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Car use of young adults: The role of travel socialization

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ABSTRACT

This study evaluates how different aspects of travel socialization during childhood and adolescence contribute to the explanation of travel mode choice in young adulthood. In an online survey with 2612 students who had access to a car three different socialization aspects were measured retrospectively: communication with parents about the environmental impact of travel mode choice at the participants' age of 15, the symbolic-affective importance of driving and acquisition of a driver's license at the age of 18, and finally multi-mobility in the peer group at the age of 18. It was expected that socialization constructs would have a direct effect on social and personal norm as wells as on car use habit and an indirect effect on car use, mediated by norms, habit and intention. Structural equation modelling showed a significant impact of all socialization constructs on either norms or car use habit or both. Moreover, the postulated mediator effect could be confirmed. The paper encourages widening the perspective of transport studies by aspects of socialization, which have been neglected in former research on adults mobility behaviour.

1. Introduction

Car use produces serious global and local problems with respect to health and environment (cf. Gärling & Steg, 2007). Main causes of these problems are emissions of greenhouse gases and toxic air pollutants as well as noise and accidents. In addition to technological solutions and an optimization of the infrastructure, an effective overall solution to these problems would require behavioural change of individual car use.

So far, psychological studies on travel mode choice focus on the influence of psychological determinants of mobility behaviour that are active in the situation when the decision is made, such as personal norms or travel mode choice habits. However, the analysis of the formation of these determinants has rather been neglected. In this paper, we consider how different aspects of travel socialization during childhood and adolescence contribute to the explanation of personal and social norms, car use habits, and travel mode choice in young adulthood in order to detect new starting points for the change of car use behaviour.

1.1. Travel socialization

The concept of socialization refers to "the ways in which individuals learn skills, knowledge, values, motives, and roles appropriate to their position in a group or society" (Bush & Simmons, 1981, p. 134). *Travel* socialization focuses on learning processes in relation to mobility behaviour. Baslington (2008) has recently introduced "a social theory of travel mode behaviour".

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According to her theory children learn about travel modes in the same way as they learn about other aspects of culture, namely through agents of socialization. The agents Baslington refers to are family, school, media, and peer group. Qualitative interviews with children suggested that the liking of various transport modes as well as the desire to drive or buy a car in the future is influenced by peers. Moreover, Baslington could show that in car-free households a higher percentage of children can imagine living happily without a car in adulthood than in households that own a car. This result is taken as an indication for the socializing influence of the parents. Results of other studies confirm the correlation between parents' car ownership and children's attitudes towards different transport modes (e.g., Cahill, Ruben, & Winn, 1996; Sandqvist, 2002).

Meaton and Kingham (1998) showed that children learn at very early age how to differentiate between different modes of transportation and form their preferences. According to their results, seven year old children already associate different modes of transportation with different levels of prestige, e.g., old people are more likely to be associated with bus driving, whereas successful looking people are linked with car brands, such as Porsche or BMW. The latter are also types of cars that children want to own when older, which Baslington (2008) takes as evidence for media influence. Although this interpretation might be overestimating the media influence as the only cause of the children's preferences, the image of certain types of cars communicated by advertisement and media might at least have contributed to this result.

With increasing age car access and car ownership become even more salient and certain life events stress this importance. Klöckner (2004) for example identified the acquisition of a driver's license as one of the most important travel mode related life events. Similarly, Schönhammer (1999) described it in terms of an "initiation rite", which does not only imply the "technical" dimension of acquiring the necessary skills to drive a car but also the social dimension of crossing a very important threshold to adult life by acquiring the license to drive.

Previous research on travel socialization mainly deals with children's perception and problem awareness (e.g., Kingham & Donohoe, 2002) regarding different transport modes. So far, impacts on later travel mode choice have been analysed mostly from a projective perspective, asking children what kind of travel mode they can imagine to use later as adults (e.g., Flade, Hacke, & Lohmann, 2001). However, there seems to be hardly any empirical research on the impact of travel socialization on later mobility behaviour, attitudes, norms, or habits from an adult's perspective. The authors suggest that especially habits and norms should be affected by socialization processes, as will be elaborated in the following. First empirical support for this hypothesis is provided by Klöckner and Matthies (2008), who showed that habits mediate the influence of three aspects of travel mode socialization on car use: frequency of parents' use of public transportation, experiencing acquisition of driver's license as initiation to adulthood, and multi-mobility of the peer group. In the paper on hand we want to expand the theoretical framework by examining the role of travel socialization in the context of norms, habits, intention, and behaviour.

