Environmental Research Letters

E-bike trials' potential to promote sustained changes in car owners' mobility habits

To cite this article before publication: Corinne Moser *et al* 2018 *Environ. Res. Lett.* in press https://doi.org/10.1088/1748-9326/aaad73

E-bike trials' potential to promote sustained changes in car owners' mobility habits

Corinne Moser*, Zürich University of Applied Sciences ZHAW, Institute of Sustainable Development, Winterthur, Switzerland

Yann Blumer, Zürich University of Applied Sciences ZHAW, Center for Innovation and Entrepreneurship, Winterthur, Switzerland

Stefanie Lena Hille, University of St. Gallen, Institute for Economy and the Environment, St. Gallen, Switzerland

*Corresponding author: Corinne Moser, Zürich University of Applied Sciences ZHAW, Institute of Sustainable Development, Technoparkstrasse 2, 8401 Winterthur, Switzerland; corinne.moser@zhaw.ch

Abstract

Modal shifts hold considerable potential to mitigate carbon emissions. Electric bikes (e-bikes) represent a promising energy- and carbon-efficient alternative to cars. However, as mobility behaviour is highly habitual, convincing people to switch from cars to e-bikes is challenging. One strategy to accomplish this is the disruption of existing habits – a key idea behind an annual e-bike promotion programme in Switzerland, in which car owners can try out an e-bike for free over a 2-week period in exchange for their car keys. By means of a longitudinal survey, we measured the long-term effects of this trial on mobility-related habitual associations. After one year, participants' habitual association with car use had weakened significantly. This finding was valid both for participants who bought an e-bike after the trial and those who did not. Our findings contrast the results of other studies who find that the effect of interventions to induce modal shifts wears off over time. We conclude that an e-bike trial has the potential to break mobility habits and motivate car owners to use more sustainable means of transport.

Keywords

Mobility-related habitual associations, long-term impacts, sustainable transport, e-bike, trial, behaviour change

1. Introduction: The challenge of changing habitual travel behaviour

Shifts toward more environmentally friendly transport modes hold considerable potential to mitigate global carbon emissions (1). Especially in developed countries, cars are still the main mode of transportation, but electric bikes (e-bikes) represent an attractive alternative. This is not only due to their high energy and carbon efficiency, but also a variety of other features, including cost savings, health benefits and avoiding traffic congestion (2, 3). While e-bikes may also replace walking or conventional biking, the evidence from the available field studies suggests that purchasing an e-bike results in considerable substitution of car usage (2, 4-10). However, while e-bike sales have shown rapid growth rates, e-bikes still represent a niche product that appeals mostly to the ‘dark green’ or ‘early adopter’ segments (2, 3, 6, 11-14).

Moving e-bikes from a niche to the mainstream is challenging. One major reason for this is that most travel behaviour is highly habitual (15-17) and generally occurs in stable contexts (including entrenched travel routes and times and established travel purposes, as well as the utilised modes of transportation), making behavioural change difficult (18, 19). Yet, disruptions of stable contexts have demonstrated a considerable potential for altering individuals’ mobility-related habits. Examples include highway closures, which may nudge car drivers to try out public transportation (20), or strikes, such as the London Underground strike of 2014, which led to lasting changes in mobility behaviour among about 5% of all affected travellers (21). In addition, natural disasters, such as hurricanes (22), and personal life events, such as a serious injury (23), qualify as disruptions that are sufficiently strong to induce changes in individuals’ mobility patterns.

While external disruptions often occur in a sudden and random manner, many behaviour-change programmes use the same principle. They deliberately introduce contextual changes to promote a shift toward more sustainable behaviour. In the mobility field, providing people with the option of experiencing alternative modes of transportation seems promising in breaking deep-rooted mobility habits, especially if these opportunities co-occur with contextual changes in individuals’ private lives (e.g. moving) (24, 25). For instance, the results of previous research suggest that providing a free travel card for public transportation to habitual car drivers can trigger significant changes in modal choices toward more efficient modes of transportation (26-31). Yet, longitudinal analyses that assess the long-term effect of these interventions are scarce, and those that exist suggest that for most participants, the effects of the interventions start wearing off after the end of the intervention (27, 28, 30).

