Environmental norms and sustainable transport mode choice on children's school travels: The norm-activation theory

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Abstract

The increasing use of car in developing countries is an important reason for traffic congestion and pollution. Using a car may partly reflect a normative choice, but the majority of previous studies that used the Norm Activation Model (NAM) to study pro-environmental transport behaviour were conducted among the general public in high income and developed countries in Europe and Northern America. The present research aimed to examine the causal chain of the NAM theory and the role of the NAM dimensions as well as sociodemographic and situational characteristics for parental sustainable transport mode choice on their children's school travels in an Iranian context. Among three core NAM dimensions, awareness of consequences refer to how aware people are of the negative consequences of car use. Ascription of responsibility refers that the individuals must perceive themselves to be personally responsible for the consequences of car use, and personal norms refer to that the individuals perceive a moral personal obligation to take action for the benefits of collective. In 2014, a self-completion questionnaire survey (n=1078) was carried out among parents of pupils (aged 7-9 years). Results (based on n=733) showed that the NAM was not significantly associated with sustainable transport mode choice in the current study. However, the structural equation modeling showed that the underlying NAM system was supported by the data. Among the sociodemographic characteristics, parents in households who had more cars were less likely to choose sustainable transport modes. Parents who exercised more reflected more sustainable mode choices. Also, accessibility to public transport had a positive effect on the choice of sustainable transport modes. A potential reason for the lack of empirical support for the behavioural link between the NAM causal chain and sustainable mode choice could have been due to that study area may be rather unsupportive of sustainable transport choices. Overall, the current findings showed that demographic, household and situational characteristics were more important than the NAM dimensions in predicting sustainable transport mode choice in an Iranian sample.

In order to promote sustainable transport mode use, it seems to be more feasible to focus on developing a safe infrastructure and to extend the availability of sustainable transport options in Iran.

Keywords: Environmental norms, Sustainable transport, Norm-Activation Model, School travel, Sociodemographic characteristics, Mode choice

1. Introduction

The increasing rate of car ownership and car use in developing countries causes issues such as traffic congestion and pollution (OECD, 2008). Among all the transport modes in cities, private cars have the largest contributions in terms of greenhouse gas (GHG) and emissions such as CO_2 (OECD, 2002). For instance, the average CO_2 emission in the world has been reported to be about 4.9 metric tons per capita, while Iran as a developing country in the Middle East and North Africa cluster has a CO_2 emission of 7.8 (Worldbank, 2011). Consequently, efforts aimed at reducing emissions should be focused particularly in rapidly developing economies such as Iran.

Although technological advances (e.g. fuel-efficient tires and vehicles) (Kojima and Ryan, 2010) and altering the spatial structures of cities (Bruun and Givoni, 2015; Cervero, 2002) could reduce the environmental problems caused by cars, several researchers have argued that a sole focus on these factors is not sufficient to solve the environmental problems caused by car transport (Steg and Sievers, 2000; Steg and Gifford, 2005; OECD, 2008). It has been reasoned that pro-environmental behaviour amendments as reflected by, for instance, mode shifts or less travelling, are necessary supplements to technological changes. Pro-environmental behaviours are usually reflected by partly giving up on personal freedom, comfort and convenience caused by using a car for the benefit of the collective (Anable and Gatersleben, 2005; Steg and Gifford, 2005). It should be pointed out, however, that the perceived convenience and comfort of using a car may be overestimated by the individuals. This is particularly relevant in contexts such as Iran, where the traffic tends to be highly congested which in turn may reverse some of the positive effects of using a car. People generally have a strong need to justify their own actions by dissonance-reducing cognitions (see also Festinger 1962), which implies that they generate positive

cognitions about car use in line with their behavioural choice of using a car, even when facing negative consequences.

Reducing the probability of choosing a car and increasing the probability of choosing sustainable transport modes can be defined as Environmental Significant Behaviour (ESB) (Joireman et al., 2001; Nordlund and Garvill, 2003; Steg, 2003). In order to reduce environmental problems caused by car transport policymakers could focus on behavioural and normative actions in addition to technological advances. This calls for research regarding psychological factors related to use of sustainable transport.

Psychological research has shown that travels which are repeatedly carried out under stable contexts become habitual and resistant to change (Verplanken et al., 1997; Verplanken and Orbell, 2003). School travels are mandatory daily trips, which could be strongly subject to habit formation, and thereby important to influence in order to benefit the environment. Elementary school pupils (7-9 years old) are not able to make transport decisions themselves, and parents usually choose transport modes for their children on school travels (McMillan, 2005). These choices may, however, socialize children into preferring certain modes of transport and it is therefore important to influence the transport mode choices that parents conduct on behalf of their children at an early stage (see also Kopnina, 2011). Overall, the present research intended to apply the norm-activation theory and examine its capability of predicting parental sustainable transport mode supplemented with sociodemographic and situational characteristics, for studying how these factors influence (non-car) choice on their children's school travel, specifically in an Iranian context.

There is no clear-cut definition of which transport modes that are "sustainable" (Beatley, 1995). All types of transport demand use of energy resources, but it is conventional to consider public

transport and active modes (cycling and walking) as sustainable transport compared to private car in general urban travels (e.g. Lind et al., 2015). In the current research, school service mode (i.e. carpooling), public transportation (e.g. urban bus) and active modes (e.g. walking) are defined as sustainable transport modes on school trips, while private car is defined as a less environmentally sound mode of transport.

1.1. Theoretical and empirical background

The Norm-Activation Model (NAM) focuses on factors leading to altruistic behaviour operationalized as giving up on personal interests in order to achieve environmental benefits for the society (Schwartz, 1977; Nordlund and Garvill, 2003). The NAM has three core components: Awareness of consequences (AC), Ascription of responsibility (AR), and Personal norms (PN). These components could predict altruistic intentions/behaviour (e.g. sustainable transport mode choice versus choosing a car) in a causal structure or chain (Figure 1) (De Groot et al., 2008). The awareness of consequences component refers to that individuals realize the negative consequences of their environmental unfriendly behaviour (e.g. choosing a car for children on school trips). Ascription of responsibility is another dimension of the norm-activation process, where the individuals must perceive themselves to be personally responsible for the consequences of their environmental behaviour. The component of personal norms refers to that the individuals perceive a moral personal obligation to take action for the benefits of collective (Schwartz, 1977).

[Figure 1. Near here]

Although the causal chain of the NAM is conceptually parsimonious, the theory has some limitations: (1) the NAM does not consider variations in situational factors in its components.

Variations in situational conditions conducive to activation of moral obligation also may affect the association between personal norms and behaviour (Schwartz, 1977), (2) evidence relevant to the sequential nature of the steps in the NAM is sparse. The NAM lacks some bi-directional relations between its components. For example, the structure of the NAM does not consider any bi-directional relations from PN to AC or from PN to AR. In spite of extending the theory in previous studies by adding a causal link between ecological worldview (values) and AC, testing the influence of anticipated pride and guilt on PN within the NAM, and even integrating the NAM with the theory of planned behaviour (Onwezen et al., 2013; Lind et al., 2015), the NAM still lacks some bi-directional relations. The role of feedback among the steps, with new input of data from later redefinitions in a chain of decisions, also merits investigation, and (3) the dimensions of the NAM (e.g. personal norm) has been exclusively designed to measure neither individual gains nor collective gains, but also, they measure a mixture of individual and collective gains.

