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EVALUATING PERSUASIVE STRATEGIES AND PERSUASIVE TECHNOLOGIES THAT PROMOTE BIKING AS SUSTAINABLE URBAN TRANSPORTATION

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1 INTRODUCTION

Cities are growing globally at an unprecedented pace, creating a manifold of new opportunities to meet and exchange ideas and goods, but at the same time generating more traffic. (United Nations, 2014) Creating a transport system that supports high quality life in urban areas, requires shifting from high-energy modes of transportation, such as private cars, to sustainable low-energy urban mobility, such as walking and biking. This helps reducing emissions in order to tackle climate change, provides health benefits to citizens and enhances the quality of urban life. However, an adoption of new modes of transportation requires a substantial behavior change. Beside hard policy measures – such as road pricing, changes in infrastructure, subsidies, etc. – different persuasive strategies embedded in various technologies can be useful in facilitating such behavioral change (Fogg, 2003; Oinas-Kukkonen and Harjumaa, 2008).

Biking represents a promising low-energy mode for urban mobility, as it is an easily accessible, fast, low-cost mode of transportation that furthermore uses less space than most other modes. In this study, three strategies that aim at encouraging individuals to cycle for utilitarian purposes are explored and evaluated. The tackled research question is: What types of persuasive strategies can lead to a modal shift towards low-energy mobility by increasing bike use? As different theoretical lenses and methodological approaches can be applied in order to answer this research question, a set of possible approaches will be discussed. An already conducted quantitative method to evaluate the immediate behavioral effect of different persuasive strategies on actual bike use is presented. Subsequently, other possible theoretical assumptions and corresponding methods for further evaluations are discussed.

Section 2 presents a brief overview on related work and describes the developed persuasive strategies. Their quantitative evaluation is presented in section 3. Section 4 shows examples for additional ways to evaluate such strategies, both for the conducted study and for future research. Section 5 provides a brief discussion and an outlook on future work.

2 DEPLOYED PERSUASIVE STRATEGIES

Although previous work has covered mode choices and bike use, little attention has been paid to a change of choice from high-energy modes to biking as a low-energy mode and how this can be supported by persuasive technologies. Heinen et al. (2010) classified five groups of determinants for bike commuting. Amongst them are psychological factors, these are attitudes, perceived social norms and habits which can be at the center of persuasive strategies. Gatterslaben & Appleton (2007) applied the transtheoretical model of behavior change (Prochaska et al., 1994) to bike commuting. Their findings suggest that different strategies are needed depending on current attitudes and behavior of individuals. Froehlich et al. (2009) developed a mobile phone application that semi-automatically sensed and revealed information about transportation behavior. In combination with a personal ambient display this should engage users in the goal of increasing green transportation choices (e.g. walking, biking, public transport). Although some statements from qualitative interviews indicated the willingness for such change, no evaluation of actual change in mobility behavior was conducted. A similar but more recent study by Gabrielli and Maimome (2013) examined the effect of a mobile app on supporting eco transport choices by citizens of an urban area. The transport choices and habits of the participants were influenced with several persuasion strategies and an overall increase of sustainable transport choices of 14% as well as a higher environmental awareness among participants was observed. However, the study design did not include a control group to better attribute behavior change to the experimental intervention. More recently, Flüchter et al. (2014) found a positive impact of social normative feedback on e-bike commuting.

Based on these empirical findings and the existing literature on persuasion and persuasive technology three strategies were designed.

2.1 STRATEGY I: FREQUENT BIKING CHALLENGE

In this strategy, the following principles of persuasion (Cialdini, 2007; Fogg, 2003) have been combined: triggering, recognition, competition, cooperation, and comparison. The overall hypothesis is that this strategy increases bike use.

Triggering. The participants received emails (Figure 1) between 3 to 5 times a week, providing them with information about their performance in the challenge and acting as a trigger for biking (Fogg, 2003). Emails were chosen as they are likely to be regularly read as opposed to a webpage or a mobile app providing the same information. They were sent in the evening to influence mobility planning for the next day. The regular email updates furthermore contained a set of notifications tailored for the individual participants. The purpose of these notifications was to keep the sent emails useful and interesting for the participants by including daily weather forecasts and entertaining elements. Furthermore they provided motivational facts about biking and suggestions on when to use a bike.