1.2. Norms as determinants of travel mode choice

Norms have been frequently shown to be an important predictor of behaviour[1]. At least two different kinds of normative influences can be differentiated: personal norm (PN) and social norm (SN)[2]. SN is defined as the perceived social pressure to engage or not to engage in behaviour and is determined by normative expectations of important referents (Ajzen, 1991). According to the theory of planned behaviour (TPB; Ajzen, 1991) SN is a direct predictor of behavioural intentions besides attitude and perceived behavioural control. In TPB, intention is assumed to be a direct determinant of behaviour. Intention is regarded as a summary of all pros and cons a person takes into account when deliberately reasoning whether or not to perform a behaviour. Studies referring to TPB confirmed the influence of SN on travel behaviour or intention respectively (e.g. Bamberg & Schmidt, 2001, 2003; Haustein & Hunecke, 2007; Heath & Gifford, 2002).

In contrast to the TPB, which has been developed to predict all kinds of behaviours where individuals have incomplete volitional control, the norm-activation model (NAM; Schwartz, 1977; Schwartz & Howard, 1981) focuses on pro-social behaviours. Here PN is regarded as the central predictor of behaviour. PN is defined as the intrinsic feeling of moral obligation to behave in accordance with the person's individual value system (Schwartz, 1977). PN is therefore a link between the value system of a person and behavioural decision making in a certain situation. Compared to SN the reference system of PN is not social influence but *personal*, which means internalized values. According to the NAM, PN is a direct, unmediated causal determinant of pro-social behaviour. Several studies have demonstrated a positive effect of PN on the use of environmentally-friendly travel modes (e.g. Harland, Staats, & Wilke, 1999; Hunecke, Blöbaum, Matthies, & Höger, 2001; Nordlund & Garvill, 2003). However, when controlling for TPB constructs PN often did not show a direct effect on travel mode choice (Bamberg & Schmidt, 2003; Heath & Gifford, 2002). Instead, the relation between PN and behaviour was found to be mediated by intention (Bamberg, Hunecke, & Blöbaum, 2007).

In most studies either PN or SN are considered, depending on the psychological model referred to (TPB vs. NAM). Assuming that both normative variables have a (direct or mediated) impact on behaviour, the question about their interrelation arises. According to Vygotsky (1981, p. 164) "all higher mental functions are internalized social relationships". From his perspective the internalization of SN into PN can be viewed as a social construction process influenced by the dialogue with

[1] For a general overview on the relevance of norms for private car use see Matthies and Blöbaum (2007).

[2] Some authors suggest a more sophisticated differentiation between normative processes. Thøgersen (2006) for example proposes an extended taxonomy of norms (descriptive, subjective social, introjected, and integrated norms). However, as personal norms and social norms have received the most empirical support we decided to analyse only these two kinds of normative influences.

relevant others. Similarly, Sherif (1966, p. 111) described how a common norm arises in an unstable situation and structures the situation. Once the common norm is established, it serves as future reference for the individuals, i.e. it will be internalized. Thus, SN should be a predictor of PN in a longitudinal perspective. In a cross-sectional perspective SN and PN are different constructs that relate to different aspects of decision making (social influence and the value system). However, given stability of social norms and of the social reference group, the influence of social norms on personal norms should still be visible. At least two studies in the domain of travel mode choice support this postulated relation between PN and SN (Bamberg et al., 2007; Hunecke et al., 2001).

As personal norms are assumed to be internalized and adjusted social norms that are formed in social interactions with agents like parents, peers, teachers or media, personal norms about travel mode choice should be constructed in a similar manner. If parents for example talk about negative aspects of individual traffic to their children, the children may over time integrate this aspect into their value system and personal norms. If a conscious decision-making process about travel modes is common in a peer group, this "open-mindedness" could be implemented into the value system and norms, too, a process that is called socialization. Furthermore, personal norms are – because they are related to the person's value system – assumed to be very stable variables that do not easily change over time (unlike most attitudes, e.g.). Therefore, socializing influences in child and adulthood should still have an impact on the adult's personal norms towards travel mode choice which in turn should influence intention on actual travel mode choice behaviour.

1.3. Habits as determinants of travel mode choice

In its application to travel mode choice, both TPB and NAM have been extended by the construct of habits (e.g. Bamberg & Schmidt, 2003; Klöckner, Matthies, & Hunecke, 2003). The main idea of the theory of habit is that people do what they do not only because they intent to or feel morally obliged to do it but also because they successfully did it before in similar situations. The more often a decision is made under the same stable circumstances the less it is influenced by processes of deliberate decision making and the more automated the activation of behavioural patterns becomes (Triandis, 1980). Support for this notion is gathered from results of studies like the meta-analysis of Ouellette and Wood (1998).

