

Personality and Biographical Variables In Relation to Driving Item Response

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Interest in this study was focused on the relations between driving item responses and selected personality and biographical variables. Survey data were obtained from 432 respondents interviewed in their homes on 24 driving items, 3 personality variables (authoritarianism, feeling of competence, and other-directedness), and 5 biographical variables (age, sex, education, occupational rating, and social area). A multiple regression equation was computed for each driving item, with the 3 personality and 5 biographical items as the independent variables. The proportion of variance accounted for by each independent variable was averaged over the 24 driving items.

The results indicated that the combined personality variables accounted for only about 1 percent of the variance in the average driving item, whereas the biographical variables contributed about 4 percent. The superior contribution of the biographical variables may have been due to their higher reliability. The relations which emerged between the personality-biographical variables and the driving item responses were essentially those which would have been expected from logical considerations.

•RESPONSES to driving items have been utilized in traffic safety research. This resort to the convenience of verbal response is justified on the grounds that driving item response is significantly correlated with more direct measures of driving behavior (1), although the correlations are seldom as high as one might wish. Nevertheless, to the extent that driving item response is related to traffic accidents, the ability to account for driving item variance is tantamount to the ability to predict accidents, which is a first step to their understanding.

There is a wide choice of variables which may be used in an attempt to account for driving item variance. For instance, driving variables (driving experience, driving exposure, accident rate, violation rate, etc.) would be expected to show correlations with driving items. While driving item response may be accounted for in part by driving variables, the use of such variables is restricted to subjects with previous driving experience. However, pre-drivers show no difficulty in answering driving items (1), suggesting the possibility of utilizing driving item response as one criterion in licensing. In this context it would be more appropriate to explore driving item response in relation to non-driving variables, and this orientation is taken in the current study.

The non-driving variables chosen for this study were personality variables and biographical variables. These two classes of variables were chosen because they have been shown to be related to traffic accidents (2, 3, 4, 5, 6, 7).

METHOD

The procedure involved the interviewing of drivers in their homes. The interview consisted of three types of items: driving, personality, and biographical. The driving items were analyzed in relation to the personality and biographical items.

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Data Collection

Personal interviews were conducted by each student in an upper division university class in attitude and opinion measurement. Each interviewer was assigned to four neighborhoods throughout Los Angeles representing four levels of social area. The levels were based on the results of a social area analysis of Los Angeles (8), and the areas were chosen such that the respondents would be represented in proportion to the distribution of population in the Los Angeles area. The interviews were conducted during a one-month period.

The interviewer introduced himself as a public opinion reporter for the University of California Studies in Public Opinion, showed an authorization letter, and was granted an interview in practically all cases. The standardized interview lasted about $\frac{1}{2}$ hour. This study is based on the 432 drivers from whom complete data were obtained. About half the subjects reported having driven in California 10 years or more, and having driven 6,000 miles or more each year over the past few years.

Driving Items

In general, each of the 24 driving items represented a specific driving situation involving interaction with another driver, and the respondent was asked to indicate which of two alternatives most closely represented the action he would take in that driving situation. A few items pertained to the respondent's evaluation of the quality of his driving. A "no opinion" response was included with that alternative having fewer responses.