While most of the available interventions focus on the switch from cars to public transportation, there have also been three studies on e-bikes (10, 11, 32). These studies showed that trying out an e-bike for 2–4 weeks is a promising approach to breaking participants' mobility habits, resulting, inter alia, in a higher willingness to purchase an e-bike (11), lower habitual association with car use directly after the trial (32) and interest in using e-bikes more often in the future (10). However, none of the previous studies provided a longitudinal assessment of whether the context disruption caused by an e-bike trial is strong enough to induce long-term shifts in participants' mobility-related habits. This is the main objective of the present study.

2. Method

2.1. Intervention design

The annual Bike4Car campaign programme in Switzerland seeks to break car drivers' habitual behaviour. In this programme, organised by a Swiss environmental nongovernmental organisation (NGO), car owners are offered a free trial of an e-bike over a 2-week period in exchange for their car keys. In 2015 was implemented in collaboration with bike retailers making e-bikes available to the participants; the Swiss Federal Office of Energy, which supported the programme with an intense national ad campaign (TV, internet and posters); and 32 cities responsible for local promotion. Between May and September 2015, 1854 car owners participated in Bike4Car. After the end of the programme, participants were offered a coupon to purchase an e-bike for a reduced price. Reductions varied by retailer. The largest participating retailer offered a reduction of 500 CHF (approx. 425 Euro), covering around 20-

25% of the price of an e-bike. By November 2015 10% of participants used their coupon to buy an e-bike.

2.2. Data collection

The following analysis is based on a longitudinal series of two online surveys of all participants of the 2015 Bike4Car programme. The organising NGO sent the link to the first questionnaire by email to participants immediately after they signed up for the trial. Between May and July 2016, about one year after the start of the programme, all participants were asked to fill out a follow-up questionnaire. To ensure a sufficiently high response rate, email reminders were sent to the participants in each study wave. As an incentive for participation, all respondents were entered into a lottery for attractive e-bike- or bike-related prizes sponsored by the programme partners. Questionnaires were available in German, Italian and French, which are the three official languages of Switzerland. As almost no participants chose the Italian option, the following analyses focus on the German and French questionnaires only.

2.3. Sample

The responses used for the analyses came from *N* = 405 participants who fully completed the pre-trial questionnaire. Compared to the overall participation in the Bike4Car programme (*N* = 1854), this corresponds to a response rate of 22%. Moreover, *N* = 300 participants completed the follow-up questionnaire (response rate = 16%). The responses used for the analyses in this paper come from the *N* = 144 participants who completed both the pre-trial and follow-up questionnaires (combined response rate = 8%, see supplementary materials A for further details). Table 1 provides an overview of the samples. It shows that, compared with the Swiss population (33, 34, 35), well-educated men were overrepresented among the survey participants. In addition, more than half of participants lived in households with two or more cars indicating that the programme reaches a target group with a real potential for mobility-related energy savings. The sample characteristics of the participants were comparable in the pre-trial and follow-up questionnaires.

Table 1. Sociodemographic characteristics of the sample compared to the Swiss population

Sociodemographic characteristics	Swiss population statistics	Pre-trial (*N* = 405)	Follow up (*N* = 300)	Pre-trial and follow up (*N* = 144)
Male	50% (33)	65%	70%	72%
Mean age (SD)	42.1 (33)	43.3 (10.5)	43.9 (10.4)	43.6 (10.7)
University degree	27% (34) [#]	57%	56%	54%
Vocational training	38% (34) [#]	29%	32%	31%
0 car in household	22% (35)	2% [§]	2% [§]	1% [§]
1 car in household	49% (35)	44%	45%	43%
2 or more cars in household	29% (35)	54%	53%	56%

Notes: [#]Education level of permanent population in Switzerland between 25 and 65 years old (34). [§] Although car owners were the programme's target group, interested people who did not own a car were not excluded from the trial.

