TOPIC 15
TRAVEL CHOICE AND
DEMAND MODELLING

TOWARDS A THEORY OF THE INTENTION-BEHAVIOR RELATIONSHIP WITH IMPLICATIONS FOR THE PREDICTION OF TRAVEL BEHAVIOR

TOMMY GÄRLING
Department of Psychology
Göteborg University, SWEDEN

DICK ETTEMA
Department of Architecture and Urban Planning
Eindhoven University of Technology, THE NETHERLANDS

ROBERT GILLHOLM
Department of Psychology
Göteborg University, SWEDEN

MARCUS SELART
Department of Psychology
Göteborg University, SWEDEN

Abstract

Measurements of intentions have gained popularity as a means of forecasting travel behaviour. However, a theoretical underpinning is needed. Drawing on social-psychological research, we propose the elements of the intention-behaviour relationship. A key assumption is that intentions are parts of plans, and that the realism of the plan is important moderating factor of the intention-behaviour relationship.

INTRODUCTION

An important methodological issue in transport research is how to forecast travel behavior (Goodwin *et al.*, 1990). Transport researchers first turned to attitude measures (Pas, 1990). Later these methods were replaced by stated-preference and stated-choice methods (Hensher, 1994; Louviere, 1988a, 1988b; Timmermans and Golledge, 1990). However, the latter lacks a substantive theoretical underpinning (Gärling, 1994). It is also not clear how stated preferences and choices relate to behavior in real-life situations. Our aim in this paper is to reintroduce and elaborate on attitude theory (Dawes and Smith, 1985) since it may provide the sought theoretical underpinning. We will also illustrate and discuss implications for the prediction of travel behavior.

Many have noted the important contributions made early by Fishbein and Ajzen (1974, 1975; Ajzen and Fishbein, 1977, 1980) to an increased understanding of the relationship between attitudes and behavior (eg Golob *et al.*, 1979; Koppelman and Lyon, 1981). An important practical implication is that measures of *intention* will predict behavior better than measures of attitude. In particular this will be the case if intention is measured in such a way that it corresponds to the intended behavior with regard to action, target, context, and time. An exception appears however to be if the behavior is habitual (Bentler and Speckart, 1979, 1981; Gärling, 1992b). In such cases engaging in the behavior is presumably not preceded by the formation of an intention (Ronis *et al.*, 1989).

More recently Ajzen (1985, 1988, 1991) proposed the theory of planned behavior in which perceived control over the behavior plays an important role. Already Fishbein and Ajzen (1975) defined as a boundary condition of their theory of reasoned action that the behavior was under volitional control. Ajzen (1985) and Warshaw and Davies (1985) accordingly make a distinction between behavior and outcome or goal. Behaviors which are not under complete volitional control are goals which one may or may not attempt to attain. A person can have such an intention but nevertheless expect that it will fail because he or she perceives a low degree of control over its attainment.

If *expectation* is measured rather than intention (see, eg Davies and Warshaw, 1992; Warshaw and Davies, 1985), then prediction of behaviors which are not under volitional control may still be possible. In a meta-analysis of the results of 87 studies with a total sample of 11,566 respondents, Sheppard *et al.* (1988) found that the average correlation between intention and behavior was 0.53 (28.1% explained variance). The correlation was 0.45 as compared to 0.58 when the attainment of goals instead of voluntary behavior was predicted. However, when expectation ("how likely I am to perform action X") was measured rather than intention ("how strongly I intend to perform action X") the correlation increased from 0.49 to 0.57 overall, from 0.38 to 0.51 when goals were predicted. Thus, measuring expectation instead of intention is a means of improving the prediction of both voluntary behaviors and the attainment of goals. Another means is to include a measure of perceived control (Ajzen and Madden, 1986; Gärling, 1992a). Still another means is to measure the confidence in an intention (Pieters and Verplanken, 1995).