The NAM has been used in several previous accounts aimed at explaining a variety of behaviours, including overall prosocial behaviour (Nordlund and Garvill, 2002; Joireman et al., 2001), recycling (Guagnano et al., 1994; Hopper and Nielsen, 1991; Bratt, 1999; Vining and Ebreo, 1992), reducing car use (Nordlund and Garvill, 2003; Bamberg and Schmidt, 2003; De Groot et al., 2008; Fujii, 2010), and also recently sustainable transport mode use among adults in urban areas (Jakovcevic and Steg, 2013; Lind et al., 2015).

Abrahamse et al. (2009) reported that awareness of consequences and personal norms could reduce car use on work trips in Canada. Further, it has been shown that personal norms could predict sustainable travel mode choice in the urban Norwegian population (Lind et al., 2015). People who reported high ascription of responsibility tended to choose public transportation

more frequently. De Groot et al. (2008) further demonstrated that the NAM structure predicted pro-environmental transport behaviour in a European context. Nordlund and Garvill, (2003) also found that stronger personal norms were related to the willingness of reducing car use among Swedish car owners.

Only very recently has the NAM been tested in other settings than Europe and North America. Jakovcevic and Steg (2013) examined the causal chain of the NAM and Value Belief Norm Theory (VBN) on pro-environmental behaviour related to transport (i.e. intention to reduce car use and acceptability of a transport pricing policy) in Argentina. The authors found support for a similar causal structure as reported in previous European studies (e.g. De Groot et al., 2008). In the multiple regression models reported in Jakovcevic and Steg (2013) stronger personal norms significantly predicted intention to reduce car use, stronger ascription of responsibility about reducing car use was significantly associated with stronger personal norms and a stronger awareness of consequences was associated with a stronger ascription of responsibility.

The majority of previous studies that used the NAM were conducted in high income and developed countries in Europe (e.g. De Groot et al., 2008; Lind et al., 2015) and Northern America (e.g. Abrahamse et al., 2009). Very few, if any, studies have tested the applicability of the NAM in rapidly emerging countries in Asia, which could shed further light on the cultural generality of the theory. Iran is an interesting case because Iranian cities have a less integrated public transport system, poor traffic safety records and weak cycling and walking infrastructures compared to developed and high income countries. One could expect both safety and environmental benefits by increasing use of sustainable transport in Iran. Further, environmental issues could have a weaker focus in Iran (Hashemzadeh, 2016) and this may reduce the importance of environmental cognitions for transport behaviour compared to studies conducted

in settings with a stronger environmental focus. The possible reason for why the environmental problems might have a weaker focus in Iran is that the other pressing problems (e.g. economic issues) may not allow people to consider environmental issues as a predominant priority in their life. This is also in line with the risk tradeoff hypothesis (Affeltranger and Thomasson, 2005) which postulates that when people have a multitude of risks to attend they tend to prioritise urgent needs such as food and stability over accidental risks such as road traffic accidents.In addition, the NAM has mainly been tested in association with individual transport behaviour (e.g. car use, intention to use a car, sustainable transport mode choice) and has infrequently been included in studies of school trip mode choices for children. The majority of previous studies which incorporated the NAM were conducted in general population-based samples and focused in particular on work trips, whereas we are not familiar with any studies which have used the model for mode choice on children's school travels. Furthermore, in the current study we include additional factors, such as demographic and household characteristics (e.g. gender, car ownership, educational level) and situational or built environment factors (e.g. perceived distance from home to school, availability of transport options, neighbourhood safety and security).

In addition to psychological factors (the NAM dimensions), several previous studies also reported the influences of socioeconomic, accessibility and spatial determinants of travel behaviour (Lind et al., 2015; Cervero, 2002; Cervero et al., 2009; Cervero and Murakami, 2010). Lind et al., 2015 showed that adults who had a high annual income had a strong tendency to walk or cycle to the workplace. A plausible explanation is that property is more expensive in and near the city centers, and most workplaces are restricted to such areas. Consequently, individuals with high income may have the option to settle near their workplace. An alternative explanation is that

people with high income are more concerned about health issues and thereby may prioritize physical activity to a stronger extent when choosing travel modes. The same study also showed that a longer distance from home to the workplace decreased the probability of walking or cycling on work travels. Cervero (2002) found the influences of three core dimensions of built environments – density, diversity, and design – as well as generalized costs and socioeconomic characteristics of travelers on mode choice. He showed that individuals who had a driving license were more likely to drive alone. An increase in job accessibility within 45-min highway network travel time increased the probability of driving alone in their travels. Furthermore, the increment of land-use diversity and ratio of sidewalks decreased the probability of driving alone (Cervero, 2002).

The current study will include several socioeconomic and situational factors since they have been demonstrated to be important for transport mode use in previous school travel studies (e.g. McMillan 2007; Easton and Ferrari, 2015; Ermagun and Samimi, 2015; Ermagun et al., 2015; Mehdizadeh et al., 2016; Helbich, 2017; Ermagun and Levinson, 2017; Mehdizadeh et al., 2017a). For instance, several studies showed that higher access to car, well-educated mothers, and higher perceived traffic safety might decrease children's walking to school (see Mitra 2013; Mehdizadeh et al., 2017a for a review). Easton and Ferrari (2015) showed that a longer distance from home to school has an important positive role for pupils' car use, but suggest that socio-spatial clustering within neighbourhoods and schools is also important correlate of distance. Ferrari and Green (2013) also reported that house prices were negatively associated with distance of travel to school. The authors found that pupils from high-price neighborhoods were more likely to go to their nearest school. Also, it may be interesting to examine the relative role of the NAM dimensions for transport mode choice when such factors are adjusted for in the analysis.

1.2. Aims and hypotheses of the study

The present study had two main aims: (1) to examine the NAM causal chain (Figure 1) on children's school travel mode use (sustainable modes versus car use) and (2) to investigate the relative role of the NAM dimensions (awareness of consequences, ascription of responsibility and personal norms) as well as socio-economic, household characteristic, and some situational and built environment factors on children's school travel (sustainable modes versus car use) in Iran.

In line with Figure 1, when parents are aware of the negative consequences (AC) of their environmentally unstainable behaviour (e.g. choosing a car for children in school travel) we hypothesized that this awareness could promote the responsibility they are willing to take for their actions (AR). The willingness to take responsibility was further hypothesized to be associated with stronger personal norms (PN) which in turn may predict pro-environmental behaviour. For example, parents who believe that private car choice for their children has undesirable environmental consequences were expected to take a stronger responsibility for the behavioural consequences. Parents who realize that they have a responsibility regarding environmental problems might perceive a stronger moral obligation and personal norms to overcome these environmental problems by choosing sustainable transport modes rather than car. We also hypothesized that those who chose sustainable transport modes instead of car would report higher scores on the specific NAM items.