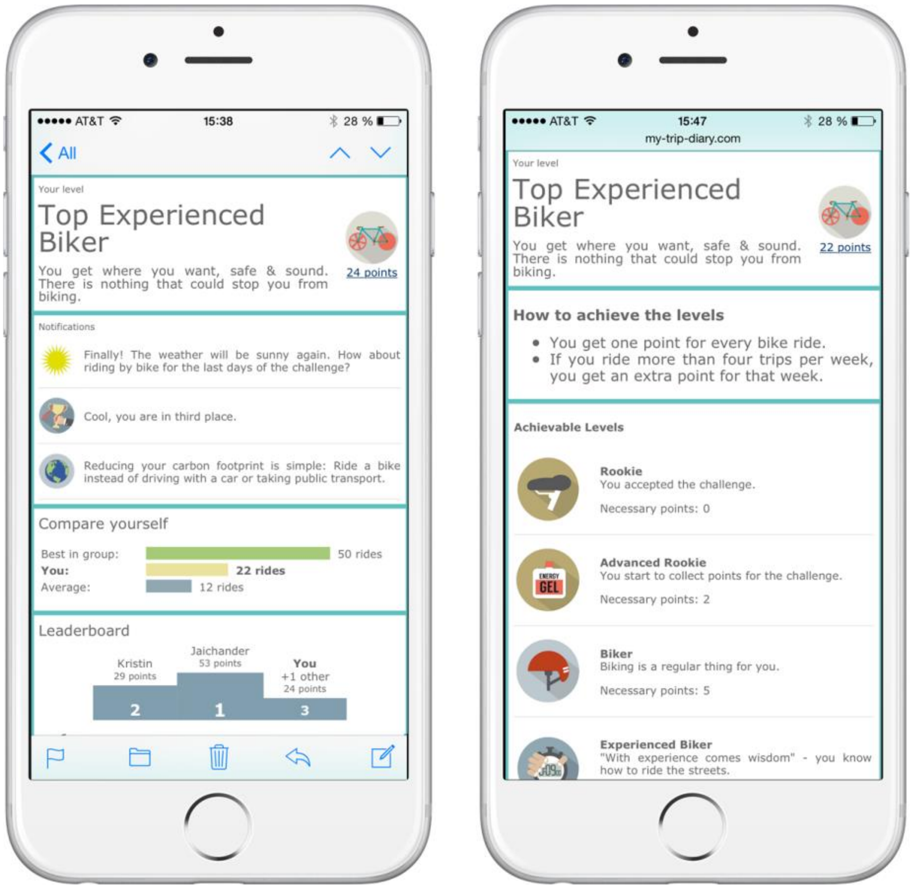

Figure 1: Left: Regularly sent email updates: Notifications, comparison chart and leaderboard. Right: Explanation of the point scheme and achievable levels for Frequent Biking Challenge.

Recognition. Based on the number of reported bike trips, participants received points and were awarded different statuses depending on the total number of points. These status levels had titles, were visualized with images and had an exploratory slogan. For example, participants achieving 5 points were recognized with the status "Experienced Biker" and the slogan: "With experience comes wisdom. You know how to ride the streets." Such recognition typically increases enjoyment (Baumeister et al., 1998) and influences future behavior. (Malone and Lepper, 1987)

Competition. The email updates furthermore included a leaderboard, showing one's own rank based on the achieved points in comparison to the other participants of the group. It was visualized with a podium for places 1, 2 and 3, followed by a list of the other ranks. Such salient metrics for people to observe their performances among other participants typically promotes competition, which consequently influences their thoughts and behavior. (Malone and Lepper, 1987)

Cooperation. At start, a collective goal of achieving 100 points collectively was included in the email to facilitate cooperation among participants. This was visualized with a bar graph that showed the sum of points from all participants and how much more were needed to reach the collective goal. The collective goal was reached in the second week of the challenge. Four days later it was replaced with a "compare yourself" comparison chart.

Social comparison. The "compare yourself" design element allowed participants to compare the number of their bike rides to an average of bike rides and the best participant within the group. This possibly influences motivation as people tend to look for self-enhancement (Wills, 1981) and self-improvement (Cialdini, 2007; Wilson and Benner, 1971).