2.4. Questionnaires

Mobility-related habitual associations. All questionnaires included the response frequency measure that Verplanken and colleagues (36) developed, which Thøgersen and Møller (28) also used. They listed nine typical mobility-related situations and asked participants to choose the means of transport that spontaneously came to mind for each one. These situations are described on a rather general level and participants are asked for spontaneous reactions. This is why Verplanken et al. (36) argue that participants' reactions draw on "pre-existing schemas or scripts about mode choice in general" (36: 290) which are dominated by habits. Although authors claim that this instrument does measure habits (36, 28), it does not measure actual behaviour but rather habitual associations. The following nine situations were taken from Thøgersen and Møller (28) and adapted slightly to better fit the Swiss context: 'picking someone up from the railway station', 'visiting a friend in the closest city', 'visiting the mountains with friends for a day', 'commuting to work', 'doing sports', 'going for a walk in the forest', 'going shopping in the closest supermarket', 'going to the closest post office' and 'visiting somebody in the countryside'. Participants could choose from a list of seven options, including car, motorcycle, train, bus/tram, bicycle, e-bike and walking (see supplementary materials B for further details). The number of times participants mentioned each means of transport was taken as an indicator of participants' mobility-related habitual associations. For each participant, a sum score for each chosen means of transport was calculated, with possible scores of 0–9.

e-Bike purchase. The follow-up questionnaire asked participants if they or a member of their household had bought an e-bike since the end of the programme. In the responses, 117 participants (39%) stated that they had not purchased an e-bike, 50 (17%) reported that they intended to buy an e-bike in the upcoming months and 133 (44%) indicated that they had bought an e-bike.

2.5. Statistical analyses

All questionnaires were matched for analyses. Statistical analyses were carried out using the Software IBM SPSS Statistics 24. They included repeated measures ANOVAs, paired-samples *t*-tests (two-tailed) and one-sample *t*-tests (two-tailed).

3. Results: Long-term impacts of the trial on mobility-related habitual associations

Of all modes of transportation, participants displayed the strongest initial (i.e. pre-trial) habitual associations with cars, followed by bicycles and walking. Participants in the e-bike trial reported stronger habitual associations with car, bike and e-bike use compared to a representative sample of the average Swiss population (see Table 2). This data has been collected in a separate survey among a sample that is representative to the Swiss population with respect to characteristics such as gender, age, educational level and income (37). The observed differences between both samples are another indicator that the programme reached a relevant target group.

Table 2. Mean sum scores of means mobility-related habitual associations for the pre-trial questionnaire and a representative Swiss sample.

Sum score	Pre-trial *M* (*SD*), (*N* = 405)	Representative sample *M* (*SD*), (N = 1476)	*t (df)*, *p*-value	Effect size *r*
Car	4.32 (2.00)	3.47 (2.63)	8.53 (404), $p < .001$***	.39

Bicycle	1.70 (1.56)	0.75 (1.33)	12.25 (404), $p < .001$***	.52
By foot	1.18 (1.15)	2.46 (1.60)	-22.46 (404), $p < .001$***	.75
Train	0.95 (0.95)	1.25 (1.32)	-6.27 (404), $p < .001$***	.30
E-bike	0.30 (0.96)	0.11 (0.55)	3.92 (404), $p < .001$***	.19
Bus/tram	0.22 (0.56)	0.72 (1.25)	-18.10 (404), $p < .001$***	.67
Motorcycle §	0.21 (0.62)	-	-	-
other	0.09 (0.52)	0.21 (0.72)	-4.84 (404), $p < .001$***	.23

Notes: Sum scores are between 0 and 9, with 9 signifying the most pronounced habitual association related to specific means of transport. § For the representative sample (37), no 'motorcycle' option was included. *** $p < .001$. One-sample *t*-tests (two-tailed).

Table 3 displays the mean sum scores for the different means of transport reported in the pre-trial and follow-up questionnaires. After one year, participants showed significantly weaker habitual associations with car and motorbike use and significantly stronger habitual associations with e-bike use compared to the associations displayed in the pre-trial questionnaire. This means that the average number of times that participants mentioned cars and motorbikes dropped significantly one year after participating in the programme, while the number of times participants mentioned e-bikes increased significantly.

Table 3. Comparison between the mean sum scores of mobility-related habitual associations in the pre-trial and follow-up questionnaires. Means (SD) and standard deviations (SD).

