

## **Applying a Modified Moral Decision Making Model to Change Habitual Car Use: How Can Commitment be Effective?**

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Une intervention basée sur une théorie a été réalisée auprès d'un échantillon de 297 automobilistes pour tenter de lancer de nouvelles habitudes de déplacement (essayer de préférer les transports en commun plutôt que la voiture). Un modèle de modification d'une décision morale relevant de la théorie de Schwartz et Howard (1981) fut exploité dans la conception d'une intervention associant une technique de décristallisation des comportements antérieurs (remise provisoire d'une carte gratuite) avec une technique focalisée sur une norme (appel à l'implication). L'échantillon était constitué de 297 citoyens allemands pouvant utiliser facilement leur voiture et vivant dans des quartiers bien desservis par les transports en commun. Les participants ont été répartis au hasard dans quatre conditions (implication précédée par une carte gratuite, seulement l'implication, seulement la carte gratuite et groupe contrôle) et durent faire part de leur choix de transport pour un trajet précis et habituel (par exemple aller au travail) sur une durée de huit semaines suivie d'une période contrôle de deux semaines. En outre, les variables du modèle (la règle personnelle de réduction de l'utilisation de la voiture, les normes sociales, les coûts comportementaux ressentis et les habitudes) ont été enregistrées toutes les deux semaines. Bien que les effets globaux de l'intervention aient été faibles, les résultats montrent qu'une motivation morale est un prédicteur pertinent du choix d'un mode de transport qui peut être renforcé par une intervention portant sur l'implication précédée par un changement temporaire de la situation.

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A theory-driven intervention was carried out to initiate the try-out of a new travel mode behavior (try out taking public transport instead of car) in a sample of habitual car users ( $N = 297$ ). A modified moral decision making model based on the theory of Schwartz and Howard (1981) served as background for the design of an intervention combining a habit-defrosting technique (temporary gift of a free ticket) with a norm-focused technique (plea for commitment). The sample consisted of 297 German citizens with good car access and living in areas with a convenient supply of public transportation. Participants were randomly assigned to four groups (commitment preceded by a free ticket, commitment only, free ticket only, and control) and had to report their travel mode choice for a particular, regular trip (e.g. trip to work) for a period of 8 weeks and a 2-week follow-up period. Additionally, model variables (personal norm to reduce car use, social norm, perceived behavioral costs, and habit) were recorded every 2 weeks. Although overall effects of the interventions were small, results indicate that a moral motivation is a relevant predictor for travel mode choices and can be stabilised by a commitment intervention preceded by a temporary change of the situation.

## INTRODUCTION

Psychology has a 30-year tradition of dealing with environmentally relevant behaviors. Starting with an analysis of the weak relationship between environmental concern and pro-environmental behaviors (see Maloney & Ward, 1973), psychologists have gone on to deal with specific behaviors such as energy consumption (for an overview see Brandon & Lewis, 1999), recycling behavior (Schultz, 1999), and also with travel mode choice (Aarts, Verplanken, & van Knippenberg, 1997). From the perspective of environmental conservation, the latter behavioral domain is of great importance. Seeing that energy usage, particularly the combustion of fossil fuels, is the principal source of greenhouse gas emissions, a reduction in private car use would constitute a substantial contribution to slowing down the greenhouse effect and related severe climatic changes.

### USING A NORM ACTIVATION MODEL TO EXPLAIN TRAVEL MODE CHOICES

Various theoretical approaches have been applied in order to understand environmentally protective behaviors (for an overview see Vining & Ebreo, 2002). Besides the theory of planned behavior (e.g. Harland, Staats, & Wilke, 1999) and protection motivation theory (e.g. Gardner & Stern, 1996), norm *activation models* in particular (Schwartz, 1977; Schwartz & Howard, 1981) have been applied to various behavioral domains, such as littering (Heberlein, 1972), energy conservation (Black, Stern, & Elworth, 1985), and recycling (Guagnano, Stern, & Dietz, 1995; Hopper & Nielsen, 1991). Recently, norm activation models have also been applied to explain the reduction of car use and travel mode choice (Harland et al., 1999; Hunecke,

