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Effects of Demographic Characteristics and Personality-Related Behavioral Factors on Driving Behavior among Professional Public Transport Drivers

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Abstract

Driving behavior is an important human factor in road safety, particularly among professional drivers who operate vehicles under demanding traffic and working conditions. This study examines the associations between demographic characteristics and personality-related behavioral dimensions and driving behavior among professional drivers. Data were collected through face-to-face questionnaire surveys from 678 drivers in four groups: suburban bus drivers, inner-city bus drivers, taxi/ride-hailing drivers, and truck/trailer drivers. Six behavioral dimensions were assessed: fatigue, risk identification, calmness, patience, stress, and thrill-seeking. Exploratory factor analysis was used to examine the dimensional structure of the questionnaire, while internal consistency was assessed using Cronbach's alpha. Pearson correlation analysis was used to examine associations between selected demographic variables and behavioral factor scores. The results indicate statistically significant associations between age, education, vehicle ownership, and several behavioral dimensions. The findings should be interpreted as cross-sectional associations rather than causal effects because the study relies on self-reported questionnaire data. The study contributes comparative evidence across four professional driver groups and highlights the value of multidimensional behavioral assessment for transportation safety management.

Keywords: Driving Behavior, Professional Drivers, Public Transport, Personality-Related Behavioral Factors, Demographic Characteristics, Road Safety

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1. Introduction

Traffic accidents remain a major transportation-safety and public-health challenge, with consequences for individuals, transport operators, and society. Although improvements in vehicle technology, infrastructure, and traffic management can reduce exposure to risk, driver behavior remains an important component of road-safety performance. Professional drivers warrant particular attention because driving is a central occupational activity for them and because their decisions affect not only themselves but also passengers, other road users, and transported goods.

The relationship between demographic characteristics, individual psychological characteristics, and driving behavior has been examined in several strands of traffic-psychology and transportation research. Previous studies have considered novice drivers, older drivers, bus drivers, professional drivers, and travel-behavior populations, but the behavioral constructs, samples, and analytical approaches differ substantially across studies. Recent transportation research has also emphasized the importance of behavioral and contextual factors in understanding travel and transport-related decisions (Mahpour et al., 2026; Baghestani et al., 2025). Nevertheless, comparative evidence covering several categories of professional drivers and several behavioral dimensions within one analytical framework remains limited.

Accordingly, the present study investigates the association of demographic characteristics and personality-related behavioral dimensions with driving behavior among professional drivers. Four groups are compared: suburban bus drivers, inner-city bus drivers, taxi/ride-hailing drivers, and truck/trailer drivers. Six behavioral dimensions are examined: fatigue, risk identification, calmness, patience, stress, and thrill-seeking. The research question is: To what extent are demographic characteristics and personality-related behavioral dimensions associated with differences in the reported driving-behavior factors of professional drivers? The study is descriptive and correlational; therefore, the results are not interpreted as evidence of causal effects.

2. Literature Review

Traffic safety is a multidimensional problem in which human, environmental, vehicle, and roadway factors interact. Within this framework, driver behavior is an important research domain because errors, violations, stress, fatigue, and risk-related attitudes can affect safety outcomes. A useful behavioral framework should distinguish observable or self-reported driving behavior from the broader psychological characteristics that may be associated with it.

Driving behavior has therefore been studied from psychological, epidemiological, and transportation perspectives. Earlier work emphasized the distinction between driving errors and deliberate violations and showed that these forms of unsafe behavior can have different

psychological and behavioral correlates (Ye & Lord, 2014). The present study follows this general human-factors perspective but does not claim to measure the full construct of personality.

Professional drivers are workers whose principal occupation involves transporting passengers or goods. Their repeated exposure to traffic, work schedules, and occupational demands makes fatigue, stress, and behavioral adaptation important areas of investigation. Previous research has linked sleepiness, work-related stress, and individual characteristics with driving safety among professional drivers (Downey et al., 2013; Bergomi et al., 2017; Montoro et al., 2018).

Research on human factors has also examined the relationship between driver characteristics and unsafe behavior. Studies of mobile-phone-related distraction, driving anger, and other behavioral factors indicate that driving behavior is shaped by a combination of individual and situational influences rather than by a single demographic variable (Holland & Rathod, 2013; González-Iglesias et al., 2012).

Driving stress is similarly influenced by the driver's appraisal of traffic conditions, previous experience, skills, and social and environmental context. Hennessy (2011) emphasizes that social, personality, and affective constructs are relevant to traffic psychology, supporting the use of multidimensional behavioral measures rather than a single indicator.

In one paper, accidents involving young drivers were assessed, investigating the effect of time passed since obtaining a license and driving experience on their behavior. In this research, a new relationship has been established between accident data and the time of obtaining a license. In this regard, accidents involving drivers between ages 17 and 21 who obtained their license between 2006 and 2009 were examined. In this study, the time of obtaining the license was classified into groups, and the number of accidents was calculated in each group for a period of 24 months (Curry et al., 2015).

The results indicate that the rate of accidents in the first months of obtaining a license was higher for people at the age of 17. Drivers who obtained a license at an older age had a lower rate of accidents in the first months of driving. In addition, at any age, drivers who had more driving experience had lower accident rates. Finally, regardless of driving experience and driver's age, the risk of accident among teenage drivers had increased significantly during the period of transition from a temporary license to a permanent license. (Curry et al.2015).

In a study titled Critical Errors of Elderly Drivers in High-Risk Accidents in the United States of America, the hazardous behavior of elderly drivers in high-risk accidents was assessed. The authors tried to identify which hazardous behavior was most influential in this type of accident. In this study, the National Road Traffic Safety Organization in America had collected data pertaining to 5470 car accidents that were reported by the police between 2005 and 2007 and for which

emergency operations were conducted. In this data, there were 620 accidents in which 647 drivers aged 70 or more were involved. Driving errors of elderly drivers were compared with those of drivers aged 35 to 54 years. Based on the results, driving errors were the main cause of 92% of accidents involving elderly drivers, among which the most common errors were lack of sufficient eyesight at 33 percent and failure to correctly recognize the distance to the vehicle in front or the speed of other vehicles. Vision error and failure to recognize the distance to the vehicle in front constituted 22% and 23% of the cases among middle-aged drivers, respectively. About 66% of vision errors and 22% of failures in recognizing time distance among elderly drivers occurred when turning left at intersections. Errors in recognizing time distance and speed of other vehicles and lack of proper eyesight were more common among elderly female drivers than middle-aged female drivers, despite the propagation of this error not having a meaningful relevance between elderly and middle-aged male drivers. These constituted 51% and 31% of errors among elderly female drivers and elderly male drivers, respectively. (Cicchino & McCartt, 2015).

