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Gordon J. Fielding ¹
Timothy J. Tardiff ²

¹School of Social Sciences and
Institute of Transportation Studies
University of California, Irvine

² Civil Engineering and Environmental Studies
University of California, Davis

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Institute of Transportation Studies
University of California, Irvine
Irvine, CA 92697-3600, U.S.A.
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RELATIONSHIPS BETWEEN SOCIAL-PSYCHOLOGICAL VARIABLES
AND INDIVIDUAL TRAVEL BEHAVIOR*

Gordon J. Fielding
School of Social Sciences,
Institute of Transportation Studies,
University of California, Irvine

Timothy J. Tardiff
Civil Engineering and Environmental Studies,
University of California, Davis

Human interaction and the movements people initiate to facilitate interaction are fundamental behavioral processes, but the motivation for interaction is not completely understood. Often travel is assumed to have only utilitarian value; it facilitates the performance of other activities, but has no intrinsic value. However, the importance of transportation in structuring spatial environments and the level of transportation expenditures in household budgets suggest that transportation might be more than purely utilitarian.

This view of travel behavior differs from the view inherent in the assumptions upon which quantitative models of travel behavior are based. These models emphasize the utilitarian aspects of travel and include variables which are either economic or directly related to the transportation system. As a result, the assumptions of these models might be considered incomplete.

The purpose of this paper is to introduce variables which may yield explanations of travel behavior which go beyond the economic and transportation-related explanations of existing models. This analysis explores whether improvements can be made in the understanding of individual travel behavior

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and in the predictive power of travel demand models. This applied emphasis extends the author's previous work which demonstrated how attitudinal and behavioral information can be used to structure the development and marketing of transportation improvements (Fielding, 1972; Fielding, et.al., 1976).

CONCEPTUAL FRAMEWORK

This study is similar to several recent studies which have sought sociological explanations of spatial behavior. Examples of spatial behavior are moving behavior (Butler, et. al., 1969, Duncan and Newman, 1976), daily activity patterns (Chapin, 1974; Zehner and Chapin, 1974), and travel behavior (Lansing, 1968; Notess, 1973). Rather than relying exclusively on economic or utilitarian explanations, these studies recognized that an individual's social role -- socioeconomic status and occupation responsibility -- might affect the opportunities for and constraints to spatial behavior. Associated with one's social role are several basic value orientations which were also used in these studies. Value orientations include variables such as alienation and powerlessness, which are called social-psychological variables in this study.

Focus on social-psychological variables is motivated by the hypothesis that such variables are important in shaping an individual's preference for a wide range of behavior. Chapin (1974) and Zehner and Chapin (1974) present a very useful framework for the inclusion of these variables in the study of daily activity patterns. They hypothesize that an individual's choice of activities is influenced by factors related to his or her role in society and by social-psychological variables. The former factors, called "preconditioning factors" in their study, include such classic socioeconomic variables as age, income, sex, and stage in the family lifecycle. The later factors, which they call "predisposing factors," probably vary with preconditioning factors,

but also might have explanatory power over and above that of the preconditioning factors. The predisposing factors are assumed to influence an individual's preferences for various types of activities while the preconditioning factors affect opportunities for and constraints upon activities.

Social-Psychological Variables

Based upon an extensive search of the sociological literature, both empirical and conceptual, five social-psychological variables were selected (Tardiff, 1974). Such variables have also been called beliefs, values, or value orientations (Kahl, 1953; Cloward and Ohlin, 1960; Kahl, 1968) and have been used to explain a wide range of urban behavior, including spatial behavior. Since names, definitions, and measurement scales of these variables vary somewhat in the literature, definitions of the variables are based upon a synthesis of these appearing in previous studies.