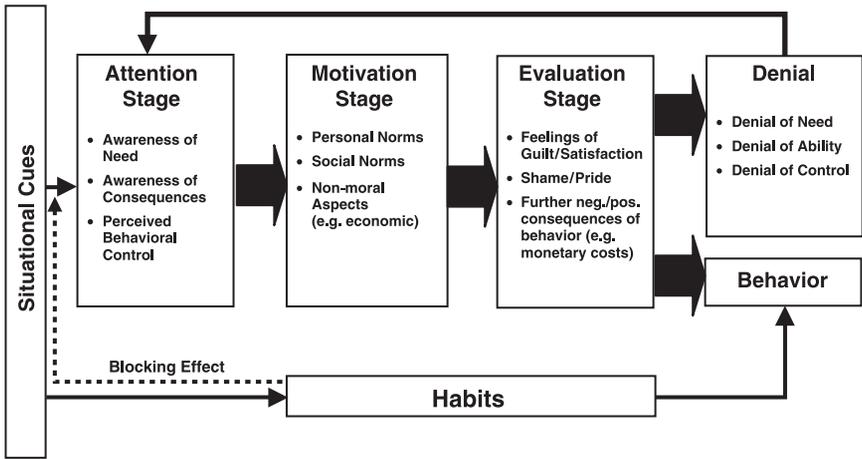


FIGURE 1. Modification of the model of moral decision making (Schwartz & Howard, 1981) including habits.

Blöbaum, Matthies, & Höger, 2001; Klöckner, Matthies, & Hunecke, 2003; Bamberg & Schmidt, 2003). In contrast to other models claiming to explain environmentally significant behavior, norm activation theory focuses on the *processes of the activation of moral norms and their transformation into action* (see Figure 1).

Although the model focuses on the activation and influence of personal norms on behavior, it explicitly takes into account that a moral motivation has to be balanced against other, competing motivations (e.g. to save monetary or behavioral costs, to fulfill expectations of others), and thus can explain that individuals frequently do *not behave in accordance with their moral motivation*. A further characteristic of the model is the assumption that the decision *to not behave in accordance with one's norms* activates defence mechanisms like *denial of responsibility or redefinition of the situation* (e.g. negating the problem or abilities). These characteristics of the model qualify it particularly for the deduction of starting points for interventions. In its application to transport behavior, we additionally integrated the *concept of habit* into the described model. The use of a private car is in many cases a very repetitive behavior, and the construct of habit has successfully been used as a relevant determinant of such behaviors (for an overview see Oullette & Wood, 1998), and in particular for travel mode choices (Aarts et al., 1997; Verplanken, Aarts, van Knippenberg, & Moonen, 1998). In two studies (Klöckner et al., 2003; Klöckner & Matthies, 2004) the personal norm to reduce car use proved to be a strong predictor of behavior

only when no counteractive car use habit was in power. Based on these results the model was modified as shown in Figure 1. When car use habits are strong, the whole process of norm activation and evaluation is blocked, and situational cues will lead directly to the habitualised choice of travel mode, without moral or other motives being considered.

## HOW CAN TRAVEL MODE CHOICE BE CHANGED?

The present paper uses the described modified norm activation model *to identify starting points for interventions* aimed at changing the problematic travel mode choice behavior. It is assumed that travel mode choice is guided by moral, social, and non-moral motivations, and that the influence of the personal norm on behavior is moderated by the strength of a counteracting car habit. Using this model as a conceptual framework, many starting points for interventions become obvious (see Matthies, 2003). In order to activate personal norms, information strategies could be applied which are targeted on the relevant cognitions of the attention stage. Taking into account the many motives relevant in the second stage, various intervention strategies also come into view (e.g. setting group goals to influence social motives, or making public transport attractive in order to support other motives). Because the personal norm is the central variable of the model, we chose to investigate an intervention technique which can be assumed to activate or stabilise the personal norm: the technique of voluntary *commitment*. Because of the blocking effects of car use habits, we took *strategies to deactivate counterproductive car use habits* as a further topic of investigation.

*Commitment strategies* have been frequently applied to improve conservation behavior (Burn & Oskamp, 1986; Katzev & Pardini, 1987/88; Wang & Katzev, 1990). Due to their implied voluntary nature, commitment strategies address the personal norm. They emphasise the moral benefits (self-satisfaction as a result of acting in accordance with personal values), and thereby increase the costs of not acting (which are feelings of guilt). Furthermore, we expect a voluntary commitment to make it difficult to deny responsibility or to redefine the situation.

