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How Do I Get There From Here? Attitudes Toward Different Modes of Transportation¹

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The acceptance of multiple-occupant modes of transportation such as buses and carpools is an important factor in energy conservation. Two experiments are reported which show how attitudes toward different modes of transportation are influenced by interpersonal factors. Experiment 1 showed that individuals perceive differences in the characteristics of people who use different modes and that these differences are related to their own transportation preferences. Experiment 2 showed that the sex of each potential rider and whether or not each rider is an acquaintance of the respondent are important factors in carpooling. The implications of such results to policy makers are discussed.

INDEX DESCRIPTORS: Attitudes, carpooling.

Each year, cars burn 14% of all the energy consumed in the United States. Commuter cars now carry an average of only 1.3 persons (*Newsweek*, April 18, 1977). If even a fraction of Americans now driving private autos would switch to mass transit or join carpools, energy savings would be tremendous. The remainder of this decade will see massive public efforts to promote the use of mass transit and ridesharing. In order to do this, it is important to understand the attitudes and decision processes of the individual who must choose between alternative modes of transportation. Ultimately, it is the individual who must judge the convenience of mass transit, the desirability of carpooling, and the value of privacy in solo driving. Thus, behavioral scientists with research methodology developed to study individual attitudes and preferences have come to play an increasingly important role in transportation research. The present paper describes two experiments that are part of a program of research at the University of Iowa designed to assess the role of psychological factors in travel behavior (Hensley & Levin, 1976; Levin, 1977a, 1977b; Levin, Mosell, Lamka, Savage, & Gray, 1977).

In one of the earlier studies (Levin et al., 1977, Experiment 2), the desirability of forming carpools was assessed as a function of the number of riders in the pools, the sex of each rider, and whether or not each rider was an acquaintance of the respondent. The acceptability of a given potential rider was a joint function of sex and acquaintanceship, with sex playing an important role when the rider was a nonacquaintance. In particular, male nonacquaintances were judged as undesirable riders by both male and female respondents. The desirability of a given carpool was an average of the desirability levels of individual riders, so that a desirable rider would compensate for undesirable riders. The implication of such results is that interpersonal factors are important in choosing multiple-occupant modes of transportation, and should be taken into account in promotional policies. The present experiments further study interpersonal factors in transportation mode choice.

RESULTS

Experiment 1

This experiment addressed the following questions: Are there commonly held opinions as to how bus riders and carpools differ from people who prefer to drive alone? If so, does a person's opinion correlate with his or her own preferred transportation mode? This experiment investigated the possibility that perceived user characteristics are a factor in transportation mode choice.

A booklet containing descriptions of 54 hypothetical travelers was presented to each of 40 (19 male, 21 female) undergraduate students at the University of Iowa. Each hypothetical traveler was described by the following characteristics: sex (male or female), age (28, 45, or 61 years), occupation (assembly line laborer, bookkeeper, or lawyer), and involvement in environmental protection (disregards, complies, or actively promotes). The various combinations of these characteristics constitute a 2 x 3 x 3 x 3 factorial design and each respondent received a

different random order of presentation of the 54 distinct traveler descriptions.

In addition, each hypothetical traveler was described as being single, living on the edge of a small city, and working from 8:00 a.m. to 4:00 p.m. Monday through Friday on the opposite edge of the city. The respondents were told that each of the three following modes of transportation to and from work were available to each traveler: riding a city bus, sharing rides with others, and driving his or her own car.

For each hypothetical traveler, the respondent was to record in the booklet the percentage of times that traveler would use each of the available modes. For example, a given respondent might indicate that a traveler with particular characteristics would drive the car 60% of the time, share rides 30% of the time, and ride the bus 10% of the time. The only restriction on assigning percentages to the different modes was that the three numbers add up to 100% for each of the hypothetical travelers described in the booklet. After completing the booklet, each respondent was asked to indicate his or her own preferred mode of transportation.

The main results are summarized in Table 1. This table shows separately the effect of each of the four independent variables—occupation, environmental involvement, sex, and age of the hypothetical travelers—on each of the three dependent variables—judged percentage of bus riders, judged percentage of ride sharers, and judged percentage of car drivers. The mean percentages shown in each column

Table 1. *Judged Percentage of Bus Riders, Ride Sharers, and Car Drivers for People of Varying Characteristics*