TABLE 1
DRIVING ITEMS

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1. Would you say your driving is better than average, or about average? Better than (50%), About average (50%)
 2. Do you feel that you are able to park a little better than, or about as well as most drivers? Better than (49%), As well as (51%)
 3. Do you sometimes fear that you will lose control of your car when driving? No (86%), Yes (14%)
 4. Suppose you are prepared to enter a parking space and another driver grabs the space. Do you sometimes tell him off? No (82%), Yes (18%)
 5. Suppose a pedestrian were trying illegally to cross in front of you in the middle of the block. Would you usually stop for him? No (7%), Yes (93%)
 6. Do you tend to use your horn less often than other drivers or more than they do? Less often (90%), More often (10%)
 7. Suppose you are waiting in the front row at a stop signal. After a long time you begin to feel that the signals must be stuck, but see that other drivers are not moving. Would you cross the intersection against the signal? No (77%), Yes (23%)
 8. Would you double-park to let a passenger out even though it meant that the driver behind you would have to wait? No (70%), Yes (30%)
 9. Signals are set for 30 mph, and traffic is heavy. Even though you are traveling 30 mph, drivers behind honk their horns. Do you generally speed up somewhat, or do you ignore them? Speed up (25%), Ignore them (75%)
 10. Do you think if you ever got in a serious accident it would more likely be your fault or the other person's fault? Respondent's fault (33%), Other's fault (67%)
 11. Suppose you are stopped in bumper-to-bumper traffic, and the car ahead of you moves forward, but before you have a chance to move up yourself, the driver on your left cuts in front of you. Do you occasionally honk your horn at him? No (56%), Yes (44%)
 12. An old car is stalled ahead on the highway. The driver is waving, but you are not sure what he wants. Do you usually drive by, or do you stop to see what he wants? Drive by (55%), Stop (45%)
 13. When you reach an intersection at the same time as a car approaching from the side street, do you usually wait for it to cross first or do you try to cross first? Wait for it (76%), Cross first (24%)
 14. When a green light changes to yellow as you approach an intersection, do you usually drive through when you're in a hurry? No (58%), Yes (42%)
 15. Suppose you find yourself behind an old car stalled at a signal. The driver is indicating that he needs a shove. Would you push him or drive around him? Push (61%), Drive around (39%)
 16. Two cars are waiting side-by-side at a signal. As you approach from behind, the signal changes to green. If only the curb lane is open, do you occasionally use it to pass the stopped cars? No (63%), Yes (37%)
 17. Suppose you have stopped in the street waiting for a driver to pull out of a parking space so that you can enter. A car behind you honks to get by. Do you move on and try to find another space, or do you stay where you are? Move on (30%), Stay put (70%)
 18. Suppose while you're waiting at a signal, the car ahead of you rolls back and hits your bumper. Would you get out to see if your car was damaged? No (49%), Yes (51%)
 19. A pedestrian has stepped off the curb on your left and is in the crosswalk as you approach the intersection. Do you usually try to drive through before he reaches the middle of the crosswalk? No (88%), Yes (12%)
 20. Suppose you are stopped behind another car at a signal, which changes to "go". The driver ahead doesn't start because he's talking to a friend on the curb. Do you usually honk until he starts? No (41%), Yes (59%)
 21. Suppose a policeman is writing you a ticket which you think is unfair. Would you tell him so? No (50%), Yes (50%)
 22. There's just enough curb space for you to park in front of the place you want to shop, but you see that half a block ahead is a larger parking space. Would you try to squeeze into the smaller space or go ahead to the larger one? Smaller (17%), Larger (83%)
 23. Suppose you are approaching an intersection, and the driver of an oncoming car signals a left turn. Do you generally speed up so that he won't cut in front of you? No (82%), Yes (18%)
 24. Do you feel that you can exceed most speed limits without endangering yourself or others? No (67%), Yes (33%)
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The 24 driving items are given in Table 1, with the percentage of responses to each alternative given in parentheses.

Personality Variables

The 16 personality items comprised three personality scales. These three personality variables will be capitalized throughout this report when they are measured by the procedures described below. The three personality measures reflected authoritarianism, feeling of competence, and other-directedness. The three scales are given in Table 2, as are the positive responses to each item. The positive responses to a given item are associated with those alternatives offered to the respondent which reflect the positive end of the personality dimension; e.g., higher authoritarianism. The procedure used in determining these alternatives is described below. For each item in Table 2, the right-hand column lists the percentage of respondents giving a positive response.