In one study, factors affecting the severity of accidents and how these factors affect the severity of accidents in the converging and diverging intersections between freeways were examined by considering drivers' characteristics, geometric design components, weather, and traffic density. In this research, accident data were extracted from Ohio State Police reports. The generalized ordinal Logit model was used to determine the weight of factors affecting the severity of injuries. The results indicated that in accidents involving trucks, the increased number of freeway lanes and ramps in converging areas, speeding, and alcohol consumption can increase the severity of injuries and fatalities. In addition, in diverging areas, accidents due to speeding and alcohol consumption increase the possibility of injuries and death (Mergia et al. 2013). In traffic psychology, there is no single, comprehensive theoretical framework, and each theory focuses on a specific issue, analyzing part of the driver's duties. Thus, many specialized models such as perception, attention, cognition, social, motivational, etc., patterns have emerged as determinants of the emotional factors of mobility and drivers' behavior, and each point of view can be a starting point in understanding the psychological dimensions of the driver. (Herrero Fernández. 2011). Human error was investigated as a field of research in the 1970s. Most of human learning in the past has been achieved through mistakes and the ability to learn from them. Thus, the reason why human errors are important in an applied context is that errors provide the feedback necessary for learning (González-Iglesias et al., 2012). Farz and Altman found that students who were allowed to make mistakes performed better compared to those who were not given the opportunity. Riesen pointed out that learning by trial and error in the control room of a chemical or nuclear plant, as in educational experiences, may have unacceptable consequences. In this way, due to the complexity of tasks (such as driving), humans may be forced to shorten their learning periods. To improve opportunities for experiential learning, including making mistakes and learning from them, efforts such as using simulators have been conducted. While studying road accidents, it was found that most human errors are related to recognition (acquiring information) and decision making

(processing information). Out of 100 marine accidents that Wagner and Groeneweg examined, only four were not due to human error; Most were due to more than one mistake involving one or two people (Groot et al., 2012). Sociodemographic, geographic, and personality factors play a significant role in transportation mode choice. Variables such as age, gender, income, and education, together with residential area and personality traits, help explain patterns of car driving versus public transportation use. The findings highlight contrasting profiles between car drivers and public transport users, offering valuable insights for policymakers and transport planners aiming to promote behavioral shifts. A key limitation is the short personality scale (BFI-10) and its factor structure (Roos et al., 2020). Bus drivers exhibited higher levels of extraversion, psychoticism, and neuroticism, with increased somatization and phobia compared to norms. Mental health was significantly influenced by demographic and personality factors, particularly smoking, drinking, and neuroticism. These findings provide insights for targeted interventions and selection strategies to reduce risky driving behaviors and enhance road safety (Wang et al., 2021).

The literature therefore provides a strong basis for examining demographic and personality-related behavioral characteristics in driving research, but several limitations remain. Many studies focus on one driver population, one behavioral construct, or crash outcomes rather than comparing multiple professional driver groups on several behavioral dimensions. The present study addresses this gap through a comparative questionnaire-based analysis of 678 professional drivers. Its contribution is primarily empirical and comparative: it does not propose a causal model, a predictive model, or a licensing decision rule.

Table 1. Comparison of Previous Studies on Driving Behavior and the Contribution of the Present Study

Authors	Study Area	Sample	Method	Main Findings	Research Gap
Curry et al. (2015)	Young drivers	17–21 years	Crash analysis	Driving experience reduced crash risk	Focused only on novice drivers
Cicchino & McCartt (2015)	Elderly drivers	647 elderly drivers	Crash database analysis	Vision and distance judgment errors were dominant	Did not examine personality factors
Mergia et al. (2013)	Freeway accidents	Ohio crash database	Generalized Ordered Logit	Speeding and alcohol increased injury severity	Focused on crash severity rather than driver behavior
Roos et al. (2020)	Travel behavior	National survey	Statistical modeling	Demographic and personality factors	Did not investigate

				influenced travel mode choice	professional drivers
Wang et al. (2021)	Bus drivers	Bus drivers	Psychological assessment	Personality significantly affected mental health and risky driving	Limited to bus drivers
Present Study	Public transport drivers	678 drivers	Factor Analysis + Correlation Analysis	Personality and demographic characteristics affecting six behavioral dimensions	Comparative analysis across four professional driver groups

Despite the growing body of research on driving behavior, limited attention has been paid to simultaneously evaluating multiple behavioral dimensions across different categories of professional public transport drivers. Existing studies have primarily focused on specific driver populations or individual behavioral characteristics, making it difficult to obtain a comprehensive understanding of how demographic and personality-related factors jointly influence driving behavior. The present study addresses this gap by comparing four categories of professional public transport drivers using a unified behavioral framework encompassing six driving behavior dimensions. The findings contribute to the literature by providing empirical evidence that can support evidence-based driver management, targeted safety interventions, and transportation policy development.

3. Methodology

This study uses a descriptive, cross-sectional research design to examine associations between demographic characteristics and self-reported driving-behavior dimensions. The research instrument was a structured questionnaire adapted from prior work on driver behavior and the Driver Stress Questionnaire (DSQ). The questionnaire was translated and adapted for the study population, followed by review and preliminary assessment before field administration. Because the study is based on self-reported responses collected at one point in time, the analysis is intended to identify statistical associations rather than establish causal relationships.

The target population consisted of professional drivers in four groups: suburban bus drivers, inner-city bus drivers, taxi/ride-hailing drivers, and truck/trailer drivers. A census of the entire population was not feasible because of time, access, and operational constraints. Therefore, a sample was selected for each target group. The reported population sizes, sample sizes, and numbers of completed questionnaires are retained from the original field study and are presented in Table 2.

Sample size was estimated using Cochran's sampling approach. For a finite population, the general form used in the study is:

(1) $$n = \frac{z^2 pqN}{d^2(N-1)+z^2 pq}$$

Where in:

N: the size of the statistical population;

n: sample volume

Z: the standard normal value corresponding to the selected confidence level; for a two-sided 90% confidence level, Z = 1.645.

P: the estimated proportion of the attribute in the population. When no prior estimate is available, P = 0.50 is commonly used because it produces the maximum binomial variance (Cochran, 1977).

q: the complementary proportion, q = 1 − P.

D: the permissible sampling error, set at 0.05 in the study. When the population size is unknown or treated as very large, the finite-population correction is omitted and the corresponding Cochran expression is used.

(2) $$n = \frac{z^2 pq}{d^2}$$

Because the population size of the truck/trailer group was treated as unknown in the source analysis, the large-population form was used for that group. The reported sample sizes are retained in Table 2 for transparency. Before journal submission, the sample-size calculations should be regenerated from the exact software/formula settings used in the field study because some reported values do not reproduce exactly when the stated assumptions (Z = 1.645, P = 0.50, D = 0.05) are applied. This is a verification issue, not a basis for inventing replacement values.

Table 2: Required sample size

Target Group	Equation	N	n	Collected
Suburban Bus Drivers	(1–4)	98	72	74
City Bus Drivers	(1–4)	165	102	104

Taxi Drivers and Ride-Hailing	(1–4)	1250	222	227
Truck and Trailer Drivers	(1–4)	∞	267	273
Total Number of Drivers				678

Because incomplete or missing questionnaires were expected, a number of questionnaires greater than the minimum calculated sample was distributed. The final number of usable questionnaires was 678.