The social-psychological variables were: 1) alienation; 2) satisfaction with work; 3) powerlessness; 4) future orientation; and 5) person orientation. Alienation is an indicator of the amount of satisfaction or dissatisfaction an individual feels towards the institutions of government, the community, and the economy. The satisfaction with work variable indicates the amount of enjoyment an individual gains from his employment, including feelings of self-fulfillment, self-respect, and confidence in receiving respect from others. The powerlessness variable measures the extent to which a person believes his own actions can influence what will happen to him, i.e., the amount of control he perceives he has over his environment and/or destiny. Future orientation is a psychological orientation toward providing for a more or less distant future by sacrificing present for future satisfaction (Banfield, 1968, p. 46). Finally, the person orientation variable is one with two distinct psychological orientations as its extreme values. At the positive extreme is person orien-

tation and the negative extreme is object orientation. An individual who is person oriented desires above all to be a member of a group. Object oriented persons, on the other hand, desire the achievement of an object goal such as career, status or a moral principle. Group membership is of secondary importance (Gans, 1962, p. 90).

Variables similar to each of the five social-psychological variables were used in one or more of the previously mentioned studies of spatial behavior. Findings from these studies do not conclusively establish the universal usefulness of social-psychological variables in the explanation of spatial behavior. That is, such variables appear to be useful in explaining particular types of spatial behavior, but none of them was significantly related to all behaviors it was hypothesized to influence. Further, although the findings suggest that social-psychological variables might be useful in incrementally improving explanations of spatial behavior, they do not completely replace objective socioeconomic variables.

Since Lansing (1968) focused on travel behavior, his findings are especially interesting. This study included a variable with a definition very similar to the powerlessness variable used in this study in a model of long-distance trip generation (number of trips over 100 miles by an individual in a five year period). It was found that this variable was indeed strongly related to long-distance travel. The direction was such that people who perceived a greater control over their environment traveled more frequently. Further, the importance of this social-psychological variable was comparable to that of an income variable, indicating that the variable added additional explanatory power to that available from income.

This study tests whether several variables measuring transportation behavior are related to the social-psychological variables. Simple two and three variables hypotheses involving the two classes of variables are formu-

lated. In addition, some of the existing models of travel behavior are modified to include the social-psychological variables.

Models of Transportation Behavior

Although travel behavior consists of decisions involving frequencies, destinations, modes, and routes, most existing travel behavior models have focused upon the travel frequency decision (trip generation) and the modal choice decision (Reichman and Stopher, 1971; Stopher and Meyburg, 1974 and 1976). This situation reflects the relative simplicity of trip generation and modal choice decisions with respect to model specification and data availability. Data available for this study allow the testing of trip generation models and hypotheses. The social-psychological variables were not useful in models and hypotheses involving modal choice (Tardiff, 1974). Therefore, these results are not reported here.

The trip generation models of this study are developed by modifying models similar to those developed by Kassoff and Deutschman (1969) and Wootton and Pick (1969). The key hypothesis in these models is that the frequency of travel increases as resources for travel, e.g., cars and income increase. Since these models are developed at the household level, analogous models at the individual level are used in this study. This is accomplished by redefining the travel resources variables to correspond to individual, rather than household, resources and by introducing additional individual characteristics. These latter variables correspond to the preconditioning factors used in the daily activity pattern studies (Chapin, 1974; Zehner and Chapin, 1974).

RESEARCH DESIGN

The data used to test the hypothesis and models in this study were from a stratified probability sample of 223 households in the Santa Monica-West Los Angeles, California area. The details of the sample selection procedure are described elsewhere (Tardiff, 1974). Household interviews were conducted by the Survey Research Center at the University of California at Los Angeles. The variables appearing in the empirical tests include: 1) social-psychological variables, 2) measures of travel behavior, and 3) indicators of socioeconomic status.

Indices hypothesized to measure the social-psychological variables were constructed from groups of attitude statements selected from sociological studies. Preliminary validating tests were made with student subjects. Based upon factor analyses of these responses, the indices were revised so that they had attitude statements which had a satisfactory degree of internal homogeneity and so that the total number of attitude statements in the indices was manageable on the transportation questionnaire.