2.2 STRATEGY II: VIRTUAL BIKE TUTORIAL

The concept of perceived self-efficacy "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations" (Bandura, 1977). Prior studies, such as Chittaro (2014), used a persuasive game to increase the perceived self-efficacy[1] of passengers in the situation of an aircraft accident. In this study, the concept of perceived self-efficacy was used in relation to perceived risk and safety, thereby assessing how users perceive their control over their own safety in a biking context. The related assumption is that an increased self-efficacy towards biking will help to overcome safety barriers and hence encourage more biking.

Participants were provided with a short video tutorial on safe urban biking. The safety related information is based on safety guidelines from city officials from New York City, Boston and Vienna. The core concept of the training session is based on the content of a city biking school program. An expert-interview with an experienced biking instructor was conducted in order to gain knowledge on how biking in the city can be taught most effectively to novice bikers.

After the tutorial, a participant should experience the effects of different biking-related decisions in an interactive video training session. The procedure started with a first-person-view video where the participant saw a typical biking scene. The video was then stopped and the participants had to decide on how to continue the ride. (Figure 2) The consequences of each possible decision were shown in a subsequent video. Different real-life scenarios (e.g. conflict with pedestrian) were tested and participants could learn about the consequences of their decisions. An increase of perceived self-efficacy due to that intervention was expected. To measure that, a self-efficacy in biking questionnaire[2] had to be completed by the participant before and after the video training session. The same questionnaire was also included in the survey at the end of the experimental period.

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[1] Chittaro referred to it as "safety locus of control". See Ajzen (1991) for a discussion on the difference between these concepts.

[2] Items were adapted from a self-efficacy in driving questionnaire. (Bandura, 2006)

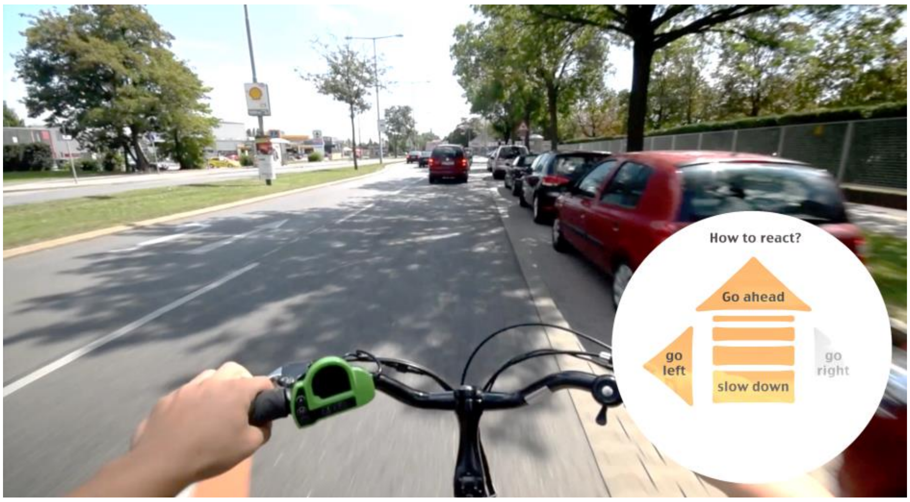

Figure 2: Screenshot of the Virtual Bike Tutorial showing hot to pass by parked cars.

2.3 STRATEGY III: BIKE BUDDY PROGRAM

The start of a new physical exercise is often supported by an experienced person such that guidance and training is provided. In order to apply this kind of learning to the biking context, participants received a one time "bike buddy experience". The hypothesis in this regard is that for novice bikers the experience of biking in an urban environment will change the perceived safety and risk of doing so. It was expected that this would lead to more positive attitudes towards biking and an overall increase of biking within the participants.

Bike buddies were recruited out of the potential participants for this study who were regular bikers and comfortable biking with new bikers. Bike buddies and participants were matched based on where they live and what routes they usually take. The bike buddies furthermore received instructions for the ride, covering safety aspects and clarifying the goal of showing the participant a safe and enjoyable biking route. They therefore were asked to find a safe and easy route for the planned bike ride and preferable inspect this route prior to the ride. They were also requested to set up a meeting point (ideally at the participant's home) for conducting the ride.