The questionnaire was derived from previous research on professional drivers and adapted using the Driver Stress Questionnaire (DSQ). The instrument was organized into behavioral dimensions covering fatigue, risk identification, calmness, patience, stress, and thrill seeking. The adaptation and translation process should be understood as instrument adaptation rather than development of a new comprehensive personality inventory.

For the purposes of this study, driving behavior is represented by six questionnaire-based behavioral dimensions: fatigue, risk identification, calmness, patience, stress, and thrill seeking. These dimensions are treated as personality-related behavioral characteristics measured through self-report items, not as a complete assessment of personality.

- The first part: It is related to Fatigue while driving. The questions in this part include five questions.
- The second part: is related to Risk Identification along the route, which includes five questions.
- In the third part: five questions were asked, which were related to keeping Calm while driving and also before and afterwards.
- The fourth part: contains 7 questions related to Patience while driving.
- The fifth part and the sixth part are related to Stress and Thrill while driving, and each part contains four questions.

The questionnaire also collected demographic and occupational information, including age, education, driving-license history, employment history, accident involvement, and other personal characteristics. Questionnaires were administered face to face. Field conditions were not always ideal; some drivers completed the questionnaire near their vehicles, where noise and the absence of a suitable writing surface could have affected concentration. This limitation is considered when interpreting the self-reported measures.

The main fieldwork limitation was the absence of a consistently controlled testing environment. Because the questionnaire was administered in operational settings, environmental distractions

could not be completely eliminated. The study therefore emphasizes statistical associations in the collected sample rather than claiming highly controlled psychological measurement.

Preliminary analysis of collected data

The analysis proceeded in three stages. First, descriptive statistics were used to characterize the sample. Second, exploratory factor analysis was used to examine the dimensional structure of the questionnaire. Third, internal consistency and correlation analyses were conducted to evaluate reliability and associations between selected demographic variables and behavioral factors.

Descriptive findings are presented first, followed by the factor-analytic and reliability results and then the correlation analyses for age, education, and vehicle ownership. The interpretation focuses on the relationships supported by the reported coefficients and significance levels.

Demographic and personal characteristics

Table (3) shows the classification of the personal characteristics and demographics of the studied drivers by target group and according to frequency and frequency percentage.

Table 3. Frequency and frequency percentage of participants according to demographic and personal variables

Parameter	Suburban Bus		Inner City Bus		Taxi		Truck & Trailer	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Age								
≤33	16	21.6	24	23.1	35	15.4	49	17.9
34-43	24	32.4	53	51.0	64	28.2	90	33.0
44-53	20	27.0	14	13.5	72	31.7	81	29.7
≥54	14	18.9	13	12.5	56	24.7	53	19.4
Marital Status								
Single	12	16.2	0	0	24	10.6	30	11.0
Married	62	83.8	104	100	203	89.4	243	89.0

Education								
Illiterate	3	4.1	0	0	11	4.8	12	4.4
Elementary	17	23.0	20	19.2	69	30.4	85	31.1
High school	24	32.4	48	46.2	87	38.3	83	30.4
College	26	35.1	29	27.9	49	21.6	80	29.3
University	4	5.4	7	6.7	10	4.4	13	4.8
Blood Type								
A	26	35.1	31	29.8	73	32.2	82	30.0
B	18	24.3	26	25.0	54	23.8	73	26.7
AB	13	17.6	22	21.2	49	21.6	50	18.3
O	17	23.0	24	23.1	51	22.5	67	24.5
Drug Abuse								
No	57	71.4	78	74.0	75	75.0	162	71.4
Yes	17	28.6	26	26.0	25	25.0	65	28.6
Vehicle Ownership								
No	56	75.7	104	100	13	55.7	127	46.5
Yes	18	24.3	0	0	214	94.3	146	53.5
Driving Experience (Years)								
1-8	24	32.4	53	51.0	93	41.0	79	28.9
9-17	20	27.0	33	31.7	84	37.0	80	29.3
18-25	21	28.4	15	14.4	42	18.5	75	27.5
25-33	7	9.5	3	2.9	6	2.6	30	11.0
≥34	2	2.7	0	0	2	0.9	9	3.3

Factor analysis and determining the main factors for each scale

Before factor extraction, the suitability of the data for factor analysis was assessed using Bartlett's test of sphericity and the Kaiser–Meyer–Olkin (KMO) measure. These tests are appropriate for evaluating whether the correlation structure is suitable for factor analysis. The supplied manuscript reports significant Bartlett tests, but the numerical KMO coefficients are not actually present in the source table. Accordingly, no KMO value is reconstructed or inferred here.

Table 4 reports the available Bartlett-test information and the KMO field as recorded in the supplied material. Because the numerical KMO values are missing from the source table, the adequacy of the data should be confirmed against the original statistical output before publication. The significant Bartlett results support the presence of correlations among the questionnaire items, but they do not by themselves establish the adequacy of the sample for every extracted factor.

Table 4. Data adequacy test results

Target Group	Bartlett's test χ^2	Sig.	KMO
Suburban Bus	780.209	<0.001	Not reported
Inner City Bus	1146.715	<0.001	Not reported
Taxi	2106.146	<0.001	Not reported
Trucks & Trailers	2659.508	<0.001	Not reported
All Groups	5893.079	<0.001	Not reported

The eigenvalue results in Table 5 indicate that seven factors have initial eigenvalues greater than 1 and together account for approximately 56% of the total variance. After extraction and rotation, the reported variance distribution is more even across the retained factors. This supports the use of a multidimensional representation of the questionnaire data. However, the retained-factor decision should ideally be confirmed using the complete factor-loading matrix and, where available, a scree plot or parallel analysis; those outputs were not included in the supplied manuscript.

Table 5. extracted factors of all groups

No.	**Initial Eigenvalues**			**The Sum of the Squares of the Extracted Factor Loadings**			**The Sum of the Squares of the Factor Loadings Extracted and Rotated**		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.055	13.440	13.439	4.033	14.449	14.449	3.289	10.938	10.939
2	2.866	9.986	23.423	2.996	9.993	23.433	2.995	9.989	20.899
3	2.735	9.084	32.497	2.732	9.083	32.486	2.739	9.098	29.996
4	2.229	7.385	39.879	2.215	7.390	39.888	2.680	8.921	38.894
5	1.930	6.420	46.290	1.931	6.420	46.289	2.093	6.993	45.827
6	1.842	6.125	52.420	1.833	6.132	52.403	1.865	6.154	52.019
7	1.110	3.686	56.078	1.109	3.679	56.085	1.219	4.064	56.082
8	0.955	3.110	59.188						
9	0.893	2.977	62.145						
10	0.849	2.820	64.959						
11	0.810	2.669	67.631						
12	0.763	2.516	70.139						
13	0.715	2.369	72.499						
14	0.694	2.299	74.787						
15	0.684	2.258	77.032						
16	0.632	2.088	79.118						

17	0.596	1.989	81.099
18	0.555	1.836	82.929
19	0.547	1.810	84.745
20	0.529	1.739	86.467
21	0.519	1.698	88.168
22	0.498	1.630	89.796
23	0.445	1.467	91.260
24	0.472	1.439	92.698
25	0.439	1.418	94.120
26	0.398	1.308	95.430
27	0.394	1.289	96.698
28	0.371	1.208	97.899
29	0.349	1.167	99.069
30	0.295	0.948	100.000

Table 5 shows that the first seven factors have initial eigenvalues greater than 1 and collectively explain approximately 56% of the variance. The result is consistent with a multidimensional structure, although the precise substantive interpretation of each factor should be based on the item-level loading matrix. Because that matrix was not included in the supplied material, the present revision avoids assigning new factor labels beyond those already used in the questionnaire.

