

XI Congreso de Ingeniería del Transporte (CIT 2014)

## Variations on the Activity-Travel Scheduling Process after Participation in Travel Behavior Change Programs

Pablo García Garcés<sup>\*,a</sup>, Tomás Ruiz<sup>b</sup>

<sup>a,b</sup> *Universitat Politècnica de València. Camino de Vera s/n, 46022 Valencia, Spain*

---

### Abstract

In the last few decades, several “soft” transport policy measures have arisen in order to shift people voluntarily out of their cars to public transport or non-polluting travel modes, such as walk or bicycle. Considering the activities as precursor of trips, travel changes affect the way people manage their agendas, so it is clear to think that behaviour change is associated with the flexibility to change daily schedules.

The aim of this paper is to present a preliminary analysis of the variations on the activity-travel scheduling process, particularly in the rescheduling time horizon, after participation in Travel Behavior Change Programs (TBCP). For this purpose, it has been used a new dataset from a two-wave activity scheduling process panel survey conducted over a period of two years in the city of Valencia (Spain). Part of the respondents participated in TPCP between both waves. Results show that there are significant differences in the rescheduling time horizon between those respondents who participated in TBCP and those who did not.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Peer-review under responsibility of CIT 2014.

*Keywords:* Activity Scheduling Process, Panel Survey, Travel Behavior Change Programs, Rescheduling Time Horizon

---

### 1. Introduction

In the last few decades, several “soft” transport policy measures have arisen in order to deliver shifts from car use to other transport modes. Examples of these “soft” measures are the Travel Behavior Change Programs (TBCP) -

---

\* Corresponding author. Tel.: (+34) 387 70 00  
E-mail address: [pablo.garcia.garces@gmail.com](mailto:pablo.garcia.garces@gmail.com)

also known as Voluntary Travel Behavior Change (VTBC) programs, Sustainable Travel Plans or simply Smarter Choices- which are carried out to motivate people to reduce their car use, specifically single-occupant trips. Several benefits to both society and individuals (when car is replaced by walking or biking) have been proved. Those programs usually include personal travel scheduling, travel awareness campaigns, workplace or study place travel plans and strategies like car sharing.

TBCP attempt to shift people voluntarily out of their cars to public transport and non-polluting travel modes, such as walk or bicycle. TBCP consists on providing better information about transport options, appropriate assistance, motivation, incentives, or development of disincentive programs for car use (Stopher and Bullock, 2003; Chatterjee and Bonsall, 2009). Several examples of TBCP that have been implemented under various names across the globe include TravelSmart® (Ampt, 2003) and Travel Blending® (Rose and Ampt, 2001) in Australia, Travel Feedback Programs in Japan (Fujii et al., 2009; Fujii and Taniguchi, 2006), 'personal travel planning' in the UK (Brög et al., 2009; Jones and Sloman, 2006), and Individualised Marketing (or IndiMark®) in EU countries (Jones, 2003).

Despite the frequent use of TBCP in the past decade, there is some debate among professionals and academics about methods used to evaluate their effectiveness (Chatterjee and Bonsall, 2009). Several studies used research techniques that did not allow statistical inferences to be drawn from their results. Particularly, many TBCP did not include a control group in their applications to evaluate travel behavior change. They just pre-test and post-test participants' behavior (Moser and Bamberg, 2008; Fujii et al., 2009). Experimental designs such as these cannot identify seasonal changes in travel behavior, or other changes caused by variations of travel costs or sociodemographic changes.

Socialdata America (2007) and Brög et al. (2009) reviewed studies of TBCP applications which did include control groups in their evaluations. In addition, the meta-analysis of Moser and Bamberg (2008) attempted to address some of the methodological shortcomings of earlier evaluations by examining pooled effect sizes. Results from the Sloman et al. (2010) evaluation and Moser and Bamberg (2008) meta-analysis appear to indicate that the TBCP effects persist when self-selection is accounted for, though the size of the effects may be somewhat smaller.

Most TBCP applications have been based on two psychological theories: the Theory of Planned Behavior (TPB) (Ajzen, 1991) and the norm-activation theory (Schwartz, 1977). For example, Heath and Gifford (2002) extended the TPB to predict and explain public transportation use. Bamberg et al. (2007) and Bamberg and Möser (2007) proposed a joint theory based on the previous, adding some elements from informational social influence theories (Moscovici, 1985). Recently, Bamberg et al. (2011) proposed and tested a self-regulatory theory of travel change, integrating elements of the joint theory and applying concepts from control theory (Cärling et al., 2002; Loukopoulos et al., 2007).

