.007]	0.999 [0.989,1.009]
Car availability (ref: yes, always)	Yes, mostly	0.947 [0.428,2.098]	0.803 [0.293,2.201]	0.703 [0.367,1.348]	0.941 [0.426,2.081]	0.846 [0.361,1.981]
	Yes, sometimes	0.817 [0.359,1.859]	1.175 [0.437,3.161]	0.954 [0.504,1.807]	0.815 [0.357,1.858]	0.912 [0.383,2.171]
	No, never	0.848 [0.339,2.119]	0.544 [0.169,1.757]	0.676 [0.329,1.390]	0.887 [0.353,2.232]	0.579 [0.209,1.604]
Bicycle availability (ref: other availability)	Yes, always	1.061 [0.318,3.537]	1.077 [0.242,4.794]	1.712 [0.571,5.128]	1.036 [0.312,3.438]	2.058 [0.400,10.58]
Received higher education (ref: no)	Yes	0.823 [0.413,1.638]	0.726 [0.312,1.686]		0.831 [0.418,1.654]	1.058 [0.486,2.302]
Personal income (before tax) (ref: less than half normal wage)	Not answered	0.622 [0.221,1.748]	0.476 [0.121,1.864]	0.420 [0.174,1.015]	0.615 [0.219,1.729]	0.449 [0.124,1.621]
	Between half and normal wage	0.960 [0.376,2.448]	1.178 [0.398,3.487]	0.869 [0.403,1.875]	0.944 [0.370,2.410]	0.790 [0.262,2.385]
	Between normal and twice normal wage	0.607 [0.237,1.555]	0.446 [0.143,1.394]	0.528 [0.244,1.146]	0.592 [0.231,1.521]	0.518 [0.169,1.589]
	More than twice normal wage	0.160*	0.159*	0.163**	0.152*	0.139*

		[0.035,0.732]	[0.030,0.858]	[0.049,0.543]	[0.033,0.697]	[0.026,0.733]
BMI		1.073* [1.000,1.152]	1.068 [0.968,1.177]	1.059 [0.999,1.123]	1.075* [1.002,1.154]	1.062 [0.981,1.149]
Number of trips					1.020 [0.980,1.061]	
Intention to increase						
Identity	Dutch	1.127 [0.926,1.370]		1.137 [0.965,1.341]	1.126 [0.926,1.369]	1.113 [0.896,1.383]
	Urban	0.878 [0.745,1.035]		0.899 [0.786,1.027]	0.877 [0.744,1.034]	0.895 [0.747,1.071]
	Parent	1.075 [0.920,1.255]		1.149* [1.018,1.297]	1.074 [0.919,1.254]	1.059 [0.893,1.258]
	Partner	0.918 [0.819,1.029]		0.909 [0.825,1.002]	0.919 [0.820,1.030]	0.916 [0.810,1.036]
	Environmentally friendly	0.867 [0.724,1.038]		0.896 [0.766,1.047]	0.866 [0.724,1.037]	0.841 [0.686,1.030]
	Career-oriented	1.237** [1.059,1.445]		1.204** [1.055,1.373]	1.236** [1.058,1.443]	1.221* [1.020,1.462]
	Car driver	1.168* [1.003,1.359]		1.078 [0.948,1.225]	1.171* [1.005,1.363]	1.254* [1.055,1.490]
Identity (sum-score)	Urban		0.940 [0.825,1.071]			
	Parent		1.041 [0.922,1.175]			
	Partner		0.904* [0.818,1.000]			