2. Method

2.1. Procedure and respondents

In 2014, a self-reported questionnaire survey was carried out among parents covering their demographic characteristics, psychological factors and mode choices for their children on school trips. The study was carried out in Rasht, Iran; a city with almost 23,550 pupils (ranging from 7-9 years old). The urban area of the city has several narrow streets with highly congested car traffic in peak hours. Carpooling taxi and urban scheduled buses were available public transport modes in the study area. Further, bicycling use is unusual among the general population and children in the city. Subject to a fee, most of the schools have provided transport services (carpooling services) for their pupils.

A total of 18,800 pupils (79.83%) were registered in public schools and 4,750 (20.16%) were enrolled in private schools in 2013 (Statistical report, RDE 2013). In Iran, parents pay fees for enrolling their children to private schools and those who are able to do this might be wealthier than parents with children in public schools where registration is free of charge. However, these two types of school systems do not contrast with one another in any other way. A pilot study was carried out in 2013 to examine whether the study procedures and instruments worked as intended. This led to minor revisions to the questionnaire. For example, the wording of a few socio-economic and travel mode questions and scales were changed or corrected.

During the main data collection, 1078 questionnaires were distributed in nine randomly selected schools in Rasht (covering 4.57% of the pupil population). The sample was representative of the target pupil population in regard of the proportion of school types, gender proportion, geographical distribution and socio-economic levels. The research team sent a request to the Rasht Department of Education to distribute an information letter about the survey to the selected schools. The heads of schools usually follow all written instructions related to empirical research given by the Rasht Department of Education. Hence, the heads of all selected schools agreed to

participate in the survey. Teachers and school officials assisted and monitored the process of distributing questionnaires and consent letters to the pupils.

School officials and teachers were instructed to ask pupils to bring the questionnaire home to parents who were requested to complete them (see also McMillan, 2005; Seraj et al., 2012; Shokoohi et al., 2012). The questionnaires were distributed among pupils in the randomly selected schools. Classes (first to third grade with an age interval of 7 to 9 years) in these schools were randomly selected and all the pupils in these classes were given the questionnaire to bring home to their parents. The selected pupils were given two school days to return the form to school. The respondents (decision makers) were parents (father or mother) in the current survey. The parents also received a written form which described the importance of the current research and its findings and how to fill out the different measures in the questionnaire.

To increase the likelihood that a decision maker in the household (fathers or mothers) filled in the forms, we requested each respondent to return an additional consent letter signed by the parents. The returned questionnaires which did not include an accompanying consent letter were excluded from further analysis. The pupils were requested to ask one of the parents to fill in the questionnaire and it was also written in the consent letter that only one of the parents were to complete the questionnaire. A total of 858 (79.6%) questionnaires were returned to the schools. School officials and teachers gathered all returned questionnaires in the selected classes. Forms that had not consent letter from parents and incomplete questionnaires (n=123) were removed from the sample.

Among valid and complete questionnaires (n=735), 78.8% (n=579) of the children were from public schools, while 21.2% (n=156) were from private schools. The proportion of boys and girls

was nearly equal in the sample. On average, the age of responding parents was 35.33 years (SD=6.73). The average reported walking time from home to school was 25.08 minutes (SD=20.71). Among complete observations, school service (e.g. school bus, carpooling mode) was the most frequently chosen mode (55.9%), followed by car (22.2%), walking (18.9%), public transport (2.73%), and father's motorcycle (0.27%; n=2). Since, the current research aimed to examine environmental norms regarding car use and other factors associated with sustainable transport modes versus car choice, the two observations reporting motorcycle use were omitted from further analysis (final analytical sample n=733).

2.2. Measures

The questionnaire had different sections and contained norm activation items, parental mode choice behaviour, socio-economic factors, household characteristics and several built environment factors. The NAM was measured by a 19-item validated instrument (De Groot et al., 2008; Jakovcevic and Steg 2013; Lind et al., 2015). All items were measured on a five-point Likert scale ranging from (1) "completely disagree" to (5) "completely agree". This instrument included eight items about personal norms (PN) such as "*If I buy a new car, I feel morally obliged to buy an energy-efficient car*", and "*I do feel personally obliged to use the car as little as possible*" (see items in Table 1). Items related to personal norms covered moral and personal obligation to reduce car use.

Ascription of responsibility (AR) included six items *such as* "*I feel joint responsibility for the exhaustion of fossil fuels by car use*", and "*Not just others, like the government, are responsible for heavy traffic, but me too*". Awareness of consequences (AC) contained five items such as "*Car use takes up a lot of space resulting in less space for cyclists, pedestrians and children"*

and "*Car use reduces urban quality of life due to traffic noise and odour nuisance*". This measure was tested in several previous pro-environmental and transport mode use studies conducted in the general public and in work trips studies (Lind et al., 2015; Nordfjærn and Rundmo, 2015; Jakovcevic and Steg 2013; Abrahamse et al., 2009; De Groot et al., 2008).

Parental mode choice behaviour on their children's school trips was measured by asking the parents how often they had chosen different modes during the week before the survey. The parents reported the frequency of each of the following mode choices: school service, private car, walking, public transport, and motorcycle in their children's trips to school. These modes were selected based on our expert knowledge about modes that are used in Rasht. The most frequently selected mode for each observation was assumed to be the parental mode choice for their children's school travel. This is also in line with the assumption that transport mode choice is a habitual behaviour. The number of school days in a week was five days and therefore the maximum frequency of mode use was 5 times in a week. Of note, more than 90% of the respondents were using solely one mode (all 5 travels undertaken with only one mode) in a week. For parents who used a mixture of different travel modes (less than 10% of the observations) during a school week, the mode with the highest use frequency was assumed to be the chosen mode.

The parents were also asked about their socio-economic and household characteristics (e.g. age, educational level, income), and other built environment factors like walking time from home to school. The grade (first to third grade with an age interval of 7 to 9 years), and gender was recorded for each pupil. The driving license status of the parents (has=1, has not=0), and their educational background (illiterate=1, under high school=2, high school=3, Bachelor of Science

or higher = 4) were recorded. Information about parental exercise in a typical week was also obtained (no exercise = 0, <1 hour, 1-2 hour, 2-3 hour, >3 hour).

The questionnaire also asked questions about the number of owned cars by each household and their proxy income. A proxy approach was used to gather household income with two questions. The first question asked what the respondents thought was the average monthly income of households in Rasht (<500,000 toman (one Euro was 3950 toman) =1, 500,000- 1 million = 2, 1 million - 1.5 million = 3, >1.5 million = 4). Further, the respondents compared their own income with the perceived average income on a five-point Likert scale ranging from (1) “Much lower” to (5) “Much Higher”. Information about the type of school (public and private) and school service (carpooling) availability in each school (yes =1, no = 0) was also obtained. Furthermore, we obtained information about each household’s accessibility to public transport on the home to school route (yes=1, no=0). A continuous scale of parental perceived walking time to school was also included.

2.3. Statistical procedures

Descriptive statistics were applied to show the overall socio-economic, walking time and environmental norms of the sample. Independent samples t-test was applied to examine mean differences in NAM scores between those who chose car and those who chose sustainable transport modes. Cohen's d effect size was calculated to indicate the standardized difference between two means. Cohen's d can be calculated as the difference between the means divided by the pooled standard deviation. A Cohen’s d-value of 0.2 is considered as a small effect size, a d of about 0.5 indicates a medium effect size and 0.8 is a large effect size (Cohen, 1992).