We design and applied several actions considering that only influencing knowledge and/or attitudes rarely leads directly to behavior change (Anable et al., 2006). Therefore we tried to study other behavior factors (social and situational factors at a variety of social levels) that may act as barriers to change. To this end, we adopted Ken Wilber's four-quadrant structure (2000), which classifies barriers to behavior change at the personal or at the collective level, and may consist of either subjective or objective factors. In particular, we focused on evaluating individual subjective barriers.

On the other hand, research in the domain of public health, energy consumption, waste management, etc. have shown that information-based campaigns, including the use of incentives, are by and large insufficient for stimulating behavioral change of lasting effect. In this context, social psychology offers a series specific persuasion techniques that are equally suitable for private sector marketing as for community based social marketing strategies and that are able to reach beyond the mere raising of awareness and knowledge (Cialdini, 2001).

As said before, the central idea of TBCP is that, given appropriate information, assistance, motivation or incentives, people will voluntarily choose to travel in more sustainable modes. Considering the activities as precursor of trips, travel changes affect the way people manage their agendas, so it is clear to think that behavior change is associated with the ability or disability to change daily schedules (Ben-Elia and Ettema, 2011).

During activity scheduling and rescheduling, individuals and households take decisions continuously about which type of activities, where, when and with whom will be performed. The time horizon or time between decision and execution vary to a greater extent, and this characteristic has been frequently taken as a basis to define the order in which activity agendas are formed (Mohammadian and Doherty, 2005; Doherty, 2005; Lee and McNally, 2006; Mohammadian and Doherty, 2006; Clark and Doherty, 2009).

Considering the direct relation between a change in travel behavior and the activity-travel scheduling process, the aim of this paper is to present a preliminary analysis of the effect of participation in TBCP on the rescheduling time horizon. To achieve this goal, data from 1<sup>st</sup> wave have been compared with data from 2<sup>nd</sup> wave considering participation or not in the TBCP. The analysis tool has been the t-test for two related samples.

The rest of the paper is organized as follows. Methodology of the panel survey and characteristics of the dataset used are presented in next section. Then t-tests are used to assess the differences in rescheduling time horizon between panelists who participated in the TBCP and those who were included in the control group. We studied how is that effect depending on the type of rescheduling decision considered, gender and labor status of the participants. The paper ends with some conclusions and discussion.

## **2. Methodology**

### *2.1. Activity Scheduling Process Panel Survey*

A two wave activity-travel panel survey was conducted over a period of two years in the city of Valencia (Spain). The main purpose of this panel survey were both to achieve a better acknowledge of the travel mode choice and to study the potential effect of Travel Behavior Change Programs (TBCP) on both the scheduling process decisions and activity-travel behavior. First and second wave took place during autumn of 2010 and 2011 respectively. Part of the respondents received a set of TBCP between both waves.

Both survey waves followed three phases: First phase was a preliminary face-to-face interview to generate a pre-planned activity-travel agenda for the following week starting the day after the interview. Respondents were asked to define all activities and travels already decided to be carried out, giving as much details as possible. Demographic and socioeconomic information was collected as well. Before finishing this interview, respondents received a mobile phone with an activity-travel diary implemented and a cash incentive (30 euro). Second phase was developed during the research week, since respondents had to complete the activity-travel diary to collect characteristics (initial time, duration, location, etc.) of activities and travels as they were executed. Information was sent in real time to the research group, who compared pre-planned agenda and observed activities and travels. Third phase consisted in an in-depth telephone interview to inquire about the differences found.

For the first wave, car users were recruited at parking slots located throughout the city of Valencia (Spain). Those who admitted using car for most of their journeys and accepted to participate in the study were subsequently interviewed face-to-face at their home or other place agreed. So willing to change was not a criterion to accept their participation. The selection of respondents amongst all drivers who accepted participating followed demographic and socioeconomic criteria in order to have a sample as similar as possible in these characteristics to Valencia population. A total of 165 respondents successfully completed the first panel wave.