1. Authoritarianism was based on seven items taken from the Short Authoritarian-Egalitarian Scale (9). These seven items, similar to those on the "F" scale, have been exposed to a validation study (10), and have been used in a previous interview survey (11). Each item presented the respondent with seven choices from "disagree very much" to "agree very much." Each of the seven items was dichotomized such

TABLE 2
PERSONALITY ITEMS

Item	Positive Responses	Percentage
Authoritarianism:		
1. A few strong leaders could make this country better than all the laws and talk.	No opinion, agree a little, pretty much, very much	52
2. Most people who don't get ahead just don't have enough will power.	Agree pretty much, very much	
3. Women should stay out of politics.	Disagree a little, no opinion, agree a little, pretty much, very much	48
4. People sometimes say that an insult to your honor should not be forgotten.	Disagree a little, no opinion, agree a little, pretty much, very much	41
5. People can be trusted.	Agree a little, no opinion, disagree a little, pretty much, very much	45
6. Human nature being what it is, there must always be war and conflict.	Agree pretty much, very much	54
7. The most important thing a child should learn is obedience to his parents.	Agree very much	69
Feeling of Competence:		
1. Some people feel that their lives have worked out just about the way they wanted. Others feel they've really had bad breaks. How do you feel about the way your life is turning out?	Satisfied	84
2. What do you think your chances are of living the kind of life you'd like to have? Do you think they are pretty good, or not so good?	Pretty good	84
3. Some people feel that they can make pretty definite plans for their lives for the next few years. Others feel they aren't in a position to plan ahead. How about you—do you feel able to plan ahead or not?	Can plan ahead	71
Other-directedness:		
1. With regard to parties, which do you prefer: a large group—"the more the merrier"—or a small group of close friends?	No opinion, large group	16
2. Which of these two kinds of books do you prefer: those about people like you and me, or famous people, adventurers, or great leaders?	People like you and me	50
3. Which kind of person do you respect more: the person who lives up to his own ideals and principles, or the person who is concerned that people will think well of him?	No opinion, others	17
4. As leisure-time activity, which do you prefer: activities like stamp collecting, photography, woodcarving, or painting, or card games such as bridge, discussion groups, or club meetings?	Games, etc.	51
5. Which do you think is more desirable: to be popular and well-liked by everybody, or to become famous and outstanding for success in some field of work or activity?	Be liked	71
6. Which of these would you prefer to belong to: political or social club or organization, or a club or organization interested mainly in scientific and educational subjects?	No opinion, political or social	38

that the dichotomy point split the ordered alternatives as close to the median as possible. The alternatives on one side of the dichotomy point were designated as positive, with the positive side being determined by that end of the item which, according to Sanford and Older (9), represented higher authoritarianism. Then, an authoritarianism score was computed for each subject by adding the number of his positive responses. Finally, these authoritarianism scores were dichotomized as close to the median as possible; a subject with a score of four or more was classified as higher in Authoritarianism.

2. Feeling of Competence was based on three presumably Guttman-type items previously utilized by Douvan and Walker (12) in an interview survey. In Table 2 the three items are given in the order suggested by Douvan and Walker. Each item was trichotomous, with the middle category being a "no opinion" category. Each of the three items was dichotomized by combining the "no opinion" category with the extreme category with the fewer responses. The alternatives on one side of the dichotomy point were designated as positive, with the positive side being determined by that end of the item which, according to Douvan and Walker (12), represented higher feeling of competence. Then, a feeling of competence score was computed for each subject by adding the number of his positive responses. Finally, these feeling of competence scores were dichotomized as close to the median as possible; a subject with a score of three (the highest possible) was classified as higher in Feeling of Competence.

3. Other-Directedness (one end of Riesman's inner- and other-directedness dimension) was based on six items developed by Kassarian (13), and utilized in an interview survey by Centers (14), who reworded the items somewhat in order to make them more suited to survey applications. Each item was trichotomous, with the middle category being a "no opinion" category. Each of the six items was dichotomized by combining the "no opinion" category with the extreme category with the fewer responses. The alternatives on one side of the dichotomy point were designated as positive, with the positive side being determined by that end of the item which, according to Kassarian (13), represented higher other-directedness. Then, an other-directedness score was computed for each subject by adding the number of his positive responses. Finally, these other-directedness scores were dichotomized as close to the median as possible; a subject with a score of three or more was classified as higher in Other-Directedness.