The research group around Verplanken and Aarts (e.g. Verplanken & Aarts, 1999; Verplanken, Aarts, van Knippenberg, & van Knippenberg, 1994) conceive of habits as schemata, hence as memory structures that determine the process of information processing during decision making. Schemata have the function to save cognitive resources or to enable people to act in situations with very restricted information, big time pressure or low motivation as they allow to reconstruct complete impressions and evaluations of situations even if very little information is given or processed.

In several studies the integration of car use habit significantly raised the predictive power of TPB (e.g. Bamberg, 1996; Bamberg & Schmidt, 2003; Verplanken, Aarts, van Knippenberg, & Moonen, 1998; Verplanken et al., 1994). Klöckner et al. (2003) and Klöckner and Matthies (2004) integrated habits into the NAM and demonstrated comparable effects in this model context.

Habits as well as norms are considered to be constructs that have a high stability over time. Thus, they should also be related to socializing influences although the process of how habits relate to socialization should be theoretically different from the way how norms relate to socialization. Habits are assumed to be formed on the basis of previous behaviour. Therefore, the influence of socialization on habits should be indirect, mediated by previous behaviour. Nevertheless, there should be a considerable correlation between socialization and habits as socialization implies a long series of (probably normatively influenced) behavioural decisions that given stability of the situation manifest themselves in a strong habit. If parents or peers for example use one travel mode (e.g., the car) consistently they create a situation in which both observed behaviour of relevant others (models) and the adolescent's own behaviour (as long as she/he complies with the others' behaviour) are continuously linked to situational cues which are ideal conditions for developing a strong habit. As long as the situational cues remain stable and behaviour can be successfully performed there is no need to change these established travel mode choice habits.

1.4. The present study

The main objective of the present study is to examine the relevance of travel socialization for the formation of habits and norms as regards travel mode choice. While the influence of habits and norms on travel mode choice has been investigated quite comprehensively (e.g. Bamberg & Schmidt, 2003; Eriksson, Garvill, & Nordlund, 2008; Heath & Gifford, 2002; Klöckner et al., 2003), the genesis of these constructs has rather been neglected. Merely, the role of SN in the activation or initialization of PN has been considered (cf. Bamberg et al., 2007; Hunecke et al., 2001). Previous empirical studies on travel socialization mainly deal with children's current knowledge and attitudes concerning different transport modes depending on parent's mobility behaviour and car ownership (e.g. Baslington, 2008; Sandqvist, 2002). However, influences of travel socialization on future norms, habits, and behaviour have not been investigated yet. A central reason for this lack of research might be the effort of conducting a longitudinal study, which would be the preferable study design for this kind of research. However, in order to gain a first estimation of the relevance of socialization processes for car use norms and habits, in the present study socialization constructs were measured retrospectively, being aware of the methodological limitations this retrospective design implicates.

Besides the communication about travel mode choice with adults and peers as two of the most important socializing agents, the perceived importance of the acquisition of a driver's license was considered as one socialization construct due

to the high relevance ascribed to this event (see Kalwitzki, 1994; Klöckner, 2004; Schönhammer, 1999). Thus, two of the investigated socializing aspects refer to the (retrospectively described) influence of socializing *agents*, the third refers to a socializing *event* and how it was perceived retrospectively. The aim of the study is therefore to demonstrate that at least in a retrospective perspective young adults link their actual travel mode choice to socializing experiences in their childhood and adolescence and that this influence is mediated by two processes: (a) integrating them into a stable value system that translates into (potentially activated) norms in a situation of behavioural choice and (b) creating stable travel mode choice habits by consistently performing travel mode choice in adolescence.

1.5. Hypotheses

Based on the introductory considerations, the following hypotheses were derived and guided the data analysis:

Hypothesis 1. Individuals who report that they have been educated by their parents about the negative impact of car use on the environment experience a stronger social and personal norm to use alternative travel modes and have weaker car-choice habits.

Hypothesis 2. Individuals who report that they have discussed different travel modes open-mindedly in the peer group (considering different travel modes as possible alternatives in each travel mode decision), experience a stronger social and personal norm to use alternative travel modes and have weaker car-choice habits.

Hypothesis 3. The retrospectively measured symbolic-affective importance ascribed to driving and acquisition of a driver's license as a young adult influences the strength of car use habits positively and personal and social norms negatively.

Hypothesis 4. Socialization processes as described in Hypotheses 1, 2 and 3 (communication with parents, peers, symbolic-affective importance ascribed to driving and acquisition of a driver's license) have an indirect effect on car use behaviour, mediated by norms, habits, and intention.