Several persuasive principles were implemented. ***Authority***, by having the bike buddy as a guide for the bike ride. ***Reduction***, by reducing the effort of the user to find a safe route (complex behavior) in the city to a simple behavior (follow the bike buddy). ***Tunneling***, by guiding participants along the route and allowing them to experience the potential benefits of biking. Finally, ***tailoring***, by providing tailored information and personalized support to the user (Cialdini, 2007; Fogg, 2003; Oinas-Kukkonen and Harjumaa, 2008).

3 QUANTITATIVE EVALUATION OF BEHAVIORAL EFFECTS

3.1 DATA COLLECTION

A real-world-experiment was conducted in the Cambridge/Boston MA area over the period of four weeks in October 2014 to quantitatively evaluate the effects of three proposed strategies.

3.1.1 Sample

Study participants were recruited primarily through mailing lists at the Massachusetts Institute of Technology, MIT. Participants should be non-routine bikers (biking not more than three times a week). 55 participants met that requirement and were randomly assigned to one of three experimental groups or the control group. However, only 44 participants reported their trip data continuously over the period of four weeks. Table 1 provides an overview of groups sizes and available data. Out of all participants, 33 had no access to a bike and were provided with a one-month local bike sharing scheme subscription. 24 participants were provided with a helmet. As prior research shows that there are significant gender differences regarding utilitarian bike use (Heinen et al., 2010), the sample should be balanced in terms of gender. The 44 participants that continually reported their trip data consisted of 22 women and 22 men.

Table 1. Group sizes within experiment

	(I) Frequent Biking Challenge	(II) Virtual Bike Tutorial	(III) Bike Buddy Program	Control
n	12	11	11	10

Participants were primarily part of the MIT community. Students make up a large portion of the sample. Therefore, the study sample is not representative for a broader population. Furthermore, the sample most likely exhibits self-selection bias. The process by which participants were recruited encourages those who want to bike, but don't have the means to do so, to join. Future studies should therefore include a more representative study sample as well as a larger sample in general to be able to detect even small changes in aggregated mobility behavior.

3.1.2 Data Gathering

Participants reported their trips including trip purpose and used mode(s) on a daily basis for collecting mobility data. They were provided with a web-application that sent the data to a webserver with a relational database. To get continuous trip data, participants were automatically reminded via email in case they forgot to input their trips of the day. The trip diary included a calendar to navigate through the days, a help section and a statistics graphic where users could see the amount of reported trips and how they were distributed among different modes of transportation. A settings section allowed the users to set a time for the daily reminders and to put in custom trip purposes.

Online questionnaires were used to measure perceived risk and perceived safety in biking at the beginning and end of the experimental period. Open questions were also included at the final questionnaire to ask for perceived behavior change.

3.2 DATA ANALYSIS

Based on the self-reported mobility data the modal split between modes was computed per person per day. To correct for bad weather, all days with precipitation above average were excluded from the analysis.[3] As can be seen in (1), the difference between the daily bike share of each participant of an experimental group $y_{g,d}$ and the mean of daily bike share within the control group $\bar{y}_{c,d}$ was computed for each day. The sum of these daily differences was divided by the number of days N_{pre} before or N_{post} after the (start of the) intervention.

$$z_{g,pre} = \frac{1}{N_{pre}} \sum_{d=1}^{N_{pre}} \left(y_{g,d} - \bar{y}_{c,d}\right) , \; z_{g,post} = \frac{1}{N_{post}} \sum_{d=1}^{N_{post}} \left(y_{g,d} - \bar{y}_{c,d}\right) \quad (1)$$

As can be seen in (1), the result is a value for average bike-share above control per participant before the intervention $z_{g,pre}$ and after the (start of the) intervention $z_{g,post}$. This approach provides a per-day correction of data which is more accurate than just comparing uncorrected per participant pre- and post-intervention mean values between experimental and control group.[4] Based on the computed values a one-sided paired sample t-test[5] was used to test the hypothesis of an increase in bike-share above the control group value.

3.3 RESULTS FOR QUANTITATIVE BEHAVIOR EFFECTS

3.3.1 Mode Shifts

By analyzing share of modes on an individual level mode-shifts can be observed. As a change in mobility patterns towards more biking could be rooted in a decrease in use of high-energy modes (car, but also public transportation), but could also stem from a decrease in walking. The former is of special interest for this research. Pearson r correlations have been calculated

[3] Average precipitation was 4.8 mm.