*Strategies to defrost habitualised behaviors* have been developed by Fujii, Gärling, and Kitamura (2001; also Fujii & Gärling, 2003). They examined strong temporary situational changes—in one case an 8-day closure of a freeway—in their effect on habits. Following the proposed model, a strong temporary change in the situation could loosen the linkage between situation and behavior and facilitate a deliberate decision in which moral motives may also be considered. Hence, the implementation of a habit-defrosting strategy would support any strategy that activates motives for or against the use of alternative travel modes.

## THE PRESENT STUDY

In order to examine the effects of a norm-focused intervention technique (plea for commitment) combined with a habit-defrosting technique (temporary free ticket), we implemented both techniques in a field experiment, individually and in combination. The aim of the intervention was *to encourage highly habitual car users to try out an alternative travel mode for a regular trip* (e.g. trip to work). According to Dahlstrand and Biel (1997), testing a new behavior is a crucial step in changing habitualised behavior. As a habit-defrosting strategy we chose to give out free tickets, which should alter the situation temporarily. To examine the effect of the intervention techniques on the model constructs, we introduced a questionnaire before and after the interventions. The following research questions have been investigated:

1. Can we effectively induce the try-out of a new travel mode by implementing a commitment intervention technique combined with a technique aimed at defrosting habits?
2. Do the variables of the model affect the try-out behavior and do the applied intervention techniques affect the model variables?

In detail we expected the commitment intervention *to stabilise the influence of the personal norm* on try-out behavior in the short run (by increasing the costs for not acting in accordance with one's norms) as well as in the long run (by making redefinitions difficult). This effect should be *stronger in combination with a habit-defrosting strategy*.

The habit-defrosting strategy was expected to weaken the negative influence of car use habits on the try-out behavior. We also expected a *short-term direct effect on the try-out behavior* because a free ticket also changes the incentive structure of the situation.

## METHOD

### Design and Sampling Procedure

In order to examine the stated research questions, we carried out a field experiment in the neighboring German towns of Bochum (approx. 400,000 inhabitants) and Dortmund (approx. 600,000 inhabitants), both situated in the Ruhr Area. For the sample recruitment, 3250 people living in areas with good access to public transportation were randomly selected from the telephone directory for each city. In April 2002, all 6500 selected subjects received a personal letter requesting participation in a forthcoming telephone poll pertaining to travel mode choices. A short initial telephone interview was conducted primarily to inquire as to subjects' willingness to take part in our study. The study itself consisted of four additional brief

Phase	Time	Activities	Design			
			Commitment with preceding free ticket	Free ticket only	Commitment only	Control group
<b>Baseline</b>	Week 1	Start of week 1: 1st personal visit to distribute and explain the logbook	O	O	O	O
	Week 2	End of week 2: 1st telephone interview recording model variables	O TI	O TI	O TI	O TI
<b>Phase 1</b> (Free Ticket)	Week 3	Start of week 3: Posting the free tickets to two intervention groups	X <sub>T</sub> O	X <sub>T</sub> O	O	O
	Week 4	End of week 4: 2nd telephone interview recording model variables	X <sub>T</sub> O TI	X <sub>T</sub> O TI	O TI	O TI
<b>Phase 2</b> (Commitment)	Week 5	Start of week 5: 2nd personal visit to exchange logbook sheets/collect commitments in two intervention groups	X <sub>C</sub> O	O	X <sub>C</sub> O	O
	Week 6	End of week 6: 3rd telephone interview recording model variables	X <sub>C</sub> O TI	O TI	X <sub>C</sub> O TI	O TI
<b>Phase 3</b> (Post-Treatment)	Week 7		O	O	O	O
	Week 8	End of week 8: 4th telephone interview recording model variables and 3rd personal visit collecting logbook sheets	O TI	O TI	O TI	O TI
<b>Follow-up</b>	Week 25	Start of week 25: Posting logbook sheets to all participants	O	O	O	O
	Week 26	End of week 26: 5th telephone interview recording model variables and 4th personal visit collecting logbook sheets	O TI	O TI	O TI	O TI