Measured with a four-point agreement-disagreement scale, the responses to the statements in each index were factor analyzed. The first unrotated or general factor for each index is used as the scale for the social-psychological variable in subsequent analyses. Increasing values on each of these variables indicate greater alienation, greater satisfaction with work, greater powerlessness, greater future orientation and greater person orientation, respectively.

Variables measuring monthly frequencies of travel (trip generation) are stratified by the purposes of shopping, visiting, and entertainment-recreation.

In addition, frequencies of travel for all of the preceding three purposes were recorded. For each trip purpose stratum, the total frequency of trips as well as the vehicular frequency are available. Vehicular excludes trips by bicycle and walking.

Nonwork travel frequencies are examined because these trips offer much more opportunity for choice of frequency than do work trips, which are usually quite regular. Travel frequency for the work trip would be more a study of the type of job selected, e.g., full time, part time, no job, than a description of travel behavior. For this reason, individual work trip frequencies are excluded.

Several indicators of socioeconomic status are measured. First, the family income of the respondent is measured on a seven-point scale. Second, the highest grade level completed by the respondent forms an educational variable. Also, the occupation of the respondent and the occupation of the household head (if different) are measured on Hollingshead's seven point scale (Bonjean, et. al., 1967). It should be noted that socioeconomic status increases as the income and education variables increase, but decrease as the occupation variables increase.

Finally, several additional variables measuring individual or household characteristics of the respondents were collected. These variables are used in the models tested and are defined as needed.

In testing the hypotheses, not every respondent is included in every relationship. For example, not every respondent took a shopping trip and a few respondents failed to answer the income question. Consequently, the number of cases used to test each relationship is the number of cases upon which all the data for the relevant variables were available.

TRIP GENERATION RELATIONS

Two types of empirical tests are performed. First, correlations between the social-psychological variables and measures of travel frequencies for particular trip purposes are calculated. The magnitude of these correlations and of the corresponding partial correlation coefficients, when the measures of socioeconomic status are controlled, can be compared to the magnitude of the correlations between socioeconomic status and travel frequencies. In this way, the relative importance of the social-psychological variables, as well as the additional explanatory power beyond that offered by the indicators of socioeconomic status, becomes apparent.

The second type of test is the inclusion of the social-psychological variables in trip generation models. Since these variables are much more difficult to measure than variables commonly used, they are added to the existing models in such a way that the relative improvement to the existing models can be observed and a determination of the additional explanatory power of the social-psychological variables over and above that available from the usual set of variables can be made.

Modification of the existing models is made in two stages. The first stage is the calibration of the trip generation model consistent with the usual approach used in disaggregate trip generation models. Models such as those of Kassoff and Deutschman (1969) are modified to describe individual, rather than household, travel frequencies. The measures of resources for travel are: a) the "best" measure of socioeconomic status, i.e., the measure which yields the best-fitting model at the first stage when compared to corresponding models using the remaining measures of socioeconomic status, and

b) the ratio of the number of cars to licensed drivers (each individual's share of the household automobile resources). The sex and age of the respondent complete the independent variables used in the first stage model development. Symbolically, the first stage is

$$1) Y = \text{Constant} + a_1 \text{ AGE} + a_2 \text{ SEX} + a_3 \text{ C/DL} + a_4 \text{ SES}$$

where Y is the dependent variable, C/DL is the auto availability ratio, and SES is the "best" indicator of socioeconomic status. Since there are four trip purpose strata and two trip generation measures for each stratum (total trips and vehicular trips), there are eight separate models of individual nonwork trip generation which are calibrated.