4. Reliability

Internal consistency was evaluated using Cronbach's alpha. An alpha value around 0.70 is commonly used as a conventional benchmark, but interpretation depends on the number of items, dimensionality, and intended use of the scale (Tavakol & Dennick, 2011). The values reported in Table 6 should therefore be interpreted dimension by dimension rather than treating 0.70 as an absolute pass/fail threshold. In particular, the three-item Thrill scale ($\alpha = 0.564$ for all groups) and the four-item Stress scale ($\alpha = 0.669$ for all groups) show weaker internal consistency than the other dimensions and should be interpreted cautiously.

Table 6. reliability of the questionnaire and extracted factors

Factor	**Number**	**Cronbach's Alpha Coefficients**				
		All Groups	Suburban Bus	Inner City Bus	Taxi	Trucks & Trailers
All Questions	30	0.706	0.722	0.728	0.683	0.709
All Constructor Variables	29	0.708	0.722	0.733	0.685	0.711
Patience	7	0.802	0.689	0.691	0.848	0.822
Calm	5	0.820	0.760	0.812	0.846	0.819
Fatigue	5	0.777	0.803	0.777	0.794	0.756
Risk Identification	5	0.746	0.801	0.816	0.698	0.738
Stress	4	0.669	0.513	0.695	0.680	0.697
Thrill	3	0.564	0.514	0.563	0.516	0.582

Uses of the topic and the results obtained

The relationships between selected personal variables and behavioral-factor scores were examined using Pearson correlation coefficients. Pearson correlation measures linear association and does not establish causation. The interpretation below is restricted to coefficients and significance levels reported in the study.

Table 7. Correlation coefficient between personal variables and different factors

Variable	Vehicle Ownership	Education	Age
Significant Pearson Coefficient F	-0.78* (p = 0.043)	0.246** (p = 0.000)	-0.303** (p = 0.000)
Significant Pearson Coefficient H	0.025 (p = 0.511)	-0.24 (p = 0.528)	0.048 (p = 0.210)
Significant Pearson Coefficient R	0.029 (p = 0.450)	-0.108** (p = 0.005)	0.203** (p = 0.000)
Significant Pearson Coefficient P	0.070 (p = 0.070)	-1.24** (p = 0.001)	0.183** (p = 0.000)
Significant Pearson Coefficient A	-0.39 (p = 0.309)	0.034 (p = 0.381)	-0.18 (p = 0.646)
Significant Pearson Coefficient of Total Number of T	0.126** (p = 0.001, N = 678)	-0.126** (p = 0.001, N = 678)	0.198** (p = 0.000, N = 678)

Table 7 presents Pearson correlation coefficients between vehicle ownership, education, age, and the reported behavioral factors. Several coefficients are statistically significant, while others are small and non-significant. Importantly, the source table contains transcription errors in several coefficients: a Pearson correlation cannot be less than −1. The values corrected in this revision are based on the reported p-values and N = 678 and should still be checked against the original statistical output before submission.

Age factor

Pearson correlation test was used to investigate whether there is a relationship between the age variable and driving behavior.

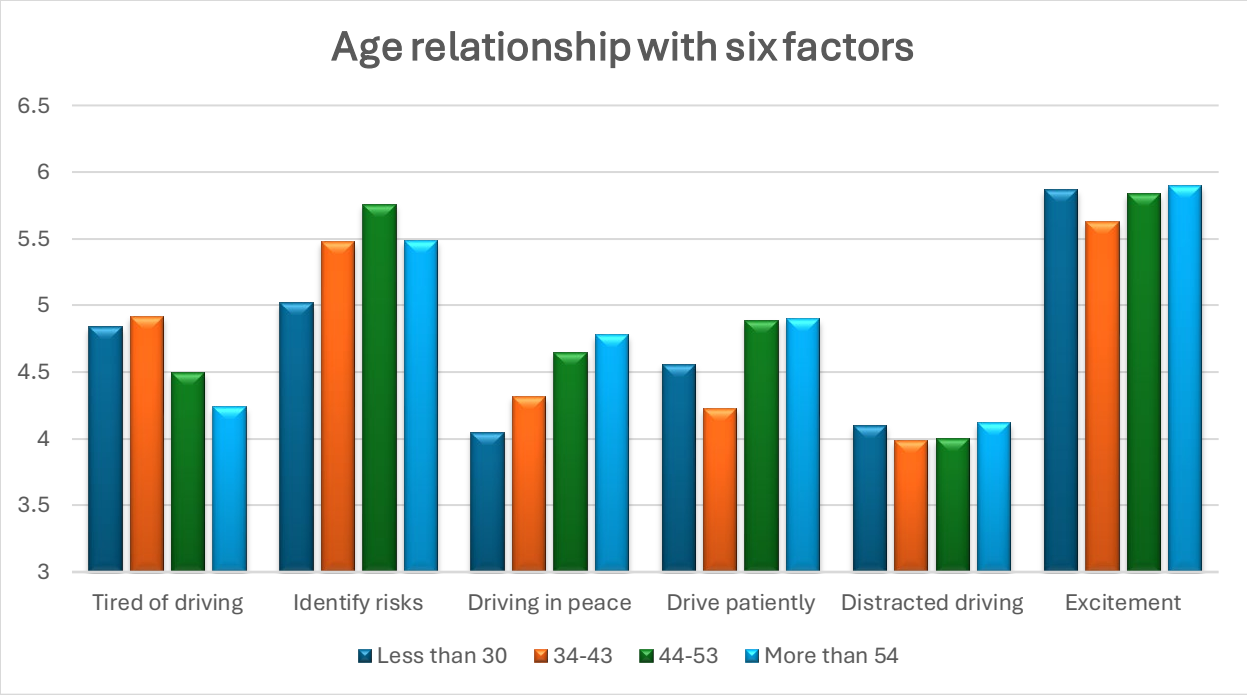


Figure 1. The relationship between age and six factors

The reported correlations indicate statistically significant associations between age and several behavioral dimensions, including fatigue, calmness, patience, and thrill seeking. The negative association between age and fatigue indicates that higher age is associated with lower fatigue-factor scores in the coding used by the questionnaire. Because the direction of the substantive construct depends on the item coding, this result should not automatically be described as “more” or “less” fatigue without checking the scoring key. The figures illustrate the observed group patterns, but they should be interpreted as descriptive associations.