FIGURE 2. Design of the study (Notes: O = Logbook; TI = Telephone Interview; X<sub>T</sub> = Free Ticket; X<sub>C</sub> = Commitment).

telephone interviews and a logbook record of the travel mode choice over a period of 8 weeks with an additional interview within a 2-week follow-up recording 4 months later (see Figure 2). The initial interview also served to clarify additional criteria for further participation in the investigation. First, we were interested in a regular trip, undertaken at least twice a week. Therefore, we had to make sure that the participants actually did these trips. Usually, we chose the trip to work but for some subjects we used other frequent trips (e.g. going to the gym three times a week). Target location and purpose of the regular trip were recorded during the first telephone

interview. Furthermore, we had to ensure that the participants had a real choice between different travel modes. Therefore, they needed to have a driver's license and access to a car at least occasionally. Finally, we had to omit individuals with commuter's tickets for public transportation due to interference with our free ticket intervention.

A total of 1890 individuals of the sample of 6500 could not be reached during the 3 weeks when the first telephone interviews took place; 1156 individuals were reached but were not willing to answer our questions; 2237 individuals were reached and were willing but did not meet our criteria for participation. They had either no driver's license, had a commuter's ticket, or did not undertake any regular trips. These conditions resulted in a fundamental but necessary reduction of the sample size of approximately one-third. In all, 1217 first telephone interviews were conducted by trained interviewers and 578 of these interviewees declared their willingness to participate in the 8-week logbook study and the follow-up. They were assigned randomly to one of the following groups: (1) commitment with preceding free tickets, (2) commitment only, (3) ticket only, and (4) a control group with no intervention. Due to the fact that groups two to four only served as control groups for the different effects of the interventions we chose to make them half the size of group one.

Finally, we started our logbook study with 438 subjects (140 declared their willingness during the first interview but withdrew before the logbook period actually began) and 297 people (185 male, 112 female; average age 45.0 years) took part over the entire 8-week period as well as in the follow-up 4 months later (commitment with preceding free ticket group:  $n = 130$ ; commitment only group:  $n = 61$ ; free ticket only group:  $n = 53$ ; control group:  $n = 53$ ). The dropout rates during the half-year between the start of the logbook and the follow-up were 27.0 per cent in the free ticket and commitment group, 33.0 per cent in the commitment only group, and 36.9 per cent both in the free ticket only and the control group. The logbook was delivered and explained by trained members of our staff. After 4 weeks the first sheets of the logbook were collected and new sheets were distributed. At the end of the first 8 weeks the logbook was collected by members of our staff. During the period of behavior recording, all participants were interviewed four times on the telephone. All contacts (visits to distribute and collect the logbook, and telephone interviews) were conducted by different staff members to ensure as little normative influence as possible.

## Measures

*Try-out behavior* as dependent variable was measured by counting the number of trips done by using a travel mode different from the car (e.g. public transport or bicycle) during each 2-week protocol period. People with

at least one of those trips were categorised as “tryers”. *Access to a car*, *perceived monetary costs*, and *perceived duration of the frequent trip* were recorded in the initial telephone interview. Access to a car was measured by one item (“How often do you personally have access to a car?”) that had to be answered by using a 5-point Likert scale (“never” to “always”). People who reported “never” or “seldom” were excluded from the study. Therefore, car access of subjects in the sample only varied between “sometimes” and “always”. Perceived duration and monetary costs of the frequent trip were measured by the following items: “Approximately how long does the complete trip take if you use public transportation? (only one way, no return trip) time in minutes” and “How much do you think is one trip if you use public transportation? (Only one way, no return trip) costs in Euros”.

The following variables were repeatedly recorded in five telephone interviews: *personal norm to reduce car use*, *social norm to reduce car use*, *perceived behavioral costs*, and *strength of car habit*.

*The personal norm to reduce car use* was measured by a set of three items (e.g. “According to my personal value system I feel obliged to use a car as seldom as possible”), which had to be answered using a 5-point agreement scale (do not agree at all, slightly agree, moderately agree, agree very much, entirely agree).

*The social norm to reduce car use* was measured by a set of two items, which read as follows: “People who are significant to me think that I should use public transportation instead of the car for my regular trip” and “People who are significant to me would support me if I used public transportation instead of the car for my regular trips”. Both items had to be answered using a 5-point Likert scale (“unlikely” to “likely”).