Between both survey waves, 47 respondents abandoned the panel due to change of residence outside the study area, transfers abroad for work or just decisions to not continue participating in the survey. In order to complete sample size in the second wave, remaining respondents were asked to inform about friends, family and colleagues who would be interested in participating. New respondents were selected as similar as possible, in terms of demographic and socioeconomic characteristics, as those who dropped out.

Finally, in the second wave there were 166 respondents who carry out the activity-travel scheduling process survey. Those who participated in both survey waves were 118 individuals. Demographics and socioeconomics in both waves were similar (Table 1)

Table 1. Sample Demographic and Socioeconomic Distribution

	1st wave	2nd wave	Panelists
Women	49.1%	51.2%	48.7%
Men	50.9%	48.8%	51.3%
Employed	69.8%	65.7%	70.1%
Students	24.6%	23.5%	20.5%
Other	5.6%	10.8%	9.4%
Aged <30	37.4%	37.4%	34.2%
Aged 30-39	32.4%	30.7%	32.5%
Aged 40-49	17.9%	16.3%	18.7%
Aged 50-59	10.6%	15.1%	12.8%
Aged 60+	1.7%	0.6%	0.0%

## 2.2. Travel Behavior Change Programs

After first survey wave, a short questionnaire was elaborated and sent to all respondents by postal and electronic mail in order to identify their internal barriers to modify travel behavior. Different question formats were used depending on the type of information to be collected. Self-identity and status, instrumental and affective attitudes towards car and alternative travel modes, and perceived behavioral control were evaluated. Response rate was 80 percent. Respondents who did not return this questionnaire but followed taking part in second wave were assigned to the control group. In order to avoid a bias in the control group, it was completed with respondents who returned the questionnaire so that both control and treatment group followed a similar demographic and socioeconomic distribution.

TBCP were designed based on results obtained in the questionnaire. Three different actions based on psychological principles of persuasion (Cialdini, 1984) were designed. First, applying persuasion principles of reciprocity and scarcity, some respondents received an envelope by postal mail including detailed description on alternatives to car on some of their usual journeys, and information about the effects in economic and environmental terms of not using the proposed alternative and keep on using car. Secondly, applying persuasion principle of authority, some respondents were invited to attend a talk given by a cardiologist and a sport trainer about the relation between health and physical activity and how walking and biking more can improve our health condition. Finally, applying persuasion principle of social proof and liking, some respondents were invited to watch a video session where people who recently had reduced their use of the car were interviewed on street about why they had decided to do so (Ruiz and García-Garcés, 2014).

73 out of 118 panelists participated in TBCP, whereas the rest formed the control group. Each participant received at least two of the previous actions to motivate them to reduce their car use.

### 2.3. Data characteristics

Executed activity-travel episodes are characterized by having been planned or not. The latter corresponds with executed episodes not included in the pre-planned agenda. Additionally, once activity-travel episodes have been pre-planned, individuals have to decide to execute them or not. The latter corresponds with episodes included in the pre-planned agenda and not executed. Finally, activity-travel episodes that have been both pre-planned and executed, can be performed as planned or with modification in any of their attributes (García-Garcés and Ruiz, 2013). Therefore, we consider three possible rescheduling decisions: add, delete and modify.

Both waves dataset provide a rich source of detailed information about scheduling, rescheduling and executing daily activities and travels. As mentioned before, in this study only rescheduling decisions have been analyzed. 118 panelists provided a total of 9,933 rescheduling episodes of activities or travels in the first wave and a total of 11,536 rescheduling episodes in the second wave. In second wave, panelists added more episodes and deleted fewer episodes than in the first wave (Table 2).

Table 2. Rescheduling Type Distribution

Rescheduling type	1 <sup>st</sup> wave		2 <sup>nd</sup> wave	
	TBCP	CG	TBCP	CG
Added episodes	2,982	1,581	4,188	2,316
Deleted episodes	995	741	862	484
Modified episodes	2,277	1,357	2,283	1,403

During the in-depth telephone interview, one of the questions asked to participants was “When did you decide to add/delete/modify [selected activity/travel episode]?” To assess the effect of TBCP on rescheduling time horizon, the answers to this question have been distributed into five groups according to when the respondent made the rescheduling decision (Table 3).