Sum score	**Pre-trial** ***M*** **(*SD*), (*N* = 144)**	**Follow-up** ***M*** **(*SD*), (*N* = 144)**	***t (df), p*-value**	**Effect size *r***
Car	4.26 (1.99)	3.74 (1.91)	3.54 (143), $p < .001$***	.28
Bicycle	1.81 (1.55)	1.69 (1.63)	0.99 (143), $p = .32$	.08
By foot	1.12 (1.14)	1.22 (1.14)	-1.19 (143), $p = .24$	.10
Train	0.95 (0.87)	0.99 (1.00)	-0.45 (143), $p = .65$	.04
E-bike	0.31 (1.02)	0.90 (1.50)	-4.70 (143), $p < .001$***	.37
Bus/tram	0.19 (0.52)	0.21 (0.51)	-0.28 (143), $p = .78$	.02
Motorcycle	0.26 (0.70)	0.15 (0.57)	2.45 (143), $p = .02$*	.20
Other	0.06 (0.26)	0.10 (0.39)	-1.30 (143), $p = .20$	.11

Notes: Sum scores are between 0 and 9, with 9 signifying the most pronounced habitual association related to specific means of transport. *** $p < .001$, * $p < .05$ (paired-samples *t*-tests, two-tailed).

Next, we analysed whether there were differences in the observed shifts of habitual associations between those participants who bought an e-bike after the trial (i.e. buyers, n = 53) and those participants who had not purchased an e-bike (i.e. non-buyers, n = 91). Table 4 displays the respective mean sum scores of habitual associations for buyers and non-buyers.

Table 4. Comparison of mean scores of mobility-related habitual associations in the pre-trial and follow-up questionnaires for buyers and non-buyers. Means (SD) and standard deviations (SD).

Sum score	**Buyers (*n* = 53); *M* (*SD*)**		**Non-buyers (*n* = 91); *M* (*SD*)**	
	Pre-trial	**Follow-up**	**Pre-trial**	**Follow-up**
Car	3.85 (1.69)	3.04 (1.13)	4.51 (2.12)	4.14 (2.14)
e-bike	0.42 (1.28)	2.06 (1.73)	0.24 (0.83)	0.23 (0.79)

Notes: Sum scores are between 0 and 9, with 9 signifying the most pronounced habitual association related to specific means of transport.

For habitual associations with car use, the repeated-measures analysis of variance (ANOVA) showed a significant main effect of time, $F(1) = 14.53$, $p < .001$, $\eta_p^2 = .09$; this indicated that participants had a weaker habitual association with car use one year after Bike4Car (see Table 3 for *M* and *SD*). Furthermore, the significant main effect for e-bike purchase, $F(1) = 9.14$, $p < .01$, $\eta_p^2 = .06$, indicated that on average, over both time points, habitual associations with car use were less pronounced for e-bike buyers compared to non-buyers. The interaction effect between the two variables time and e-bike purchase was not statistically significant, $F(1)$, = 2.12, $p = .15$, $\eta_p^2 = .02$ (see Figure 1). This suggests that the programme had a long-term effect on participants' habitual associations with car use, regardless of whether they would go on to purchase an e-bike.

For habitual associations with e-bike use, we found a significant main effect of time, $F(1) = 52.43$, $p < .001$, $\eta_p^2 = .27$, as well as a significant main effect for e-bike purchase, $F(1) = 39.94$, $p < .001$, $\eta_p^2 = .22$. These main effects were further qualified by a significant interaction effect between the two variables time and e-bike purchase, $F(1)$, = 53.85, $p < .001$, $\eta_p^2 = .28$. This finding indicates that only participants who bought an e-bike after the programme exhibited increased habitual associations with e-bike use one year later. For non-buyers, habitual associations with e-bike use stayed practically the same over time (see Table 4 and Figure 1).