In addition, Sheppard *et al.* (1988) found that the strength of the intention-behavior relationship increased when subjects were faced with choices as compared to when they were not. On the basis of Fishbein and Ajzen (1980), an attenuated relationship was expected if a choice entails comparisons between intentions formed separately for each alternative behavior. If, on the other hand, the choice is made before an intention is formed (of performing the chosen alternative) no difference was expected. Sheppard *et al.* (1988) assumed that the latter would occur when the choice alternatives are mutually exclusive. An example would be choice of travel mode for a single trip.

Sometimes the alternatives are not mutually exclusive but are all possible (and desirable) to perform, although not at the same time. In these cases a person has competing intentions which he or she at some point in time must coordinate. Activity choices frequently make up such a *scheduling* problem (Axhausen and Gärling, 1992; Ettema *et al.*, 1993b; Gärling *et al.*, 1994). The more carefully the person schedules, leading to a higher degree of the realism of the resulting

schedule or plan, the more likely it is that he or she will perform the intended activities. However, if a choice of mutually exclusive alternatives are not made, the scheduling is perhaps incomplete. We believe that this is the reason why the intention-behavior relationship was found to be weaker when no explicit choice was required (Sheppard *et al.*, 1988). In addition, direct experimental evidence is becoming available that *explicit* planning increases the likelihood of performing an intended activity (Gillholm *et al.*, 1995; Gollwitzer 1993).

Although measuring expectation instead of intention, measuring the confidence in an intention, or measuring perceived control in addition to intention have all been found to improve prediction of both voluntary behaviors and behaviors not under volitional control, we propose an alternative method which does not rely on a single subjective rating or set of such ratings. In this alternative method, data need to be collected about interdependent choices concerning a future time slot rather than about a single choice. An example which we use as an illustration is the computerized interview procedure developed by Ettema *et al.* (1993b). Briefly, respondents are asked to report what they intend to do the following day, including choices of activities, durations, transportation modes, destinations, and departure times. We expect that predictions of a target choice (of, for instance, activity) would be improved if available information is used to assess the degree of realism of these interdependent choices.

DATA COLLECTION

Procedure

The data were collected in September/October 1994. The procedure entailed two sessions. First, a computerized interview was conducted. After having provided general information about engagements in everyday activities, subjects were requested to schedule the activities they intended to perform the day after the interview. Second, an activity diary was handed out at the end of the computer interview. Subjects were requested to fill out this diary the following day and then mail it back.

Computerized interviews

For the computerized interviews, the program MAGIC (Ettema *et al.*,1993b) was used. MAGIC consists of two parts. Each is preceded by thorough instructions presented on the computer screen which inform subjects about the task and how to use the program. Interviews were performed in subjects' homes with a laptop computer.

In the first part, data were first collected about possible activities which subjects may perform on the target day. A list of 32 activities was presented for which the following information was requested from the subject: (1) How many days ago the activity was performed last time; (2) The average frequency of performing the activity (times per month); (3) How long it takes to perform the activity (minimum duration, average duration, and maximum duration in hours and minutes); (4) How likely it is that the activity will be performed on the target day (rated on a 0-100 scale); and (5) The locations at which the activity can be performed. For each location the subject is asked to provide the name, the hours at which the subject would consider performing the activity at this location (which may be a smaller range than implied by strict opening hours), the attractiveness of the location (rated on a 0-10 scale) indicating how pleasant the location is to stay at, and the address of the location.

It should be noted that not all information is required for each activity. For instance, in case of an incidental activity such as visiting a doctor, frequency is not asked for. Also for daily activities like having breakfast, asking for frequency is avoided. The computerized data collection thus customises the questions to the specific situation. Furthermore, the consistency of the data is checked directly. For instance, the program checks if the minimum duration is always shorter than the average or maximum duration. If the input of any information does not exceed the predefined range is also checked. In this way the quality of the data is improved significantly in comparison with traditional mail-back questionnaires.

After the information about the activities had been provided, the subject was asked to specify his or her estimated travel times between pairs of locations that were recorded in the preceding phase. This was asked for all travel modes (automobile, motorbike, public transport, biking, and walking) that the subject believed he or she may use for the trip. Travel times between alternative locations for the same activity were not asked for. Furthermore, because the number of possible trips may become prohibitively large, a cutoff point was set at 20 trips. These trips included locations for the activities that were most likely to be performed. All the information on activities, possible locations, and travel times were recorded in data files.