[4] For that reason, the common method for pre-post-control designs of ANCOVA (analysis of covariance) was not applied.

[5] Shapiro-Wilk tests were conducted prior to all t-tests to check for normal distribution.

as a basic indicator for the dependence of mode share over the four weeks in which the mobility data was recorded. These correlations show a negative dependency of bike use and use of high-energy modes for at least 16 out of 44 (36%) participants (Table 2). As can be expected there are also statistically significant (p<.05) negative correlations between bike use and walking for 13 out of 44 (30%) participants (not shown in Table 2).

Table 2. Pearson r for biking in relation to high-energy modes. (*** p<.001; ** p<.01;* p< .05; Only statistically significant values (p<0.05) are included; "C" stands for Control group)

Participant	#132	#80	#100	#51	#89	#129	#82	#69
Strategy / Group	I	II	III	II	III	III	II	C
bike~high-energy	-0.97***	-0.93***	-0.75***	-0.75***	-0.74***	-0.71***	-0.64***	-0.62***
Participant	#133	#111	#53	#70	#64	#67	#99	#73
Strategy / Group	III	I	II	C	I	I	III	C
bike~high-energy	-0.58**	-0.57**	-0.56**	-0.54**	-0.51**	-0.44*	-0.41*	-0.40*

3.3.2 Effectiveness of Behavior Change Strategies

The reported mobility data showed an overall increase of bike trips within the study sample. Giving participants access to bikes did by itself encouraged some of them to use it more often and to include biking into daily mobility routines.

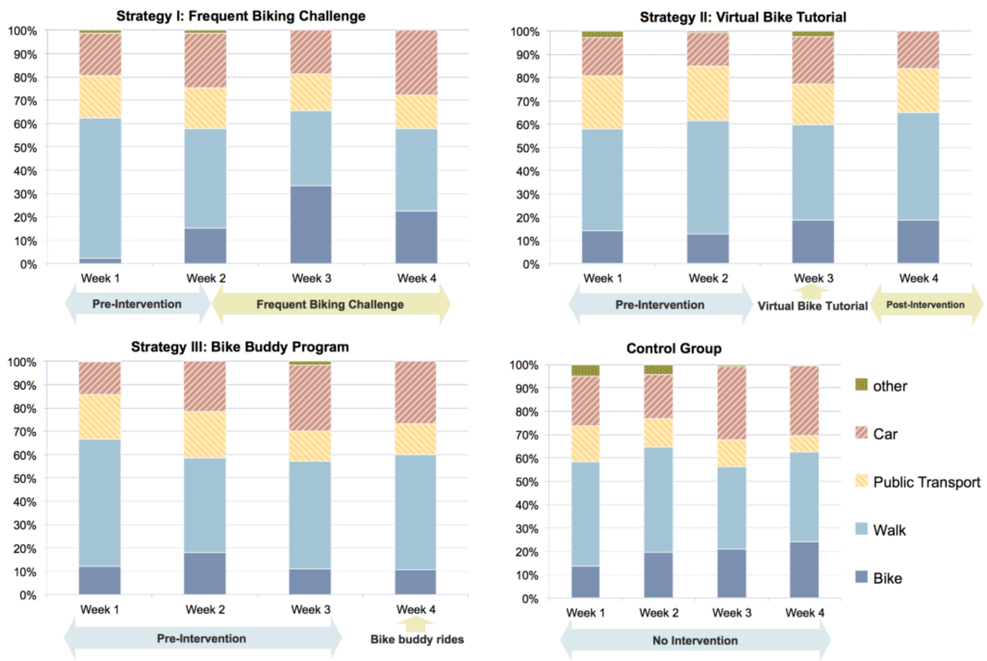

Figure 3: Modal split during experimental period.

As shown in Figure 3 a clear increase in bike share occurred for strategy I. It rose from 2% in week 1 to 15% in week 2 and 33% in week 3. Week 4 showed a decrease to 23%. The change from pre- to during-intervention values of bike share is 13.5 percentage points[6] above control group levels at statistically significant levels (p=0.03).

The participants of strategy II conducted the tutorial in weeks two and three of this study. The results demonstrate an increase of biking share within all trips after the intervention from about 14% in week one and two to 19% in weeks three and four. When compared to control group shares, the change in bike use is not statistically significant for this strategy.