2. Methodology

2.1. Procedure and participants

The study was conducted as online research with students of the Ruhr-University Bochum (RUB, Germany) between mid of November and end of December 2007. Beforehand, the whole population of 30,215 students of all faculties received a letter announcing the study. In this letter, the students were informed about the aim of the study, the access to the online questionnaire, and a lottery for participants at the end of the survey. After two weeks a reminding letter was sent to all students to increase the response rate.

About 4473 students (14.8%) participated in the study. The response rate is within the expected range of an online survey census. For this analysis only people with a driving license and access to a private car were selected. This was to ensure that participants had real choice between the alternative transport modes. Finally, data of 2612 participants were used in this study. Among these were 1418 females (54%) and 1194 males (46%), most of them (62.2%) within an age range of 21 to 25 years, 13.4% younger and 24.4% older[3]. The sample's distribution to faculties corresponded to the actual distributions of RUB students and was thus regarded as representative for RUB students.

2.2. Measures

The online survey collected data on norms, habits, intention, socialization, mobility behaviour, and socio-demographics.

Each latent variable was measured by two up to four indicators (see Appendix for a complete list of the items used). Personal norm (PN) and social norm (SN) were each measured with four items on a seven-point agreement scale (1 = strongly disagree, 7 = strongly agree).

The latent construct car-choice habit (HABIT) was operationalized using two different habit measures as indicators. The response frequency measure (RFM) introduced by Verplanken et al. (1994) is a script-based general index of car use in five imagined situations (cf. Appendix for details). The respondents were confronted with five imaginary travel destinations (e.g. visiting a friend in a nearby town) and asked to name the first travel mode that came to their mind for conducting this trip. The number of times a particular travel mode ("car" in this case) was chosen equals the strength of the general car-choice habit. The RFM-index was entered as one of two indicators of habit strength into the structural equation models presented in the results part. The second indicator was a shortened version of the self-report index of habit strength (SRHI) (Verplanken & Orbel, 2003). Six out of 12 items of the SRHI reflecting the automaticity of car use were included in the questionnaire and evaluated on a seven-point agreement scale (see Appendix). The SRHI-index was calculated using the mean of the six items.

[3] Due to instructions of the university's data protection officer it was not allowed to ask for the exact age but only for an age range.

In contrast to the measurement of norms and habits, for the new socialization constructs only little experience from previous research existed (e.g. Blöbaum et al., 2004). Thus, a larger set of items to measure possible socialization influences was pretested. Based on item analyses (internal consistency, confirmative factor analysis) items were selected and revised. Finally, eight items referring to three socialization aspects were included in the present study. Establishment of problem awareness (ACE) was measured with two items, each referring to parents' communication about environmental problems of travel mode choice at the participants' age of 15. Receiving a driving license and driving a car as initiation to adulthood and autonomy (AUT) was measured with four items, two of them referring to the experience of acquiring a driver's license and two referring to the experience of driving (at the age of 18). As a measure of multi-mobility in the peer group (MM-PEER) students were asked with two items whether different travel modes were discussed open-mindedly in their peer group when a decision about a travel mode had to be made (at the age of 18).

Socialization constructs were measured retrospectively, which implies methodological problems: especially selective memory might lead to biased results (Dehmel & Wittchen, 1984). This problem was addressed by instructing the participants to picture their living conditions at the age of 15 or 18, respectively as lively as possible. However, the problem remains that a retrospective measure always includes the process of reconstructing an experience from the past with the actual behaviour and norms in mind. Socialization indicator variables were measured on seven-point agreement scales. The same scale was used for measuring intention to use public transportation instead of the private car (INT), which was assessed with two items.

Finally, mobility behaviour was recorded in an online travel logbook. For the period of one week the students reported details for up to two trips to each of four possible destinations (university, most frequently used shop, most frequent leisure activity, work). The logbook was limited to four frequently visited destinations and only the trips *to* these destinations not the *return* trips in order to make it as simple for the students as possible. The variable car use behaviour (BEH) was computed as number of reported trips by car divided by the total number of reported trips.

3. Results

3.1. Descriptive results

In the Appendix means and standard deviations of all indictor items are listed as well as internal consistencies of the latent constructs. With one exception (AUT: Cronbach's alpha = .76) all construct have internal consistencies above .80. The means of the items measured on seven-point agreement scales mostly range between 2.5 and 4.5. However, in case of AUT, the agreement is even higher, especially with regard to one item referring to the importance of the acquisition of a driver's license. This result stresses the high importance ascribed to this life event.

Standard deviations are mostly below 2. Higher variance can be observed for intention and SRHI-items.

