# Behaviour theory and soft transport policy measures

Sebastian Bamberg [a], Satoshi Fujii [b,*], Margareta Friman [c], Tommy Gärling [d]

[a] University of Applied Science Bielefeld, Germany
[b] Kyoto University, Japan
[c] Karlstad University, Sweden
[d] Karlstad University and University of Gothenburg, Göteborg, Sweden

## ARTICLE INFO

## ABSTRACT

The aim is to propose a theoretical grounding of soft transport policy measures that aim at promoting voluntary reduction of car use. A general conceptual framework is first presented to clarify how hard and soft transport policy measures impact on car-use reduction. Two different behavioural theories that have been used to account for car use and car-use reduction are then integrated in a self-regulation theory that identifies four stages of the process of voluntarily changing car use: setting a car-use reduction goal, forming a plan for achieving the goal, initiating and executing the plan, and evaluating the outcome of the plan execution. A number of techniques are described that facilitate the different stages of the process of voluntary car-use reduction and which should be used in personalized travel planning programs.

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## 1. Introduction

In several respects private car use is a future threat to the human environment (Gärling and Steg, 2007). This has led to the development and implementation of transport policy measures aiming at reducing or changing car use (e.g. Kitamura and Fujii, 1998; Kitamura et al., 1997). These measures may be divided into "hard" and "soft." Hard measures include, for instance, improvements of infrastructure for and management of public transport services, increased costs for car use, and prohibition or rationing of car use. These measures may however not alone be effective in achieving car-use reduction (Stopher, 2004), and some are difficult to implement because of public opposition or political infeasibility (Gärling and Schuitema, 2007; Jones, 2003). Interest has therefore increased in soft measures which use techniques of information dissemination and persuasion to influence car users to voluntarily switch to sustainable travel modes (Gärling and Fujii, 2009; Jones and Sloman, 2006; Rose and Ampt, 2003; Taniguchi et al., 2007; Taylor, 2007; Taylor and Ampt, 2003). Soft transport policy measures are also referred to as voluntary change measures (Loukopoulos, 2007), psychological and behavioural strategies (Fujii and Taniguchi, 2006), or mobility management tools (Cairns et al., 2008). Frequently implemented such measures include workplace travel plans (encouraging work commuters not to use the car), school travel plans (encouraging parents not to drive their children to school), personalized travel planning

(encouraging reduced car use for all trip purposes), marketing of public transport (mass advertising campaigns), and travel awareness campaigns (increasing awareness of problems resulting from car use; Cairns et al., 2008).

In the following we limit our definition of soft transport policy measures to various forms of *personalized travel planning* (PTP). Available empirical evidence for their effectiveness is first briefly summarized (Section 2). A lack of theoretical grounding has been noted (Chatterjee and Bonsall, 2009; Richter et al., 2010b). The main aim of the present paper is to show (Section 3) that behavioural theories provide such a theoretical grounding. After first presenting a general conceptual framework (Section 3.1), we briefly describe (Section 3.2) two psychological theories that frequently have been used to identify psychological determinants of car use and changes in car use. In the same subsection we then present a joint theory that combines elements of these theories. Finally, we extend the joint theory to a self-regulation theory that would work as a theoretical grounding of PTP. We explicate (Section 4) how the self-regulation theory can be used to theoretically ground the techniques that are part of PTP. The paper concludes (Section 5) with a discussion of future research needs.

## 2. Evidence for the effectiveness of soft transport policy measures

Several narrative reviews (Brög et al., 2009; Cairns et al., 2008; Richter et al., 2010a; Taylor, 2007) have concluded that soft

* Corresponding author. Tel.: +81 75 383 3238; fax: +81 75 383 3236.
E-mail address: fujii@trans.kuciv.kyoto-u.ac.jp (S. Fujii).

transport policy measures are effective. Two meta-analyses (a technique that provides quantitative estimates of treatment effects, see e.g. Lipsey and Wilson, 2001) of previous research results have also been conducted. In one of these meta-analysis Möser and Bamberg (2008) synthesised the results of 141 studies evaluating the car-use reduction effects of workplace travel plans (44 studies), school travel plans (25 studies), and travel awareness campaigns/marketing of public transport (72 studies). Across all 141 studies a significant standardised mean effect size of 0.15 (Cohen's $h$) was found, corresponding to a 11% decrease in the proportion of trips conducted by car (from 61% to 54%). However, all studies used a quasi-experimental single treatment group before–after test design that fails to control for several threats to the internal validity of causal inferences (Fujii et al., 2009; Stopher et al., 2009). Furthermore, external validity or generalizability of the results is threatened by the fact that most of the synthesised evaluation results were based on non-representative samples.