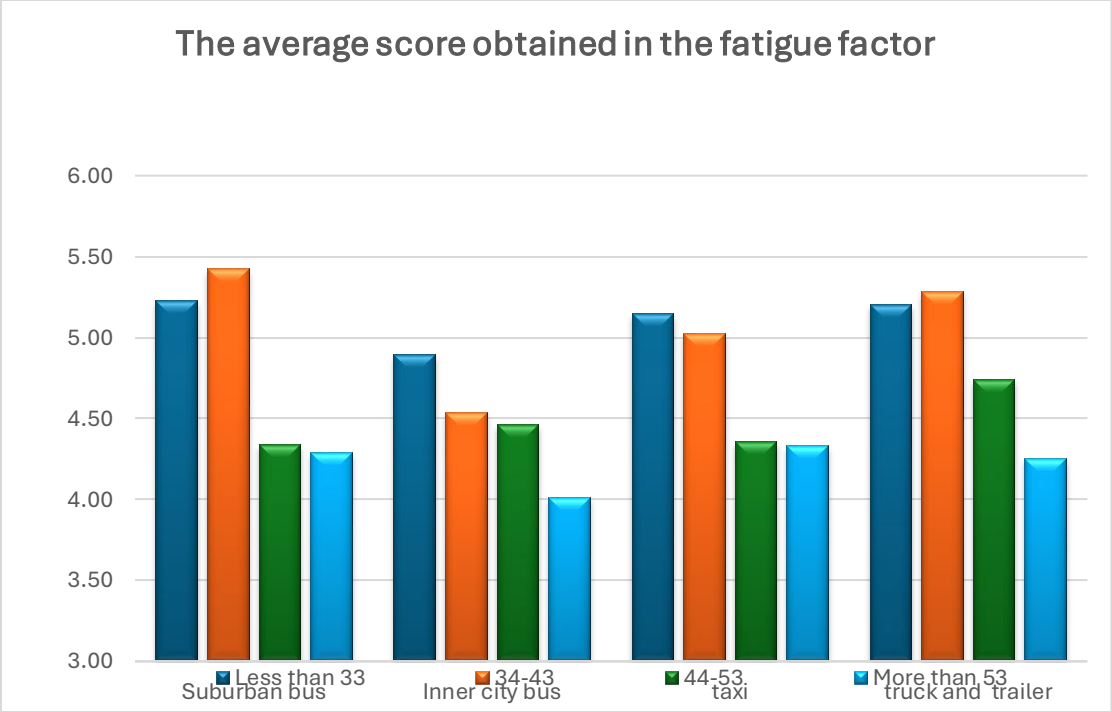


Figure 2. The relationship between age and fatigue factor by driver group

The descriptive figures show differences in calmness, patience, and thrill-seeking scores across age groups. These differences are consistent with an association between age and behavioral scores in the sample. However, physiological or psychological mechanisms are not directly tested by the present cross-sectional questionnaire design, so explanations involving changes in reaction ability, endurance, or personality stability are treated as possible interpretations rather than established causal mechanisms.

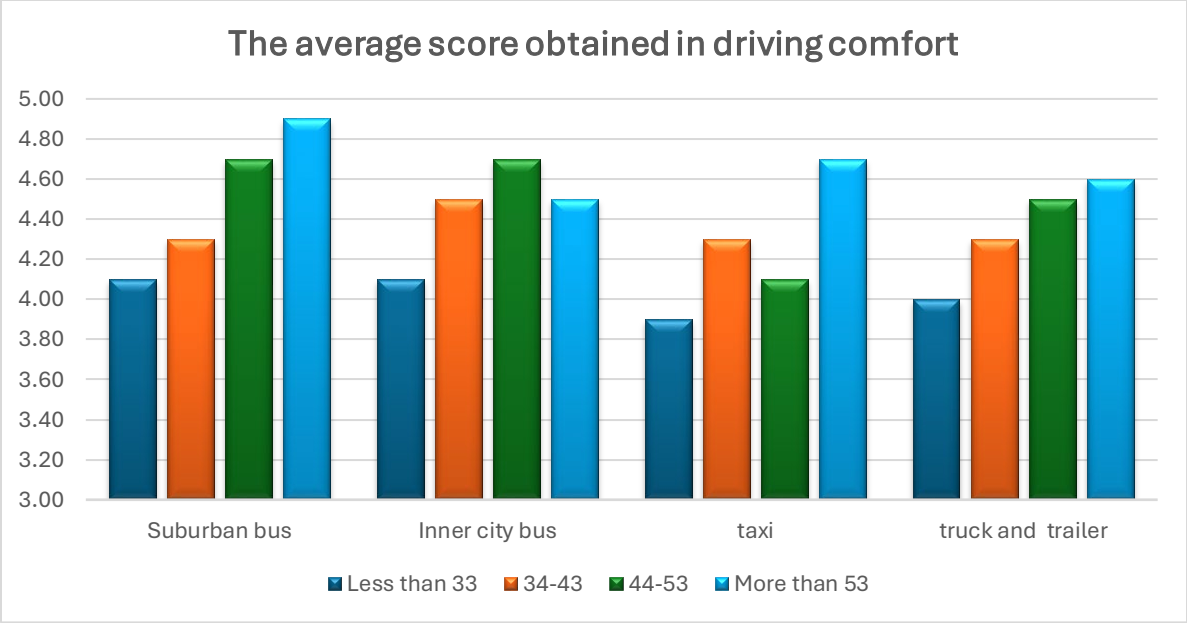


Figure 3. The relationship between age and relaxation factor in driving by driver group

The younger age group showed different stress-related scores from middle-aged and older groups in the descriptive comparisons. The pattern may reflect differences in occupational experience, workload, or other unmeasured characteristics, but the present data do not permit these explanations to be tested causally.