3.2. Socialization aspects as determinants of norms and habits (Hypotheses 1, 2 and 3)

One aim of this study was to test the influence of socialization constructs on the formation and strength of car use habit, PN and SN. Fig. 1 shows the results of a structural equation model (SEM), in which habits, PN and SN are determined by ACE, AUT and MM-PEER. The SEM was assessed using the maximum likelihood method (c.f. Jöreskog & Sörbom, 1993). The latent constructs were measured by the indicator items described in Section 2.2 and listed in the Appendix. Due to lack of space, the measurement model is not included in Fig. 1. Standardized factor loadings of indicator items are presented in Table 1 instead. The correlation matrix of the indicators, which was used as the input matrix, can be obtained from the first author of this paper.

Regarding the socialization constructs, car habit is mainly influenced by the symbolic-affective importance ascribed to driving and acquisition of a driver's license as a young adult (AUT). While the communication with peers (MM-PEERS) has a negative influence on car use habit, the communication with parents (ACE) has no significant effect. ACE turns out to be the strongest predictor of SN. Here, peers (MM-PEER) only play a minor role and the acquisition of a driver's license (AUT) has no significant effect. Finally, PN is significantly affected by all of the three socialization constructs. In sum, Hypothesis 2, which specifies the influences of MM-PEER on norms and habits, is confirmed completely, whereas Hypothesis 1 and 3 can only partly be confirmed as ACE is not a significant predictor of habits and AUT is not a significant predictor of SN. As in previous studies, SN is a significant predictor of PN. Moreover, PN to use public transportation considerably weakens car use habit.

The model's fit statistics are shown in the legend of Fig. 1. Knowing that the Chi^2-statistic is strongly influenced by sample size and in large, complex models almost always reaches statistical significance (Hu & Bentler, 1995; Marsh & Hocevar, 1985), it does not surprise that it is also significant in our model. Therefore, a 2-index presentation strategy was used as proposed by Hu and Bentler (1999) to asses the model fit. Their results suggest that a cut-off value close to .08 for Standardized-Root-Mean-Square-of-Residual (SRMR) and a cut-off value close to .06 for Root-Mean-Error-of-Approximation (RMSEA) are needed to conclude a good fit between the hypothesized model and the observed data. Both are given in the suggested model, which can thus be described as empirically acceptable.

3.3. Travel socialization and behaviour (Hypothesis 4)

It was assumed that socialization constructs have an indirect effect on behaviour mediated by norms, habits and intention. To establish mediation the following conditions must hold (Baron & Kenny, 1986): the independent variables

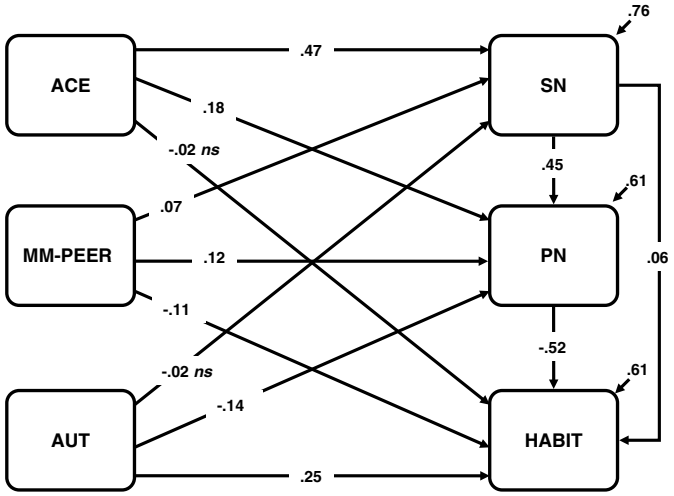

Fig. 1. Graphical presentation of the structural equation model on the effects of socialization constructs on SN, PN, and habit, $N = 2586$. *Note*: Relations between constructs are directed and are indicated by arrows. Arrows without origin indicate proportion of error and unexplained variance. β-coefficients (i.e., standardized multiple regression coefficients) represent the strength of the relations between constructs. ns = not significant at $p < .05$ level; Fit-statistics: $\chi^2 = 466.84^{***}$, df = 120; RMSEA = .033; SRMR = .026.

Table 1
Standardised factor loadings in the measurement models of structural equation models in Figs. 1–3.