In the second meta-analysis Fujii et al. (2009) used data from evaluation studies of 15 Japanese PTP programs (referred to as "travel feedback programs"). The methodological quality of these studies is higher because they incorporated comparison or control groups in a before–after test design. A standardised mean effect size of 0.17 (Cohen's $d$) was calculated. This corresponds to a decrease in the average number of weekly car trips from 6.9 to 5.7. However, the total number of studies was small and most of them were based on small non-representative samples. Furthermore, at least some of the studies seem to have used non-equivalent treatment and comparison groups, thus making it difficult to rule out alternative explanations for the reported before–after test differences.

To summarise, the currently available evaluation results provide empirical evidence for that PTP is effective in influencing car use. However, because of the noted methodological problems (Fujii et al., 2009; Stopher et al., 2009), the question still remains somewhat open of how much of the observed car-use reduction can be causally attributed to the impact of the techniques that are components of PTP. Furthermore, in their narrative review Richter et al. (2010a, 2010b) identified several gaps of knowledge and needs for additional research. One recognized research priority is longitudinal panel studies that examine the time course of changes in travel. Research is also needed to clarify what factors account for the existence (or nonexistence) of long-term effects. Additional research should illuminate how the simultaneous implementation of hard transport policy measures would increase the effectiveness of soft transport policy measures and *vice versa*. Of most relevance to the present paper, Richter et al. (2010b) concluded that research is needed that shows why PTP is effective. Such research should be guided by theory explaining why techniques promoting goal setting, plan formation, and customizing information are effective. Both the cost-effectiveness of single techniques and, more importantly, their combinations need to be assessed.

## 3. A theoretical grounding of soft transport policy measures

In the last decades the need for theory-driven interventions has been recognized (Bartholomew et al., 2006). When there are no explicit theoretical links between interventions and their intended effects, one cannot ascertain why the interventions did or did not work. An evaluation is therefore of less value for improving the intervention. Likewise, when success or failures cannot be attributed to the techniques employed, it is difficult to transfer evaluation results to other implementations, in other locations, or targeting other populations.

In implementations of PTP, one finds very little explicit statements about a theoretical rationale (Gärling and Fujii, 2009). Frequently reference is made to social marketing (Jones and Sloman, 2006). As Thøgersen (2007) notes, social marketing is however a tool for assisting the systematic development and implementation of an intervention, not a behavioural theory. Thus, proponents of PTP cannot reasonably claim that the techniques they use for changing car use are based on empirically supported theories.

### 3.1. A general conceptual framework

We start with presenting a general conceptual framework relating car users' decision making to the objective environment and socio-demographic factors, which frequently are evoked to account for disaggregate travel behaviour (e.g. Hanson, 1995). In the conceptual framework (see Fig. 1) perceptions of features of the objective environment (e.g. available travel modes, spatial distribution and quality of shopping and leisure facilities) provide the knowledge base from which car users derive their personal set of possible travel options. It is assumed that these options consist of trip chains (see Axhausen and Gärling, 1992; Gärling et al., 2002) defined as bundles of attributes (i.e. purposes, departure and arrival times, travel times, monetary costs). Besides the objective environment, socio-demographic factors (i.e. family structure, income, employment), and situational factors (i.e. family logistics, time pressure, weather, time of day, weekday) are assumed to influence car users' perceptions of possible travel options.

Hard transport policy measures modify the objective environment. It may lead to changes in travel if car users perceive how the environment is modified (e.g. blocked freeway lanes), deliberately reflect on the consequences it may have for the possible set of travel options (e.g. resulting in increased travel time by car), and judge that these consequences provide sufficient reasons to change current car travel (e.g. public transport provides a faster service). In contrast, the aim of PTP or generally soft transport policy measures is to directly influence car users'decision making by altering their perceptions of the objective environment, by altering their judgements of the consequences associated with the use of different travel options, and by motivating and empowering them to switch to alternative travel options.

It should be noted that the conceptual framework stresses the interdependence of hard and soft transport policy measures. With the implementation of hard transport policy measures that change the relative attractiveness of travel options, the possibility increases that soft transport policy measures would be effective in motivating and empowering car users to switch to these options.

### 3.2. Behavioural theories of car use and car-use reduction

In the last decade most psychological research targeting determinants of car use has primarily been guided by two theories (Anable et al., 2006): the Theory of Planned Behaviour (TPB) (Ajzen, 1991) and the norm-activation theory (Schwartz, 1977) which are briefly described in the following.