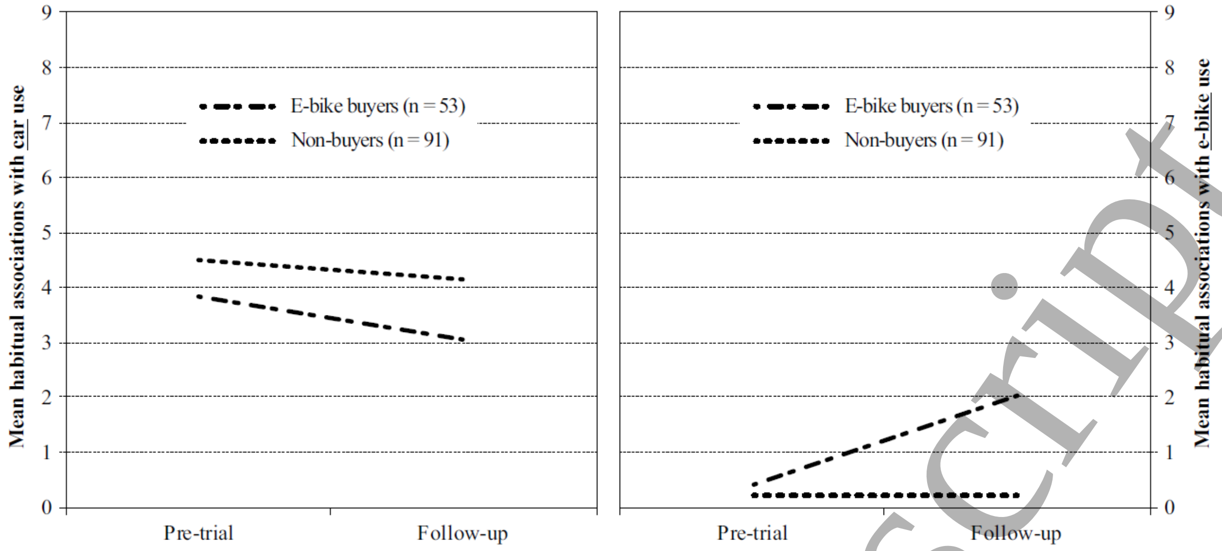

Figure 1: **Change in habitual associations with car use and e-bike use over time for buyers and non-buyers of e-bikes**. Main effects of time and purchase behaviour and their interaction on habitual associations with car use (left side) and e-bike use (right side; *N* = 144).

4. Discussion and conclusions

In line with previous research (11, 15, 16, 21, 24, 26, 27), our study findings indicate that disruptions of individuals' mobility context may trigger changes in habitual travel choices. Bearing in mind that our study did not measure actual habits but rather habitual associations it provides strong evidence that exchanging one's car keys for an e-bike for just a few weeks influences long-term habitual associations with car usage, and that this change persists even a year after the end of the intervention. This contrasts the findings of other studies who find that the effect of interventions wears off over time (27, 28, 30). While this decrease in habitual associations with car use was most pronounced for participants who did buy an e-bike following the trial, participants who did not change their mobility context displayed a significant long-term shift away from car use as well. Furthermore, it is noteworthy that this shift in habitual associations could be observed after a winter season has passed; which is usually cold, rainy and sometimes even snowy in Switzerland, and thus, not ideal for riding a bike – electric or not.

We can point to several plausible explanations for the observed persistence of the intervention's effect mobility-related habitual associations. One is the strength of the habit disruption induced by the programme, as participants were required to hand over their car keys for the 2-week duration of the trial. Hence, participants could not rely on their cars for commuting, shopping or leisure activities; instead, they had to organise their day-to-day activities around their e-bikes. Most studies that offer participants free use of public transportation as an alternative to cars (26, 27) may not have been able to provide a strong enough disruption, as they do not require participants to completely forgo the use of their cars. Furthermore, while habitual car drivers may have some misconceptions about public transportation (20), most people in Switzerland have experience with using it, which makes it improbable that they are positively surprised by a trial. In contrast, since it is still a niche mode of transportation, most participants may not have any previous experience with riding an e-bike. Hence, during the 2-week trial, participants may have had novel, first-hand experiences of the benefits of e-bikes, including health benefits, time savings or the realisation that steep slopes – a key barrier to conventional cycling (2, 3, 11, 32) – are much less of a challenge than they may have expected.