Latent variables	Standardised factor loadings		
	Fig. 1	Fig. 2	Fig. 3
ACE1	0.77	0.78	0.78
ACE2	0.89	0.88	0.89
MM-PEER1	0.79	0.78	0.79
MM-PEER2	0.89	0.89	0.88
AUT1	0.74	0.74	0.74
AUT2	0.61	0.60	0.61
AUT3	0.73	0.73	0.73
AUT4	0.62	0.62	0.62
PN1	0.81		0.81
PN2	0.87		0.87
PN3	0.82		0.82
PN4	0.86		0.86
SN1	0.85		0.85
SN2	0.88		0.88
SN3	0.89		0.89
SN4	0.76		0.76
RFM-index	0.72		0.77
SRHI-index	0.84		0.81
INT1			0.89
INT2			0.89

(socialization constructs) must affect the mediators, which was tested in the first model (Fig. 1). In a second model the independent variables must be shown to affect the dependent variable (behaviour); and in a third model the mediators (norms, habits and intention) must affect the dependent variable. Finally, the effects of the independent variables on the dependent variable have to be weaker or insignificant in the third model compared to the second.

The second and the third model are presented in Figs. 2 and 3. Standardized factor loadings of indicator items of both models are presented in Table 1. Because car-choice behaviour was included as a single indicator, its measurement error could not be estimated and was arbitrarily set to zero.

As Fig. 2 demonstrates, the three socialization constructs are all significantly related to behaviour, however the respective coefficients are relatively low. Altogether only 5% of behavioural variance is explained. The postulated indirect relations of socialization on behaviour are modelled in Fig. 3, which is an extension of the first model (cf. Fig. 1). However, in Fig. 3 the non-significant paths of the first model were deleted and the latent constructs intention and behaviour were added. In case of MM-Peer and AUT the direct effects on behaviour are considerably weakened when the mediator variables norms, habits, and intention are introduced, which confirms the mediator effect. The remaining direct effects are so small that they can be neglected even if they are significant, probably due to the large sample size. In terms of ACE the direct influence has still the

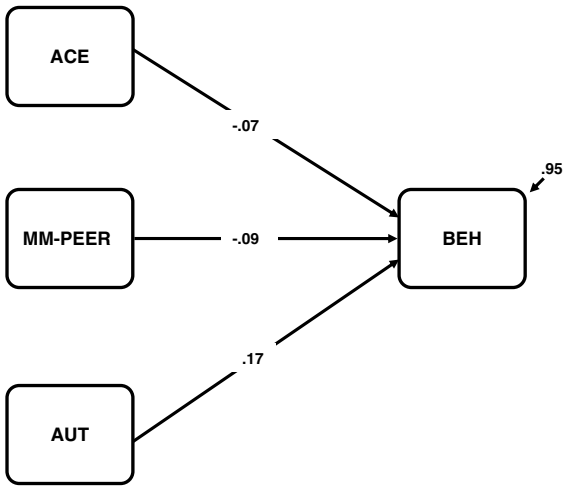

Fig. 2. Graphical presentation of the structural equation model on the direct effects of socialization constructs on behaviour, $N = 2586$. *Note*: All beta-coefficients are statistically significant at $p < .05$ level. Fit-statistics: $\chi^2 = 150.17^{***}$, df = 22; RMSEA = .047; SRMR = .025.

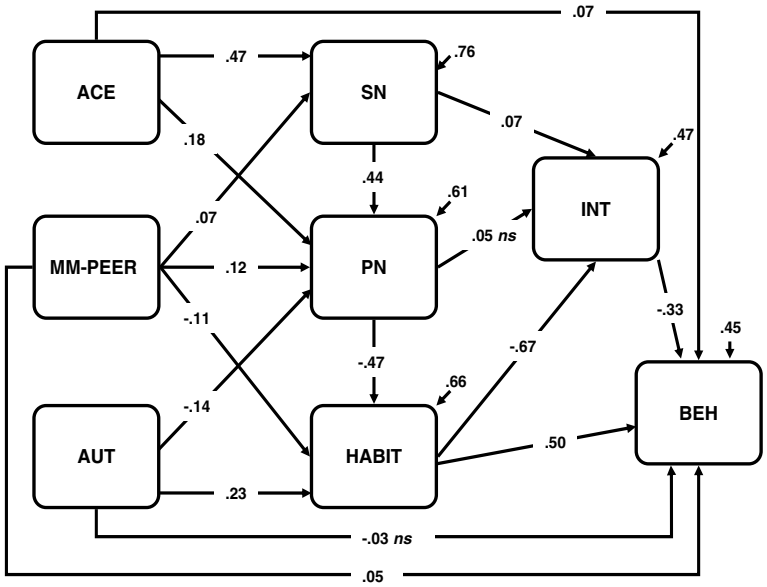

Fig. 3. Graphical presentation of the structural equation model on the effects of socialization constructs on behaviour mediated by SN, PN, habit, and intention, $N = 2586$. *Note*: ns = not significant at $p < .05$ level; Fit-statistics: $\chi^2 = 740.51^{***}$, df = 170; RMSEA = .036; SRMR = .031.

same size but opposite signs. In case of MM-PEER and AUT the signs have also changed. This result indicates that the absolute size of the indirect effects is bigger than the absolute size of the direct effects and thus also confirms the postulated mediator effect.