Due to difficulties with scheduling, only six participants did the bike buddy rides in week 4 or after. Because the rides took place so late, no post-intervention trip data is available.

4 FUTURE EVALUTATIONS

To achieve a deeper understanding of processes that may lead to a change in mobility behavior, strategies and technologies as described above could be evaluated in the light of various theoretical perspectives. The field of psychology offers a wide set of theories to do that. The most relevant theories in the context of mobility are the ones conceptualizing choices, behavior and / or habits. It has to be questioned if these three concepts themselves are clearly separate. As for mobility, one might *choose* to take the bike to commute on one day. Such a choice, if somewhat repeatedly made, can then be seen as a behavior. (Bamberg et al., 2003) When such a behavior is performed repeatedly a habit is formed. That habit guides future behavior eliminating the need for elaborate decision processes. (Aarts et al., 1998)

The various aspects of individual mobility behavior are always embedded in a broader context. This can be emphasizes by taking on a sociological perspective on how travel choices are made. From that perspective, a change in mobility patterns will always rely on a change at social levels rather than just a change of individual behaviors. (Cairns et al., 2014)

4.1 EVALUATION FROM A THEORY OF PLANNED BEHAVIOR PERSPECTIVE

The theory of planned behavior (TPB) states that, "intentions to perform behaviors of different kinds can be predicted with high accuracy from attitudes toward the behavior, subjective norms, and perceived behavioral control; and these intentions, together with perceptions of behavioral control, account for considerable variance in actual behavior." (Ajzen, 1991) The presented strategies where developed with a focus on safety concerns, which were operationalized by measuring perceived safety and perceived risk (PSPR). These constructs can be seen as part of the attitude toward the behavior within the TPB. The hypothesis has been that for

[6] These values refer to percentage points within the modal split.

non-routine bikers the experience of biking in an urban environment will lead to an increase in perceived safety and decrease in PSPR of doing so. To test for a difference in the means of PSPR scores, a paired sample t-test was conducted. The comparison of the scores of these two variables for the beginning and end of the experimental period did not show a change. For now, this leads to inconclusive results, as actual behavior changes where present for one group without a change of PSPR. Future research could therefore focus primarily on the effect of PSPR.

Strategy II was built on the hypothesis, that perceived self-efficacy has an influence on actual behavior. The concept of self-efficacy can be viewed as very similar to that of "perceived behavioral control" within the TPB. (Ajzen, 1991) Perceived self-efficacy of participants starting at lower levels at the beginning of the intervention showed a slight increase. (Figure 4) However, on average there was no clear rise in perceived biking self-efficacy. A possible explanation emerged from the conducted interviews. Participants stated, that the bike tutorial content was more suited for people without prior biking experience whereas regular bikers did not perceive the scenarios as challenging and could not learn from them. However, a rise in self-efficacy depends on such a learning process. (Bandura, 1977)

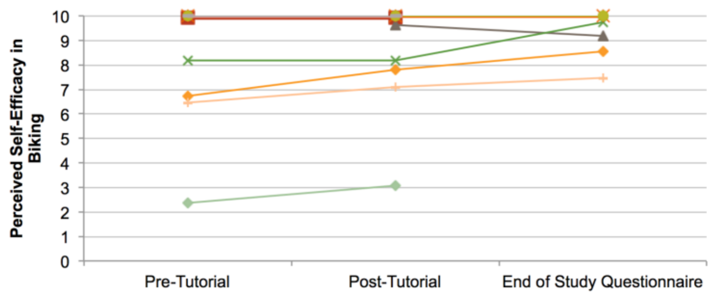

Figure 4: Change in perceived self-efficacy for biking. Each line represents one participant.

For the purpose of developing behavior change strategies, it is suggested to start by testing the ability of an intervention to change PSPR and perceived self-efficacy. If this can be confirmed, a measurement of the intention to perform the behavior as well as the behavior itself may show the actual effect of PSPR and perceived self-efficacy.