The second part of the interview consisted of the task of scheduling the activities for the day after the interview. The resulting schedule entails the selected activities and the sequence in which they were planned to be performed, the locations at which the selected activities were planned to be performed, and the travel modes by which subjects planned to travel to the various locations. An agenda with activities to perform on the target day was listed on the screen (Figure 1). This agenda contains the same activities that were used in the first part. Activities were listed in random order to avoid any systematic bias. The locations were the same as in the first part of the experiment. The scheduling task was thus customized to the subjects' specific situations.

Given the agenda, the subject can construct the schedule by adding activities from the agenda to the schedule, deleting activities, changing the order of activities in the schedule or changing previously selected travel modes. The selection of operations took place by using function keys, whereas activities, location, and travel modes were selected by arrow keys. The selection of the place to insert an activity in the schedule was also guided by the arrow keys. The schedule under construction was always displayed at the right side of the screen. According to this procedure, the subject kept adjusting the schedule until he or she was satisfied with it. In addition the subject was requested to specify the start and end times for each activity in the schedule. The operations chosen by the subject were recorded in data files together with the final schedule.

Activity diaries

An activity diary was used to record the activities subjects actually performed on the day after the interview. As the last thing of the day, subjects were asked to recall the activities performed on that day and to fill out the questionnaire. Activities, locations, and travel modes were listed in a free format. In addition start and end times of the activities were specified. To enable matching of the activity diaries to the computerized interviews, subjects also specified their home addresses. In the processing of the data, the activities were coded in the same categories as used in the interview procedure.

Respondents

Respondents were 402 residents of the city of Veldhoven (population 39,949), located in the south-eastern part of the Netherlands, who participated in return for a small gift. They were selected using the random walk method. According to this method interviewers are assigned a start address based on which a number of following addresses are visited. The start addresses were distributed equally across different districts to obtain sufficient variation in home locations. During the data collection subjects were furthermore screened on age and gender to obtain a close correspondence to the population distribution. The sample included subjects with different main occupancy such as out-of-home work, education, or housekeeping.

Of the 402 subjects who participated in the computerized interview, 320 (79.6%) returned the activity diary. Not all diaries of this share could be matched to the recorded computer interviews due to missing or incomplete addresses. Discarding the subjects with incomplete addresses, 241 (60%) subjects remained for whom both the computer interview and the activity diary were available.

Screen 1

AGENDA	SCHEDULE		
TIME: 7.00 LOCATION: HOME	ACTIVITY	LOCATION	TRAVEL MODE
work	sports	recreation center	public transport
preparing dinner	breakfast	recreation center	
cleaning	GO HOME		
washing	cleaning	HOME	walking
buying groceries	lunch	HOME	
breakfast	visit friend	address	bicycle
sports	GO HOME		
visit friend	dinner	HOME	bicycle
watching TV	watching TV	HOME	
reading ⇓			

F1 Add activity to schedule F2 Remove activity from schedule F3 Change location
F4 Change travel mode TAB Schedule finished

Screen 2

State start and end times of activities in the schedule

ACTIVITY	LOCATION	TRAVEL MODE	START TIME	END TIME
sports	recreation center	public transport	8.00	9.00
breakfast	recreation center		9.30	9.45
cleaning	HOME	walking	10.45	12.30
lunch	HOME		13.00	13.30
visit friend	address	bicycle	15.00	18.00
dinner	HOME	bicycle	18.30	19.30
watching TV	HOME		19.30	23.00

↑↓: Choose activity ↵: Confirm

Figure 1 **Views of the computer screen during the scheduling phase of the interview procedure (In the gray areas subjects inserted activities, locations, travel modes, and start/end times)**

DATA ANALYSIS

Table 1 shows the mean frequency of activities across subjects which were intended, planned, and executed. From this table it is clear that there is an association between intention and execution ($\phi = 0.344$) as well as between planning and execution ($\phi = 0.590$ for intended activities). Table 2 displays for each activity subjects' mean rated frequency of performing the activity, mean rated likelihood of performing the activity, mean frequency of planning, and mean frequency of executing the activity, respectively. As may be seen, there is a substantial variation in these different measures across activities. Because of this we decided to confine the subsequent analyses to single activities.