*Perceived behavioral costs* which go into our model as non-moral costs were measured by a set of three items including different aspects of behavioral costs (e.g. “Using public transportation instead of the car for my regular trip would be too time consuming”; other aspects were inconvenience and intricateness). Monetary costs were not included. All three items had to be answered using a 5-point agreement scale (see above).

*Strength of car habit* was measured using a modified version of the *response frequency measure* established by Verplanken, Aarts, van Knippenberg, and van Knippenberg (1994). In each telephone interview, five statements indicating imaginary trips and providing little additional information were presented to the participants (e.g. visiting a friend in a neighboring city). They were asked to name the first travel mode which came to mind. With such limited usable information, the choice of travel mode was supposed to be guided by habit. The strength of car habit was represented by the number of choices of the mode “car”. A detailed description of this operationalisation is provided by Verplanken et al. (1994).

## Intervention Procedures

As can be seen in Figure 2, the free tickets for the “commitment with preceding free ticket” group and the “free ticket only” group were handed out to the participants after the first telephone interview in the logbook phase. The free ticket period consisted of the third and fourth week. Upon completing the interviews, the interviewers informed a member of our staff who immediately mailed the personalised free ticket. This ticket was valid for the next 14 days and could only be used for the regular trip reported in the logbook. Together with the tickets we sent a letter explaining how the tickets could be used and offered assistance in planning the trip by public transportation. After the free ticket phase of 2 weeks, the tickets were collected together with the logbook sheets from the first 4 weeks during the second personal visit (see Figure 2).

The commitment was solicited at the beginning of Phase 3 (fifth and sixth week). During the second personal visit, after the logbook sheets had been exchanged and the free tickets had been collected in the combined intervention group, the staff member handed out a form which introduced the commitment to the participants. A persuasive text presented information on the negative effects of car use on the world’s climate combined with the conclusion that even the smallest change in personal behavior would help. A list of ten alternative commitments to climate-saving activities was presented (e.g. “I commit to change the way I drive to save fuel during the next two weeks”, or “I commit to inform myself within the next two weeks about possibilities of car pooling for my regular trips”). We included other activities than the target behavior, in order to allow for a free choice. Only two of the ten possible commitments directly referred to the try-out of public transport (“I commit to use public transportation at least one/two times during the next two weeks for my regular trip”). Subsequently, the participants were asked to decide which of the activities they were willing to choose. Participants were allowed to choose more than one of the presented activities on the list. One copy of this list was left with the participants to remind them of the behaviors they had committed themselves to and another copy was taken back to the research team. In all, 166 of the 191 subjects assigned either to the commitment or to the commitment and ticket group actually committed themselves to at least one of the 10 possible behaviors on the list. Only 38 of the 166 chose try-out behavior.

## RESULTS

To determine whether the interventions had a direct effect on the amount of “tryers”, a series of logistic regressions was calculated (see Table 1). The following variables were entered: trying versus not trying as dependent

TABLE 1  
 Logistic Regressions of Personal Norm, Social Norm, Perceived Behavioral Costs, Free Ticket, and Commitment on Trying Alternative Travel Modes

	<i>Baseline</i>		<i>Phase 1</i>		<i>Phase 2</i>		<i>Phase 3</i>		<i>Follow-up</i>	
	B	p	B	p	B	p	B	p	B	p
Personal norm	.50	.03*	.68	.00**	.93	.00***	.73	.00**	.50	.03*
Social norm	.08	.64	.01	.94	-.18	.41	-.20	.29	.09	.64
Perceived behavioral costs	-.54	.01*	-.22	.25	-.64	.00**	-.70	.00***	-.52	.00**
Free ticket	-	-	.97	.02*	.44	.29	.97	.02*	.34	.41
Commitment	-	-	-	-	-.17	.66	-.43	.26	-.15	.71
<i>N</i>	293		292		276		282		286	

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

variables and personal norm, subjective norm, and perceived behavioral costs as independent variables. “Having received a free ticket” was entered into the regressions in Phases 1, 2, and 3 as well as in the follow-up phase (1 = free ticket, 0 = no free ticket). The commitment intervention was entered in binary form (1 = received a plea for commitment, 0 = no plea). Commitment was entered into the regression equations in Phases 2 and 3 as well as in the follow-up. The personal norm was a predictor in each phase of our study. The social norm had no influence on behavior. Perceived behavioral costs had a significant influence during each phase except in Phase 1. Receiving a free ticket determined try-out behavior during Phase 1 and also in Phase 3. Having received a plea for commitment had no *direct* influence on behavior.

