Title

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Abstract

A stressful nature of exposure to traffic congestion in automobile commuting has been demonstrated in previous quasi-experimental research that has been measurement-intensive but conducted with relatively small samples. The present study examined commuting stress in automobile travel with a large representative sample (N = 2591) in southern California through telephone survey. Commuting stress was found to be significantly associated with distance and duration of the commute, controlling for age and income. As predicted, the stressful effects of long distance commutes (> 20 miles) were further moderated by gender, as women in such commutes perceive much greater commuting stress spillover to work and home. Some hypothesized stress-mitigating effects of ridesharing were found, as full-time ridesharers were significantly less bothered by traffic congestion and more satisfied with their commutes than solo drivers. In analyses of prospective adoption by solo drivers of alternative commuting modes, it was found that the perception of one's commute as having a negative impact on family life had a very significant effect on the inclination to try carpooling and train/rail, beyond the effect associated with distance itself. Commuting stress is discussed as an external cost of traffic congestion that is internalized by the solo driver. Marketing strategies for alternative modes of commuting might increase their effectiveness by highlighting stress consequences, especially negative impacts on family life.

Commuting Stress, Ridesharing, and Gender: Analyses from the 1993 State of the Commute Survey in Southern California

Among the external costs believed to be associated with traffic congestion are the human stress effects. Remaining attached to the private automobile travel mode and constrained by the availability of affordable housing, workers endure congested commutes and absorb the stressful consequences. Indeed, the stressful effects of chronic exposure to traffic congestion and other demands of long-distance driving in commuting between home and work have been demonstrated in a series of studies (most recently, Novaco, 1992; Novaco, Stokols, & Milanesi, 1990; Novaco, Kliewer, & Broquet, 1991). In these studies, traffic congestion has been understood to be stressful by virtue of its impedance properties. That is, it operates as a behavioral constraint on movement and goal attainment, thus constituting an aversive, frustrating condition. As such, it elevates physiological arousal, elicits negative emotional states, and impairs cognitive performance. This research has found that high impedance commuting, indexed by objective and subjective dimensions, has adverse effects on blood pressure, mood, frustration tolerance, illness occasions, work absences, job stability, and overall life satisfaction.

The methodology used in this research program on commuting stress has been a measurement-intensive, quasi-experimental field site testing procedure that has incorporated many control variables as covariates in the analyses. However, this methodological rigor has come at the expense of assurances regarding generalizability, due to the relatively small samples sizes (each of these previous projects has involved approximately 100 participants) and the location (all studies were conducted with companies in one city).

The present study, therefore, examined commuting stress associated with automobile travel in a much larger geographic area with a large representative sample of commuters. For this purpose, several items pertaining to commuting stress were added to the southern California

"1993 State of the Commute" survey. Collier & Christiansen (1992a & 1992b) have reported on the results of this survey on previous years. The newly added items sought to index commuting stress in terms of the aversiveness of the commute and the negative impact of traffic exposure on work and home life.

Ridesharing has been promoted as an alternative commuting mode to reduce traffic, air pollution, and stress. The present study also examined the merit of ridesharing in comparison with solo driving regarding the stress effects of long distance commuting. National trends in commuting patterns have indicated that increases in the workforce, in the availability of automobiles, and the shift of jobs to suburban locations have significantly increased commuting by private automobile (Pisarski, 1987). From 1960 to 1980, travel to work by private automobile increased from 70% to 85% nationally, while use of public transit declined from 12.6% to 6.2% (Pisarski, 1987). While increased congestion and air quality management regulations have prompted ridesharing programs, Teal (1987) has shown with national data that the large majority of drive-alone commuters lack any transportation or economic motivation to carpool.