In this study it was not possible to track participants' actual travel behaviour over time. This is an important direction for future research using for example tracking devices and travel diary studies. Still, the observed shifts of participants' mobility-related habitual associations hint that e-bike trials hold a considerable potential in terms of promoting sustained energy and carbon efficient travel behaviour. Thus, policy-makers should consider supporting programmes that enable people to experience the benefits of novel means of transport directly. Creating options for such experiences has the potential for promoting sustainable mobility behaviour, and such measures may also be useful in inducing behaviour change related to the use of other energy-related services.

Acknowledgments

This research project is part of the National Research Programme "Managing Energy Consumption" (NRP 71) of the Swiss National Science Foundation (SNSF). Further information on the National Research Programme can be found at www.nrp71.ch. The project is also part of the Swiss Competence Center for Research in Energy, Society and Transition

(SCCER CREST), Work Package 2 Change of Behaviour, for further information see http://www.sccer-crest.ch/. We would like to thank myblueplanet for their cooperation in developing the questionnaires, for managing the data collection and for sharing insights into the programme Bike4Car.

Author contributions

CM contributed to the development of questionnaires, data analysis, and paper writing. SH and YB contributed to the development of questionnaires and paper writing.

References

1. Sims R, Schaeffer R, Creutzig F, Cruz-Núñez X, D'Agosto M, Dimitriu D, et al. 2014: Transport. In: Edenhofer O, Pichs-Madruga R, Sokona Y, Farahani E, Kadner S, Seyboth K, et al., editors. Climate Change 2014: Mitigation of Climate Change Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press; 2014.

2. Fishman E, Cherry C. E-bikes in the Mainstream: Reviewing a Decade of Research. Transport Reviews. 2016;36(1):72-91.

3. Popovich N, Gordon E, Shao Z, Xing Y, Wang Y, Handy S. Experiences of electric bicycle users in the Sacramento, California area. Travel Behaviour and Society. 2014;1(2):37-44.

4. SFOE. Verbreitung und Auswirkungen von E-Bikes in der Schweiz [distribution and impacts of e-bikes in Switzerland]. Bern: Swiss Federal Office of Energy, 2014.

5. Fyhri A, Sundfør HB, Weber C. Effect of subvention program for e-bikes in Oslo on bicycle use , transport distribution and CO 2 emissions [Effekt av tilskuddsordning for elsykkel i Oslo på sykkelbruk, transportmiddelfordeling og CO2 utslipp]. Norwegian Institute of Transport Economics 2016.

6. Jones T, Harms L, Heinen E. Motives, perceptions and experiences of electric bicycle owners and implications for health, wellbeing and mobility. Journal of Transport Geography. 2016;53:41-9.

7. Fyhri A, Fearnley N. Effects of e-bikes on bicycle use and mode share. Transportation Research Part D: Transport and Environment. 2015;36:45-52.

8. Winslott Hiselius L, Svensson Å. E-bike use in Sweden – CO2 effects due to modal change and municipal promotion strategies. Journal of Cleaner Production. 2017;141:818-24.

9. Cherry CR, Yang H, Jones LR, He M. Dynamics of electric bike ownership and use in Kunming, China. Transport Policy. 2016;45:127-35.

10. Cairns S, Behrendt F, Raffo D, Beaumont C, Kiefer C. Electrically-assisted bikes: Potential impacts on travel behaviour. Transportation Research Part A: Policy and Practice. 2017;103(Supplement C):327-42.

11. Fyhri A, Heinen E, Fearnley N, Sundfør HB. A push to cycling—exploring the e-bike's role in overcoming barriers to bicycle use with a survey and an intervention study. International Journal of Sustainable Transportation. 2017;11(9):681-95.

12. Wolf A, Seebauer S. Technology adoption of electric bicycles: A survey among early adopters. Transportation Research Part A: Policy and Practice. 2014;69:196-211.

13. Seebauer S. Why early adopters engage in interpersonal diffusion of technological innovations: An empirical study on electric bicycles and electric scooters. Transportation Research Part A: Policy and Practice. 2015;78:146-60.

14. Wüstenhagen R, Markard J, Truffer B. Diffusion of green power products in Switzerland. Energy Policy. 2003;31(7):621-32.

15. Wood W, Tam L, Witt MG. Changing circumstances, disrupting habits. Journal of personality and social psychology. 2005;88(6):918.