To determine whether commitment to try out public transport stabilises the relation between personal norm and try-out behavior, we conducted a series of moderated regressions (see Borkeu, 1985) with try-out behavior as dependent variable and personal norm and commitment to try out as independent variables for all post-intervention phases (Phase 2, Phase 3, follow-up). In a second step, the interaction of commitment and personal norm was entered. Table 2 displays the results.

Commitment for try-out had a significant positive influence on try-out behavior in all three post-intervention phases. Entering the interaction terms increased the explained variation significantly in Phase 3. To show the direction of the moderating effect we dichotomised the personal norm: If the participants gave commitment for try-out and had a strong personal norm, 36.3 per cent maintained try-out behavior during Phase 3 whereas 0.0 per cent who had given commitment for try-out and had a weak personal norm maintained try-out behavior. In the no commitment group 7.4 per cent with a weak personal norm and 7.1 per cent with a strong personal norm

TABLE 2  
Moderated Regression of Personal Norm and Commitment for Try-out (COT)  
on "Try-out" Behavior

	Step 1					Step 2						
	P-Norm		COT		Nagelkerkes R <sup>2</sup>	P-Norm		COT		P-Norm × COT		Nagelkerkes R <sup>2</sup>
	B	p	B	p		B	p	B	p	B	p	
Phase 2	.75	.02*	1.11	.05*	.14	.43	.29	-1.90	.45	.91	.22	.16
Phase 3	.45	.12	1.22	.02*	.10	-.03	.93	-4.22	.11	1.75	.03*	.17
Follow-up	.36	.18	1.06	.05*	.07	.01	.98	-2.65	.24	1.18	.08	.11

\* =  $p < .05$ .

maintained try-out behavior. In the follow-up phase the interaction term was marginally significant ( $p < .08$ ) and in the same direction as in Phase 3.

Because of the small sample size of participants who gave commitment for try-out ( $n = 38$ ) it was not possible to further investigate a moderating effect of the habit intervention on the effect of the commitment. To determine whether the free ticket intervention affected habit strength, we calculated the mean habit strength in ticket groups and no-ticket groups. Results indicate that receiving a ticket had no direct effect on the strength of habit. The mean differences (ANOVA) between "free ticket" and "no-ticket" groups were not significant ( $\alpha = .05$ ) during any phase (baseline:  $df$  1/294,  $F = .81$ ,  $ns$ ; Phase 1:  $df$  1/291,  $F = 1.55$ ,  $ns$ ; Phase 2:  $df$  1/290,  $F = 2.47$ ,  $ns$ ; Phase 3:  $df$  1/292,  $F = .59$ ,  $ns$ ; follow-up:  $df$  1/295;  $F = 1.69$ ,  $ns$ ). An ANOVA for dependent repeated measurement showed no intra-subject effect ( $df$  4/284,  $F = 1.55$ ,  $ns$ ). To test if the effect of a free ticket was moderated by perceived monetary cost, perceived duration of the trip, and access to a car three moderated regressions were conducted with try-out behavior during Phase 1 as dependent variable and free ticket and the possible moderators as covariates. In a second step the interaction terms of free ticket and the moderators were entered. No significant interaction terms could be detected. The explained variation did not increase significantly.

To determine whether receiving a free ticket breaks up habits, a series of analyses of variance (ANOVA) was conducted to test mean differences in habit strength between tryers and non-tryers. In the baseline (tryers:  $M = 2.44$ ,  $SD = 1.31$ ,  $N = 265$ ; non-tryers:  $M = 1.88$ ,  $SD = 1.13$ ,  $N = 29$ ;  $F = 5.00$ ,  $df = 1/293$ ,  $p < .05$ ), in Phase 2 (tryers:  $M = 2.51$ ,  $SD = 1.36$ ,  $N = 242$ ; non-tryers:  $M = 1.55$ ,  $SD = 1.18$ ,  $N = 37$ ;  $F = 16.35$ ,  $df = 1/278$ ,  $p < .001$ ) and in Phase 3 (tryers:  $M = 2.46$ ,  $SD = 1.37$ ,  $N = 241$ ; non-tryers:  $M = 1.81$ ,