In California, road use charges are virtually nonexistent, gasoline remains inexpensive, and nearly everyone who needs a car has one. The impact of the latter is illustrated by the fact that from 1980 to 1989, many California counties have had a greater proportionate increase in registered automobiles than in population. For example, the population of San Francisco County increased by 50,400 (7.4%) during those years, while the number of registered automobiles increased by 49,835 (18.8%). The corresponding figures for Santa Clara County were 154,200 (12%) people and 183,643 (25.4%) autos; for Los Angeles County 1,205,900 (16.2%) people and 870,191 (23.6%) autos; and for Orange County 357,900 (18.6%) people and 330,621 (30.8%) autos.

Regarding reducing the demand for road space, transportation alternatives to solo driving in southern California have only made small gains. Analyses of the first year results of the trip

reduction mandated by Regulation XV (Giuliano, Hwang, and Wachs, 1992; Wachs & Giuliano, 1992) found that Average Vehicle Ridership increased from 1.213 to 1.246 (although there was considerable variation across sites) and that "(t)he number of worksites meeting the target AVR actually decreased during the first year of the program" (p. 9). Increased carpooling accounted for virtually all of the increase in AVR. While the Giuliano et al. data from employment sites found the solo driving mode to be at 71% around mid-1991, the Collier and Christiansen (1992b) "State of the Commute" survey found the drive alone rate to be 77% at regulated sites across southern California counties, continuing the national trend of solo-driving commuting noted by Pisarski (1987) and Liss (1991). To the extent that ridesharing mitigates commuting stress, marketing strategies might then be devised that highlight this benefit and be targeted toward the population sectors that are most at risk or who are otherwise sensitized to stress themes.

Regarding the question of at risk or sensitized population sectors, the previous research on commuting stress has examined the hypothesized moderating role of gender, whereby commuting stress impacts in the residential domain were expected to be greater for females commuting on routes of high physical impedance. Reasoning from a convergence of findings in the three areas of travel behavior, workers' stress physiology, and work effects on family life, Novaco et al. (1991) expected that female high impedance commuters (>20 miles; > 50 minutes on PM commute) would be highest on residential domain stress measures. This hypothesis was strongly confirmed across multiple measures and analyses, which rigorously controlled for potentially confounding factors as covariates.

The significant effects for high impedance females, relative to their male counterparts, were obtained for measures of dysphoria, general spirits, satisfaction with location, desire to move, and ratings of the home physical environment; although not statistically significant, the results were in the expected direction for negative mood at home, satisfaction with dwelling, and

satisfaction with neighborhood. Indeed, women in the high physical impedance commutes appraised their commutes more negatively than did men in the same condition, despite these women have higher family incomes and not differing in education, marital status, or home ownership; nor did they differ in the objective characteristics of their commutes. However, these high physical impedance females reported considerably more constraint than did men, particularly for the AM commute -- they reported being delayed more often by traffic jams, being less able to avoid traffic, and being less satisfied with their commutes. They did not, however, have more complex travel segments than did the high impedance men in that study, hence Novaco et al. (1991) speculated that differential role strain (work and household responsibilities) might be an explanatory factor.

While the effort to explain previously obtained gender effects is an important research agenda, it is also imperative that the question of gender differences in commuting stress be examined with a much larger representative sample. Hence, this issue is pursued in the present study with the 1993 State of the Commute Survey. Gender effects were examined in various statistical designs with commuting mode (solo driving, part-time ridesharing, and full-time ridesharing) and distance (as a continuous measure and as categorically partitioned).

METHOD

Survey Design and Procedure

The State of the Commute is an annual study conducted by Commuter Transportation Services, Inc. (CTS). The 1993 State of the Commute study is based on a telephone survey of 2,591 commuters within Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. Respondents surveyed included only commuters who work full-time and excluded those for whom the home is a primary work site. The survey provides updated information on

commuters' travel behavior and attitudes about traffic congestion, alternative travel modes, employer transportation programs, and high occupancy vehicle lanes.

CTS contracted Interviewing Services of America, Inc. (ISA) to draw a sample based on random-digit dialing using their copy of GENESYS's sampling program. This method, rather than directories, is used because of the high proportion of unlisted telephone numbers in the Los Angeles area. Random-digit dialing avoids the bias introduced by using only listed telephone numbers. An extensive cleaning and validation process was undertaken to ensure that all phone numbers in GENESYS's database were assigned to the correct area code and to increase the probability of reaching a working residential number.