Characteristics	Judged Percentage of:		
	Bus Riders	Ride Sharers	Car Drivers
Occupation			
Assembly Line Laborer	26.5	35.2	38.5
Bookkeeper	24.9	33.2	41.8
Lawyer	19.4	31.1	49.5
Environmental Involvement			
Disregards	10.7	17.0	72.4
Complies	26.5	38.6	35.0
Promotes	33.7	44.0	22.4
Sex			
Male	23.0	32.5	44.6
Female	24.2	33.9	41.9
Age			
28 Years	23.2	33.5	43.4
45 Years	22.9	33.4	43.8
61 Years	24.8	32.6	42.6

of this table were obtained by collapsing over cells of the factorial design to obtain the mean response to each level of each of the variables of interest. Comparisons can then be made to see which characteristics are most often associated with which modes of transportation. The statistical significance of each variable was assessed using repeated measures analysis of variance.³

It can be seen that lawyers were judged to drive cars more often and ride buses less often than bookkeepers or assembly line laborers. People who disregard environmental protection were thought to drive cars more often and share rides or ride buses less often than people who comply with or promote environmental protection. Males were thought to drive cars more often and share rides or ride buses less often than females. These differences were all statistically significant at the .05 level. The analyses of variance revealed that environmental involvement contributed by far the largest proportion of variance in the judged percentages of bus riders, ride sharers, and car drivers. Occupation was the next most potent factor. Age of the hypothetical traveler was not a significant factor. There were several small (but statistically significant) interaction effects showing that the environmental involvement factor overrides the other factors — e.g., the extent to which hypothetical travelers who promote environmental protection are judged to be ride sharers depends little on their occupations.

On the average, the hypothetical travelers were judged to drive cars most often (43% of the time) and ride buses least often (23%), with ride sharing being of intermediate judged frequency (33%). Bus riders and ride sharers were perceived to be more likely female than male, more likely laborers than bookkeepers or lawyers, and more likely active than compliant or disregarding in promoting environmental protection. Car drivers were perceived to be more likely male, lawyers, and disregarding of environmental protection.

We do not know how accurate these perceptions are, but the perceptions themselves are of primary interest. Respondents do perceive differences in the characteristics of people who use different modes of transportation. If these differences are thought to reflect social status, they may affect the social acceptability of different modes. This, in turn, may be a factor in actual mode choice. The present experiment provides some evidence on this point.

Respondents were divided into the following three groups: those who prefer car driving (n = 14), those who prefer ride sharing (n = 21), and those who prefer the bus (n = 5). Respondents preferring a particular mode tended to perceive a disproportionate number of people as using that mode. Respondents who preferred a particular mode were also more apt to perceive the users of that mode as being young. While all three groups of respondents perceived bus riders and ride sharers as being more active in supporting environmental protection than car drivers, respondents preferring to drive alone perceived ride sharers as being more active in environmental protection than bus riders. One reason why some people prefer to drive alone may be that buses and carpools are seen as less socially desirable modes of transportation by these people. For example, the high status occupation "lawyer" was most apt to be associated with car driving. However, as observed in the present study, "ride sharers" in particular are seen as being more involved in environmental protection than "car drivers." This fact may be used in the future as a means of promoting ride sharing among people who normally drive alone.

The next experiment provides an additional analysis of factors that may affect attitudes toward carpooling.

Experiment 2

This experiment is a direct extension of the earlier study (Levin et al., 1977, Experiment 2) in which the desirability of forming carpools was assessed as a function of the sex and acquaintanceship of potential carpool participants. Most studies of travel choices have dealt exclusively with cost and time factors. The present experiment is the first to

directly manipulate cost, time, and interpersonal factors and observe their effects on the desirability of carpooling.

A booklet containing hypothetical carpool descriptions was presented to each of 36 (17 male, 19 female) undergraduate students at the University of Iowa. Participants were instructed to imagine that they had an opportunity to carpool to work with two other people. They were presented with a number of different hypothetical carpools described by the following factors: the amount of money that would be saved per day by participating in that carpool as compared to driving alone (20¢ or 50¢), the amount of additional commuting time that would be spent in the carpool as compared to driving alone (10 min. or 30 min.), and the personal characteristics of each of the two other people in the carpool—sex and whether or not the person was a prior acquaintance of the respondent. The ten levels of the personal characteristics factor are listed in the bottom half of Table 2. The various combinations of the cost, time, and personal characteristics factors constitute a 2 x 2 x 10 factorial design, and each respondent received the resulting 40 carpool descriptions in a different order. Two additional descriptions with extreme values of the cost and time factors were inserted at the beginning to anchor the ends of the response scale (see below).

For each hypothetical carpool, the respondent indicated the likelihood that he or she would join that carpool. The respondent expressed this likelihood by placing a slash mark at some point along a 15-cm line labeled "very likely" at one end and "very unlikely" at the other end. Responses were scored on a scale from 0 to 15 with higher numbers representing a greater likelihood of carpooling.