SD = 1.20,  $N = 42$ ;  $F = 8.19$ ,  $df = 1/282$ ,  $p < .01$ ) habit strength among tryers was significantly weaker than among non-tryers. During the follow-up phase, the difference was weaker but still significant for one-sided testing (tryers:  $M = 2.35$ ,  $SD = 1.38$ ,  $N = 253$ ; non-tryers:  $M = 1.91$ ,  $SD = 1.07$ ,  $N = 33$ ;  $F = 3.09$ ,  $df = 1/293$ ,  $p < .05$ ). However, during Phase 1 with free ticket the mean difference between habit strength of tryers and non-tryers was not significant (tryers:  $M = 2.45$ ,  $SD = 1.35$ ,  $N = 249$ ; non-tryers:  $M = 2.19$ ,  $SD = 1.13$ ,  $N = 43$ ;  $F = 1.43$ ,  $df = 1/291$ ,  $ns$ ). This indicates that participants with stronger habits are more likely to be among the tryers during the free ticket intervention than during the other four phases.

To determine the effect of both interventions on the amount of tryers we compared the quota of tryers in the four experimental groups during all five phases. A free ticket given to the “commitment preceded by a free ticket” group led to an increase of tryers from 7.0 per cent in the baseline to 16.3 per cent in Phase 1. This difference was significant ( $\chi^2 = 17.20$ ,  $df = 1$ ,  $p < .001$ ). During the following Phase 2 which included the commitment, the amount of tryers decreased to the level of the baseline (8.1%) followed by a significant increase to 12.1 per cent during Phase 3 ( $\chi^2 = 5.00$ ,  $df = 1$ ,  $p < .05$ ). The amount of tryers remained slightly higher than in the baseline (10.3%) during the follow-up, but the difference from the baseline was not significant. To determine whether the lack of significant effects was due to small statistical power we conducted a power analysis. An increase of the quota of tryers from 7.0 per cent in the baseline to 10.3 per cent in the follow-up is a small effect size ( $w = .131$ ). To reduce the probability of beta-errors to 20 per cent we would have needed a sample size of approximately  $N = 785$  (see Cohen, 1992) which we had not been able to achieve because of the high cost of such extensive data collection. Intervening by collecting a commitment only led to a short-term increase of the amount of tryers from 11.7 per cent in the baseline to 16.7 per cent in Phase 3. Nevertheless, this difference remained statistically non-significant ( $\chi^2 = 1.46$ ,  $df = 1$ ,  $ns$ ; again a power analysis indicated that the sample was too small for such a small effect size ( $w = .156$ )). Furthermore, the increase in the amount of tryers was reduced to zero in the post-treatment phase and during the follow-up. A continuous increase was detected in the “free ticket only” condition. The highest level was reached during Phase 3, and the difference between Phase 3 and the baseline was statistically significant ( $\chi^2 = 5.33$ ,  $df = 1$ ,  $p < .05$ ). No significant increase in tryers could be detected in the control condition.

## DISCUSSION

Did the intervention strategies have the expected effects on try-out behavior, and can the effects be explained by our modified normative decision making model? According to the results of a multiple logistic regression,