ISA was also contracted to perform data collection. The survey questionnaire was pretested by interviewers from ISA. Since the majority of the survey questions were consistent with previous surveys, only minor formatting changes were made.

From October 9 to December 7, 1992, ISA's interviewers, using a Computer Assisted Telephone Interviewing system (CATI), contacted respondents in the five-county area. The use of a CATI system assures strict adherence to skip patterns, eliminates key entry errors, and allows for extensive quality control. No interviews were conducted between November 19 and November 30 due to the unpredictable travel patterns around the Thanksgiving holiday. A minimum of three call-back attempts were made. English and Spanish versions of the questionnaire were available to meet the language requirements of respondents. Five hundred and twenty-five interviews were completed in each county in order to make county comparisons possible. A 4.5 percent sampling error is normally associated with sample sizes of 500. Regionally, a total of 2,591 interviews was used in the analysis. A two percent sampling error is normally associated with sample sizes of 2,500.

Each interview began with the screener question, "How many persons 18 years or older in your household work full-time outside the home?" Actual selection of eligible respondents was based on the person who had the most recent birthday. This process was used in order to avoid the possible bias of surveying a disproportionate number of women and children, since they are most likely to answer the telephone. Once interviewing had been completed, responses were weighted by the number of eligible respondents within each household. This ensures that small households are not over-represented in sample statistics. Furthermore, for the analysis at the regional level, data were additionally weighted by the working population in each county based on 1990 U.S. Census figures.

Commuting Stress Measures

Four survey items constituted the commuting stress indices. "Commuting satisfaction," rated on a nine-point scale, has been a item in previous State of the Commute surveys (Collier & Christiansen, 1991 & 1992), and a similar item has been a component of the subjective impedance indices in the Novaco at al. (1990 & 1991) studies. Thus, it is here incorporated as a stress index. Three other items, rated on five-point scales, were newly composed for the 1993 State of the Commute study: "How often do you feel bothered by traffic congestion in commuting to or from work?"; "After your commute to work, how often do you feel a need to wind down and relax before starting work?"; and "Some people say that dealing with traffic on their commute home from work has a negative effect on their home life. To what extent is this true for you?". The first of these new items is intended to assess the aversiveness of the commute. Aversiveness of travel has been a principle components factor in the subjective impedance measures of Novaco et al. (1990; 1991). The other two items aim to assess work and home domain impacts which are part of the commuting stress construct. While it is less than

optimal to operationalize the construct with these four simple items, the pragmatics of survey research demand simplicity.

Hypotheses and Analytical Procedures

1. Commuting stress indices were expected to be significantly correlated with distance and duration of the commute, controlling for age and income. This was examined by simple correlation and in multiple regressions with the control variables.

2. Consistent with the concept of impedance, commute duration was expected to be a stronger predictor of stress than would be commute distance. Commute time to work was expected to be the strongest predictor of the work arrival stress measure ("need to wind down"), whereas commute time home was expected to be the strongest predictor of the home stress measure ("negative impact on family life").

3. Following the rationale and results of the Novaco et al. (1991) study, females commuting a long distance (20+ miles) were predicted to have higher commuting stress than men -- i.e. females would be less satisfied with their commute, be more bothered by traffic congestion, report a greater need to wind down on arrival at work, and perceive a greater negative impact on their family life. This prediction was tested in a 2 X 2 (distance X gender) analysis of variance. In addition to the interest in replication of the previous research, distance rather than duration is used as the commuting condition factor because it is a more stable attribute of the commute. While drivers may indeed vary their route, commute distance fluctuates less than does duration which is affected not only by road conditions but also by ridesharing.

4. Ridesharing is expected to buffer the stress effects of commuting, especially in the case of long distance commutes (20+ miles), comparing full-time ridesharing to solo driving. No

predictions were made for partial ridesharers. This was examined in a 3 X 2 analysis of variance design (commute mode X distance), and post-hoc comparisons (Scheffe tests) of the solo driver and fulltime ridesharer means for the stress indices.