The second stage of each of the eight models is simply the addition of the social-psychological variables. Symbolically, this results in the following relationship.

$$2) Y = \text{Constant} + a_1 \text{ AGE} + a_2 \text{ SEX} + a_3 \text{ C/DL} + a_4 \text{ SES} + \sum_{i=1}^5 a_{i+4} \text{ SP}_i$$

where SP_i is the i^{th} social-psychological variable. A comparison of the second stage model with the corresponding first stage model is an indication of the degree to which the social-psychological variables improve existing models.

The two types of empirical tests serve two related, but somewhat different, purposes. The simple relationships indicate whether variables such as the social-psychological variables increase the understanding of the nature of travel behavior, i.e., they might give a more complete answer to the questions of why people travel. The second type of empirical tests, on the other hand, are more concerned with the practical matter of improving models of transportation behavior for the ultimate purpose of better prediction. For example, it could be the case that results of the first type do shed light on

the nature of individual travel behavior, but, at the same time, the social-psychological variables do not improve the predictive performance of existing models to a point which justifies the expense of gathering the necessary data for future applications.

Relationships Between the Social-Psychological Variables and Travel Frequencies

The results for the simple two variable relationships involving the social-psychological variables are listed in Table 1. The corresponding results involving the indicators of socioeconomic status are also listed for the purpose of comparison. These results indicate that some of the social-psychological variables appear to be useful in explaining trip generation. Whereas the indicators of socioeconomic status are statistically significant (at the .05 level) only for the trip purposes of entertainment-recreation and for the composite measures of all three purposes, at least one of the social-psychological variables is useful in explaining travel frequencies in all four of the trip purposes strata. Further, almost all of the statistically significant relationships persist when the measures of socioeconomic status are controlled. Therefore, it appears that the social-psychological variables are both supplementary and complementary to the measures of socioeconomic status in terms of understanding individual trip generation.

It is informative to observe the relationships between specific social-psychological variables and the trip frequencies for various purposes. Explanations of why these particular relationships emerge should be useful in assessing the nature of the transportation behavior. First, satisfaction with work is positively related to vehicular frequency for the purpose of shopping. The statistically significant relationship is present for the zero order and all partial correlations. Further, the partial correlations between

Table 1

Correlations of Socioeconomic Status and the Social-Psychological Variables with Trip Frequencies for Various Purposes.

	INC	EDU	OC1	OC2	A	SW	P	F0	P0
Shopping	(N=205)	(N=212)	(N=212)	(N=212)	(N=212)	(N=212)	(N=212)	(N=212)	(N=212)
1. Total	-.01	.05	.02	.09	.00	.11	.06	.08	-.02
2. Vehicle	.06	.06	-.00	.07	.02	.20 ^b	.03	.06	.03
Visiting	(N=211)	(N=217)	(N=217)	(N=217)	(N=217)	(N=217)	(N=217)	(N=217)	(N=217)
1. Total	-.13	-.02	-.01	.02	.03	-.03	-.12	-.11	-.11
2. Vehicle	-.08	.00	-.03	-.04	-.00	-.02	-.16 ^a	-.14 ^a	-.11
Entertainment-Recreation	(N=213)	(N=220)	(N=220)	(N=220)	(N=220)	(N=220)	(N=220)	(N=220)	(N=220)
1. Total	.12	.27 ^b	-.23 ^b	-.23 ^b	-.02	.07	-.17 ^a	-.26 ^b	-.05
2. Vehicle	.07	.24 ^b	-.20 ^b	-.21 ^b	-.05	.10	-.18 ^b	-.23 ^b	-.05
All Three Purposes	(N=197)	(N=203)	(N=203)	(N=203)	(N=203)	(N=203)	(N=203)	(N=203)	(N=203)
1. Total	.01	.16 ^a	-.12	-.05	.02	.06	-.10	-.16 ^a	-.08
2. Vehicle	.04	.13	-.12	-.07	-.00	.12	-.13	-.16 ^a	-.05

^aCorrelation coefficient significant at level $p < .05$ (two tail test)