*Theory of Planned Behaviour (TPB)*. The theory of reasoned action (TRA) was developed in the 1970s (Ajzen and Fishbein, 1977; Fishbein and Ajzen, 1974) and very early had an influence on theories of travel behaviour (Gärling et al., 1998; Golob et al., 1979; Koppelman and Lyon, 1981). Yet, it never out-competed discrete choice models (McFadden, 2001). TRA or its successor the theory of planned behaviour (TPB) (Ajzen, 1991) is not a theory of discrete choice but of how intentions to perform behaviours are formed. It is referred to as an expectancy-value theory (Fishbein
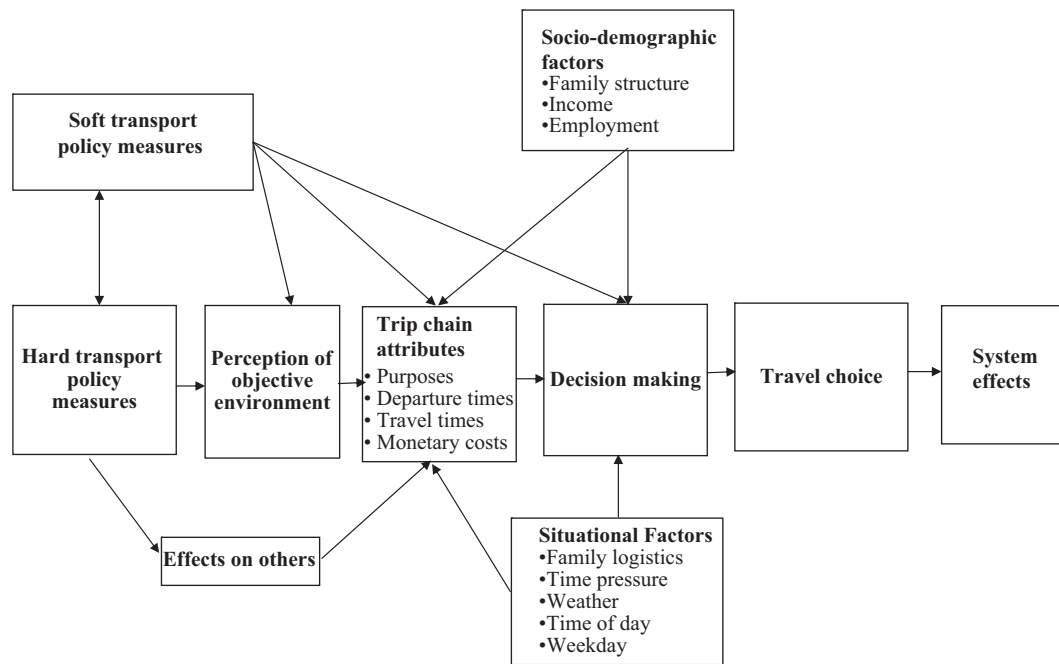
**Fig. 1.** A general conceptual framework.

and Ajzen, 1975) since it is based on the assumption that an attitude[1] towards the behaviour is formed by summing the products of the subjective probabilities of the occurrence and the positive vs. negative evaluations of all salient expected consequences of the behaviour. This assumption is similar to expected utility theories (Starmer, 2004) that have been proposed to account for discrete choice. According to TPB, if alternative behaviours exist, a choice is made among them based on the relative strengths of the intentions to perform the behaviours. A difference to discrete choice models (see Ben-Akiva et al., 1999) is that intentions are also determined by other factors than the attitudes towards the behaviours. TPB stresses the importance of situational constraints. For example, when forming an intention to use car or bus, people do not only take into account their attitudes toward these two travel modes but they also judge the difficulty of using them. This is referred to as perceived behavioural control. Social norm is a third factor influencing intention. In TPB social norm is conceptualised as perceived social pressure, that is expectations of the degree to which significant reference persons will approve performance of the behaviour (e.g. the use of a specific travel mode).

*Norm-Activation Theory.* Originally the norm-activation theory (Schwartz, 1977) aimed at explaining pro-social behaviour. It has later been developed into value-belief-norm theory (Stern, 2000) to specifically account for pro-environmental values, attitudes, and behaviour. The norm-activation theory may fare better than TPB in explaining car-use reduction. Whereas car use predominantly depends on evaluations of positive and negative consequences for the car user (Garvill, 1999), car-use reduction appears to depend more strongly on pro-social motives. This is consistent with findings that personal norm is an important determinant of car-use reduction (e.g. Nordlund and Garvill,

2003). A personal norm is defined as the felt obligation to bring own behaviour in line with important internalised self-standards (e.g. Biel and Thøgersen, 2007). The formation and activation of personal norms result from an interplay of cognitive, emotional, and social factors. Problem awareness and perceived responsibility are cognitive preconditions for its development (Schwartz, 1977).