RESULTS

Consistent with Hypothesis 1, the commuting stress indices are significantly related to the distance and duration attributes of the commute, which are much more strongly associated with the stress measures than are age and income. These correlations are given in Table 1 for the full sample. Table 2 partitions the sample according to automobile commute mode (solo driving, partial ridesharing, and full-time ridesharing) giving the correlations of the stress measures with miles and minutes to work. It can be seen that for solo drivers the magnitude of each correlation is stronger than the corresponding coefficient in the full sample, except one for which it is the same. Except for the part-time ridesharers, the magnitude of the correlations is generally stronger for females than for males. There is some indication in the set of coefficients in Table 2 that full-time ridesharing attenuates the correlation between commute attributes and the stress measures, but this is more properly assessed in the ANOVA tests of group means reported later.

The differential effects stipulated in Hypotheses 1 and 2 were tested by multiple regressions performed with age and income as control variables entered on the first step, and then the distance and duration measures entered as predictors in separate equations. For "commute satisfaction", time to work accounts for 12.2% of the variance (R2 change = .122, T = 16.3, df = 3,2157, $p < .0001$) above that are associated with the covariates of age and income, which together account for 1%. The R2 change effects for time home and for distance respectively are .108 and .075, which both are also highly significant ($p < .0001$). The effects

follow a similar pattern for the other stress variables regressed with the covariates of age and income: "bothered by traffic" is most strongly related to time to work (R2 change = .134, T = 18.5, df = 3,2193, $p < .0001$); "need to wind down on work arrival" is most strongly related to time to work (R2 change = .063, T = 12.2, df = 3,2181, $p < .0001$); and "negative impact on family life" is most strongly related to time home (R2 change = .057, T = 11.5, df = 3,2176, $p < .0001$). These findings are supportive of our predictions of differential effects.

Analyses of the effect of distance ("low" versus "high") was examined in a 2x2 ANOVA design with gender. The means, standard deviations, and ANOVA results are presented in Table 3. The distance effect is very highly significant for all of the stress indices. Significant gender differences were found only for commuting satisfaction; women are more satisfied than men. The interaction of distance with gender was highly significant for the need to wind down on arrival at work and for perceived negative impact on family life. The interaction is more exactly an additive effect, showing the moderating influence of gender on the effect produced by distance. Women in the long distance commutes perceive much greater commuting stress spillover to work and home.

The hypothesized mitigating influence of ridesharing on the stress-inducing effects of distance are presented in Table 4. There is a significant commuting mode main effect on the "satisfaction", "bothered", and "need to wind-down" indices, as indicated by the ANOVA tests given in the table. [At this time we are not presenting the results of a three-way analysis that included gender because of the complexity of the interactions.] Regarding the two-way analysis (distance X mode), because the differences between means on the stress variables are partly due to the part-time ridesharers, post-hoc Scheffe tests were performed to compare the solo drivers with the full-time ridesharers, so as to examine Hypothesis 4. Summing across distance conditions, the full-time ridesharers, compared to the solo drivers, are significantly higher in

commuting satisfaction and less bothered by traffic congestion ($p < .05$ for both Scheffe tests). Thus, Hypothesis 4 was only partially confirmed.

Determinants of Prospective Ridesharing

We further examined the effects of distance, gender, and stress on solo drivers' endorsement of alternative commute modes. Table 5 presents the percentage of respondents, grouped according to distance ranges (1-6 miles, 7-14 miles, 15-29 miles, and 30+ miles) and gender, who stated that they would "definitely try" the various alternative commuting modes (carpool, vanpool, bus, train). These distance ranges were selected to optimize the distribution of respondents. The survey question, asked for each mode, was "Would you consider commuting by _____ for 1 or 2 days a week to see if you like it?" The response options were "definitely try," "might try", and "not try" (If commute distance was less than 21 miles, the vanpool question was not asked. As the chi-square tests given in Table 5 indicate, there are significant effects for distance and gender for carpooling and for train/rail. The disposition to try carpooling and rail modes increases significantly with a commute of 15 miles or more, especially for women in the very long distance range. In contrast, men in the 30+ mile commutes have a decreased inclination to try the alternative modes, when compared to those in the 15-29 mile range.