Table 3. Time Horizon Distribution

Time horizon	1 <sup>st</sup> wave		2 <sup>nd</sup> wave	
	TBCP	CG	TBCP	CG
TH0. At the moment	4,272	2,461	4,883	2,805
TH1. Few hours before	821	556	1110	648
TH2. The day before	714	419	810	395
TH3. Few days before	398	224	513	323
TH4. Few weeks before	49	19	17	32

### 3. Preliminary analysis and results

In order to make a preliminary analysis of the effect of participation in TBCP on the rescheduling time horizon, first all three rescheduling decisions have been analyzed together. The analysis tool is the t-test for two related samples (also called dependent t-test, paired t-test or paired-samples t-test). It is usually used to compare the means of two related groups to detect whether there are any statistically significant differences. In this case, related groups

are either panelist who received the TBCP or panelist who form the control group, since both groups have been measured twice (1<sup>st</sup> and 2<sup>nd</sup> wave) on the same variables. Acronyms used in t-tests are shown in Table 4.

Table 4. Acronyms used in t-test

Acronym	Definition
1st TH0-2nd TH0	Comparison between episodes rescheduled at the moment in the 1st wave Vs 2nd wave
1st TH1-2nd TH1	Comparison between episodes rescheduled few hours before in the 1st wave Vs 2nd wave
1st TH2-2nd TH2	Comparison between episodes rescheduled the day before in the 1st wave Vs 2nd wave
1st TH3-2nd TH3	Comparison between episodes rescheduled few days before in the 1st wave Vs 2nd wave
1st TH4-2nd TH4	Comparison between episodes rescheduled few weeks before in the 1st wave Vs 2nd wave

Therefore, two t-tests have been used to study the whole sample of rescheduling episodes. First one is to compare rescheduling time horizon data of the 45 panelists who belong to the control group, between 1<sup>st</sup> and 2<sup>nd</sup> wave. Later, another t-test is used to make the same comparison for the 73 panelists who received the TBCP (Table 5). In the case of participants in the control group, results show significant differences in the means of the episodes rescheduled at the moment in both waves, while in the case of participants in TBCP, results show significant differences in the means of the episodes rescheduled at the moment, few hours before and few weeks before. This means that an effect of TBCP is likely to exist, which should be confirmed with a subsequent statistical analysis.

Table 5. T-test results for panelists in the control group Vs panelists who received the TBCP. All episodes

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-7.644	17.661	-2.904	0.006	-8.37	21.000	-3.405	0.001
1st TH1-2nd TH1	-2.044	11.807	-1.162	0.252	-3.959	10.758	-3.144	0.002
1st TH2-2nd TH2	0.533	11.632	0.308	0.760	-1.315	11.257	-0.998	0.322
1st TH3-2nd TH3	-2.200	11.583	-1.274	0.209	-1.575	9.159	-1.470	0.146
1st TH4-2nd TH4	-0.289	2.332	-0.831	0.410	0.438	1.907	1.963	0.053

Similar analyses have been carried out for each type of scheduling decision. Considering added episodes, results for panelists in the control group show significant differences in the means of the episodes rescheduled at the moment and few hours before, while in the case of participants in TBCP the results show also significant differences in the means of the episodes rescheduled the day before (Table 6). In latter case, an effect of TBCP is likely to exist. Regarding modified episodes, only significant differences have been observed for participants in TBCP in the means of the episodes rescheduled few weeks before (Table 7). As before, these initial results should be confirmed later with a statistical analysis. In relation to deleted episodes, no significant differences have been found.

Table 6. T-test results for panelists in the control group Vs panelists who received the TBCP. Added episodes

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-10.689	14.137	-5.072	0.000	-9.849	22.811	-3.689	0.000
1st TH1-2nd TH1	-2.756	7.224	-2.559	0.014	-2.630	7.938	-2.831	0.006
1st TH2-2nd TH2	-1.644	6.589	-1.674	0.101	-2.027	7.149	-2.423	0.018
1st TH3-2nd TH3	-1.089	7.458	-0.979	0.333	-1.014	5.927	-1.461	0.148

1st TH4-2nd TH4	-0.156	1.770	-0.589	0.559	0.178	1.337	1.138	0.259
-----------------	--------	-------	--------	-------	-------	-------	-------	-------

Table 7. T-test results for panelists in the control group Vs panelists who received the TBCP. Modified episodes