Table 1 **Frequency of intention, planning, and execution of activities**

	Nonintended		Intended	
	Nonplanned	Planned	Nonplanned	Planned
Nonexecuted	5088	52	470	197
Executed	1025	61	104	715

Table 2 **Mean estimated frequency of execution/month, mean rated intention, mean frequency of planning, and mean frequency of execution for each activity (standard deviations are given within parentheses)**

	Estimated frequency/month	Intention	Planning	Execution
work/voluntary work	9.8 (10.3)	50.8 (49.5)	0.32 (0.47)	0.33 (0.47)
getting education	1.4 (4.3)	24.6 (43.0)	0.04 (0.20)	0.07 (0.25)
preparing dinner	17.3 (13.5)	70.3 (43.7)	0.54 (0.50)	0.48 (0.50)
cleaning	17.6 (15.1)	62.6 (44.8)	0.49 (0.50)	0.43 (0.50)
washing and ironing	0.0	0.0	0.0	0.15 (0.36)
dish washing	0.0	0.0	0.0	0.48 (0.50)
buying groceries	8.6 (7.5)	40.1 (45.3)	0.34 (0.48)	0.41 (0.49)
getting food (snackbar, Chinese)	1.5 (2.5)	11.5 (27.2)	0.02 (0.14)	0.02 (0.16)
buying shoes/clothes	0.0	0.0	0.0	0.08 (0.28)
visit specialty shop	3.1 (4.3)	14.4 (31.5)	0.07 (0.26)	0.16 (0.37)
pick up someone	6.2 (14.2)	23.8 (40.5)	0.12 (0.33)	0.17 (0.37)
deliver something	1.5 (4.9)	18.6 (36.6)	0.01 (0.11)	0.04 (0.19)
visit doctor/dentist	5.4 (5.7)	3.3 (16.2)	0.04 (0.2)	0.08 (0.27)
visit post office/bank/cashpoint	4.5 (3.7)	17.0 (34.2)	0.03 (0.18)	0.03 (0.18)
breakfast	0.0	0.0	0.0	0.83 (0.38)
lunch	0.0	0.0	0.0	0.73 (0.44)
dinner	0.0	0.0	0.0	0.87 (0.34)
visit library	1.0 (1.5)	13.5 (31.3)	0.03 (0.17)	0.02 (0.13)
visit club activity	3.0 (5.0)	14.6 (34.1)	0.09 (0.29)	0.09 (0.29)
sports	1.5 (3.4)	25.4 (43.6)	0.06 (0.23)	0.07 (0.26)
visit sports match	0.8 (1.6)	10.0 (29.4)	0.01 (0.11)	0.0
theater/concert/cinema	2.7 (4.2)	0.70 (5.18)	0.0	0.0
visit café/bar/restaurant	0.0	0.0	0.0	0.05 (0.21)
visit museum/exhibition	1.5 (2.9)	1.4 (10.0)	0.0	0.0
visit friends/family	0.0	0.0	0.0	0.39 (0.49)
walking/biking	9.4 (18.8)	32.3 (44.6)	0.15 (0.35)	0.19 (0.39)
sightseeing	7.0 (11.5)	3.3 (16.3)	0.03 (0.17)	0.01 (0.11)
studying at home	1.7 (5.7)	32.0 (43.4)	0.04 (0.19)	0.04 (0.19)
have visitors	10.3 (9.4)	32.3 (41.3)	0.15 (0.36)	0.17 (0.38)
hobbies at home	12.6 (13.8)	58.6 (43.6)	0.35 (0.48)	0.24 (0.43)
watching TV	31.9 (12.3)	86.7 (28.5)	0.75 (0.43)	0.75 (0.43)
reading (not for study)	28.1 (17.7)	83.2 (34.3)	0.55 (0.50)	0.53 (0.50)