Finding this significant effect for distance on the disposition to try alternative commute modes, we then examined whether the experience of stress would add to this inclination. Given the findings of previous research on home environment consequences of commuting stress (Novaco, et al. 1991), the "negative impact on family life" index was of particular interest. Selecting for long distance solo drivers having commutes greater than 15 miles (for comparison with the data in Table 5 and to get a sufficient N for the analysis), this subset of respondents

was then partitioned into those reporting "low negative impact" (a recoding of "not at all", "a little", and "somewhat" responses) versus those reporting "high negative impact" (a recoding of "fairly much" and "very much" responses). These low/high grouping were then crosstabulated with the disposition to try commuting alternatives, performed separately for each commute mode, for each gender, and across genders. In Table 6 are the percentages of respondents in each column category who endorsed the "definitely try" response, separately tabulated for each commute mode alternative. The effect of the stress variable is significant for both males and for females in the case of carpooling and for train/rail. The chi-square tests are given in the table. The effect of family life impact is especially strong for females with regard to carpooling. Nearly 48% of the women solo drivers in long distance commutes who perceive that exposure to traffic congestion has a negative impact on their family life indicate that they would definitely try carpooling. This is a considerably greater percentage than that found for the long distance condition itself.

DISCUSSION

We have found that commuting stress is significantly associated with the distance and duration of commuting, controlling for age and income. This study then replicates with a large representative sample of southern California commuters some of the main research findings of previous research on this topic conducted with small samples in one city. The finding that commute duration was more strongly related to the stress measures is consistent with the concept of impedance, as developed in the previous work done by Novaco and his colleagues. In other analyses with this data set, we are examining degree of impedance in terms of variation in commute duration at fixed distance points (shorter vs. longer time to travel the same

distance), and our preliminary findings are strongly supportive of the stress propositions. This will be addressed in a subsequent paper.

The moderating effect of gender still remains to be understood, because we did have some mixed results regarding our gender hypothesis and because understanding the explanatory factors requires further analysis of the data set. Contrary to our predictions, women over all were more satisfied with their commutes than were men, although this effect for commute satisfaction is primarily in the shorter distance condition. In contrast, a number of our analyses found stronger stress effects for women than for men. In the long distance commutes, women report a greater need to wind down upon arrival at work and perceive greater negative impact on family life. The factors that might explain these effects remain to be examined. Travel elements of the commute itself, differential sensitivity to commute aversiveness, and role strain are among the areas for examination. It is known that women's commute trips tend to be more complex than those of men, and we need to disentangle variables associated with child care and other household responsibilities.

Some evidence was found that supported full-time ridesharing as a buffer of commuting stress, but such results occurred only for two of the four stress indices. The failure to find greater support for a ridesharing effect may in part be a function of the few stress measures used, which was determined by feasibility. It can also be expected that people select into their commute modes and psychologically adapt to them. Curiously, there were some indications that part-time ridesharers may be acutely sensitive to commuting stress and may be unsatisfied with their ability to mitigate it. The characteristics of this group need to be examined more fully, particularly as demographic and household variables may be entangled with part-time ridesharing. The significant effects for higher commuting satisfaction and being less bothered

by traffic congestion found for full-time ridesharers are encouraging for ridesharing program efforts.

The effect of the sensitivity to family life stress in boosting the inclination to try alternatives to solo driving among those commuters who travel relatively long distances to work suggests that marketing strategies for ridesharing and for train commuting highlight these potential stress consequences. Concern with the quality of family life is a salient theme in contemporary American society, and it would seem to be efficacious for transportation management practitioners to call attention to the psychological stress costs to the family associated with time-intensive, long distance solo driving, especially for female commuters.