Biographical Variables

Each of the five biographical variables was measured by a single item. These five biographical variables will be capitalized throughout this report when they are measured by the procedures described below.

1. Age was based on the report of the respondent. These reported ages were dichotomized at a point as close to the median as possible; a subject who reported his age as 40 or more was classified as higher in Age.

2. Sex was based on the interviewer's observation.

3. Education was based on an item with seven ordered categories, ranging from "no schooling" to "completed college." These categories were dichotomized at a point as close to the median as possible; a subject who reported having completed high school, or a higher level, was classified as higher in Education.

4. Occupational Rating was based on the Warner, Meeker, and Eells scale (15), which involves seven ordered categories. These categories were dichotomized at a point as close to the median as possible; a subject who fell into one of the upper four categories was classified as higher in Occupational Rating.

5. Social Area was based on the interviewer's rating of the respondent's residential area according to one of four ordered categories, ranging from poor to wealthy. These categories were dichotomized at a point as close to the median as possible; a subject who fell into one of the upper two categories was classified as higher in Social Area.

Data Analysis¹

Data analysis involved the determination of the contribution of three personality and five biographical measures to the variance in each driving item. Such a determination requires correlational analyses, and these are facilitated if all correlations involve only one type of correlation coefficient. Since the driving items were inherently dichotomous, it was decided to dichotomize the personality and biographical measures. The dichotomizing procedures have been described in the two previous sections.

In general, a determination of the proportion of variance in a dependent variable accounted for by n independent variables requires the solution of the equation $Ax = k$, where A is an $n \times n$ matrix whose elements represent the correlations between the independent variables, x is the unknown n -dimensional vector whose elements represent the correlations between the independent variables and the dependent variable. The n products of corresponding entries in the x and k vectors constitute the proportions of variance in the dependent variable accounted for by the n independent variables. The elements of the x vector are the beta weights, and the dot product of x and k is the coefficient of multiple determination, R^2 .

The solution for x is often found by pre-multiplying k by the matrix inverse to A . However, in this study the x vector was found by the conjugate gradient method (16, 17), a method which does not require the computation of an inverse but which involves the application of an algorithm to yield a precise solution of the x vector in exactly n iterations.

RESULTS

Table 3 gives the percentage of subjects classified as higher on the three personality and five biographical variables. For sex, the percentage is for males.

Table 4 gives the variance in the driving items accounted for by the three personality and five biographical measures.

The last row shows the column average, which represents the variance, averaged over the driving items, accounted for by each personality and biographical variable.

The last column shows the row total, which represents the total variance in each driving item accounted for by the personality and biographical variables. This variance

is also the coefficient of determination, the square of the multiple correlation of the driving item with the personality and biographical variables. A coefficient of determination of 0.0437 is significant at the 0.01 level. This level was achieved by 14 of the 24 driving items, and these 14 items are so indicated in Table 4. The test of significance is appropriate when all variables (dependent and independent) are normally distributed. Since the variables in this study were dichotomized (Sex was already dichotomous), some attention needs to be given to the applicability of the test employed.

Before dichotomization, most of the variables in this study were approximately normal. For instance, the distribution of the authoritarianism scores did not depart significantly from normality (chi-square = 9.51, $df = 5$), as was also the case for the other-directedness scores (chi-square = 7.39, $df = 4$). After dichotomization, none

TABLE 3
CLASSIFICATION OF SUBJECTS FOR
PERSONALITY AND BIOGRAPHICAL
VARIABLES

Variable	Classified as Higher (%)
Personality:	
Authoritarianism	54
Feeling of competence	58
Other-directedness	49
Biographical:	
Age	49
Sex (males)	51
Education	58
Occupational rating	36
Social area	34

¹The computations were performed on an IBM 7090 and SWAC, both machines being operated by the UCLA Computing Facility.