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-0.178	14.059	-0.085	0.933	0.767	11.626	0.564	0.575
1st TH1-2nd TH1	-0.467	4.546	-0.689	0.495	-0.890	4.608	-1.651	0.103
1st TH2-2nd TH2	0.533	5.371	0.666	0.509	0.123	4.576	0.230	0.819
1st TH3-2nd TH3	-0.756	5.131	-0.988	0.329	-0.342	3.404	-0.860	0.393
1st TH4-2nd TH4	-0.156	0.999	-1.045	0.302	0.260	1.118	1.988	0.051

Finally, two more analyses have been carried out considering gender and labor status of the participants. Considering women, there are significant differences in the means of the episodes rescheduled at the moment for those in the control group, while in the case of women in TBCP the results show also significant differences in the means of the episodes rescheduled few days and few weeks before (Table 8). In case of men in the control group, significant differences have been found in the means of the episodes rescheduled at the moment, whereas participants in TBCP show also differences in the means of the episodes rescheduled few hours before (Table 9).

Table 8. T-test results for women in the control group Vs women who received the TBCP.

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-6.630	18.396	-1.873	0.072	-9.161	19.406	-2.628	0.013
1st TH1-2nd TH1	-3.852	12.606	-1.588	0.124	-3.290	10.86	-1.687	0.102
1st TH2-2nd TH2	1.444	13.681	0.549	0.588	-1.581	11.123	-0.791	0.435
1st TH3-2nd TH3	-0.296	9.758	-0.158	0.876	-2.806	7.977	-1.959	0.059
1st TH4-2nd TH4	-0.556	2.778	-1.039	0.308	0.710	1.970	2.006	0.054

Table 9. T-test results for men in the control group Vs men who received the TBCP.

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-9.167	16.902	-2.301	0.034	-7.786	22.316	-2.261	0.029
1st TH1-2nd TH1	0.667	10.238	0.276	0.786	-4.452	10.787	-2.675	0.011
1st TH2-2nd TH2	-0.833	7.786	-0.454	0.655	-1.119	11.485	-0.631	0.531
1st TH3-2nd TH3	-5.056	13.683	-1.568	0.135	-0.667	9.938	-0.435	0.666
1st TH4-2nd TH4	0.111	1.410	0.334	0.742	0.238	1.859	0.830	0.411

Working panelists in control group show significant differences in the means of the episodes rescheduled at the moment, while in case of those participants in TBCP there have been also found significant differences in the means

of the episodes rescheduled few hours before (Table 10). Considering students, unemployed and retired panelists, there are significant differences in the means of the episodes rescheduled at the moment, few hours before and the day before for those in the control group, while in the case of participants in TBCP the results show only significant differences in the means of the episodes rescheduled few days before (Table 11). As mentioned before, all this preliminary results should be confirmed later with a statistical analysis.

Table 10. T-test results for working panelists in the control group Vs working panelists who received the TBCP.

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-5.774	17.285	-1.860	0.073	-10.364	23.229	-2.959	0.005
1st TH1-2nd TH1	-0.516	11.060	-0.260	0.797	-4.886	11.203	-2.893	0.006
1st TH2-2nd TH2	0.548	9.936	0.307	0.761	-1.818	12.290	-0.981	0.332
1st TH3-2nd TH3	-0.968	11.957	-0.451	0.655	-0.364	10.042	-0.240	0.811
1st TH4-2nd TH4	-0.032	1.871	-0.096	0.924	0.545	2.204	1.641	0.108

Table 11. T-test results for non working panelists in the control group Vs non working panelists who received the TBCP.

	Related differences							
	Control group				TBCP			
	Mean	Std. Deviation	t	Sig. (bilateral)	Mean	Std. Deviation	t	Sig. (bilateral)
1st TH0-2nd TH0	-13.400	18.572	-2.282	0.048	-7.375	17.208	-1.714	0.107
1st TH1-2nd TH1	-6.900	10.333	-2.112	0.064	-3.750	10.510	-1.427	0.174
1st TH2-2nd TH2	-4.600	7.820	-1.860	0.096	-0.188	11.071	-0.068	0.947
1st TH3-2nd TH3	-4.800	8.351	-1.818	0.102	-4.563	7.789	-2.343	0.033
1st TH4-2nd TH4	-0.800	2.530	-1.000	0.343	0.625	1.544	1.619	0.126

#### 4. Conclusions and discussions

This paper aims to present a preliminary analysis of the variations on the activity-travel scheduling process, particularly in the rescheduling time horizon, after participation in Travel Behavior Change Programs. For this purpose, it has been used a new dataset from a two-wave activity scheduling process panel survey conducted over a period of two years in the city of Valencia (Spain). The analysis tool used is the t-test for two related samples, in order to compare the means of two related groups (same group observed in 1<sup>st</sup> and 2<sup>nd</sup> wave) and detect whether there are any statistically significant differences or not.