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Table 1

Correlations of Objective Travel and Demographic Indices With Commuting Stress Measures (1993 State of the Commute Survey N = 2591)

	Satisfaction With Commute			How Often Bothered By Traffic Congestion			Need To Wind Down After Commute To Work			Dealing With Traffic Has Negative Impact On Family Life		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
Miles to Work	-.25**	-.32**	-.29**	.25**	.34**	.29**	.13**	.26**	.18**	.19**	.25**	.21**
Minutes to Work	-.33**	-.36**	-.35**	.34**	.41**	.38**	.20**	.33**	.26**	.20**	.30**	.24**
Minutes to Home	-.35**	-.35**	-.35**	.32**	.43**	.37**	.18**	.29**	.23**	.20**	.32**	.25**
Age	.08*	.07	.07**	-.04	-.10*	-.07*	-.07	-.16**	-.11**	-.05	-.14**	-.10**
Income Level	-.08*	-.02	-.06*	.14**	.07	.11**	-.07	-.12**	-.09**	.03	.01	.02

* $p < .01$ ** $p < .001$

Table 2

Correlations of Objective Travel Indices With Commuting Stress Measures for Solo Drivers, Part-time Ridesharers and Full-time Ridesharers (1993 State of the Commute Survey, N = 2591)

	Satisfaction With Commute			How Often Bothered By Traffic Congestion			Need To Wind Down After Commute To Work			Dealing With Traffic Has Negative Impact On Family Life		
Mode Groups	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
Solo Drivers (n=1914)												
Miles to Work	-.34**	-.33**	-.34**	.28**	.34**	.31**	.16**	.28**	.20**	.19**	.28**	.21**
Minutes to Work	-.40**	-.37**	-.39**	.34**	.45**	.39**	.20**	.38**	.28**	.23**	.34**	.28**
Part-time Ridesharers (n=141)												
Miles to Work	-.16	-.44**	-.29*	.24	.18	.21	.33	.24	.28*	.51**	.07	.24*
Minutes to Work	-.27	-.56**	-.42**	.43**	.04	.21	.33*	.08	.21	.43**	.03	.15
Full-time Ridesharers (n=536)												
Miles to Work	.09	-.27**	-.08	.06	.42**	.23**	.02	.20*	.10	.10	.27**	.18**
Minutes to Work	-.14	-.29**	-.22**	.36**	.43**	.40**	.23*	.22*	.23**	.04	.27**	.16*

* $p < .01$ ** $p < .001$

Table 3

Commuting Indices as a Function of Distance and Gender

Commuting Stress Indices	Distance (≤20) Males n=943	Distance (≤20) Females n=1004	Distance (>20) Males n=326	Distance (>20) Females n=189	Analyses of Variance $F_{(D)}$	$F_{(G)}$	$F_{(DxG)}$
Satisfaction with commute	6.5 (1.9)	6.8 (1.8)	5.5 (2.1)	5.6 (2.1)	124.4	6.4	NS
Bothered by Traffic Congestion	2.8 (1.3)	2.7 (1.2)	3.5 (1.4)	3.6 (1.3)	130.4	NS	NS
Need to Wind Down on Arrival at Work	2.0 (1.3)	1.9 (1.2)	2.3 (1.4)	2.7 (1.5)	62.0	NS	17.2
Negative Effect on Family Life	1.6 (1.0)	1.6 (1.0)	2.0 (1.1)	2.3 (1.3)	78.2	NS	11.4

Note: The "satisfaction with commute" measure is a nine-point scale; all other indices are on five-point scales. Standard deviations are given in parentheses below the means. All F ratios given in right-side section for distance (D) and the interaction (DxG) are significant beyond $p < .001$. The one gender (G) effect is significant at $p < .02$.