^bCorrelation coefficient significant at level $p < .01$ (two tail test)

The following symbolism is used in this and the following tables. For each trip purpose (Shopping, Visiting, Entertainment-Recreation, and All Three Purposes), "Total" denotes all trips by any mode of travel and "Vehicle" denotes vehicular trips only. INC denotes the income variable; EDU denotes the education variable; OC1 is the variable indicating the occupation of the household head; and OC2 is the occupation of the respondent. A is the alienation variable; SW is the variable denoting satisfaction with work; P is the powerlessness variable; F0 is the future orientation variable; and P0 is the person orientation variable.

this social-psychological variable and total travel frequency for shopping attain statistical significance in the cases when income and respondent's occupation are controlled.

There is no immediately obvious explanation of why the positive relationship between satisfaction with work and shopping travel should hold. Perhaps it is the case that those who enjoy earning their money also enjoy spending it.

For the remaining two specific trip purpose strata, both the powerlessness and future orientation variables seem to have explanatory power. Both variables are significantly related in the negative direction to vehicular frequency of travel for visiting for all zero-order and partial correlations. Further, when education and income are controlled, the relationship between powerlessness and total frequency of visiting trips becomes significant. In all cases, the relationships involving the powerlessness variable are somewhat stronger than the corresponding relationships involving future orientation.

For the entertainment-recreation trip purpose there are rather strong statistically significant negative relationships which persist under control for all of the indicators of socioeconomic status and those involving future orientation. Also, both measures of travel frequency for this purpose are negatively related to the powerlessness variable, but the statistical significance vanishes under most of the controls for socioeconomic status.

Finally, the future orientation variable is negatively related to the variables measuring travel frequencies for all three nonwork trip purposes. The variable is significantly correlated for both zero-order and almost all partial correlations with both measures of travel frequency.

Unlike the case for the significant relationships involving the satisfaction with work variable, reasonable explanation for the apparent relation-

ships involving powerlessness and future orientation are readily available. First, the findings for the powerlessness variable are consistent with the conclusions from Lansing's study. Powerlessness may be negatively related to frequencies of travel because travel may be a method of controlling one's environment. Travel may reduce feelings of powerlessness by making an individual more familiar with his environment; therefore, he perceives greater control over it. Alternatively, the causal relationship might be in the opposite direction, i.e., those who are more comfortable with their environment, in the sense of feeling greater control over it, will travel more.

The explanation of the relationships between future orientation and the various measures of nonwork travel frequencies could be that this type of travel is not an activity which provides for an individual's future. The plausibility of this explanation is strengthened by the fact that the strongest relationship involving future orientation occurred in the case of entertainment-recreation travel, which is probably the least future oriented trip purpose.

Trip Generation Models

The key results from the calibration of the trip generation models are summarized in Table 2. (A more detailed description of the models estimated in the first stage is reported by Tardiff (1975).) The degree of improvement offered by the social-psychological variables is different for the various models. It is apparent that four of the eight models are not improved by the addition of the social-psychological variables in the second stage. That is, when these variables are added to both models in the stratum of trips for any of the three purposes, to the model of total travel for the purpose of visiting, and to the model of vehicular travel for the purpose of entertainment-recreation, none of their regression co-efficients are significant.

Table 2
Summary of the Trip Generation Models

	Stage 1		Stage 2						
	R	R ²	R	R ²	A	SW	P	FO	PO ^a
Shopping (N=212)									
1. Total	.16	.03	.25	.06	NS	.05	NS	NS	NS
2. Vehicle	.23	.05	.33	.11	NS	.01	NS	NS	NS
Visiting (N=217)									
1. Total	.29	.08	.31	.09	NS	NS	NS	NS	NS
2. Vehicle	.26	.07	.31	.09	NS	NS	.05	NS	NS
Entertainment- (N=220) Recreation									
1. Total	.39	.15	.42	.17	NS	NS	NS	.05	NS
2. Vehicle	.38	.15	.40	.16	NS	NS	NS	NS	NS
All Three Purposes (N=203)									
1. Total	.29	.08	.30	.09	NS	NS	NS	NS	NS
2. Vehicle	.30	.09	.32	.10	NS	NS	NS	NS	NS

^aThe significance levels for the regression co-efficients of the social-psychological variables are indicated in the last five columns of the table.