	Healthy		0.891 [0.720,1.104]			
	Career-oriented		1.113 [0.924,1.340]			
	Innovative		0.947 [0.815,1.100]			
	Car driver		1.163* [1.024,1.321]			
Sex (ref: male)	Female	0.864 [0.535,1.397]	0.931 [0.506,1.712]	0.741 [0.492,1.117]	0.884 [0.544,1.437]	0.881 [0.521,1.489]
Age		0.960** [0.935,0.985]	0.944*** [0.915,0.974]	0.953*** [0.933,0.975]	0.961** [0.935,0.987]	0.961* [0.932,0.991]
Children at home (ref: no)	Yes	0.317* [0.131,0.766]	0.279* [0.0971,0.801]	0.276*** [0.139,0.549]	0.325* [0.134,0.790]	0.391 [0.147,1.045]
Living alone (ref: no)	Yes	0.539 [0.285,1.021]	0.368* [0.161,0.843]	0.445** [0.257,0.771]	0.542 [0.286,1.026]	0.605 [0.305,1.200]
Student (ref: no)	Yes	0.642 [0.169,2.442]	0.655 [0.126,3.418]	0.419 [0.137,1.287]	0.670 [0.174,2.578]	0.501 [0.104,2.424]
Working (ref: no)	Yes	0.793 [0.250,2.516]	0.475 [0.124,1.816]	0.496 [0.200,1.232]	0.771 [0.242,2.455]	0.626 [0.166,2.357]
Commute distance		0.999 [0.991,1.008]	1.000 [0.990,1.011]	0.997 [0.990,1.005]	0.999 [0.991,1.008]	1.000 [0.991,1.009]
Car availability (ref: yes, always)	Yes, mostly	2.429* [1.182,4.990]	2.709* [1.155,6.351]	1.612 [0.889,2.923]	2.411* [1.173,4.956]	2.876** [1.330,6.219]
	Yes, sometimes	3.575*** [1.758,7.271]	3.277** [1.344,7.988]	2.442** [1.327,4.496]	3.583*** [1.760,7.296]	5.182*** [2.365,11.36]
	No, never	4.396*** [1.909,10.12]	3.928** [1.427,10.81]	2.680** [1.331,5.397]	4.487*** [1.937,10.39]	6.302*** [2.441,16.27]
Bicycle availability (ref: other availability)	Yes, always	1.055 [0.363,3.066]	0.951 [0.256,3.524]	0.984 [0.405,2.390]	1.049 [0.361,3.046]	1.052 [0.334,3.311]
Received higher education (ref: no)	Yes	1.136 [0.555,2.328]	0.974 [0.406,2.334]		1.144 [0.559,2.344]	0.958 [0.446,2.057]
Personal income (before tax) (ref: less than half normal wage)	Not answered	0.543 [0.227,1.302]	0.529 [0.163,1.715]	0.507 [0.229,1.121]	0.542 [0.227,1.298]	0.630 [0.217,1.829]
	Between half and normal wage	1.029 [0.435,2.433]	1.106 [0.396,3.089]	0.901 [0.427,1.902]	1.023 [0.432,2.421]	1.158 [0.435,3.082]
	Between normal and twice normal wage	0.557 [0.236,1.312]	0.853 [0.304,2.392]	0.544 [0.256,1.157]	0.553 [0.235,1.305]	0.581 [0.214,1.572]
	More than twice normal wage	0.433	0.320	0.403	0.424	0.545