As there is rising criticism on the TPB, it is questionable, if future research should be based on this theory at all. One has to ask the question if a theory based on only four explanatory concepts is sufficiently elaborated to explain human behavior. Empirical results show that the predictive validity of the TPB is limited. Furthermore, results supporting TPB assumptions are based on mere correlations and no more robust methods like experimental settings could show the validity of the theory. As the TPB is static by its nature it is also questionable if it can be used to explain behavior change at all. (Sniehotta et al., 2014)

4.2 EVALUATION FROM A TPB WITH HABITS PERSPECTIVE

There is an ongoing discussion on the role of habit for explaining mobility behavior. Based on an extensive literature review Verplanken and Arts (1999) found that habits "appear as boundary conditions of the validity of models of planned behaviour and rational decision-making. A habit seems to be accompanied by an enduring cognitive orientation, which we refer to as 'habitual mind-set', that makes an individual less attentive to new information and courses of action, and thus contributes to the maintenance of habitual behaviour. Focusing on habitual mind-sets and automatic cue-response links, rather than on statistical associations between past and future behaviour, makes habit an interesting construct for future research." (ibid.)

Several studies expanded the TPB with the concept of habit yielding more insights on explaining mobility behavior. There is consistent evidence that habits can override both moral norm and environmental concern in predicting behavior. This is particularly the case when perceived behavioral control is weak and habit is strong. (Aarts et al., 1998; Donald et al., 2014; Eriksson et al., 2008) The predictive power of TPB constructs might also depend on the strength of a habit, with travel mobility behavior being more likely in line with intentions and personal norms before a habit is developed. (Eriksson et al., 2008)

As habits seem to be relevant to explain actual mobility behavior, several studies tried to explore how a change in habits can be achieved and what effect this might have. Structural interventions, such as closure of freeways or free public transport tickets, can lead to an interruption in habits and produce a lasting behavior change, in this case an increased use of public transportation. (Fujii and Gärling, 2003; Fujii and Kitamura, 2003) These structural interventions had a habit-changing effect even though they were only temporarily in place.

The presented set of experiments included such a structural intervention by giving participants without a bike access to the local bike sharing system. By comparing the participants that got a new access to bikes with the ones who did not, a clear change in bike usage emerges as shown in Figure 5. A future evaluation on this effect is already planned. By comparing the reported bike use during the experimental period to the bike use at a later time, the persistency of changed habits will be evaluated. Furthermore, bike access has been free to the participants during the experimental period, but having access after that required them to pay for the bike sharing service or to buy a bike. It shall therefore be evaluated, if the participants took the financial effort to further perform their new habit.

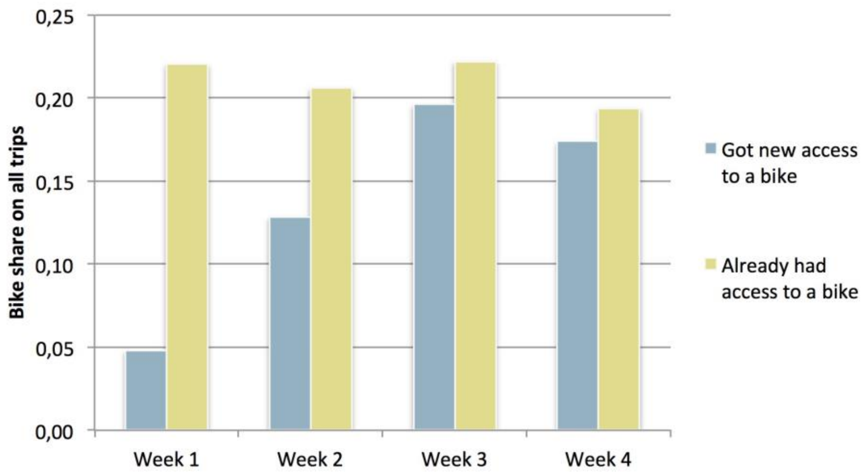

Figure 5. Effect of provision of bike access

4.3 EVALUATION FROM A TRANSTHEORETICAL MODEL OF BEHAVIOR CHANGE PERSPECTIVE

The transactional model of behavior change (Prochaska and Diclemente, 1986) views behavior change as a process that consists of five stages: Precontemplation, contemplation, preparation, action and maintenance.

Some findings within the presented study can be viewed from that theoretical perspective. The trip diary has raised general awareness of biking and the experimental period was described as a time of personal reflection on mobility. One participant mentioned: “I also now consider what form or transportation I take before I take it because the trip diary made me consider the different forms of transportation.” That can be linked to a process of moving from the stage of precontemplation to contemplation. Other participants stated, that they were considering to get a bike but just did not do so yet. By providing them with access to the local bike-sharing scheme they were able to get from the stage of contemplation to the stage of action. The previously discussed long-term evaluation may test the hypotheses that participants had also reached the stage of maintenance.