TABLE 4
 VARIANCE IN DRIVING ITEMS ACCOUNTED FOR BY PERSONALITY AND BIOGRAPHICAL VARIABLES

Item	Personality Variable			Biographical Variable					Total Variance
	Authoritarianism	Feeling of Competence	Other-Directedness	Age	Sex	Education	Occupational Rating	Social Area	
1	0.0003	0.0001	0.0036	0.0064	0.0125	0.0056	0.0055	0.0052	0.0391
2	0.0213	0.0034	0.0016	0.0045	0.0328	-0.0001	0.0000	0.0047	0.0682 ^a
3	0.0058	0.0096	0.0007	0.0007	0.0294	0.0032	-0.0002	0.0076	0.0567 ^a
4	0.0004	0.0102	0.0012	0.0001	0.0056	0.0001	0.0051	0.0010	0.0238
5	0.0005	0.0012	0.0030	0.0040	0.0034	0.0045	0.0000	0.0143	0.0308
6	0.0035	0.0067	0.0075	0.0006	0.0032	-0.0001	0.0036	-0.0012	0.0238
7	0.0054	0.0036	0.0196	0.0104	0.0179	0.0136	0.0108	0.0012	0.0825 ^a
8	-0.0009	0.0040	0.0060	0.0312	0.0002	0.0122	-0.0025	0.0190	0.0693 ^a
9	0.0094	0.0000	0.0009	0.0178	0.0080	0.0112	0.0040	-0.0002	0.0511 ^a
10	0.0070	0.0003	0.0102	0.0002	0.0080	0.0008	0.0011	0.0010	0.0283
11	0.0150	0.0110	0.0021	0.0047	0.0004	0.0002	0.0122	0.0002	0.0457 ^a
12	-0.0005	0.0030	0.0011	0.0000	0.0376	0.0152	0.0017	0.0019	0.0600 ^a
13	0.0063	0.0008	0.0039	0.0000	0.0008	0.0026	0.0151	0.0011	0.0306
14	0.0099	-0.0002	0.0043	0.0389	0.0152	0.0079	0.0176	0.0164	0.1101 ^a
15	-0.0033	0.0004	0.0021	0.0024	0.0606	0.0045	0.0127	0.0012	0.0805 ^a
16	0.0009	0.0001	0.0038	0.0361	0.0047	0.0053	-0.0001	0.0006	0.0515 ^a
17	-0.0059	0.0024	0.0003	0.0087	0.0011	0.0254	0.0095	0.0074	0.0488 ^a
18	0.0047	0.0006	0.0015	0.0029	0.0007	0.0104	-0.0005	0.0009	0.0213
19	0.0028	0.0013	0.0000	0.0035	0.0128	0.0082	0.0078	0.0001	0.0365
20	-0.0002	0.0001	0.0032	0.0035	0.0066	0.0006	0.0136	0.0084	0.0359
21	0.0000	-0.0002	0.0041	0.0031	0.0095	0.0002	0.0116	0.0000	0.0284
22	0.0039	0.0017	0.0115	0.0211	0.0155	0.0016	0.0007	0.0013	0.0574 ^a
23	0.0033	0.0067	0.0021	0.0332	-0.0002	0.0033	0.0003	0.0004	0.0491 ^a
24	0.0118	0.0090	0.0038	0.0454	0.0125	0.0005	-0.0002	0.0005	0.0832 ^a
Avg. Variance	0.0042	0.0032	0.0041	0.0116	0.0124	0.0057	0.0054	0.0039	0.0505

^aSignificant at the 0.01 level.

of the personality or biographical variables departed significantly from a 50-50 split.

In general, a product-moment correlation based on two normal distributions will be larger than the phi correlation based on dichotomizations of the normal distributions. However, beta coefficients are relatively independent of which type of distribution is involved. If normal distributions are dichotomized, then the average element in the correlation matrix is reduced, resulting in an increase in the size of the average element of the inverse matrix. However, since this inverse matrix pre-multiplies a correlation vector whose average element is also reduced, the average resulting beta coefficient has a value which is essentially the same had it been based on the original normal distributions.

Since beta coefficients are relatively independent of which type of distribution was involved in their computation, the bias in the beta-r product is contributed primarily by r. Since a phi correlation based on dichotomizations of two normal distributions tends to be biased downward slightly, a slight Type II error is introduced in applying the test of significance to the entries in the last column of Table 4. Thus, in all probability, the correlations indicated by asterisks are indeed significant.