trying out public transport for a regular trip seems to be influenced by only two of the three motivations specified in the model: personal norm and non-moral costs. The subjective norm did not qualify in this analysis. This is surprising because the subjective norm was shown to be a relevant predictor in many domains of environmental behavior (e.g. Bamberg, 2003; Hopper & Nielsen, 1991) and also in the specific domain of travel mode choice (Hunecke et al., 2001; Klöckner et al., 2003). The lack of influence may be due to the fact that we examined habitual behavior. The assumption that awareness of expectations of others decreases when a behavior is carried out very frequently should be analysed in further studies. The logistic regressions revealed that the free ticket intervention had an additional effect on behavior, whereas the commitment intervention—as expected—had no direct effect. We had hypothesised a *moderating effect of commitment*, which was confirmed by our results for the two last post-intervention phases. In a moderated regression with personal norm and *commitment for try-out vs. no commitment* as covariates the commitment had a significant positive influence on try-out behavior in each of the three post-intervention phases, indicating that participants who committed themselves to trying out a new behavior actually realised their commitment. The personal norm had a significant influence only in Phase 2, during the commitment intervention period. Moreover, an interaction effect became significant in Phase 3 (2 weeks after the commitment intervention) and in the follow-up phase 23 weeks after the baseline measurement (this effect was only marginally significant), which indicates that the personal norm has a *long-term influence* if participants give a *strong commitment*. However, the effects that we found are rather small, showing once again how difficult it is to change habitual behavior. At the same time, our finding of a long-term effect of a commitment intervention is in line with the results of several studies in the domain of recycling and energy saving (Katzev & Pardini, 1987/88; Wang & Katzev, 1990). Against the background of our results and our theory we conclude that a plea for commitment can be successful *if there are strong personal norms in favor of the target behavior*. We assume that the long-term effect of commitment interventions is due to a blocking effect on redefinition procedures and denial of responsibility.

Because of the small sample size of participants who actually committed themselves to try out public transport we did not investigate the hypothesised moderating effect of the habit-defrosting strategy on the commitment intervention, but we analysed the impact of the ticket intervention on the general habit and on the relation between habit and behavior. An ANOVA revealed that the ticket intervention did not alter the general car habit. This is not surprising, because a general, cognitive habit should not be affected by a temporary change of one specific travel situation. However, the intervention seemed to have a moderating effect on the impact of a general car habit on behavior. Over the whole sample, habit strength among tryers was

significantly lower than among non-tryers, but during Phase 1 (phase of the ticket intervention) habit strength of tryers and non-tryers did not differ. Thus, the ticket intervention seems to invalidate a general car use habit. This is in line with the findings of Fujii, Gärling, and Kitamura (2001) who proved that a strong situational change can invalidate habits. However, a temporary situational change as a defrosting of habits can only lead to a long-term change to new behavior (see Dahlstrand & Biel, 1997) if the evaluation of the new behavior is positive, which requires that the internal and external determinants are in favor of the new behavior (e.g. lower costs or better connections than expected). We assume that in this case the other determinants were rather unfavorable and herein see a possible reason for the strong decrease in the percentage of tryers in the follow-up phase. In the combined ticket and commitment intervention, the decrease was obviously smaller, indicating a compensatory long-term effect of the commitment intervention. That incentives and commitment interventions work very well in combination has already been shown by Katzev and Pardini (1987/88).

Regarding the percentage of tryers in the three intervention groups (plea for a commitment preceded by a free ticket, plea for a commitment only, and free ticket only) and across all five phases, we succeeded to some degree in initiating try-out behavior: all applied intervention strategies were followed by a significant increase in the percentage of tryers in at least one of the subsequent phases. Overall the effects were small, but this is not surprising if we consider the specific behavior, which in our case was a regular and thus highly habitualised trip. The free ticket intervention had the strongest effect, which once again affirms the short time effect of an incentive. The combined intervention: free ticket plus plea for commitment worked best in the long run.

Altogether, the results *weaken the statement that travel mode choice is a behavior solely guided by anticipated non-moral costs and benefits and thus confirms the relevance of norm activation models in this context*. Moreover, travel mode choice behavior, and presumably environmental behavior in general, seems to be guided by a *mixture of different motivations*, with a moral motivation being a relevant part. The main finding of theoretical relevance is that the influence of a personal norm can *not only be moderated by external variables* (e.g. costs), as Diekmann and Preisendörfer (1998) have considered in their so-called “low-cost” hypothesis, but that internal factors, e.g. the amount of habitualisation, may also be relevant moderators. However, the explanatory power of our study is restricted by the fact that only *subjective measures* have been used. Future research could deal with these restrictions, e.g. by using different measures of habits, including the observation of past behavior.

From a practical perspective, it follows that not only so-called “hard measures” (e.g. fiscal instruments) can be applied to alter the problematic behavior, but that also “soft measures” (e.g. plea for commitment), which

target the moral dimension of environmental behavior, may be helpful under some circumstances: if readiness for a commitment is high and if the plea for commitment is combined with a habit-defrosting strategy.

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