Principal component analyses (PCA) with iteration and varimax rotation were used to investigate the dimensional structure of the instruments. Cronbach's α was calculated to test scale reliability and internal consistency. Kaiser criterion (an eigenvalue above 1 was considered as a significant value) and the Scree plot were used to determine the number of dimensions. A factor loading above 0.30 was also used as a criterion for items to be retained in the NAM dimensions. In addition to PCA, a confirmatory factor analysis (CFA) was deployed to confirm factors previously identified in the literature. The factor structure of the NAM was analyzed using confirmatory factor analysis (CFA) conducted in IBM SPSS Amos 23.0.0. The Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI) were used as fit indices to determine the fit of the data to the specified model. The chi-square (χ^2) with corresponding significance level was also reported. Furthermore, structural equation modeling (SEM) was also used to test the hypothesized model postulated in Figure 1.

Also, Pearson's correlation coefficients were used to investigate associations between environmental dimensions (AC, AR, and PN), socio-economic factors, perceived walking time to school, access to public transport and pupils' car use. To predict sustainable transport versus car use, binary logistic regression analyses were carried out. The predictors (environmental dimensions, sociodemographic and situational factors) were added simultaneously in the model. The model aimed to predict sustainable transport modes (aggregation of school service, public transport and walking) versus car choice.

3. Results

3.1. Differences in NAM items among car and sustainable transport users

Descriptives for the NAM items separated for those who chose car and sustainable transport the most frequently are reported in Table 1. As shown, the AR item "*In principle, one person cannot decrease the problems of car use"* was highest both among the car and sustainable transport groups (in the car group: Mean=4.45, SD=0.72; in the sustainable transport group: Mean=4.35, SD=0.89). Parents who tended to choose sustainable transport modes for their children reported stronger agreement with environmental norms such as *Env15* (Mean=3.93, $t = -3.39$, $p < 0.001$), *Env16* (Mean=2.98, $t = -2.79$, $p < 0.01$), *Env17* (Mean=4.09, $t = -5.24$, $p < 0.001$), and *Env18* (Mean=3.89, $t = -5.67$, $p < 0.001$).

[Table 1. Near here]

3.2. Dimensionality and reliability indices for NAM items

The PCA showed that the NAM segmented into three dimensions (Table 2). Awareness of consequences (AC) contained four items ($\alpha = 0.748$, Average corrected inter-item correlation = 0.53, Explained variance = 16.14%). Ascription of responsibility (AR) included four items ($\alpha = 0.721$, Average corrected inter-item correlation = 0.40, Explained variance = 13.68%). Personal norms (PN) included seven items ($\alpha = 0.798$, Average corrected inter-item correlation = 0.51, Explained variance = 20.10 %). In addition to PCA, the outcome of a CFA for the NAM is shown in Figure 2. This analysis showed that a three-factor solution had acceptable fit to the data ($\chi^2 = 336.45$, $df = 87$, $p < 0.001$, $RMSEA = 0.064$, $CFI = 0.95$, $TLI = 0.91$).

Four items were removed because they failed to load consistently. These four items had factor loadings below 0.2 in PCA or did not have significant factor loadings in the CFA. These items were therefore removed from the tested factor structure. The excluded items were: 'By reducing car use the level of air pollution will decrease (*Env5*)' assumed to load on the awareness of

consequences factor, 'I am jointly responsible for the problems caused by car use (*Env7*)' and 'My contribution to the problems of car use is negligible (*Env11*)' assumed to load on the ascription of responsibility factor, and 'I feel personally obliged to travel in an environmentally sound way, such as by using a bicycle or public transport (*Env12*)' assumed to load on the personal norms factor.

[Table 2. Near here]

[Figure 2. Near here]

3.3. Correlations between the study variables

The next step was to test bi-variate associations between the NAM dimensions, demographic and household characteristics and pupils' car use. As displayed in Table 3, as could be expected parents who chose car the most for their children were more likely to own a car (*r=0.27*). Those who chose car the most were also slightly more likely to have a higher income level (*r=0.13*). A longer walking time from home to school was associated with a somewhat weaker tendency to choose a car (*r=-0.09*). Parents who reported stronger personal obligations and norms about the environment tended to choose the car slightly less (*r=-0.10*). Respondents who perceived longer distance to school had better access to public transport (*r=0.17*). Furthermore, Older parents reported somewhat stronger personal obligations towards reducing car use (r=0.13). Respondents with higher income (*r=-0.13*) and higher owned car (*r=-0.11*) tended to report weaker personal norm. Well-educated mothers were related to weaker personal norm (*r=-0.10*). In addition, well-educated fathers (*r=-0.07*) and mothers (*r=-0.09*) reported stronger ascription of responsibility.

[Table 3. Near here]

3.4. Test of the NAM causal chain

A SEM showed that the underlying NAM causal structure was supported, but the link between the NAM and reported behaviour did not receive empirical support (Figure 3). However, the SEM model indicated that the overall model had good fit to the data (χ^2= *339.25, df= 101, p< 0.001, RMSEA= 0.057, CFI= 0.91, TLI= 0.89*). Awareness of consequences significantly predicted ascription of responsibility (*β=0.55, p< 0.001*). Ascription of responsibility was a significant predictor of personal norms (*β=0.76, p< 0.001*). The behavioural link of the NAM system, between personal norms and pro-environmental behaviour, was not significant (*β=0.07, p= 0.062*). The regression weights estimates and their standardized weights are shown in Table 4 and Table 5, respectively.

[Figure 3. Near here]

[Table 4. Near here]

[Table 5. Near here]

3. 5. Predictors of sustainable transport modes versus car choice

The binary logistic model (see Table 6) significantly predicted sustainable transport modes versus car (Model χ^2 = 106.34, $p < 0.001$). Father's driving license status (OR =0.77, $p < 0.05$, CI95%: (0.62, 0.98)), mother's driving license status (OR =0.54, $p < 0.01$, CI95%: (0.32, 0.91)), increased car ownership (OR =0.35, $p < 0.001$, CI95%: (0.24, 0.54)), higher education of the mother (OR =0.66, $p < 0.01$, CI95%: (0.44, 0.99)) and higher perceived safety of walking facilities (OR =0.89, $p < 0.05$, CI95%: (0.71, 0.99)) were negatively related to sustainable transport mode choice on children's school trips. Pupils from public schools were more likely to use sustainable transport modes (OR =1.59, $p < 0.05$, CI95%: (1.02, 2.88)). Parents who exercised more in a week were more likely to choose sustainable transport modes for their

children (OR =1.22, $p < 0.01$, CI95%: (1.04, 1.43)). Availability of school service (OR =3.47, $p < 0.001$, CI95%: (1.90, 6.34)) and accessibility to public transport (OR =1.88, $p < 0.001$, CI95%: (1.14, 3.46)) was positively related to choosing sustainable transport modes. Regarding the NAM components (AC, AR and PN), personal norms (PN) was slightly related to an increased probability of choosing sustainable transport modes for the children (OR =1.20, $p < 0.05$, CI95%: (1.03, 1.41)). Two other NAM components (AC and AR) as well as other demographic and household characteristics (e.g. pupils' gender, grade and household income level) failed to significantly predict sustainable transport mode choice versus car.