DISCUSSION

The last row of Table 4 reveals the major result emerging from this study: in comparison to the personality variables, the biographical variables account for more of the item variance. In fact, the average personality variable accounts for less than half as much variance as the average biographical variable. The personality variables as a group account for about 1 percent of the variance in the average driving item, the biographical variables about 4 percent. The predictive superiority of the biographical variables emerges more clearly when it is recalled that the personality variables involve 16 items, whereas the biographical variables involve only 5 items. The results suggest that a prediction of the response to the average driving item made on the basis

of all three personality variables combined would be about as accurate as a prediction made on the basis of age or sex alone.

The difference between the personality and biographical variables in predictive ability may be due to a difference in the reliabilities of these variables. Estimates of the reliabilities of the three personality scales were computed from the data of this study (18). The results yielded a Kuder-Richardson estimate of reliability of 0.38 for Authoritarianism, 0.48 for Feeling of Competence, and 0.21 for Other-Directedness. Since the Kuder-Richardson estimate of reliability is proportional to the inter-item covariance (19), one would expect the estimate of reliability to be related to the correlations between items within the same scale. This expectation is confirmed by the average correlation between items within the same personality scale: 0.08 for the Authoritarianism scale, 0.25 for the Feeling of Competence scale, and 0.04 for the Other-Directedness scale. Since each of the biographical variables involved a single item, estimates of consistency could not be computed. However, results from other survey studies indicate that the stability reliability for Age should be about 0.90, for Education about 0.80, for Occupational Rating and Social Area about 0.70 (20, 21). The reliability of Sex should approach 1.00. These results suggest that the proportion of driving item variance accounted for by each of the independent variables is related to its reliability.

The results do not necessarily mean that personality variables, in relation to biographical variables, are inherently less related to driving item response. The inherent relation between these two classes of variables and driving item response can be assessed only when the reliabilities of the two classes of variables are approximately equal. Nevertheless, if one were to want to predict driving item variance, one would want to use the predictive measures as they exist, with any limitations which they may have. Further, neither the personality nor biographical areas have been measured broadly, and the results, of course, apply only to those personality and biographical measures actually used in this study. For instance, when social area is measured not only by the interviewer's estimate of the neighborhood but also by his estimate of the respondent's home, social area accounts for twice the variance shown in Table 4.

While the results show clearly that the personality variables account for less of the driving item variance than do the biographical variables, even the combination of the two classes of variables does not account for much of the variance. In fact, only one of the 24 items has as much as 10 percent of its variance accounted for by all eight independent variables combined.

An examination of the results in Table 4, as well as of the correlations (not shown) between each driving item and the personality and biographical variables, suggests that (a) Authoritarianism is positively related to defensiveness about one's driving, (b) Feeling of Competence is positively related to acceptance of driving restrictions, (c) Other-Directedness is positively related to a dependency on other drivers to make initial moves, (d) Age is positively related to driving cautiousness, (e) Sex is related to driving confidence, with males tending to express a greater confidence, while (f) Education, Occupational Rating, and Social Area are all positively related to expediency and lack of social concern. All of these statistical results are those which might have been expected from logical considerations.

SUMMARY

Responses to driving items have been utilized in traffic safety research. This resort to the convenience of verbal response is justified on the grounds that driving item response is significantly correlated with more direct measures of driving behavior. To the extent that driving item response is related to accidents, the ability to account for driving item variance leads to the ability to predict accidents.

Pre-drivers show no difficulty in answering driving items, suggesting the possibility of utilizing driving item response as one criterion in licensing. In this context it is appropriate to explore driving item response in relation to non-driving variables, and this orientation is taken in the current study.

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The results indicated that the personality variables combined accounted for only about 1 percent of the variance in the average driving item, whereas the biographical variables contributed about 4 percent. The superior contribution of the biographical variables may have been due to their higher reliability. The relations which emerged between the personality-biographical variables and the driving item responses were essentially those which would have been expected from logical considerations.

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