The first part of the data analysis attempted to establish that planning actually improves the prediction of execution of an activity. Analyzing single activities also make it possible to compare the results with previous findings (Sheppard *et al.* 1988). The analyses were performed for six activities (work, preparing dinner, cleaning, buying groceries, watching TV, and reading) fulfilling the criterion that they were intended and executed, respectively, by at least 25% and at most 75% of the subjects. The execution of these activities were predicted from intention to a degree that was comparable to Sheppard *et al.*'s (1988) results (r varying from 0.314 to 0.876). By also including the frequency with which the activity is usually performed (habit) and whether or not the activity was planned, the degree of prediction was for all activities increased. As Table 3 shows, whether or not an activity was planned most consistently contributed to the increases in the accuracy of the prediction.

Gillholm *et al.* (1995) similarly found that engaging in planning increased the intention-activity correlation. A possible reason ruled out in a follow-up study was that planning augments the strength of the intention. More consistent with the results was that planning makes a plan associated with the intention more realistic (Gollwitzer, 1993). The present data neither support nor rule out that planning affected execution. If it is assumed that subjects in planning reported those activities which were part of their plans, they are however consistent with the hypothesis that a more accurate prediction is possible from knowledge of whether the activity is planned. An additional question asked was therefore whether for those activities which were planned, it would be possible to improve prediction further by including measures of the realism of the plan. Four

such measures were constructed: number of activities included in the plan (NRACT), available time when the activity can be performed (OPHOURS), number of locations where it can be performed (NRLOC), and number of those locations which were accessible by walking (NRWALK). However, as Table 4 shows, none of these measures increased the correlation with execution over and above intention.

Table 3 **Product moment correlations between intention and execution, squared multiple correlations and standardized regression coefficients for intention, frequency, and planning from sets of regression analyses with execution of single activities as dependent variable**

	$\beta_{Intended-Executed}$	$\beta_{Intended}$	$\beta_{Frequency}$	$\beta_{Planned}$	$R^2_{adjusted}$
work/voluntary work	.876***	0.18+	-0.01	0.74***	.827***
preparing dinner	.714***	0.40***	0.02	0.38***	.559***
cleaning	.347***	-0.05	0.14+	0.53***	.309***
buying groceries	.454***	0.30***	0.00	0.22**	.222***
watching TV	.314***	0.06	0.03	0.50***	.282***
reading (not for study)	.337***	0.19*	-0.03	0.45***	.277***

+$p<.10$ *$p<.05$ **$p<.01$ ***$p<.001$

Table 4 **Squared multiple correlations and standardized regression coefficients for intention, number of activities in the plan (NRACT), available time (OPHOURS), number of available locations (NRLOC), and number of those locations which were accessible by walking (NRWALK) from sets of regression analyses with execution of single activities as dependent variable (in the those cases no regression coefficients were obtained, the variable did not vary for a given activity)**

	$\beta_{Intended}$	β_{NRACT}	$\beta_{OPHOURS}$	β_{NRLOC}	β_{WALK}	$R^2_{adjusted}$
work/voluntary work	10.91***	0.08*	0.01	0.06	. 05	.813***
preparing dinner	30.70***	0.00	-	0.07	-	.492***
cleaning	40.28***	0.14*	-	0.10	-	.126***
buying groceries	70.44***	0.04	-	0.03	-0.04	.193***
watching TV	310.35***	-0.03	-	0.06	-	.109***
reading (not for study)	320.34***	0.09	-	0.00	-	.114***