[Table 6. Near here]

4. Discussion and conclusion

The present research aimed to investigate the causal chain of the NAM theory and the role of the NAM dimensions as well as sociodemographic and some situational and built environment characteristics on parental sustainable transport mode choice on their children's school travel in an Iranian context. Intriguingly, and in contrast to previous studies (Jakovcevic and Steg, 2013; De Groot et al., 2008) and our initial hypothesis, the NAM did not predict sustainable transport behaviour in the current study undertaken in an Iranian context. The SEM showed that the underlying NAM system was supported by the data. However, personal norms did not predict sustainable behaviour which suggests that the NAM does not predict pro-environmental adaptions in this Iranian sample. As hypothesized, stronger awareness of consequences was associated with higher ascription of responsibility. Furthermore, stronger ascription of responsibility predicted a stronger personal norms and moral obligation of parents in reducing car choice for their children. Since the NAM structure and pro-environmental behaviour relationship was not supported in the study, the present findings may challenge the generality of

the assumption that the NAM theory predicts sustainable transport mode choices. The findings also align with a recent study which suggested that the NAM components may not predict mode choice behaviour in China (Nordfjærn & Zavareh, 2017).

A potential reason for the lack of empirical support for the link between the NAM and sustainable transport mode choice was the fact that the study area environment may be rather unsupportive of sustainable transport choices. As such, many parents who had strong personal norms may not have been able to act in accordance with these norms because public transport and sustainable transport facilities were not available in their pool of transport mode options. The current study was conducted in an area with rather weak infrastructures for cycling and walking, which are situational factors that might play a significant role in parental transportation mode choice. Although the perceived walking time from home to school, accessibility to public transport in the home to school path, availability of school services and car have been measured in this study, using a more extensive instrument for measuring situational factors (e.g. Black et al., 1985; Tanner, 1999; Cervero, 2002) could be useful for explaining environmental behaviour in less industrialized countries.

A plausible speculation for why the NAM chain was not associated with behaviour is that situational constraints, spatial and built environment factors may be more important precursors of mode use than normative processes (Nordfjærn and Zavareh, 2017). We cannot rule out the NAM as a predictor of other environmental behaviours in Iran, but transportation mode use is subject to a wide range of situational and spatial constraints that may render it difficult to attend to normative factors when choosing/using a mode. For instance, Collin and Chambers (2005) examined the relative role of values, beliefs and situational factors on commuter-transport mode choice. They found that contextual and situational features (e.g. travel costs and accessibility to

public transport) and normative factors (e.g. personal norm) were jointly associated with travel mode choice. Therefore, external constraints may play a role in explaining travel mode choice in addition to normative factors. Furthermore, several previous studies showed that sustainable transport mode choice was related to an extensive set of spatial structures and built environment factors both for school trips (e.g. Easton and Ferrari, 2015; Ferrari and Green, 2013; Schlossberg et al., 2006) and other trip purposes (e.g. Cervero, 2002; Cervero et al., 2009; Bruun and Givoni, 2015). Spatial and contextual constraints and opportunities should be investigated further in order to test their relative role when the NAM components are accounted for.

One possible explanation for why the different NAM dimensions did not explain mode choice may be the educational background of the parents. Individuals who have a higher educational level may have stronger environmental attitudes and feelings of stress for environmental consequences of car use in an Iranian setting (Kalantari et al., 2007). However, this could even be an issue among those who have a high education. Transport-related pollution does not receive much attention neither in the Iranian educational system nor in the media. As such, also those who are highly educated may strive to see the link between transport use and pollution (Hashemzadeh, 2016).

Another possible explanation is that there is weak endorsement regarding the link between pro-environmental behaviour and quality of life in Iran. Quality of life could be indicated in a wide-range of factors such as comfort, economy, safety, health and time resources (e.g. Steg and Gifford, 2005; Poortinga et al, 2004). Some sustainable modes of transport may have negative influences on the quality of life of Iranian households. For example, if a pupil uses public transport for school travels, parents might have concerns about their children's safety and security. Also, it is often unpractical and unsafe to let children travel to school with public

transport as the access points may not be available close to the schools. Policymakers should consider people's quality of life when sustainable transport policies are devised. Policies aimed to restrict car use should take into account different aspects of quality of life, such as freedom of choice (Steg and Gifford, 2005). For instance, if a policy restricts the freedom of choice it may have negative effects on behaviour and car users may continue driving, regardless of the potential negative consequences. This is in line with reactance theory where a behaviour becomes even more valuable when an external party tries to restrict it (Brehm, 1966). In line with this reasoning, it is critical that transport push factors aimed at making car use less attractive is accompanied with efforts targeted to make sustainable mode use both available and more attractive (i.e. transport pull factors).

Even though the focus of the current study was the associations between the NAM and behaviour, it may also be interesting to discuss socioeconomic attributes related to the NAM components. A few socioeconomic variables were correlated with the NAM dimensions but not to an extent where multicollinearity was an issue and where we could expect the socioeconomic variables to replace the NAM framework. For example, households with an increased number of private cars and high income had weaker personal norms regarding car use. This may be related to their economic wealth, and these parents may also focus more on convenience and safety in private car instead of seeking out the rather unintegrated and unsafe options in the active transport sectors. In addition, well-educated mothers tended to report weaker personal norms than less-educated mothers. This may also imply that individuals with higher safety knowledge and education might have more awareness and concerns on non-car modes (e.g. walking and public transport) in their children's school travels. Hence, these mothers might give more priorities to safety and convenience in transport by private cars.

Another important aim of the current research was to examine the relative role of the NAM dimensions (awareness of consequences, ascription of responsibility and personal norms,) as well as sociodemographic factors, household characteristics and some situational factors on parental sustainable transport mode choice versus car for their children. In this analysis, the NAM dimensions did not have an important role for the odds of sustainable transport choice relative to other household and situational variables. Somewhat expected on the basis of the theoretical underpinnings in the NAM, higher ascription of responsibility and awareness of consequences did not predict sustainable transport choice versus private car. Personal norms had a rather weak positive relation with sustainable transport mode choice in the model. These findings are in contrast with previous studies that examined normative considerations and car use reductions by the NAM theory in Western nations (Abrahamse et al., 2009; Lind et al., 2015; Jakovcevic and Steg, 2013; De Groot et al., 2008).

When the groups of sustainable transport and car choosers were compared, the number of owned cars in the households, type of school, mother's driving license and educational degree, perceived safety of walking safety, and parental exercise in a week were also significant predictors of mode choice. Parents in households with more cars were less likely to choose sustainable transport modes (Van Goeverden and De Boer, 2013; Mehdizadeh et al., 2017a). Pupils from public schools had a higher probability of using sustainable modes. School type was also found to be an important predictor of school service choice on pupil's school travels in Toronto (Mitra and Builing, 2015). The authors found that pupils who attended non-public schools more likely to use school bus over other modes. Walking time to school or distance has been found as an important variable that could negatively influence the children's walking/cycling to school in several previous studies (Mehdizadeh et al., 2017a). One plausible

explanation for a non-significant relationship between walking time and sustainable transport choice in the binary logistic regression could be that the sustainable transport alternative is an aggregation of walking and school service mode. Although the probability of choosing walking may be decreased by increasing walking time to school, but on the other hand, this increased walking time might increase the probability of school service choice.