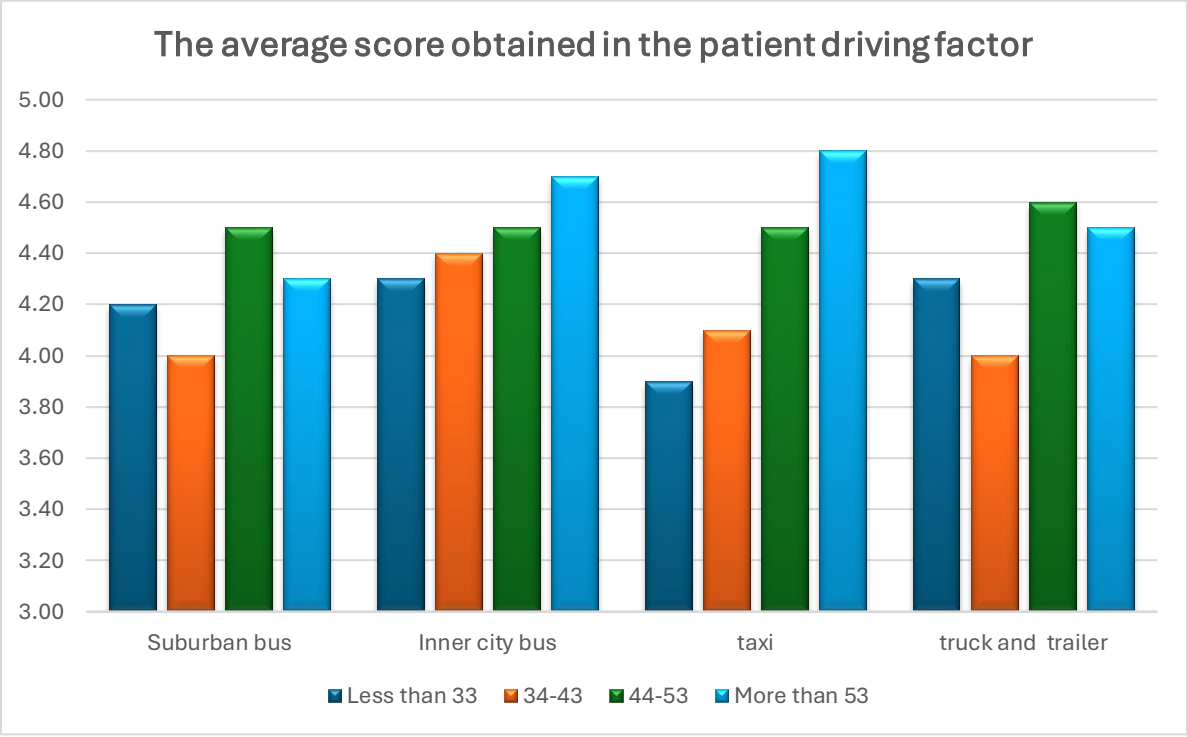


Figure 4. The relationship between age and patient driving factor by driver group

The descriptive pattern for patience and related behavioral scores varies across age groups. Previous studies have reported age-related differences in aggressive or risky driving, but the mechanisms may involve experience, exposure, work conditions, and other factors. The present study identifies an association in the collected sample and does not establish that age itself causes the observed differences.

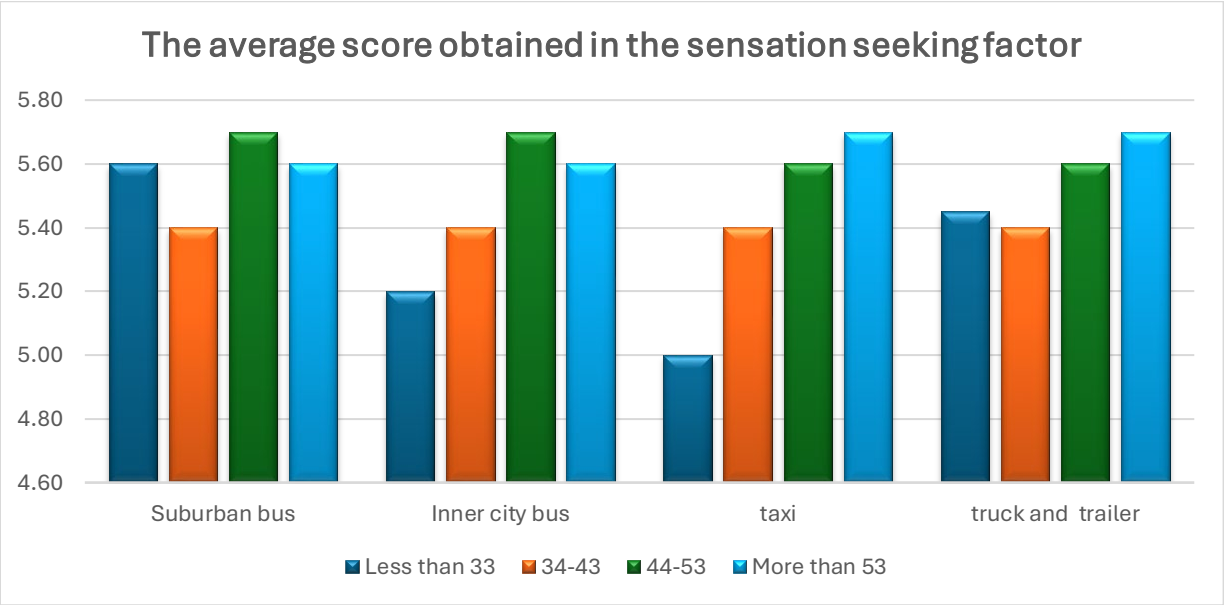


Figure 5. The relationship between age and Thrill-Seeking factor by driver group

Younger drivers displayed different scores on calmness, patience, and thrill seeking in the descriptive comparisons. Previous research has associated younger driving age with greater risk-taking in some populations, but the present results should be interpreted within the occupational context of the sampled drivers and should not be generalized beyond the study population without further evidence.

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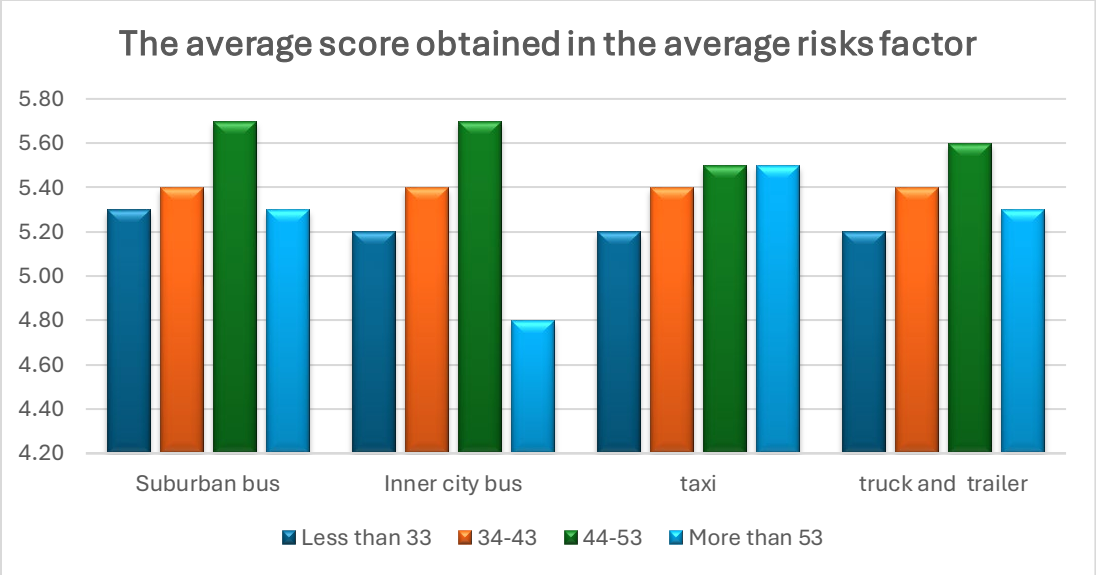


Figure 6. The relationship between age and risk identification factor by driver group

The age-related pattern for risk identification is not statistically significant in the reported correlation analysis. Although the descriptive scores fluctuate across age groups, the absence of a significant correlation means that the observed pattern should not be interpreted as evidence of a systematic linear age effect. The possible role of experience or automaticity is therefore a hypothesis for future research rather than a conclusion of this study.