Table 4

Means of Commuting Stress Indices as a Function of Mode and Distance

Commuting Mode	Satisfaction with Commute	How Often Bothered by Traffic Congestion	Need to Wind Down After Commute to Work	Dealing with Traffic Has Negative Impact on Family Life
Solo Drivers				
Distance ≤20 (N=1447)	6.7	2.8	1.9	1.7
Distance >20 (N=407)	5.4	3.6	2.4	2.1
Part-time Ridesharers				
Distance ≤20 (N=127)	6.4	2.8	2.2	1.6
Distance >20 (N=12)	5.5	3.5	3.2	2.5
Full-time Ridesharers				
Distance ≤20 (N=373)	6.7	2.6	2.0	1.5
Distance >20 (N=100)	6.1	3.4	2.4	2.1

Note: There is a highly significant ANOVA main effect for distance on all four stress indices ($F = 64.6$ to 136.2, $p < .0001$); there is a commuting mode main effect for "satisfaction" ($F = 3.4$, $p < .04$), "bothered" ($F = 4.5$, $p < .02$), and for "wind down" ($F = 3.7$, $p < .03$). The interaction is significant for "satisfaction" ($F = 4.0$, $p < .02$). There are also a number of interactions with gender, which are not tabled here due to complexity of presentation.

Table 5

"Definitely Try" Responses for Alternative Commuting Modes as a Function of Commute Distance and Gender

	Distance Categories											
	1-6 Miles (N=606)			7-14 Miles (N=512)			15-29 Miles (N=420)			30+ Miles (N=287)		
	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total
Definitely Try:												
Carpool	15.7%	15.9%	15.8%	10.8%	14.6%	12.7%	27.7%	19.5%	24.2%	19.6%	33.2%	24.4%
Vanpool	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	26.5%	18.3%	23.9%	13.2%	30.0%	19.0%
Bus	9.7%	6.3%	7.7%	10.9%	4.3%	7.6%	9.7%	10.5%	10.0%	8.3%	7.8%	8.1%
Train/Rail	9.5%	10.7%	10.2%	13.9%	20.9%	17.4%	27.3%	22.3%	25.2%	14.8%	31.8%	20.7%

Note: The distance categories were partitioned to optimize the distribution of respondents. The tabled percentages are the proportion of respondents in that distance range who state that they would "definitely try" the given commuting alternative (other response options were "definitely not" and "maybe try"). Crosstabulation analyses of the distance effect for the total sample were significant for carpooling, X^2 (df = 6) = 48.6, $p < .0001$, and for train/rail, X^2 (df = 6) = 55.4, $p < .0001$. It is also significant for each gender for these same two commute alternatives ($p < .0001$).

Table 6

"Definitely Try" Responses to Alternative Commuting Modes as a Function of Perceived Impact on Family Life and of Gender Among Long-Distance Commuters

	Low Negative Impact on Family Life			High Negative Impact on Family Life			Chi Square Analyses (df=2)		
	Males n=386	Females n=238	Total n=623	Males n=40	Females n=44	Total n=83	X^2_M	X^2_F	X^2_T
Carpooling	23.4%	20.2%	22.1%	33.5%	47.9%	41.2%	8.8	16.8	15.5
Vanpooling	16.9%	24.1%	19.1%	23.8%	39.5%	32.3%	*ns*	*ns*	*ns*
Bus	9.6%	8.6%	9.2%	3.3%	15.8%	9.5%	*ns*	*ns*	*ns*
Train/Rail	20.2%	25.2%	22.1%	39.9%	29.3%	34.1%	8.3	7.3	7.2

Note: This "long distance" subsample was selected for distance = 15 miles or more, in order to have a sufficient number of respondents for testing the family life variable and for comparison with the effects of distance by itself, given in Table 4. The "high negative impact" category here is composed of respondents reporting "fairly much" or "very much" (ratings 4 and 5 on a five-point scale) for the family life stress variable. The "low negative impact" group are those respondents reporting "not at all," "a little," and "somewhat." The tabled percentages are the proportions of respondents in each of these groupings who state that they would "definitely try" the respective commuting alternatives. The chi-square tests are given on the right.