Furthermore, parents who exercised more in a week had more sustainable transport mode choices (Mehdizadeh et al., 2016). Mehdizadeh et al. (2016) found that parents with higher rates of exercise in a week were more likely to choose walking for their children on school travels. Parents who had higher rates of exercise could be more likely to consider health outcomes when deciding how their children should travel to school. These parents might take important health-related priorities, such as daily physical activity and fitness, into consideration when making their transport mode choice (Ryley, 2006). Exercise may be one of the reasons for choosing walking as a "green" and health promoting mode for children's school travel. Further, these parents are probably more likely to walk for recreational purposes and it probably transfers to what they choose for their children. Accessibility to public transport had a positive effect on the choice of sustainable transport modes (Mitra and Builing, 2015). Hence, it seems like pull factors such as making public transport more available and attractive to use could be feasible in promoting use of sustainable transport in an Iranian context. Overall, the current results showed that demographic, household characteristics and situational factors were more important than the NAM dimensions in predicting sustainable transport mode choice in our sample.

To our knowledge, the present research is the first to test normative and moral considerations in parental mode choice (sustainable transport modes versus car choice) on their children's school travel in an Iranian context. The current research findings suggest that it is important to focus on

personal norms by making parents more aware of the environmental problems associated with car use and to strengthen their sense of responsibility as the latter could activate personal norms leading to pro-environmental behaviour. Children's school trips may differ from adults' urban and work trips in important ways. On children's school trips, parents usually choose the transport modes on behalf of their children. Furthermore, to act in an altruistic (pro-environmental) manner, parents must suppress some of their personal interests to achieve environmental benefits for the society. For instance, when choosing sustainable transport modes versus car in areas with less public and active transport facilities and also lower safety, parents may not consider normative factors such as the NAM dimensions. They may prioritize other transport aspects like safety and security of modes, the travel convenience for their children, and travel flexibility (e.g. being able to travel at a specific time). However, there are also some negative aspects of using a car. Driving in Iran may be stressful partly due to narrow roads with rather high accident rates and an overall chaotic driving environment. In addition, due to heavy traffic, a rather dense urban form and the low number of parking slots in centroid business districts in the study area, delays and traffic congestion might reduce the utility of car use.

Furthermore, Iranian cities have a less integrated public transport system, poor traffic safety records and weak cycling and walking infrastructures compared to developed high income countries. Hence, parental attitudes towards sustainable transport modes (e.g. walking, cycling), and attitudes towards transport safety and security may influence sustainable transport mode use on children's school travel (Hopkins and Mandic, 2017; Woldeamanuel, 2016; Mehdizadeh et al., 2017b; Ermagun and Samimi, 2017). In addition, and in line with the current results, adults might prioritize socio-economic factors more than pro-environmental normative factors in developing contexts like Iran.

In the present study, we assumed that the respondents (mothers or fathers) were the decision makers for children's travel mode to school (McMillan, 2005). However, the father or mother may not always be the decision makers regarding travel mode use among the children. Indeed, we assumed that either the father or mother who responded to the questionnaire, had a direct influence on the final decision making for children's travel mode choice. However, for instance, in some households fathers may have a key role for children's mode use (fathers may be final decision maker), while mothers responded to the questionnaire. While this is a possibility, decisions regarding children mode use are likely to be discussed and negotiated between the parents, and as such the caregivers will most of the time report similar mode use patterns and decision making for the children. This is likely to be particularly true for habitual and routine behaviours, such as transportation mode use to repeated destinations.

The present study examined mode use behaviour for the youngest pupils who do not have sufficient autonomy to make travel decisions by themselves (McMillan, 2005). We assumed that parents (mothers or fathers) were the final decision makers for their children's travel mode use, which is an assumption that has been argued in several previous empirical accounts (e.g. McMillan, 2007; McDonald, 2009). It may be interesting to replicate the study among teenagers who have more autonomy than the youngest pupils in terms of transport mode choices.

To further investigate whether the NAM causal chain applies to mode use in a Middle East context, it is suggested that this theory could be tested in the general public and examined in relation to pro-environmental transport outcomes, such as sustainable transport mode use or intention to use such modes. Also, it may be more feasible to focus on developing a safe infrastructure and to extend the availability of sustainable transport options in Iran. It could be that a focus on promoting norms, such as argued by the NAM, is not efficient in Iran with the

current level of infrastructure and accessibility of sustainable transport. Norms may only be important when the environment allows the individuals to act in accordance with them. Therefore, future studies should examine important aspects of transport options (e.g. travel flexibility and reliability), situational factors (e.g. availability and accessibility of modes) and quality of life characteristics on sustainable transport in less developed countries like Iran.

Acknowledgement

We would like to acknowledge the authorities of Rasht Department of Education, schools' officials, teachers, pupils, and parents who in different ways helped us to conduct the current research.

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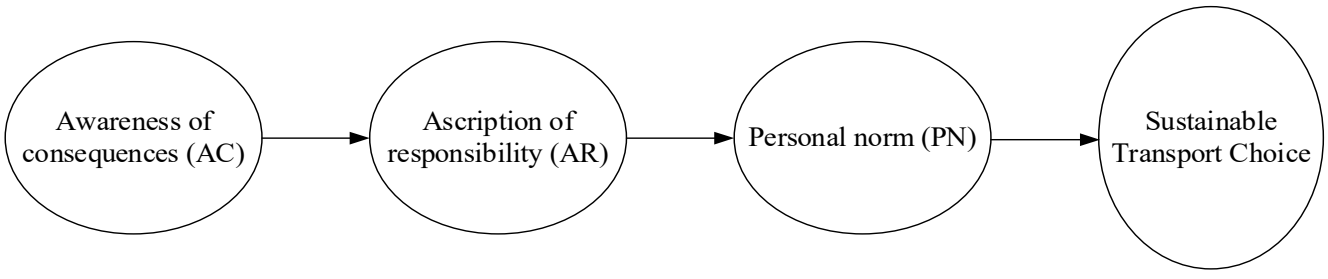


Figure 1. Causal structure of the NAM and sustainable transport mode choice

Table 1

Descriptives for NAM items among those who chose car and sustainable transport (N=733)

Item (abbreviation)	Car (N=163)		Sustainable transport (N=570)		t-value	Cohen's d-value
	Mean	SD	Mean	SD		
Car use causes exhaustion of scarce resources, such as oil (*Env1*)	3.14	1.14	3.09	1.18	0.75	0.04
Car use takes up a lot of space resulting in less space for cyclists, pedestrians and children (*Env2*)	3.47	1.23	3.38	1.16	1.08	0.07
Car use is an important cause of traffic-related accidents (*Env3*)	3.05	1.23	3.13	1.22	-0.61	-0.06