		[0.134,1.397]	[0.063,1.636]	[0.143,1.133]	[0.131,1.372]	[0.146,2.037]
BMI		1.020	1.011	1.032	1.021	1.002
		[0.950,1.096]	[0.917,1.114]	[0.971,1.096]	[0.950,1.096]	[0.926,1.086]
Number of trips					1.009	
					[0.974,1.045]	
N	570	384	786	570	490	
pseudo R-sq	0.16	0.21	0.14	0.16	0.17	

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 6: Association between identity and intention to change level of bicycle use

		Maximally adjusted	sum score	Without education	With number of trips	Restricted to number of trips > 6
Intention to decrease						
Identity	Dutch	1.117 [0.779,1.603]		0.862 [0.658,1.131]	1.108 [0.768,1.598]	1.148 [0.675,1.952]
	Urban	1.289 [0.921,1.804]		1.176 [0.902,1.533]	1.324 [0.942,1.860]	1.531 [0.931,2.518]
	Countryside-lover	0.989 [0.730,1.341]	1.013 [0.830,1.237]	0.944 [0.747,1.192]	0.990 [0.728,1.346]	1.038 [0.657,1.641]
	Healthy	0.868 [0.573,1.316]	1.000 [0.747,1.338]	0.836 [0.615,1.137]	0.885 [0.587,1.335]	1.014 [0.531,1.939]
	Sporty	0.968 [0.695,1.349]	0.996 [0.823,1.206]	1.064 [0.814,1.391]	0.990 [0.712,1.377]	1.091 [0.672,1.772]
	Bicyclists	0.495*** [0.347,0.707]	0.626*** [0.503,0.780]	0.685** [0.537,0.873]	0.471*** [0.326,0.680]	0.310*** [0.180,0.533]
Sex (ref: male)	Female	0.562 [0.217,1.454]	0.545 [0.207,1.438]	0.673 [0.315,1.438]	0.530 [0.202,1.390]	0.779 [0.209,2.899]
Age		0.964 [0.924,1.005]	0.967 [0.926,1.011]	0.986 [0.955,1.017]	0.957* [0.916,0.999]	0.957 [0.899,1.019]
Children at home (ref: no)	Yes	0.294 [0.046,1.881]	0.269 [0.039,1.864]	0.361 [0.0951,1.37]	0.247 [0.037,1.650]	0.356 [0.032,3.972]
Student (ref: no)	Yes	0.162 [0.024,1.110]	0.120* [0.016,0.900]	0.497 [0.109,2.271]	0.160 [0.023,1.094]	0.057 [0.002,1.874]
Dutch (ref: no)	Yes	0.193* [0.042,0.888]	0.174* [0.042,0.724]	0.648 [0.176,2.383]	0.222 [0.047,1.050]	0.110* [0.017,0.729]
Working (ref: no)	Yes	0.234* [0.065,0.850]	0.137** [0.033,0.576]	0.366 [0.134,1.005]	0.342 [0.083,1.416]	0.171 [0.015,1.992]
Car availability (ref: yes, always)	Yes, mostly	3.031 [0.453,20.280]	2.951 [0.410,21.220]	0.806 [0.193,3.365]	3.032 [0.437,21.020]	8.625 [0.996,74.710]
	Yes, sometimes	5.268* [1.205,23.030]	3.662 [0.858,15.620]	1.366 [0.463,4.036]	6.000* [1.314,27.400]	4.887 [0.733,32.570]
	No, never	2.529 [0.551,11.610]	2.830 [0.672,11.920]	0.633 [0.209,1.921]	2.556 [0.541,12.080]	3.133 [0.370,26.510]
Bicycle availability (ref: other availability)	Yes, always	0.497 [0.107,2.300]	0.790 [0.180,3.460]	0.183** [0.0591,0.567]	0.592 [0.124,2.829]	2.929 [0.284,30.170]
Received higher education (ref: no)	Yes	0.481 [0.157,1.476]	0.364 [0.124,1.063]		0.418 [0.134,1.303]	1.516 [0.247,9.311]
Personal income (before tax) (ref: less than half normal wage)	Not answered	1.017 [0.180,5.747]	1.512 [0.283,8.065]	0.944 [0.218,4.090]	1.039 [0.189,5.709]	0.226 [0.010,5.079]
	Between half and normal wage	1.259 [0.290,5.477]	2.063 [0.487,8.737]	1.710 [0.500,5.853]	1.295 [0.295,5.687]	0.401 [0.046,3.476]
	Between normal and twice normal wage	1.154 [0.207,6.446]	1.557 [0.274,8.850]	1.063 [0.264,4.288]	1.300 [0.232,7.301]	0.549 [0.059,5.093]
	More than twice normal wage	0.000 [0.,.]	0.000 [0.,.]	0.000 [0.,.]	0.000 [0.,.]	0.000 [0.,.]
BMI		1.019 [0.894,1.160]	1.048 [0.913,1.203]	1.072 [0.967,1.188]	1.034 [0.909,1.176]	0.976 [0.798,1.193]
Number of trips				0.954 [0.885,1.028]		
Intention to increase						
Identity	Dutch	1.011 [0.860,1.189]		0.936 [0.818,1.071]	1.009 [0.858,1.186]	0.896 [0.733,1.096]
	Urban	0.976 [0.863,1.104]		0.986 [0.890,1.093]	0.973 [0.860,1.101]	1.044 [0.900,1.211]
	Countryside-lover	1.121* [1.007,1.249]	1.129** [1.045,1.221]	1.101* [1.005,1.205]	1.115* [1.000,1.242]	1.140* [1.003,1.295]
	Healthy	0.886 [0.741,1.058]	0.944 [0.825,1.082]	0.898 [0.773,1.042]	0.878 [0.735,1.050]	0.941 [0.753,1.176]
	Sporty	1.012 [0.883,1.159]	0.993 [0.909,1.085]	1.047 [0.932,1.176]	1.010 [0.881,1.157]	0.973 [0.824,1.149]
	Bicyclists	1.118	1.070	1.053	1.118	1.121