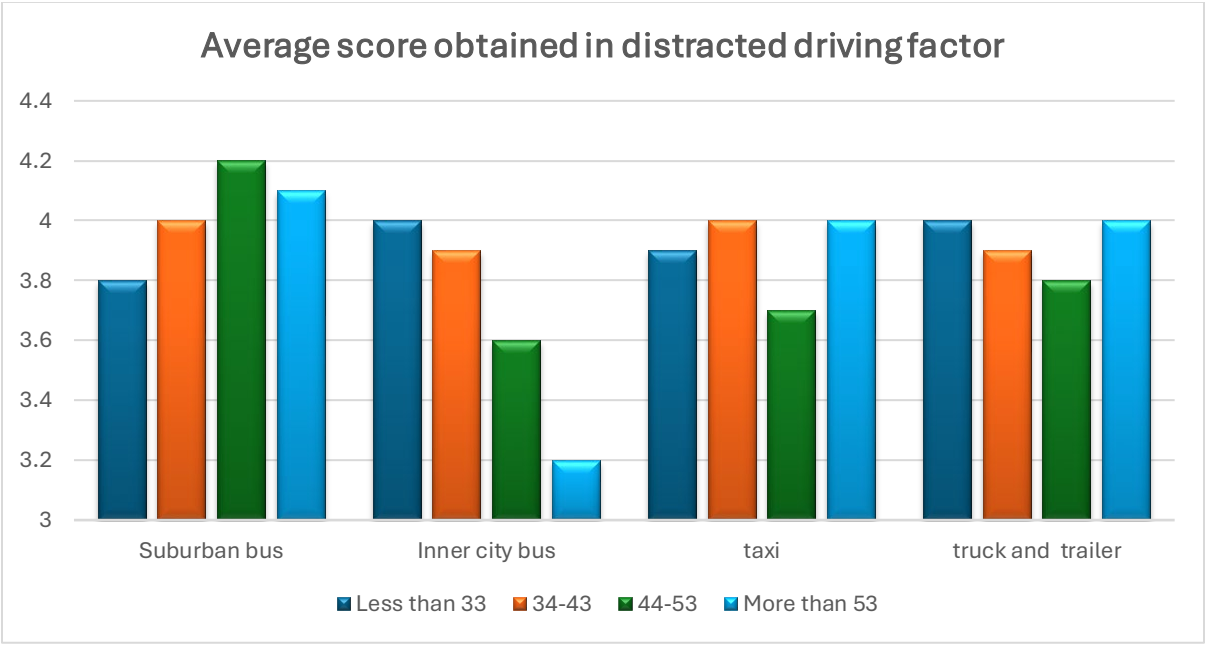


Figure 7. The relationship between age and the factor of distracted driving by driver group

The analysis did not identify a statistically significant linear relationship between age and the reported distracted-driving factor. Differences visible in individual driver groups may therefore reflect group-specific variation rather than a general age effect. This distinction is important because visual trends in subgroup figures do not replace the statistical test.

Educational status and type of driving

For further investigation, Pearson's correlation test was used to examine the relationship between educational status and driving behavior.

The correlation analysis also examined education level in relation to the behavioral dimensions. Statistically significant associations were reported for several factors, while other relationships were weak or non-significant. The results should be interpreted as associations within the sample rather than evidence that education directly changes driving behavior.

The reported positive association between education and the fatigue factor indicates that higher education is associated with higher scores on that factor under the questionnaire's coding scheme. The direction of the substantive interpretation depends on how the fatigue items were coded; therefore, the coefficient itself is reported without claiming that higher education causes more favorable or unfavorable behavior.

This can be seen in figure (8). Also, figure (9) shows the relationship between the educational status and the scores obtained from the fatigue factor of four groups of drivers, separated by the target group.