The perception that one is responsible for a behaviour causing harm to other people frequently triggers feelings of guilt (e.g. Weiner, 1995), which is a pro-social emotion in that it results in a felt obligation to compensate for the caused damage (Baumeister, 1998). Besides feelings of guilt, social norms also inform people about what behavioural standards their social reference group views as appropriate in a particular context. Social norms are eventually internalised in which case they are referred to as personal norms.

*A joint theory.* The existence of two contrasting theories for explaining car use is unsatisfying. Bamberg et al., (2007) and Bamberg and Möser (2007) therefore proposed to augment TPB by adding personal norm from norm-activation theory as another determinant of intention. Furthermore, in the joint theory social norm has another definition than in TPB. In line with research on informational social influence (e.g. Moscovici, 1985), it is posited that people follow social norms because these inform what is normal behaviour. Thus, whereas personal norms provide information about whether a behaviour is morally right or wrong, social norms provide information about that the behaviour is performed by a majority of others.

Bamberg et al. (2007) conducted two studies in which they successfully applied the joint theory to explain choice of public transport for daily travel. Furthermore, the model was tested in Bamberg and Möser (2007) using the results of a meta-analyses of 46 studies published since 1995 in peer-reviewed journals. These studies reported correlations between the constructs posited in the joint theory and measures of different pro-environmental behaviours obtained from 57 independent samples. The correlation matrices were submitted to meta-analytical structural equation modelling (MASEM, see Becker, 2000; Viswesvaran and Ones, 1995). Whereas meta-analyses synthesizes the quantitative

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[1] Attitude is commonly defined as a positive vs. negative evaluation of an attitude object which is any discernible aspect of the environment (including a behaviour). A review of cognitive, affective, and behavioural methods of measuring attitudes is given in Eagly and Chaiken (1993). Note also that attitude is similar to preference but refers in general to a more enduring disposition of behaving in a certain way.

research findings across different studies and contexts, MASEM assesses the degree to which a model based on a theory fits the empirical pattern of the pooled correlations from the studies included in meta-analyses. Fig. 2 shows standardized path coefficients and explained variance (model fit: $\chi^2(14)=148.54$, $p<.001$; RMSEA$=.089$; CFI$=.98$). It can be seen that intention accounts for 27% of the variance in behaviour. Furthermore, intention mediates the effects on behaviour of the other constructs. Perceived behavioural control, attitude and personal norm have independent effects on intention. Together they explain 52% of the variance in intention. Feelings of guilt, social norm, responsibility, and problem awareness all have significant effects on personal norm. Together they explain 58% of the variance in personal norm. Social norm has a direct effect on perceived behavioural control and attitude in addition to its direct and indirect (via feelings of guilt) effects on personal norm. There is also a direct effect of feelings of guilt on attitude. Problem awareness has a direct effect on responsibility, feelings of guilt, social norm, and personal norm.

Gardner and Abraham (2008) reported the results of a meta-analyses of 23 studies of psychological determinants of car-use reduction. The right part of Table 1 presents the pooled correlations between car-use reduction and the constructs of the joint theory. As can be seen, the pooled correlations reported for car use are similar to those reported by Bamberg and Möser (2007) (left part of the table) for different pro-environmental behaviours. Thus, it is suggested that the joint theory may be generalized to account for car-use reduction.

*A self-regulation theory of travel change.* For the development of PTP, a theory is needed of the process of car users' voluntarily changes of their current car use. In order to accomplish this some elements must be added to the theories presented above. In this vein Bamberg (2010) proposed and tested a self-regulation theory that integrates elements of the joint theory. Self-regulation refers to that the theory applies concepts from control theory (Gärling et al., 2002; Loukopoulos et al., 2007).

In line with Prochaska and DiClemente (1982), the self-regulation theory posits that behavioural change is a transition through a time-ordered sequence of stages reflecting the cognitive and motivational difficulties people encounter in implementing a general behavioural change goal into concrete actions. As illustrated in Fig. 3, we consider here four stages of the process, the pre-contemplation, contemplation, preparation, and maintenance stages.

In the *pre-contemplation* stage the task is to choose among competing wishes such that one becomes a binding goal. This is referred to as goal setting. Gollwitzer (1990) proposes an expectancy-value framework for explaining goal setting. According to this framework people consider the feasibility and desirability of relevant outcomes and then commit themselves to a valued goal (goal intention) for which the subjective probability of achieving it is sufficiently high.