+$p<.10$ *$p<.05$ **$p<.01$ ***$p<.001$

DISCUSSION

It was assumed that an intention may be prevented from being implemented when it is in conflict with other concurrent intentions. From this assumption the prediction was made that an intention to perform an everyday activity forming part of a plan would better predict the actual execution of the activity. The results reported in the paper supported this prediction. Both in an analysis across all activities (Table 1) and in analyses of each of six selected single activities (Table 3), whether or not an activity was scheduled during the computerized interview turned out to be a better predictor of performance than a measure of intention (likelihood of performing the activity). The same was found by Gillholm *et al.* (1995) for a smaller sample. The results are furthermore consistent with the observation from a meta-analysis of a large number of studies (Sheppard *et al.* 1988) that the intention-behavior correlation increases if forming the intention entails choices. Some qualification may be needed since none of the measures constructed to assess the realism of the plans improved prediction over and above that of intention. Number of activities included in the plan, available time to perform the activity, number of locations where the activity can be performed, and how many of those locations which were accessible by walking appear all to be indicators of the realism of the plan. However, at the same time they may correlate with other factors. For instance, number of activities included in the plan reflect perhaps how meticulously a

subject plans. Thus, the relationship is ambiguous. Similarly, the number of locations available is perhaps larger for nonroutine activities which are less likely to be executed even though they are planned (Gärling, 1992b; Gillholm *et al.*, 1995). Further research is therefore called on to define valid measures of realism of a plan which augment the intention-activity correlation.

Irrespectively of whether subjects who were interviewed actually planned or reported their plans, the results supported the hypothesis that planning plays a mediating role in the implementation of intentions. However, whether subjects did one or the other has bearing on another issue. If the computerized interviews not only assess the respondents' schedules or plans but induce them to make such plans (*cf.* Jones, 1979; Jones *et al.*, 1989; Lee-Gosselin, 1990) which increase the likelihood that intentions are implemented, then the method produces artefactual results. This was actually what Gillholm *et al.* (1995) found. Yet such a finding may depend on several conditions such as the selection of activities and subjects, how the instructions are phrased, and possibly others. These are still other questions in need of being addressed in future research.

ACKNOWLEDGMENTS

The research reported in the paper was financially supported in part by grants to Harry Timmermans at Eindhoven University of Technology, in part by grant #93-315-22 to Tommy Gärling from the Swedish Transportation and Communication Research Board.

REFERENCES

Ajzen, I. (1985) From intentions to actions: A theory of planned behavior. In: *Action Control: From Cognition to Behavior* (J. Kuhl and J. Beckmann, eds.), pp. 11-39. Springer, Heidelberg.

Ajzen, I. (1988) *Attitudes, Personality, and Behavior.* Dorsey, Chicago.

Ajzen, I. (1991) The theory of planned behavior. *Org. Beh. Hum. Dec. Proc.*, 50, 179-211.

Ajzen, I. and M. Fishbein (1977) Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychol. Bull.*, 84, 888-918.

Ajzen, I. and M. Fishbein (1980) *Understanding Attitudes and Predicting Social Behavior.* Prentice-Hall, Englewood Cliffs, NJ.

Ajzen, I. and T. J. Madden (1986) Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *J. Exp. Soc. Psychol.*, 22, 453-474.

Axhausen, K. and T. Gärling (1992) Activity-based approaches to travel analysis: Conceptual frameworks, models, and research problems. *Transp. Rev.*, 12, 323-341.

Bentler, P. .M. and G. Speckart (1979) Models of attitude-behavior relations. *Psychol. Rev.*, 86, 452-464.

Bentler, P.M. and G. Speckart (1981) Attitudes "cause" behaviors: A structural equation analysis. *J. Pers. Soc. Psychol.*, 40, 226-238.

Davis, F. D. and P. R. Warshaw (1992) What do intention scales measure? *J. Gen. Psychol.*, 119, 391-407.

Dawes, R. M. and T. L. Smith (1985) Attitude and opinion measurement. In: *Handbook of Social Psychology* (R. P. Abelson and A. Levy, eds.), Vol. I, pp. 509-566. Random House, New York.

Ettema, D., A. Borgers and H. P. J. Timmermans (1993a) Simulation model of activity scheduling behavior. *Transp. Res. Rec.*, 1413, 1-11.

Ettema, D., A. Borgers and H. P. J. Timmermans (1993b) Using interactive computer experiments for investigating activity scheduling behavior. *Proc. PTRC 21st Summer Annual Meeting, University of Manchester*, P366, 267-282.