16. Verplanken B, Roy D. Empowering interventions to promote sustainable lifestyles: Testing the habit discontinuity hypothesis in a field experiment. Journal of Environmental Psychology. 2016;45:127-34.

17. Gärling T, Axhausen KW. Introduction: Habitual travel choice. Transportation. 2003;30(1):1-11.

18. Danner UN, Aarts H, de Vries NK. Habit vs. intention in the prediction of future behaviour: The role of frequency, context stability and mental accessibility of past behaviour. British Journal of Social Psychology. 2008;47(2):245-65.

19. Verplanken B, Aarts H, van Knippenberg A, Moonen A. Habit versus planned behaviour: A field experiment. British Journal of Social Psychology. 1998;37(1):111-28.

20. Fujii S, Gärling T, Kitamura R. Changes in Drivers' Perceptions and Use of Public Transport during a Freeway Closure. Environment and Behavior. 2001;33(6):796-808.

21. Larcom S, Rauch F, Willems T. The benefits of forced experimentation: striking evidence from the London Underground network. The Quarterly Journal of Economics. 2017.

22. Kaufman S, Qing C, Levenson N, Hanson M. Transportation During and After Hurricane Sandy. Rudin Center for Transportation NYU Wagner Graduate School of Public Service, 2012.

23. Musselwhite CBA, Calcraft MJ, Roberts M, Fox R, Swinkels A, Turton P, et al. Breaking the habit: Does fracturing your wrist change your travel and driver behaviour? Transportation Research Part F: Traffic Psychology and Behaviour. 2016;38:83-93.

24. Verplanken B, Walker I, Davis A, Jurasek M. Context change and travel mode choice: Combining the habit discontinuity and self-activation hypotheses. Journal of Environmental Psychology. 2008;28(2):121-7.

25. Strömberg H, Rexfelt O, Karlsson ICM, Sochor J. Trying on change – Trialability as a change moderator for sustainable travel behaviour. Travel Behaviour and Society. 2016;4:60-8.

26. Abou-Zeid M, Ben-Akiva M. Travel mode switching: Comparison of findings from two public transportation experiments. Transport Policy. 2012;24:48-59.

27. Fujii S, Kitamura R. What does a one-month free bus ticket do to habitual drivers? An experimental analysis of habit and attitude change. Transportation. 2003;30(1):81-95.

28. Thøgersen J, Møller B. Breaking car use habits: The effectiveness of a free one-month travelcard. Transportation. 2008;35(3):329-45.

29. Thøgersen J. Promoting public transport as a subscription service: Effects of a free month travel card. Transport Policy. 2009;16(6):335-43.

30. Matthies E, Klöckner CA, Preißner CL. Applying a Modified Moral Decision Making Model to Change Habitual Car Use: How Can Commitment be Effective? Applied Psychology. 2006;55(1):91-106.

31. Abou-Zeid M, Witter R, Bierlaire M, Kaufmann V, Ben-Akiva M. Happiness and travel mode switching: Findings from a Swiss public transportation experiment. Transport Policy. 2012;19(1):93-104.

32. Moser C, Blumer Y, Hille SL, editors. Getting Started on a Car Diet: Assessing the Behavioural Impacts of an E-Bike Trial in Switzerland. Proceedings of the 2016 International Energy Policies & Programmes Evaluation Conference; 2016.

33. SFSO. Population: Key figures 2014. Neuchãtel: Swiss Federal Statistical Office, 2016.

34. SFSO. Bildungsstand der Bevölkerung 2016 [level of education of the Swiss population 2016]. Neuchãtel: Swiss Federal Statistical Office, 2017.

35 SFSO. Verkehrsverhalten der Bevölkerung [mobility behaviour of the Swiss population]. Neuchâtel: Swiss Federal Statistical Office, 2017.

36. Verplanken B, Aarts H, van Knippenberg A, van Knippenberg C. Attitude Versus General Habit: Antecedents of Travel Mode Choice1. Journal of Applied Social Psychology. 1994;24(4):285-300.

37. Moser C, Cometta C, Frick V. How do different residential consumer groups react towards monetary and uncon- ventional non-monetary incentives to reduce their electricity consumption? Ittigen: Swiss Federal Office of Energy, 2016.