After comparing the significant differences between panelists in TBCP and panelists in control group, major findings are:

- Studying all rescheduling episodes, significant differences have been found in episodes rescheduled few hours before and few weeks before only for TBCP participants.
- Analyzing each type of rescheduling decision, significant differences have been found only for TBCP participants in episodes rescheduled the day before in case of added episodes and few weeks before in case of modified episodes. In relation to deleted episodes, no significant differences have been found.
- According to gender, significant differences have been found in episodes rescheduled few days before and few weeks before only for women in TBCP. In case of men, only participants in TBCP show differences in the means of the episodes rescheduled few hours before.



- There have been found significant differences in episodes rescheduled few hours before only for working participants who received TBCP. Considering students, unemployed and retired panelists in the TBCP, the results show only significant differences in the means of the episodes rescheduled few days before.

All these findings mean that spontaneous rescheduling decisions do not seem to be affected by participation in TBCP while in contrast an effect is likely to exist in mid and long term rescheduling decisions, which should be confirmed with a subsequent statistical analysis using econometric models. Besides, other variables like age, marital status, education or household role should be taken into account.

The reported work provides a starting point for further research in other variations on the Activity-Travel Scheduling Process after Participation in Travel Behavior Change Programs, such as variations in scheduling time horizon, time allocated to carry out work and non-work activities at-home and out-of-home, and influence of other people in the scheduling and rescheduling process.

## References

- Anable, J., Lane, B. and Kelay, T. (2006). An evidence base review of public attitudes to climate change and transport behavior. *Report for Department of Transport*, London
- Ampt, E. (2003). Understanding Voluntary Travel Behaviour Change. *Paper presented at the 26th Australasian Transport Research Forum*, Wellington, New Zealand.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, pp. 179–211.
- Bamberg, S., Hunecke, M., Blöbaum, (2007). Social context, morality, and the use of public transportation results from two field studies. *Journal of Environmental Psychology* 27, pp. 190–203.
- Bamberg, S., Fujii, S., Friman, M. and Gärling, T. (2011). Behaviour theory and soft transport policy measures. *Transport Policy*, 18, pp. 228–235.
- Bamberg, S., Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology* 27, pp. 14–25.
- Ben-Elia, E. and Ettema, D. (2011). Changing commuters' behavior using rewards: A study of rush-hour avoidance. *Transportation Research Part F*, 14, pp. 354–368
- Brög, W., Erl, E., Ker, I., Ryle, J. and Wall, R. (2009). Evaluation of voluntary travel behavior change: experiences from three continents. *Transport Policy*, vol. 16, no. 6, November, pp. 281–292.
- Chatterjee, K. and Bonsall, P. (2009). Special Issue on Evaluation of programs promoting voluntary change in travel behavior. *Transport Policy*, vol. 16, no. 6, November, pp. 279–280.
- Cialdini, R. B. (1984). *Influence: how and why people agree to things*. 1<sup>st</sup> ed. New York: William Morrow and Company, Inc.
- Cialdini, R. B. (2001). Harnessing the science of persuasion. *Harvard Business Review*, 79(5), pp. 71–80.
- Clark, A. F. and Doherty, S. T. (2009). Activity rescheduling strategies and decision processes in day-to-day life. *Transportation Research Record: Journal of the Transportation Research Board*, 2134, pp. 143–152.
- Doherty, S. T. (2005) How far in advance are activities planned? Measurement challenges and analysis. *Transportation Research Record: Journal of the Transportation Research Board*, 1926, pp. 41–49.
- Fujii, S., Taniguchi, A. (2006). Determinants of the effectiveness of travel feedback programs—a review of communicative mobility management measures for changing travel behaviour in Japan, *Transport Policy*, vol. 13, pp. 339–348. IE Aust (1996). *Policy on Travel Demand Management*. Institution of Engineers, Australia, Canberra.
- Fujii, S., Bamberg, S., Friman, M. and Gärling, T. (2009). Are effects of travel feedback programs correctly assessed?, *Transportmetrica*, 5:1, pp. 43–57.
- García-Garcés, P. and Ruiz, T. (2013) Simultaneous Analysis of Global Decisions in the Activity-Travel Scheduling Process. *Transportation Research Record: Journal of the Transportation Research Board*. Volume 2382, pp. 121–131
- Gärling, T., Eek, D., Loukopoulos, P., Fujii, S., Johansson-Stenman, O., Kitamura, R., Pendyala, R., Vilhelmson, B. (2002). A conceptual analysis of the impact of travel demand management on private car use. *Transport Policy* 9, pp. 59–70.
- Heath, Y. and Gifford, R. (2002). Extending the Theory of Planned Behavior: predicting the use of public transportation. *Journal of Applied Social Psychology*, 32, 10, pp. 2154–2189.
- Jones, P. (2003). Acceptability of transport pricing strategies: meeting the challenge. In J. Schade & B. Schlag (Eds.), *Acceptability of transport pricing strategies* (pp. 27–62). Oxford: Elsevier.
- Jones, P., Sloman, L., 2006. Encouraging behavioral change through marketing and management: what can be achieved?. In: K.W., Axhausen (Ed.), *Moving Through Nets: The Physical and Social Dimensions of Travel*, ed. Elsevier, Oxford, pp. 221–243.
- Lee, M. S.; McNally, M. G. (2006). An empirical investigation on the dynamic processes of activity scheduling and trip chaining. *Transportation*, 33, 6, pp. 553–565.
- Loukopoulos, P., Gärling, T., Jakobsson, C., Fujii, S. (2007). A cost-minimization principle of adaptation of private car use in response to road pricing schemes. In: Jensen-Butler, C., Larsen, M., Madsen, B., Nielsen, O.A., Sloth, B. (Eds.), *Road Pricing, the Economy, and the Environment*. Elsevier, Oxford, pp. 331–349.