Table 2 shows the mean ratings for carpools varying as a function of cost savings, additional travel time, and rider characteristics. These mean ratings were obtained by collapsing over cells of the factorial design to isolate the effects of each variable. Each of these effects was statistically significant for both male and female respondents³. It can be

Table 2. Mean Rated Likelihood of Carpooling for Carpools of Varying Characteristics

Carpool Characteristics		Male Respondents	Female Respondents
Daily Savings			
20¢		7.1	7.0
50¢		8.9	8.6
Additional Travel Time			
10 min.		10.9	10.2
30 min.		5.1	5.4
Characteristics of Riders*			
No Acquaintances	2MNA	6.2	5.6
	1MNA, 1FNA	7.0	7.0
	2FNA	7.2	7.5
One Acquaintance	1MNA, 1MA	7.8	7.5
	1MNA, 1FA	8.1	8.2
	1FNA, 1MA	8.2	8.1
Two Acquaintances	1FNA, 1FA	8.4	8.3
	2MA	9.1	8.2
	1MA, 1FA	8.9	8.5
	2FA	9.0	9.2

*Abbreviations are as follows: MA-male acquaintance, FA-female acquaintance, MNA-male nonacquaintance, FNA-female nonacquaintance.

seen that carpool ratings were about 1.7 points higher when the daily savings were 50¢ than when they were 20¢, and ratings were about 5 points higher when the additional daily travel time was 10 min. than when it was 30 min. In addition, ratings varied about 3 points as a function of rider characteristics. Rider characteristics thus had comparable effects to cost and time factors. These results suggest that interpersonal factors play a significant role in determining one's likelihood of carpooling.

In examining the effects of rider characteristics on carpool ratings, it can be seen that ratings increased as number of acquaintances increased. When there was at least one acquaintance in the carpool, the ratings were at or above the midpoint of the scale. Both male and female respondents rated carpools with female riders higher than carpools with male riders and gave the lowest ratings to carpools where both riders were male nonacquaintances. The sex of the riders did not affect the carpool ratings as much when the riders were acquaintances as when they were nonacquaintances. All of these findings related to rider characteristics are consistent with the findings of the earlier study (Levin et al., 1977, Experiment 2) in which only rider characteristics were varied. The present experiment extends these findings to situations where cost and time factors, as well as rider characteristics, are evaluated in rating the desirability of alternative carpool formations. We feel that interpersonal factors are of sufficient importance to warrant their inclusion in future studies of carpooling.

SUMMARY AND CONCLUSION

These two experiments showed that attitudes affecting travel behavior are influenced by interpersonal factors. Experiment 1 demonstrated that individuals perceive differences in the characteristics of people who use different modes of transportation and that these perceived differences may affect preferred mode choice. Experiment 2 demonstrated that interpersonal factors may be of comparable importance to cost and time factors in the decision of whether or not to participate in carpools.

These experiments employed college students as participants. However, there is reason to believe that the major findings can be generalized. For example, results of the present carpooling study are consistent with field research findings concerning carpooling behavior of various population segments in the Washington, D.C., metropolitan area (Margolin, Misch, & Dobson, 1976). Margolin et al. observed that people are resistant to telephone a stranger to form a carpool. This is consistent with the low ratings obtained in Experiment 2 when the riders were described as nonacquaintances. The present study added to the field study's findings by showing how sex and acquaintanceship were interrelated in determining carpool desirability.

Some of the findings of the present experiments describe inhibiting influences on the use of multiple-occupant transportation modes. Awareness of these influences may be useful in promoting such energy

saving modes. For example, mass transit and ride sharing programs may be promoted by emphasizing that the users of such modes are concerned individuals who share an involvement in environmental issues. Ridesharing programs can be further enhanced by supplementing the usual carpool matching procedures with attempts to match on interpersonal factors. Results of programs which match only on the basis of origin and destination are often disappointing because reluctance to contact strangers overrides the potential advantages of carpooling (Dueker, Bair, & Levin, 1977). If matching procedures could be extended to ensure that each carpool member had a prior acquaintance in the pool, reluctance to contact strangers would no longer be a factor. It thus may be shown that transportation modes with multiple occupancy can incorporate favorable interpersonal conditions which make their use socially desirable as well as economically advantageous.

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FOOTNOTES

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- 2.) Requests for reprints should be addressed to Irwin P. Levin.
- 3.) The complete analysis of variance for each dependent measure and a complete table of means for each cell of the factorial design for each experiment can be obtained by writing to the last author.