What activates people's setting of goals still remains a somewhat open question. This is where the discrepancy-reducing function of self-regulation loops comes into play (Gärling et al.,
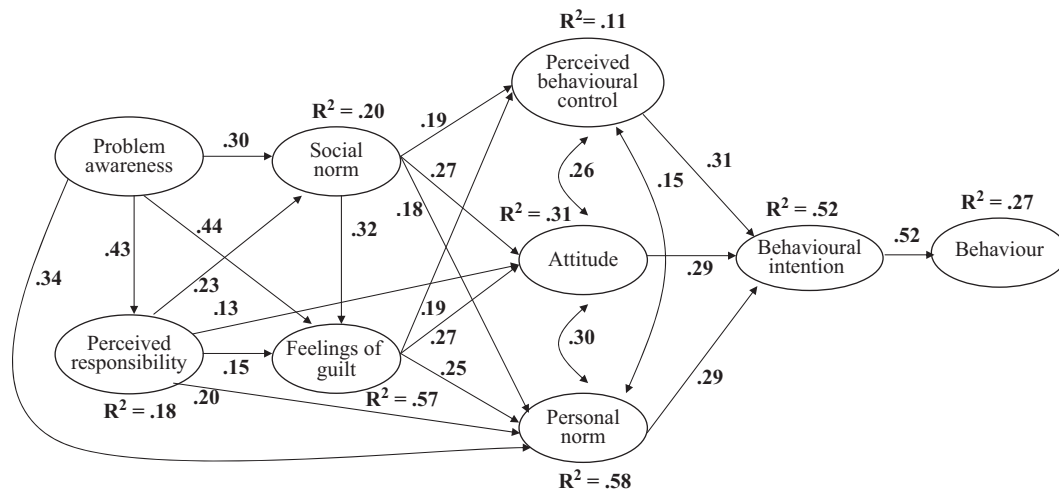


**Fig. 2.** Results of path analysis of meta-analytically pooled correlations. (Single-headed arrows represent causal paths, double-headed arrows represent correlations; standardized path coefficients and explained variance are shown; adapted from Bamberg and Möser, 2007).

**Table 1**
Pooled correlations ($r$) between hypothesized determinants and pro-environmental behaviours and car-use reduction, respectively.

| Determinant | Pro-environmental behaviours | | | | Car-use reduction | | | |
|---|---|---|---|---|---|---|---|---|
| | *N* | *k* | *R* | 95% CI | *n* | *k* | *r* | 95% CI |
| Problem awareness | 8276 | 18 | .22 | [11, .27] | 799 | 3 | −.24 | [−.33, −.15] |
| Perceived responsibility | 1866 | 6 | .25 | [13, .34] | — | — | — | — |
| Social norm | 7325 | 18 | .31 | [21, .41] | 993 | 2 | .36 | [.36, .36] |
| Feelings of guilt | 3203 | 5 | .31 | [21, .38] | — | — | — | — |
| Perceived behavioural control | 8029 | 18 | .30 | [18, .40] | 324 | 2 | .31 | [−.05, .65] |
| Attitude | 6751 | 17 | .54 | [26, .56] | 569 | 4 | .27 | [−.15, .70] |
| Personal norm | 6840 | 11 | .58 | [12, .61] | 563 | 2 | −.41 | [−.70, −.11] |
| Behavioural intention | 5654 | 15 | .52 | [42, .61] | 2517 | 4 | .53 | [.35, .72] |