As fit indices indicate, the data correspond well with the proposed model in Fig. 3. About 55% of the variance of behaviour is explained, 53% of intention.

4. Discussion

According to the results of this study, all three retrospectively reported socialization constructs have a significant impact on either norms or car use habit or both. In Hypothesis 1 it was expected that the communication with parents about the negative impact of car use (ACE) would lead to a stronger social and personal norm to use alternative travel modes and form weaker car-choice habits. While the impact of ACE on SN and PN could be empirically confirmed, a significant impact on habit could not be shown. However, in case of the communication with the peer group (MM-PEER) significant effects on

SN, PN as well as habit could be demonstrated in line with Hypothesis 2. It was further hypothesized that the symbolic-affective importance ascribed to driving and acquisition of a driver's license as a young adult (AUT) influences the development and strength of car use habits and personal and social norms (Hypothesis 3). This could again only partly be confirmed as AUT failed to have a significant influence on SN.

While for the formation of norms the communication with parents and peers is especially important, for car habit the experience of acquiring the driver's license as an initiation to adulthood is of greater relevance. This can be explained by the strong impact the symbolic-affective evaluation of acquiring the driver's license has on car use during that period of life (Klöckner, 2004). Adolescents who appoint a high importance to acquiring a driver's license are more likely to use the car a lot after acquisition of the license. Therefore, they should form much stronger car-choice habits. This argumentation is reflected by the data. Communication about travel mode choice with friends and parents on the other hand does not necessarily have an impact on the adolescent's behaviour at that time. It is interesting that the impact of communicating with parents about travel mode choice on social norms is much stronger than that of discussions with peers. This could lead to the conclusion that parents are more important as socializing agents on this behalf than peers. However, it has to be kept in mind that the *current* social norms are related to socialization influences. This means that it is likely that the parents still are relevant actors for the young adult's social norms but that his/her friends from adolescence are probably not anymore. Furthermore, the different content of communication should also be taken into account. The communication with parents referred to the ecological consequences of car use whereas with peers the focus was on the openness to consider pros and cons of different travel modes when a decision about a travel mode had to be made. For a definite answer whether the agents or contents of communication are responsible for the higher influence of ACE compared to MM-PEER on social norms, both communication contents should be queried in combination with both kinds of agents in future research.

As expected, the influences of all three socialization aspects on behaviour are mediated by habits, norms and intention (Hypothesis 4). This shows that socialization with regard to travel mode choice is translated into behavioural decisions through at least two theoretically assumed paths: One path is that socialization occurs in communicating with parents and peers (and other socialization agents) which leads to the development of social norms that incorporate these expectations learned during adolescence. These social norms are internalized and transformed into personal norms which then guide behavioural decisions. Probably, the early socializing experiences make the young adults more receptive for actual social norms in line with their already learned and internalized social norms.

The second path that is made plausible in this study represents the development of stable travel mode choice habits during a history of repeated (observed or made) behavioural decisions. For future research it would be interesting to investigate whether it is necessary to make a behavioural decision by oneself or whether the mere observation of parents' or peers' decisions is already sufficient in order to form a habit.

In the final model (Fig. 3) that describes how socialization aspects affect car use via norms, habits, and intention it is noticeable that habits have a stronger impact on behaviour than has intention. As this study only considered travel mode choice for frequently conducted trips where habits are expected to have a greater impact, this result is not surprising and should not lead to a general overestimation of the influence of habits on travel mode choice.

As to the methodology, a limitation of this study consists in measuring socialization retrospectively, which makes information about the socialization aspects less reliable. It is possible that the participants reconstructed their travel mode socialization based on their actual norms, habits and behaviour. Therefore the relation between socialization and these constructs might be overestimated. Secondly, car-choice habit, norms and intention are not the only possible mediators of socialization influences on behaviour. Recent research has shown that other psychological and also demographic and infrastructural variables determine travel mode choice (e.g. Hunecke, Haustein, Grischkat, & Böhler, 2007; Klöckner & Blöbaum, 2008). Thus, it is likely that the process of translating socialization into actual behaviour includes other mediators (e.g. attitudes, perceived behavioural control) that were not considered in this study. Finally, the study is based on the analysis of correlation data at one point in time which does not allow any inference about causal relations. A study analysing the effects more thoroughly should also expand the sample to include persons with lower levels of education as the student sample is selective in this regard.