Car use reduces urban quality of life due to traffic noise and odour nuisance (*Env4*)	3.74	1.05	3.69	1.05	0.87	0.04
By reducing car use the level of air pollution will decrease (*Env5*)	4.20	0.86	4.24	0.79	-0.34	-0.04
I feel joint responsibility for the exhaustion of fossil fuels by car use (*Env6*)	3.65	0.73	3.72	0.81	-1.05	-0.09
I am jointly responsible for the problems caused by car use (*Env7*)	3.02	1.07	2.89	1.05	1.27	0.12
Not just others, like the government, are responsible for heavy traffic, but me too (*Env8*)	3.96	0.86	3.98	0.79	-1.11	-0.02
In principle, one person cannot decrease the problems of car use (*Env9*)	4.45	0.72	4.35	0.89	1.97*	0.12
I feel joint responsibility for the contribution of car traffic to global warming (*Env10*)	3.92	0.89	3.98	0.80	-0.89	-0.07
My contribution to the problems of car use is negligible (*Env11*)	3.18	1.16	3.34	1.14	-2.58**	-0.13
I feel personally obliged to travel in an environmentally sound way, such as by using a bicycle or public transport (*Env12*)	3.91	0.81	3.95	0.78	-0.39	-0.05
I would be a better person if I used more often other transport modes instead of the car (*Env13*)	3.73	1.13	3.80	0.97	-0.65	-0.06
People like me should do whatever they can to minimize their car use (*Env14*)	3.96	0.87	3.99	0.82	-0.25	-0.03
I feel obliged to take the environmental consequences of car use into account when making travel choices (*Env15*)	3.79	0.70	3.93	0.68	-3.39***	-0.21
I do feel guilty when I use the car even though there are other feasible transport alternatives available (*Env16*)	2.81	0.75	2.98	0.88	-2.79***	-0.20
If I buy a new car, I feel morally obliged to buy an energy-efficient car (*Env17*)	3.89	0.93	4.09	0.82	-5.24***	-0.22
I feel morally obliged to use the car as little as possible, regardless of what other people do (*Env18*)	3.69	0.89	3.89	0.81	-5.67***	-0.23
I do feel personally obliged to use the car as little as possible (*Env19*)	3.34	1.06	3.38	1.10	-0.23	-0.03

*: P-value < 0.05, **: P-value < 0.01, ***: P-value < 0.001.

Table 2

PCA and reliability indices for NAM items

	Loadings		
Dimensions	PN	AC	AR
1- Personal norms (α = 0.798, Aiic = 0.51,Ev = 20.10%, Dimension's mean (SD) = 3.69 (0.97))			
I do feel guilty when I use the car even though there are other feasible transport alternatives available (*Env16*)	0.76		
I do feel personally obliged to use the car as little as possible (*Env19*)	0.72		
I feel morally obliged to use the car as little as possible, regardless of what other people do (*Env18*)	0.65		
I would be a better person if I used more often other transport modes instead of the car (*Env13*)	0.62		
If I buy a new car, I feel morally obliged to buy an energy-efficient car (*Env17*)	0.53		

I feel obliged to take the environmental consequences of car use into account when making travel choices (*Env15*)	0.50		
People like me should do whatever they can to minimize their car use (*Env14*)	0.50		
2- Awareness of consequences (α = 0.748, Aiic = 0.53,Ev = 16.14%, Dimension's mean (SD) = 3.33 (1.15))			
Car use takes up a lot of space resulting in less space for cyclists, pedestrians and children (*Env2*)		0.77	
Car use is an important cause of traffic-related accidents (*Env3*)		0.73	
Car use causes exhaustion of scarce resources, such as oil (*Env1*)		0.70	
Car use reduces urban quality of life due to traffic noise and odour nuisance (*Env4*)		0.70	
3- Ascription of responsibility (α = 0.721, Aiic = 0.40,Ev = 13.68%, Dimension's mean (SD) = 4.01 (0.81))			
Not just others, like the government, are responsible for heavy traffic, but me too (*Env8*)			0.64
In principle, one person cannot decrease the problems of car use (*Env9*)			0.64
I feel joint responsibility for the contribution of car traffic to global warming (*Env10*)	0.31		0.61
I feel joint responsibility for the exhaustion of fossil fuels by car use (*Env6*)	0.31		0.52

Notes: Factor loadings <0.30 not reported.

Aiic = Average corrected inter-item correlation.

Ev = Explained variance.