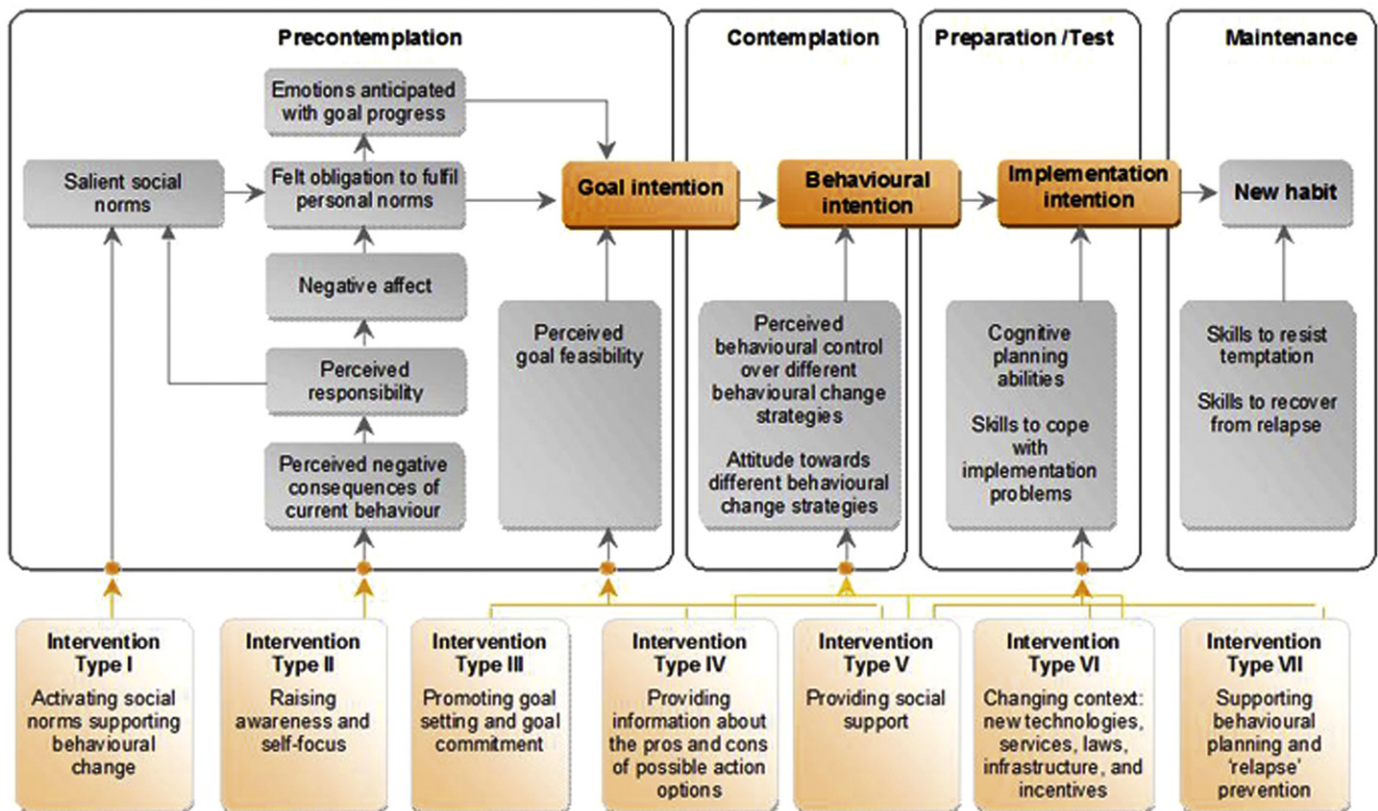Note. $k=$number of pooled studies; $n=$pooled sample size; CI$=$confidence interval.

**Fig. 3.** Self-regulation theory's hypothesized stages of the process of behavioural change and their determinants.

2002). If external information (e.g., obtained from discussion with friends or media news) indicates a discrepancy between current behaviour and an ideal or ought self, this perception should elicit negative affects (Higgins, 1987). Negative affects in turn increase self-focus, resulting in a felt obligation to bring current behaviour more in line with important self-standards. Other lines of research provide a more detailed account of this process. For instance, Weiner (1995) claimed that the perceived negative consequences of behaviour only elicit negative affects like guilt or shame if personal responsibility is attributed for causing this harm to the self. Accepting that own behaviour inflicts harm on another person, group, or the environment, it may also raise concerns that important reference persons disapprove of this behaviour. The fear of social sanctions for not fulfilling the expectations of these others (social norms) may increase people's felt obligation to bring their behaviour more in line with identity-related self-standards (personal norms). Carver and Scheier (1998) further hypothesized that the possibility of fulfilling personal norms elicits anticipated positive affect associated with changing the behaviour. This anticipated positive affect also contribute to the formation of a goal intention.

The task in the *contemplation* stage is to choose the most suitable means for reaching the goal. People retrieve from memory the personal consequences (attitude) associated with different optional behaviours as well as the perceived difficulty in performing them (perceived behavioural control). Weighing the pros and cons of the different options results in a behavioural intention.

In the *preparation* stage a plan for implementing the behavioural intention is formed. This is not difficult when the actions are well practiced, but new behaviours may need to be more carefully planned (Gollwitzer and Sheeran, 2006). Gollwitzer (1999) conjectures that forming a plan creates a mental link between a specific future situation and the enactment of the intended new behaviour. By specifying when, where, and how to implement the intention, people are ready to perform the new behaviour when encountering the appropriate situation.

In the *maintenance* stage people evaluate what they have achieved and decide whether further action is necessary. They do this by comparing the goal with the achieved outcomes. At this stage it is important to exert self-control to prevent relapses into the old behaviour.

Bamberg (2010) reports survey data from a sample of 1055 respondents allowing a correlational test of the self-regulation theory.[2] Fig. 4 presents a structural equation model based on these data. The coefficients were estimated with the MLR procedure (Muthen and Muthen, 2007), which is robust to violations of multivariate normality. According to the criteria recommended by Hu and Bentler (1999), the goodness of fit of the model is acceptable ($\chi^2$(5 0 5)=1129.16; CFI=0.94; TLI=0.94; RMSEA=0.034). As theoretically expected, in the pre-contemplation stage 64% of the variance in *goal intention* is accounted for by direct effects of personal norm, emotions anticipated from goal progress, and goal feasibility. There are also indirect effects of personal norm via both emotions anticipated from goal progress and goal feasibility. Also consistent with the theory, via responsibility for negative consequences perceived negative consequences of own car use affect social norm which in turn affects personal norm and feelings of guilt and fear which in turn affect both personal norm and emotions anticipated from goal progress.