4.4 EVALUATION FROM A DUAL PROCESS THEORY PERSPECTIVE

Rational decision making is an underlying assumption of both the theory of planned behavior and its expanded version including habits. However, a large amount of psychological research shows that this view on humans as rational decision-makers neglects the (at least) equally important different type of intuitive decision-making. Dual process theories in general distinguish two types of thinking and consequently different processes underlying decision making. Rapid autonomous processes (Type 1 or System 1) yield default responses whereas Type 2 (or System 2) processing is needed for hypothetical thinking and loads heavily on working memory. (Evans and Stanovich, 2013; Kahneman, 2011) Many techniques of persuasion are based on actively inducing type 1 decision-making. Furthermore, choices on modes of transportation rely mostly on the fast, automatic and experience-based type 1 decision-making.

Applying this theoretical lens has consequences both for intervention design and the intervention evaluation. If it is assumed, that choices within daily transportation are based on type 1 thinking one has to ask how to design an intervention to be effective under this circumstance. Consequently, methods applied for evaluation would have to be designed in a way that they can show a change of the type 1 choice-making regarding transportation.

4.5 EVALUATION FROM A SOCIAL PRACTICE PERSPECTIVE

Human behavior is often viewed as acts of individuals, based on their attitudes and choices, within a given context. However, this view typically overemphasizes the role of the individual and does not represent the recursive nature of human acts within societies and the forces that shape these behaviors. This view can be corrected by adopting the lens of social practice theory. Here, the individual is seen as a social actor who carries a social practice. The object of inquiry is the social practice itself rather than the single acts of individuals. (Giddens, 1986; Reckwitz, 2002) As described from Shove et al. (2012), social practices are objects consisting of three central elements: First, materials, which in the field of transportation would include overall available technologies, tangible physical entities like cars, a bike or a bus, and the resources to build these objects. Second, there are competences, for example the skill to ride a bike or the know-how of finding a route to the desired destination. Third, there are meanings of social practices, which would for example include the symbolic meanings of driving a car or using a public bus service, as well as more general the ideas and aspirations that relate to different mobility related practices.

Again, this theoretical lens would influence both intervention design and the intervention evaluation. For design purposes, a profound understanding of the social practices that different modes of transportation represent would have to be combined with a choice oriented reasoning on why individuals carry a specific practice. Interventions should be designed in a way that they connect to or fit into existing practices. Evaluation in this regard should be considered as a tool for explaining changes in the long run, as changes in social practices typically occur over longer periods of time. For this reason, this theoretical lens would probably not yield a sufficient evaluation method applicable to interventions like the ones presented in this paper. Nevertheless, social practices can be a helpful lens to understand structures of space and time and the change of these in the long term. (Giddens, 1986) Thereby avoiding a theory induced blindness and reaching a macroscopic understanding of everyday human acts beyond concepts of “attitudes”, “behaviors”, “choices” or “contexts”.

5 DISCUSSION AND FUTURE RESEARCH

The design of three persuasive strategies with the goal to motivate people to cycle and a method for a quantitative evaluation was presented. Based on the available data, a statistically significant effect was found for one of the three interventions. As the sample sizes have been small and the sample was not representative for a larger part of a population, a repetition in a larger scale is necessary to test the effectiveness of this strategy.

For an evaluation beyond the behavioral effect and in order to better understand the involved processes, different theoretical backgrounds that are applicable in this field were shown. Instead of relying on a toolbox of techniques, as for the presented strategies in this study, future evaluations should be based on a proper theoretical foundation. By subsequently applying appropriate methods, a better understanding of involved processes as well as a richer overall evaluation could be accomplished.

Human mobility patterns are complex and interwoven in a social context as well as a built environment. They are fuzzy and there is no prevailing theory available to accurately describe or even predict a change of them. Consequently, understanding transportation behaviors and designing for a change of them are challenging tasks. On one side, research could therefore limit itself to describing and measuring existing mobility behaviors. But on the other side, it could as well try to find why and how a change in mobility behavior occurs and by that being able to show how such a change can actively be encouraged. This paper tried to give a glimpse at both.

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