		[0.964,1.296]	[0.973,1.176]	[0.935,1.185]	[0.964,1.297]	[0.942,1.334]
Sex (ref: male)	Female	0.776 [0.547,1.099]	0.784 [0.540,1.138]	0.810 [0.599,1.095]	0.810 [0.569,1.152]	0.832 [0.553,1.250]
Age		0.987 [0.972,1.003]	0.986 [0.969,1.003]	0.987 [0.974,1.000]	0.989 [0.973,1.005]	0.982 [0.964,1.001]
Children at home (ref: no)	Yes	0.976 [0.632,1.506]	1.135 [0.716,1.797]	1.059 [0.741,1.512]	1.035 [0.666,1.606]	0.930 [0.570,1.519]
Student (ref: no)	Yes	0.771 [0.347,1.714]	0.729 [0.313,1.699]	0.731 [0.369,1.449]	0.786 [0.353,1.749]	1.016 [0.307,3.356]
Dutch (ref: no)	Yes	0.581 [0.278,1.214]	0.639 [0.328,1.247]	0.677 [0.365,1.257]	0.581 [0.278,1.215]	0.716 [0.297,1.726]
Working (ref: no)	Yes	0.754 [0.412,1.379]	0.743 [0.387,1.426]	0.729 [0.443,1.198]	0.601 [0.312,1.156]	1.025 [0.384,2.738]
Car availability (ref: yes, always)	Yes, mostly	1.005 [0.585,1.729]	0.994 [0.565,1.749]	0.862 [0.544,1.367]	0.985 [0.572,1.697]	0.957 [0.525,1.742]
	Yes, sometimes	0.919 [0.561,1.506]	1.008 [0.596,1.706]	0.881 [0.577,1.344]	0.922 [0.562,1.512]	0.910 [0.521,1.589]
	No, never	0.773 [0.472,1.266]	0.816 [0.486,1.370]	0.707 [0.465,1.074]	0.792 [0.483,1.299]	0.654 [0.364,1.175]
Bicycle availability (ref: other availability)	Yes, always	0.837 [0.312,2.244]	1.016 [0.359,2.878]	1.120 [0.480,2.616]	0.858 [0.319,2.304]	0.873 [0.287,2.651]
Received higher education (ref: no)	Yes	0.595* [0.358,0.987]	0.738 [0.436,1.250]		0.604 [0.364,1.003]	0.655 [0.364,1.181]
Personal income (before tax) (ref: less than half normal wage)	Not answered	1.710 [0.911,3.210]	1.500 [0.778,2.893]	1.392 [0.802,2.419]	1.724 [0.918,3.239]	1.927 [0.775,4.790]
	Between half and normal wage	0.727 [0.389,1.361]	0.639 [0.335,1.218]	0.819 [0.483,1.388]	0.723 [0.386,1.355]	0.836 [0.369,1.895]
	Between normal and twice normal wage	0.926 [0.492,1.743]	0.870 [0.456,1.659]	0.808 [0.472,1.383]	0.920 [0.488,1.735]	0.981 [0.430,2.237]
	More than twice normal wage	0.684 [0.294,1.589]	0.638 [0.263,1.544]	0.518 [0.253,1.062]	0.646 [0.276,1.510]	0.782 [0.282,2.165]
BMI		1.038 [0.984,1.094]	1.052 [0.993,1.115]	1.056* [1.008,1.106]	1.039 [0.986,1.096]	1.058 [0.992,1.128]
Number of trips					1.024 [0.998,1.051]	
N		670	593	899	670	493
pseudo R-sq		0.11	0.12	0.09	0.12	0.10

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

*p < 0.05; **p < 0.01, ***p < 0.001.

Appendix 7: Association between identity and intention to change level of walking