It is also in agreement with the theory that in the contemplation stage 79% of the variance in *behavioural intention* is accounted for by direct effects of goal intention, attitude towards the behaviour, perceived behavioural control, and personal norm.

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[2] For further details about the data collection and measures of the different constructs, see the paper by Bamberg (2010) that may be obtained electronically from the author (sebastian.bamberg@fh-bielefeld.de).
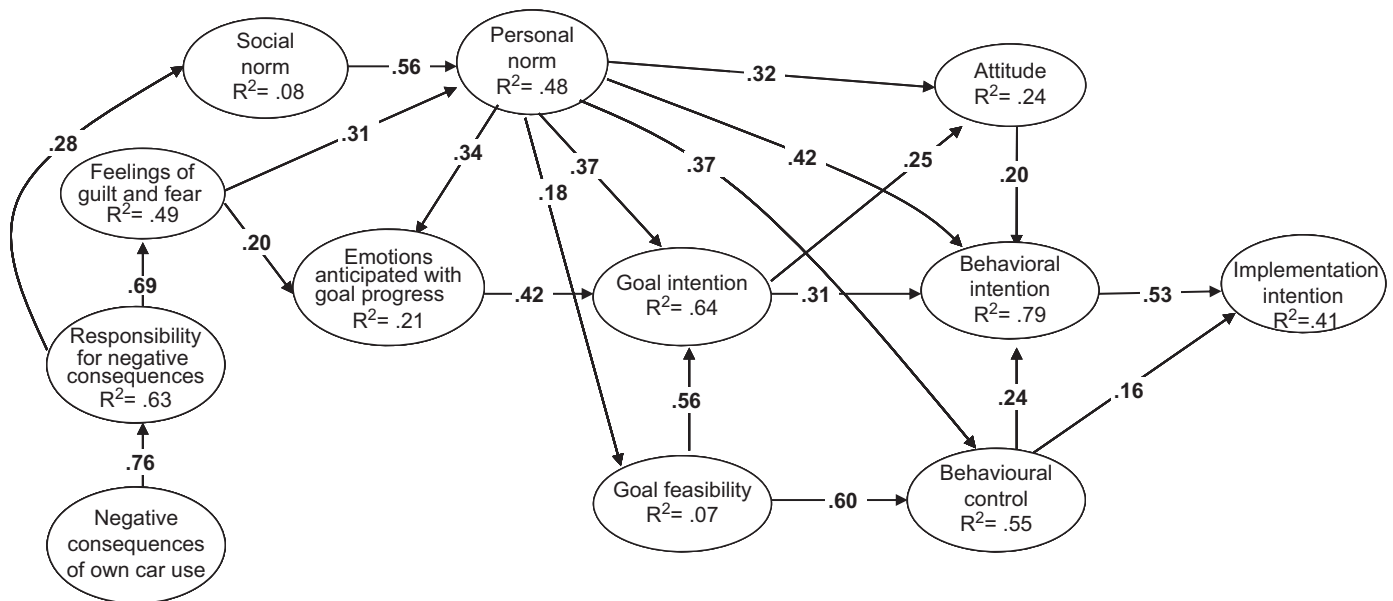
**Fig. 4.** An estimated structural model based on the self-regulation theory of voluntary change of car use. (Standardised path coefficients and explained variances are shown).

There are indirect effects of goal intention via attitude, of goal feasibility via perceived behavioural control, and of personal norm via attitude and perceived behavioural control.

Finally, as expected in the preparation stage, 41% of the variance in *implementation intention* is accounted for by behavioural intention and perceived behavioural control.

To summarise, the results are consistent with the self-regulation theory. A discrepancy is however that personal norm not only affects goal intention and emotions anticipated from goal progress, but also goal feasibility, perceived behavioural control, attitude, and behavioural intention. Further studies are needed to clarify whether this is a replicable finding. If it is, rethinking the theoretical status of personal norm is called for.

The presented correlational data provide empirical support for that the self-regulation theory is fruitful for gaining insight into the psychological processes underlying voluntary car-use reduction. Bamberg (2010) provides additional experimental evidence that the transition through the stages is associated with actual car-use reduction.