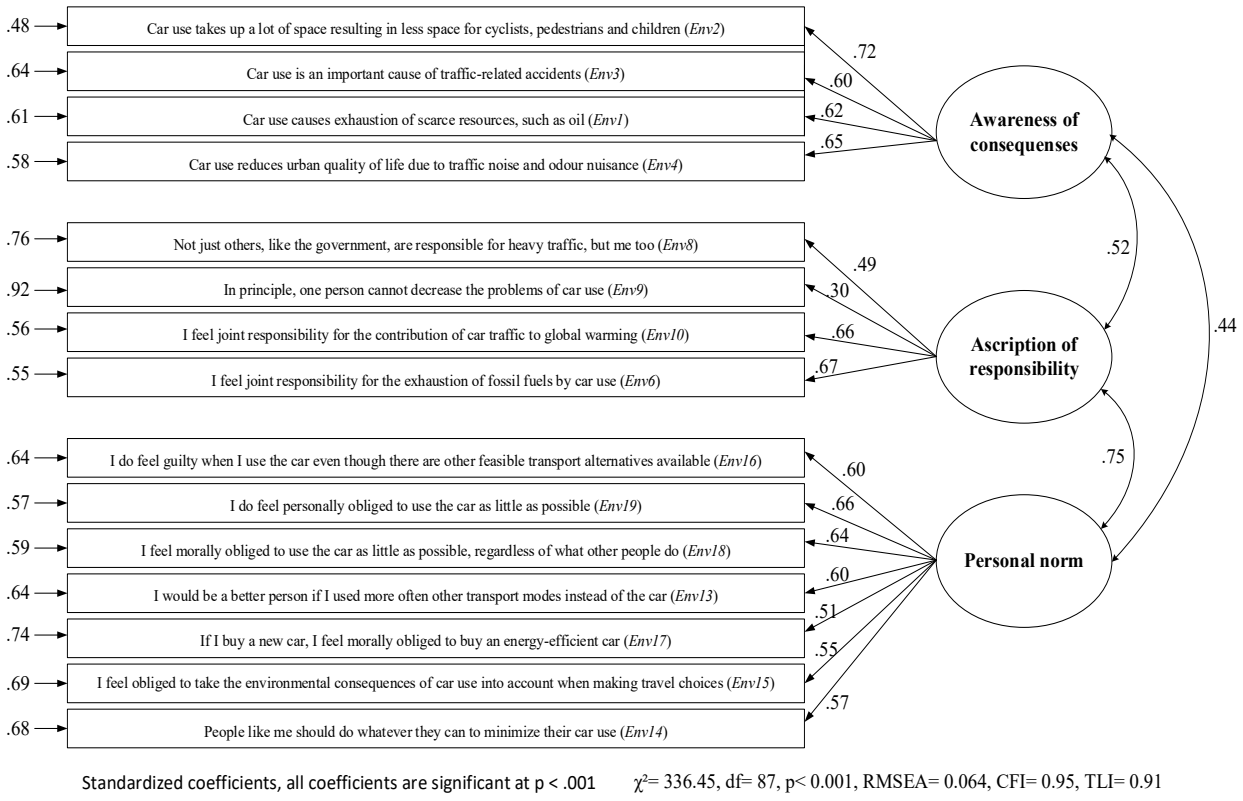


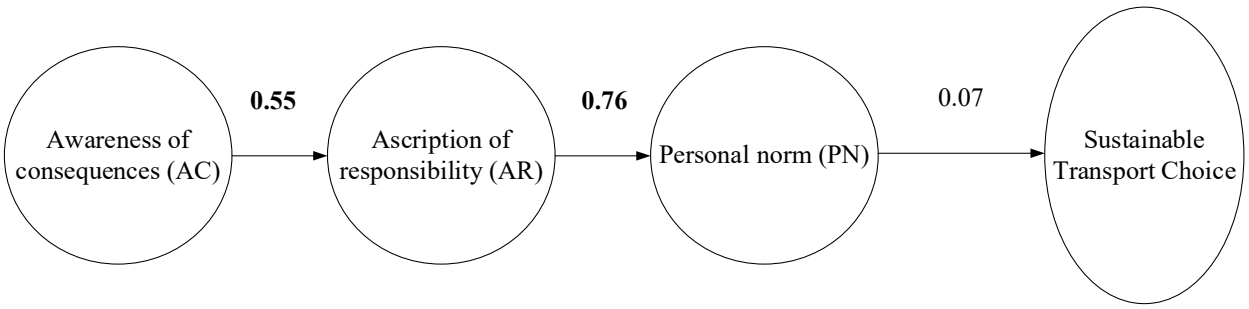
Figure 2. Three-factor NAM with factor loadings

Table 3

Correlations between the study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1- Grade of pupil	1													
2- Number of private car	-0.04	1												
3- Father education	**-0.12**	**0.27**	1											
4- Mother education	**-0.11**	**0.24**	**0.59**	1										
5- Income	-0.02	**0.38**	**0.31**	**0.32**	1									
6- Parental exercise in a week	0.06	0.06	**0.11**	0.06	**0.16**	1								
7- Walking time from home to school	-0.06	-0.03	**-0.07**	-0.03	**-0.07**	-0.01	1							
8- Accessibility to public transport	-0.04	-0.01	-0.04	-0.07	0.04	-0.01	**0.17**	1						
9- Perceived safety of walking facilities	0.01	-0.01	**-0.07**	**-0.09**	0.07	0.02	-0.05	0.11	1					
10-parent age	**0.11**	0.03	**0.10**	0.01	0.05	-0.01	**-0.08**	-0.04	-0.02	1				
11-Personal norms	0.05	**-0.11**	-0.06	**-0.10**	**-0.13**	0.04	-0.03	-0.05	0.01	**0.13**	1			
12-Awareness of consequences	0.05	-0.02	-0.03	-0.02	-0.05	0.02	-0.05	-0.07	-0.02	0.02	0.01	1		
13-Ascription of responsibility	0.05	0.04	**0.07**	**0.09**	**0.09**	0.01	0.02	0.15	-0.05	0.02	0.01	0.01	1	
14-car use in a week	-0.01	**0.27**	**0.11**	**0.15**	**0.13**	-0.05	**-0.09**	-0.01	0.02	0.03	**-0.10**	0.02	0.01	1

Bold figures: $p<0.05$.



Standardized coefficients, significant $p < .001$ coefficients in bold

$\chi^2 = 339.25$, df= 101, $p < 0.001$, RMSEA= 0.057, CFI= 0.91, TLI= 0.89

Figure 3. SEM model testing the NAM

Table 4

Estimated unstandardized regression weights between the variables in the structural equation model of the NAM chain

			Estimate	S.E.	C.R.	P
AR	<---	AC	.411	.045	9.226	***
PN	<---	AR	1.011	.088	11.469	***
Env19	<---	PN	1.000			
Env18	<---	PN	.841	.059	14.186	***
Env17	<---	PN	.699	.059	11.813	***
Env16	<---	PN	.933	.070	13.403	***
Env15	<---	PN	.652	.052	12.642	***
Env14	<---	PN	.669	.052	12.863	***
Env13	<---	PN	.843	.063	13.431	***
Env4	<---	AC	1.000			
Env3	<---	AC	1.045	.084	12.508	***
Env2	<---	AC	1.062	.086	12.359	***
Env1	<---	AC	.883	.082	10.748	***
Env10	<---	AR	1.000			
Env9	<---	AR	.444	.069	6.390	***
Env8	<---	AR	.725	.069	10.567	***
Env6	<---	AR	.974	.074	13.147	***
Sustainable transport choice	<---	PN	.044	.024	1.864	.062

Note. ***: $P < 0.001$.

Table 5

Standardized regression weights between the variables in the structural equation model of the NAM chain

			Estimate
AR	<---	AC	.554
PN	<---	AR	.765
Env19	<---	PN	.655
Env18	<---	PN	.642
Env17	<---	PN	.515
Env16	<---	PN	.598
Env15	<---	PN	.558
Env14	<---	PN	.569
Env13	<---	PN	.600
Env4	<---	AC	.690
Env3	<---	AC	.625
Env2	<---	AC	.660
Env1	<---	AC	.551
Env10	<---	AR	.654
Env9	<---	AR	.279
Env8	<---	AR	.491
Env6	<---	AR	.668
Sustainable transport choice	<---	PN	.076

Table 6

Predictors of sustainable transport mode choice on school travel

	Sustainable transport [a] vs Car choice		
	B	S.E.	Exp (B)
Constant	3.05**	1.18	
Gender of pupil (boy=1, girl=0)	-0.17	0.20	0.83
Type of school (public=1,private=0)	0.46*	0.20	1.59
Grade of pupil	-0.07	0.12	0.92
Father driving license status (has=1, not=0)	-1.02*	0.47	0.77
Mother driving license status (has=1, not=0)	-0.60**	0.24	0.54
Number of private car	-1.02***	0.20	0.35
Father job status (full time=1, part time=0)	-0.07	0.08	0.92
Mother job status (full time=1, part time=0)	0.01	0.09	1.01
Father education	0.20	0.18	1.22
Mother education	-0.41**	0.16	0.66
Income	0.08	0.16	1.08
Parental exercise in a week	0.20**	0.08	1.22
Walking time from home to school (min.)	0.02	0.01	1.01
Accessibility to public transport (yes or no)	0.87***	0.20	1.88
Availability of school service	1.24***	0.30	3.47
Perceived safety of walking facilities	-0.10*	0.05	0.89
Parental (father or mother) age	-0.01	0.01	0.98
Personal norms	0.10*	0.05	1.20
Awareness of consequences	-0.11	0.09	0.89
Ascription of responsibility	0.01	0.09	1.01
Model χ^2	106.34***		
Cox & Snell R2	.13		
Nagelkerke R2	.20		
Number of observations	733		

a. car=0, sustainable transport=1,

*: P < 0.05, **: P < 0.01, ***: P < 0.001.