- Mohammadian, A. and Doherty, S.T. (2005). Mixed logit model of activity-scheduling time horizon incorporating spatial-temporal flexibility variables. *Transportation Research Record: Journal of the Transportation Research Board*, 1926, pp. 33-40.
- Mohammadian, A. and Doherty, S. T. (2006). Modeling activity scheduling time horizon: Duration of time between planning and execution of pre-planned activities. *Transportation Research Part A, Policy and Practice*, 40, 6, pp. 475–490.
- Moscovici, S. (1985). Social influence and conformity, in G. Lindzey and E. Aronson (eds.) *Handbook of social psychology* (Volume 2, pp. 347-412), New York: McGraw-Hill
- Moser, G. and Bamberg, S. (2008). The effectiveness of soft transport policy measures: A critical assessment and meta-analysis of empirical evidence. *Journal of Environmental Psychology*, 28, pp. 10–26.
- Rose, G. and Ampt, E. (2001). Travel blending: an Australian travel awareness initiative. *Transportation Research Part D*, 6, pp. 95-110
- Ruiz, T. and García-Garcés, P. (2014) Measuring the impact of travel behavior change programs on the activity-travel scheduling process. *Transportation Letters*. In press
- Schwartz, S.H. (1977). Normative influence on altruism. In: Berkowitz, L. (Ed.), *Advances in Experimental Social Psychology*, vol.10. Academic Press, New York, pp. 221–279.
- Sloman, L., Cairns, S., Newson, C., Anable, J., Pridmore, A. and Goodwin, P. (2010) The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report, *Report to the Department for Transport*, London, February.
- Socialdata America (2007). Individual Transportation Options Pilot Project. *Final Report prepared for Oregon Department of Transportation*.
- Stopher, P. and Bullock, P. (2003). Travel behavior modification: a critical appraisal. *Papers of the 26th Australasian Transport Research Forum* [www.patrec.org/atrf.aspx](http://www.patrec.org/atrf.aspx), Wellington, New Zealand.
- Wilber, K. (2000). *Integral Psychology*. Boston: Shambhala.