## 4. Theory-based techniques

Based on the self-regulation theory, more cost-effective PTP programs may be developed. Particularly important is the conceptualization of voluntary car-use reduction as a transition through different stages, that is forming a goal intention to reduce car use, behavioural intention to do this, and choosing the alternative travel option that reduces car use.

Currently, one single measure is usually used for all car users (Richter et al., 2010a). If car-use reduction is a transition through different stages, more flexibility would be needed, allowing matching the measure employed to the stage of the car user. If targeting car users in an early stage, the measure would likely be more effective if targeting problem awareness and perceived responsibility. Making social norms salient would also be important in this stage. For car users who already have formed a car-use reduction goal, providing information about the availability as well as evaluations of different alternative travel options would be more effective. Car users who already have formed an

intention to use a specific alternative travel option would benefit most from support of its implementation.

The self-regulation theory also provides a "blueprint" for theory-based techniques as components of PTP. Fig. 3 shows how the mechanisms underlying the formation of the three critical stage-specific transition points may be activated by different intervention types. For example, a variety of techniques exist that aim at making social norms salient, for instance mass media role-modelling (e.g., McAlister, 1995, see also Goldstein and Cialdini, 2007; Schulz, 1998). Scenario-based risk information (e.g. Hendrickx et al., 1989) and consciousness raising (e.g. Prochaska et al., 2002) are examples of techniques that increases problem awareness and responsibility. Locke and Latham (2002) have demonstrated that stimulating the setting of feasible but challenging goals leads to better performance than does setting easy goals. However, the positive effect of difficult goals depends on that people accept the challenge and have sufficient experience, possess self-efficacy and obtain adequate feedback (e.g. McCalley and Midden, 2002). There are also a number of techniques that aim at increasing the perceived behavioural control as well as enhancing positive attitudes towards alternative options (e.g. Ajzen and Manstead, 2007). Linking members to new networks by mentor programs, buddy systems, and self-help groups (e.g. Heaney and Israel, 2002) are examples of techniques to improve social support. Examples of techniques that would facilitate goal achievement include planning or practicing when, where, and how to initiate a new behaviour (e.g. Gärling and Fujii, 2002; Gollwitzer, 1999; Gollwitzer and Sheeran, 2006) as well as training of coping skills like identifying risk situations, practicing solutions, and coping with lapses (e.g. Marlatt and Gordon, 1985). Immediate customized feedback is important for maintaining the new behaviour (e.g. Carver and Scheier, 1998).

## 5. Future research directions

Two lines of future lines of research are particularly needed for the further development of cost-effective personalized travel planning (PTP) programs. One would concentrate on the theory-based development and experimental tests of techniques. The focus of this research should be based on the insights from

behavioural science research addressed in this paper to improve the theory of the causal determinants of car use as well as of voluntary car use changes. If supported by solid empirical evidence, in a second step the identified causal determinants of voluntary change should be systematically connected with techniques potentially able to strengthen these determinants. In a third step a series of small-scale field experiments should be conducted to test whether the newly developed techniques are able to strengthen the causal determinants and whether this results in changes in car use (for an example of such a research program, see Taniguchi and Fujii (2007); Taniguchi et al., 2007). A critical feature of such field experiments is the random assignment of participants to experimental and control groups (Fujii et al., 2009). Because the focus of this research is on causality, internal validity is essential whereas external validity – the generalizability of the results – is less important. In studies aiming at testing the causal effects of new theory-based techniques, it is for this reason not essential to use population-based samples. Ideally, as illustrated in Fig. 3, this type of research would result in sets of empirically supported causal determinants and techniques that strengthen these determinants.

A second line of research would focus on the development of large-scale evaluations of prototypes of PTP programs under field conditions. In practice most PTP programs consist of packages of different empirically supported techniques. However, the development of such packages should also be based on theory-grounded propositions of the causal role of each element included in the package. Besides the evaluation of the procedures used for producing and delivering the intervention to the target group (process evaluations), the aim of such large-scale intervention studies is the valid estimation of the behavioural effects of the programs under field conditions (outcome evaluations). For this purpose both high internal and external validity are essential. Thus, to guarantee a high internal validity of the evaluation results, true experimental research designs should be used. Fuji et al. (2009) provide an overview of how to apply such research designs. To guarantee high external validity of the results, large-scale evaluations are required based on data from representative population-based samples. As soon as a body of adequate high-quality evaluation studies is available, meta-analytic techniques (e.g. Lipsey and Wilson, 2001) should be used to calculate reliable and precise estimates of the effects. Furthermore, if a synthesis of the available evaluation results indicates a strong variability of the reported effects, meta-analyses provide statistical tools for analysing the potential sources of this variability, that is the possible impact of different population characteristics, differences in techniques, or differences in location. A precondition for this is that the evaluation reports contain enough detailed information about these factors.

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