		Maximally adjusted	sum score	Without education	With number of trips	Restricted to number of trips > 6
Intention to decrease						
Identity	Dutch	0.846 [0.574,1.247]		0.838 [0.619,1.136]	0.839 [0.568,1.238]	0.755 [0.501,1.138]
	Family-oriented	1.008 [0.780,1.303]		1.021 [0.824,1.266]	1.017 [0.786,1.315]	1.123 [0.838,1.505]
	Healthy	1.144 [0.708,1.849]		1.213 [0.824,1.786]	1.115 [0.691,1.801]	1.144 [0.686,1.910]
	Pedestrian	0.637** [0.458,0.886]		0.610*** [0.470,0.793]	0.640** [0.459,0.893]	0.569** [0.394,0.820]
Identity (sum score)	Countryside-lover		0.872 [0.690,1.102]			
	Family-oriented		1.011 [0.842,1.214]			
	Healthy		1.055 [0.724,1.535]			
	Pedestrian		0.773* [0.609,0.980]			
Sex (ref: male)	Female	0.562 [0.217,1.454]	0.545 [0.207,1.438]	0.673 [0.315,1.438]	0.530 [0.202,1.390]	0.779 [0.209,2.899]
Age		0.964 [0.924,1.005]	0.967 [0.926,1.011]	0.986 [0.955,1.017]	0.957* [0.916,0.999]	0.957 [0.899,1.019]
Children at home (ref: no)	Yes	0.294 [0.0460,1.881]	0.269 [0.0388,1.864]	0.361 [0.0951,1.367]	0.247 [0.0369,1.650]	0.356 [0.0318,3.972]
Living alone (ref: no)	Yes	0.175* [0.0360,0.851]	0.165 [0.0257,1.055]	0.175** [0.0505,0.610]	0.181* [0.0372,0.883]	0.267 [0.0541,1.318]
Student (ref: no)	Yes	4.348 [0.289,65.31]	31.300 [0.375,2611.0]	2.108 [0.247,18.02]	5.123 [0.326,80.56]	1.110 [0.0467,26.35]
Dutch (ref: no)	Yes	1.910 [0.174,20.97]	1.956 [0.175,21.89]	1.083 [0.188,6.246]	1.983 [0.178,22.07]	1.643 [0.135,20.06]
Working (ref: no)	Yes	2.685 [0.257,28.07]	22.100 [0.332,1468.8]	1.845 [0.324,10.50]	2.414 [0.228,25.50]	2.203 [0.170,28.57]
Commute distance		1.010 [0.993,1.026]	1.022* [1.002,1.042]	1.010 [0.997,1.024]	1.009 [0.993,1.026]	1.007 [0.991,1.023]
Car availability (ref: yes, always)	Yes, mostly	0.769 [0.177,3.352]	1.954 [0.436,8.748]	0.380 [0.094,1.542]	0.772 [0.177,3.358]	0.605 [0.134,2.735]
	Yes, sometimes	0.541 [0.119,2.452]	1.031 [0.206,5.158]	0.426 [0.119,1.520]	0.570 [0.125,2.586]	0.595 [0.132,2.689]
	No, never	1.071 [0.270,4.242]	1.062 [0.226,4.995]	0.721 [0.220,2.362]	1.189 [0.291,4.862]	0.344 [0.0588,2.016]
Bicycle availability (ref: other availability)	Yes, always	0.342 [0.0546,2.146]	0.912 [0.0752,11.07]	0.331 [0.0803,1.366]	0.341 [0.0536,2.163]	0.298 [0.0354,2.513]
Received higher education (ref: no)	Yes	0.280* [0.082,0.953]	0.154** [0.038,0.622]		0.290* [0.084,0.997]	0.414 [0.104,1.654]
Personal income (before tax) (ref: less than half normal wage)	Not answered	2.280 [0.416,12.490]	2.287 [0.378,13.83]	1.950 [0.403,9.430]	2.296 [0.417,12.65]	0.695 [0.072,6.703]
	Between half and normal wage	0.868 [0.131,5.767]	0.668 [0.097,4.620]	0.900 [0.176,4.598]	0.813 [0.122,5.440]	0.354 [0.048,2.632]
	Between normal and twice normal wage	1.325 [0.215,8.153]	0.744 [0.109,5.079]	0.809 [0.165,3.958]	1.240 [0.200,7.703]	0.452 [0.063,3.263]
	More than twice normal wage	0.270 [0.018,4.022]	0.162 [0.009,2.841]	0.109 [0.009,1.390]	0.235 [0.016,3.573]	0.103 [0.005,2.014]
BMI		1.011 [0.860,1.188]	1.044 [0.868,1.255]	1.039 [0.911,1.185]	1.011 [0.859,1.190]	1.080 [0.904,1.290]
Number of trips					1.040 [0.967,1.118]	
Intention to increase						
Identity	Dutch	1.016 [0.856,1.205]		0.916 [0.802,1.047]	1.015 [0.854,1.207]	0.926 [0.766,1.119]
	Family-oriented	1.141* [1.025,1.270]		1.163*** [1.067,1.268]	1.143* [1.026,1.273]	1.100 [0.979,1.236]
	Healthy	0.830* [0.692,0.997]		0.837* [0.724,0.968]	0.818* [0.681,0.984]	0.905 [0.743,1.103]