Nevertheless, this study encourages widening the perspective of transport studies by incorporating aspects of socialization that have been neglected in former studies on adults' mobility behaviour. The results deliver important cues for transportation education of children. So it seems worthwhile for parents to invest in the establishment of problem awareness by talking about the problems of car use as this aspect is related to later norms that prevent habitualized car use. It can be assumed that also other agents of socialization, such as teachers and the media can contribute to higher problem awareness. Thus, it is advisable to put more effort in education concerning the relation of transportation, environment, and behaviour. However, problematization of car use alone will not be sufficient to change behaviour as long as the relevance that is attributed to the car in society is as high as reflected by the importance that is ascribed to the acquisition of a driver's license. In terms of the autonomy dimension, public transportation is clearly in an inferior position compared to the car (Anable & Gatersleben, 2005). However, there are also aspects children like when using public transportation, namely the social context (Baslington, 2008). Positive experiences with public transportation could be fostered by using public transport (e.g. train) for school trips and by reducing the need to be driven to school that prevents experiences of other modes of transportation together with peers. Pre-conditions for a positive evaluation of these experiences are attractive public transport services and a safe route to school.

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Appendix

Descriptive statistics for indicator variables and latent constructs.

Latent variable	Indicator variable	Alpha	*M*	SD
Establishment of awareness of consequences (ACE)		.86		
ACE1	My parents spoke with me about the ecological impact of motoring when I was 15 years of age		2.52	1.71
ACE2	My parents educated me to have the environmental impact in mind when choosing a travel mode		2.90	1.75
Multimobility of peers (MM-PEER)		.82		
MM-PEER1	In my peer group we weighed up pros and cons of different travel modes when we wanted to get somewhere when I was 19 years of age		3.91	1.93
MM-PEER2	In my peer group at the age of 19 we deliberately decided between alternatives when choosing a travel mode		3.63	1.88
Receiving a driving license and driving a car as initiation to adulthood and autonomy (AUT)		.76		
AUT1	When I received my driving license, I really felt grown up		4.63	1.89
AUT2	Receiving the driving license was an important step for me		6.11	1.39
AUT3	Driving a car meant freedom to us		5.25	1.84
AUT4	Driving a car felt like an adventure		4.22	1.99
Personal norm (PN)		.91		
PN1	Due to values important to me I feel obliged to use the car as seldom as possible		3.47	1.87
PN2	Due to my values/principles I feel personally obliged to use environmentally friendly means of transportation like bike, bus or train		3.65	1.86
PN3	When choosing a travel mode, environmental protection is deep-seated in my own value system		3.71	1.76
PN4	When choosing a travel mode, I feel personally obliged to have the environmental impact in mind		3.88	1.80
Social norm (SN)		.90		
SN1	People who are important to me expect that I use environmentally friendly means of transportation		2.55	1.62
SN2	People who are important to me give me to understand that I should consider environmental protection when I choose a travel mode		2.94	1.76
SN3	People who are important to me try to convince me of an environmentally-friendly travel mode choice		2.68	1.65
SN4	People who are important to me support me when I use environmentally-friendly means of transportation instead of the car		3.48	1.88
Habit (HAB)				
RFM-index	Number "car" was chosen in the following items		1.59	1.23
RFM1	Visiting a friend in a nearby town			
RFM2	Taking a stroll in the city centre			
RFM3	Visiting a pub in the evening			
RFM4	Making an excursion in nice weather			
RFM5	Shopping daily needs			
SRHI-index	Mean of SRHI1-SRHI6	.91	3.62	1.89
SRHI1	Using the car is something that makes me feel weird if I do not do it		2.36	1.72
SRHI2	Using the car is something I do automatically		3.65	2.21
SRHI3	Using the car is something I do without thinking		3.62	2.14
SRHI4	Using the car is something that belongs to my routine		3.82	2.26
SRHI5	Using the car is something that is typically for me		3.29	2.12
SRHI6	Using the car is something I have no need to think about doing		3.72	2.13

(*continued on next page*)

Appendix (*continued*)

Latent variable	Indicator variable	Alpha	*M*	SD
Intention (INT)				
INT1	My intention to use public transportation instead of the car for my frequent trips (university, shopping, leisure, work) in the next seven days is strong	.88	4.28	2.27
INT2	I intend to use public transportation instead of the car for my frequent trips (university, shopping, leisure, work) in the next seven days		4.26	2.30
Behaviour (BEH)		–		
BEH	Calculated percentage of car use		0.45	0.36

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