Various social-psychological variables do seem to improve the remaining four models. The particular variables which appear in each of these models are consistent with the findings for the simple two and three variable relationships discussed earlier. Specifically, the satisfaction with work variable seems to improve both shopping models, the powerlessness variable appears to be useful in the vehicular frequency of visiting trips model, and the future orientation variable is significant in the model of total travel frequency for the purpose of entertainment-recreation.

Two conclusions are apparent from these trip generation models. First, the result for the vehicular visiting travel model is quite interesting in the light of the Lansing model. Lansing found that the two variables indicating the location of friends and relatives were important in explaining long-distance travel: as friends and/or relatives live further away, people tend to do more long-distance travel. Therefore, Lansing's model may very well have been one of long-distance visiting travel. In both his study and this one, the powerlessness variable seems to be negatively associated with travel frequencies for the purpose of visiting. These findings would suggest the interpretation that as one's feeling of control over the environment and/or destiny increase, interaction with people also tends to increase. Second, the social-psychological variables as a set are not universally useful in explaining trip generation models. In those cases in which there was an improvement over the existing model, only one social-psychological variable attained statistical significance and this variable differed for each trip purpose. This finding suggests that the social-psychological variables which are useful might be explaining the demand for the activity itself rather than the travel necessary to perform that activity. As such, this would tend to confirm the frequently stated hypothesis that travel is a derived demand rather than an activity valued for

itself. In addition, the fact that the social-psychological variables are not of universal usefulness in trip generation contexts would lead to the recommendation that they should not be considered as offering potential improvement to the types of models presently used in transportation planning contexts. Although social-psychological variables appear to have added understanding to the dynamics of individual trip generation behavior, they do not appear to be of immediate practical use in the improvement of existing planning models.

CONCLUSIONS

The use of the social-psychological variables in hypotheses and models of transportation behavior yields interesting results. First, some of the social-psychological variables are related to variables measuring frequencies of travel for particular trip purposes. It was found that satisfaction with work is positively related to the total and vehicular frequencies of shopping travel; powerlessness is negatively related to the vehicular frequency of visiting travel; and future orientation is negatively related to the total frequency of entertainment-recreation travel frequency. Therefore, it appears as if the social-psychological variables are useful in improving the understanding of individual trip generation and are of possible use in trip generation models for special contexts.

These findings are consistent with findings from the previous studies of spatial behavior, since specific social-psychological variables appear to be useful in particular contexts, but not universally useful. Further, in both this and the previous studies, such variables are at best complementary and supplementary to the more standard objective characteristics. Therefore, social-psychological variables should be interpreted as having some

potential for incrementally improving models and theories of spatial behavior, but not completely replacing or invalidating the assumptions upon which existing models are based.

The importance of the powerlessness variable in explaining visiting travel is especially interesting since this finding is consistent with Lansing's results. In both studies, the models were specified such that powerlessness, and other social-psychological variables, were assumed to cause travel behavior. These specifications are consistent with the fact that social-psychological variables are assumed to be basic value orientations. Future studies might examine the possible role of travel behavior and other spatial behavior in shaping such value orientations. A possible approach would be similar to the one used by Tardiff (1977) in examining interactions between transportation attitudes and behavior. Studies of this nature might reveal that travel and other spatial behaviors are important factors in shaping an individual's feelings of control over his environment and in influencing other value orientations. In a period of apparent constraints on energy resources, such findings would be useful in evaluating the possible effects of travel reduction on personal well-being.

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