	Pedestrian	1.334*** [1.151,1.547]		1.211** [1.076,1.365]	1.355*** [1.167,1.574]	1.243** [1.060,1.459]
Identity (sum score)	Countryside-lover		1.086 [0.982,1.200]			
	Family-oriented		1.062 [0.977,1.154]			
	Healthy		0.874 [0.749,1.021]			
	Pedestrian		1.193** [1.072,1.329]			
Sex (ref: male)	Female	1.235 [0.829,1.839]	1.182 [0.727,1.922]	1.343 [0.963,1.874]	1.329 [0.886,1.993]	1.228 [0.799,1.887]
Age		0.997 [0.980,1.015]	0.994 [0.973,1.015]	1.001 [0.987,1.016]	1.000 [0.983,1.018]	0.999 [0.979,1.018]
Children at home (ref: no)	Yes	0.473** [0.280,0.799]	0.454* [0.248,0.832]	0.587* [0.385,0.893]	0.508* [0.299,0.863]	0.411** [0.231,0.730]
Living alone (ref: no)	Yes	0.848 [0.501,1.436]	0.627 [0.331,1.188]	1.074 [0.703,1.643]	0.851 [0.501,1.445]	0.680 [0.388,1.194]
Student (ref: no)	Yes	1.515 [0.508,4.514]	2.906 [0.714,11.82]	0.805 [0.333,1.948]	1.697 [0.563,5.118]	1.782 [0.487,6.527]
Dutch (ref: no)	Yes	0.649 [0.301,1.397]	0.791 [0.369,1.699]	0.630 [0.329,1.206]	0.640 [0.296,1.384]	0.776 [0.336,1.794]
Working (ref: no)	Yes	1.968 [0.814,4.758]	3.714* [1.145,12.04]	1.050 [0.536,2.057]	1.724 [0.707,4.206]	2.165 [0.741,6.323]
Commute distance		0.994 [0.986,1.001]	0.997 [0.988,1.006]	0.994 [0.988,1.001]	0.994 [0.986,1.001]	0.992* [0.984,1.000]
Car availability (ref: yes, always)	Yes, mostly	0.900 [0.502,1.613]	0.963 [0.489,1.897]	0.807 [0.501,1.300]	0.867 [0.482,1.558]	0.879 [0.477,1.620]
	Yes, sometimes	0.854 [0.503,1.451]	1.002 [0.522,1.923]	0.872 [0.559,1.360]	0.843 [0.495,1.436]	0.980 [0.559,1.719]
	No, never	0.678 [0.399,1.154]	0.909 [0.482,1.717]	0.613* [0.392,0.957]	0.700 [0.410,1.195]	0.644 [0.361,1.151]
Bicycle availability (ref: other availability)	Yes, always	0.705 [0.273,1.822]	0.849 [0.270,2.667]	0.783 [0.357,1.714]	0.693 [0.268,1.794]	0.723 [0.249,2.096]
Received higher education (ref: no)	Yes	0.340*** [0.189,0.610]	0.257*** [0.127,0.520]		0.344*** [0.191,0.620]	0.376** [0.202,0.698]
Personal income (before tax) (ref: less than half normal wage)	Not answered	0.896 [0.414,1.942]	0.566 [0.214,1.496]	0.815 [0.421,1.578]	0.890 [0.409,1.935]	1.174 [0.468,2.942]
	Between half and normal wage	0.534 [0.253,1.130]	0.613 [0.262,1.435]	0.520* [0.280,0.967]	0.520 [0.245,1.101]	0.741 [0.314,1.746]
	Between normal and twice normal wage	0.814 [0.389,1.706]	0.985 [0.419,2.316]	0.582 [0.313,1.082]	0.790 [0.376,1.658]	1.050 [0.446,2.471]
	More than twice normal wage	0.650 [0.252,1.680]	0.724 [0.240,2.180]	0.399* [0.178,0.893]	0.588 [0.226,1.531]	0.940 [0.323,2.736]
BMI		1.075* [1.012,1.141]	1.099* [1.018,1.186]	1.074** [1.022,1.128]	1.075* [1.013,1.141]	1.090* [1.020,1.164]
Number of trips					1.035* [1.005,1.067]	
N		574	423	792	574	492
pseudo R-sq		0.11	0.14	0.09	0.12	0.10

Multinomial logistic regression with 'no intention to change' as the reference outcome category. Values tabulated are relative risk ratios (RRR) and 95% confidence intervals (95% CI). The significant findings are in bold.

*p < 0.05; **p < 0.01, ***p < 0.001.