Fishbein, M. and I. Ajzen (1974) Attitudes towards objects as predictors of single and multiple behavior criteria. *Psychol. Rev.*, 81, 59-74.

Fishbein, M. and I. Ajzen (1975) *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.

Gärling, T. (1992a) Determinants of everyday time allocation. *Scand. J. Psychol.*, 3, 160-169.

Gärling, T. (1992b) The importance of routines for the performance of everyday activities. *Scand. J. Psychol.*, 33, 170-177.

Gärling, T. (1994) *Behavioral assumptions overlooked in travel-choice modelling*. Paper presented at the 7th international conference on travel behavior, Valle Nevado, Santiago, Chile.

Gärling, T., M.-P. Kwan and R. G. Golledge (1994) Computational-process modelling of household activity scheduling. *Transp. Res. B*, 25, 355-364.

Gillholm, R., D. Ettema, M. Selart, and T. Gärling (1994) *Intention-behavior consistency: The mediating role of planning*. Manuscript.

Gollwitzer, P. M. (1993) Goal achievement: The role of intentions. *Eur. Rev. Soc. Psychol.*, 4, 141-185.

Golob, T. F., A. D. Horowitz and M. Wachs (1979) Attitude-behavior relationships in travel demand modelling. In: *Behavioral Travel Demand Modelling* (D. A. Hensher and P. R. Stopher, eds.), pp. 205-220. Croom Helm, London.

Goodwin, P., R. Kitamura and H. Meurs (1990) Some principles of dynamic analysis of travel behaviour. In: *Developments in Dynamic and Activity-Based Approaches to Travel Analysis* (P. Jones, ed.), pp. 56-72. Avebury, Aldershot, UK.

Hensher, D. (1994) Stated preference analysis of travel choices: The state of practice. *Transp.*, 21, 107-133.

Jones, P. M. (1979) HATS: A technique for investigating household decisions. *Env. Plan. A*, 11, 59-70

Jones, P. M., M. Bradley, and E. S. Ampt (1989) Forecasting household response to policy measures using computerised, activity -based stated preference techniques. In: *Travel behavior research*, pp. 41-63. Gower, Aldershot, UK.

Koppelman, F. and P. K. Lyon (1981) Attitudinal analysis of work/school travel. *Transp. Sci.*, 15, 233-254.

Lee-Gosselin, M. (1990) The dynamics of car use patterns under different scenarios: A gaming approach. In: *Developments in Dynamic and Activity-Based Approaches to Travel Analysis* (P. Jones, ed.), pp. 250-271. Avebury, Aldershot, UK.

Louviere, J. J. (1988a) *Analyzing Decision Making: Metric Conjoint Analysis*. Sage, Newbury Park, CA.

Louviere, J. J. (1988b) Conjoint analysis modelling of stated preferences. *J. Transp. Econ. Policy*, 22, 93-119

Pas, E. (1990) Is travel demand analysis and modelling in the doldrums? In: *Developments in Dynamic and Activity-Based Approaches to Travel Analysis* (P. Jones, ed.), pp. 3-27. Avebury, Aldershot, UK.

Pieters, R. G. M. and B. Verplanken (1995) Intention-behavior consistency: Effects of consideration set size, involvement, and need for cognition. *J. Eur. Soc. Psychol.* (in press)

Ronis, D. L., J. F. Yates, and J. P. Kirscht (1989) Attitudes, decisions, and habits as determinants of repeated behavior. In: *Attitude Structure and Function* (A. R. Pratkanis, S. J. Breckler and A. G. Greenwald, eds.), pp. 213-239. Erlbaum, Hillsdale, NJ.

Sheppard, B. H., J. Hartwick and P. R. Warshaw (1988) The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *J. Cons. Res.*, 15, 325-343.

Timmermans, H. P. J. and R. G. Golledge (1990) Applications of behavioral research on spatial problems II: Preference and choice. *Prog. Hum. Geog.*, 14, 311-354.

Warshaw, P. R. and F. D. Davis (1985) Disentangling behavioral intention and behavioral expectation. *J. Exp. Soc. Psychol.*, 21, 213-228.