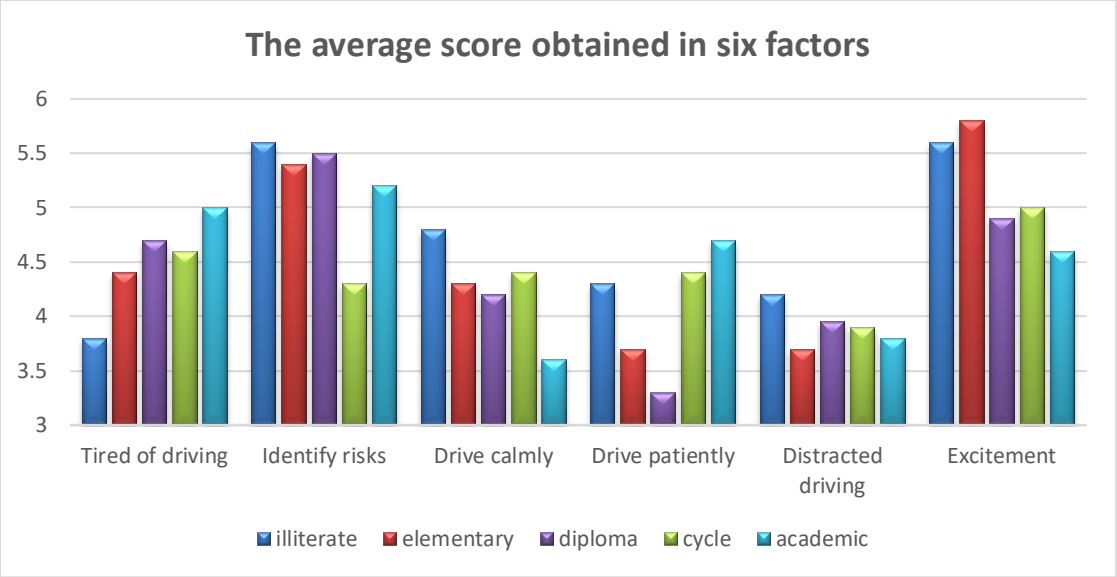


Figure 8. The average score obtained in six factors

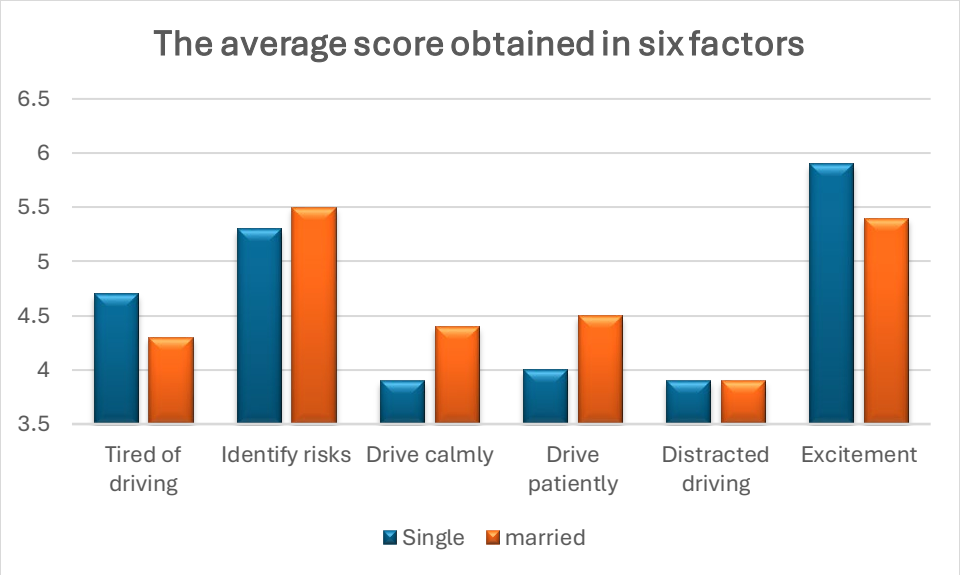


Figure 9. The relationship between education and six factors

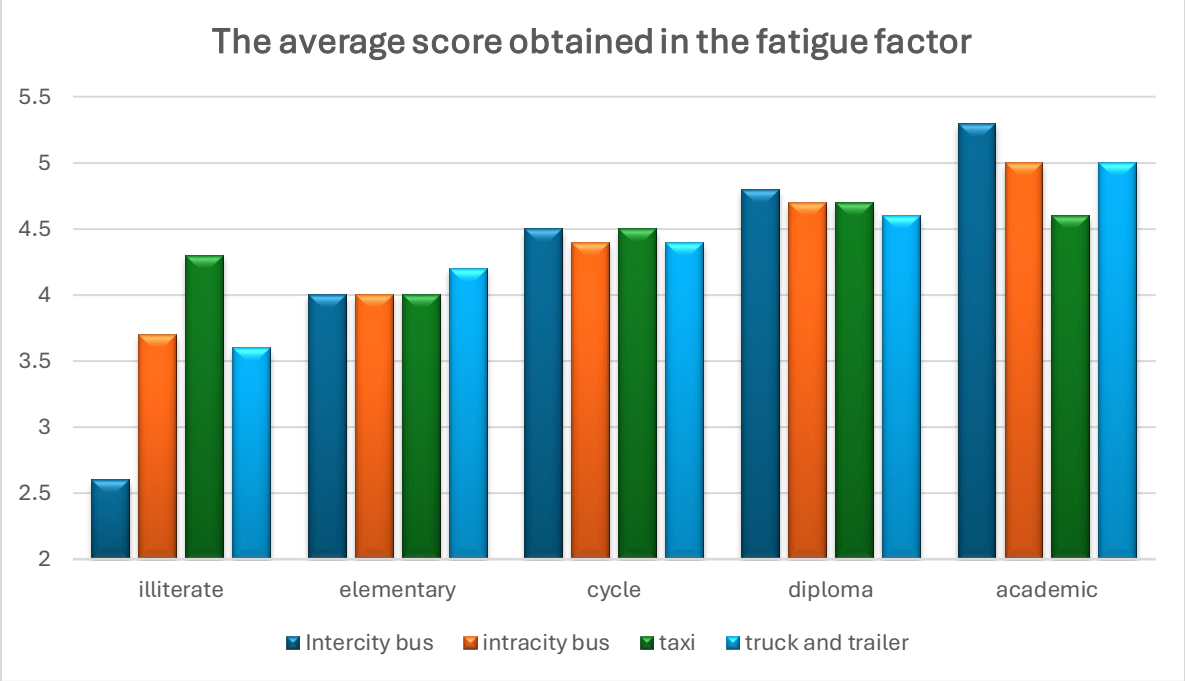


Figure 10. The relationship between education status and fatigue factor by driver group

The higher scores observed among some more-educated respondents may partly reflect differences in age, occupation, or other characteristics across groups. Because the present analysis does not control simultaneously for these potential confounders, this explanation remains tentative.

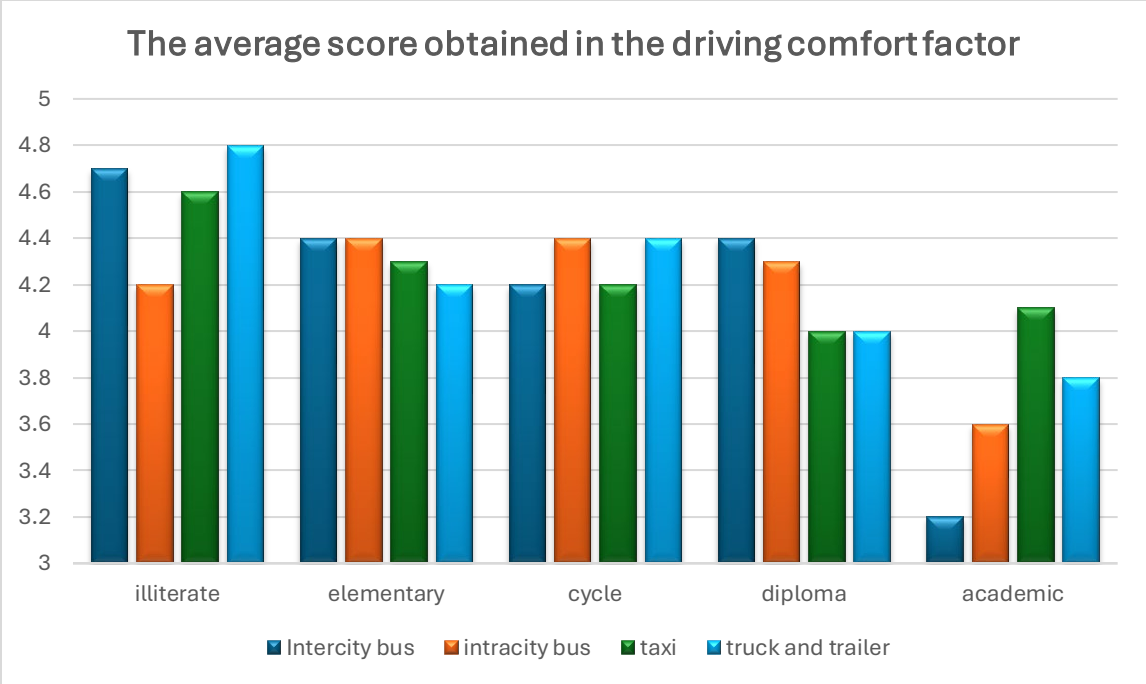


Figure 11. The relationship between education status and relaxation factor by driver group

The descriptive relationship between education and calmness/stress scores should be interpreted cautiously. Occupational conditions, workload, employment expectations, and other socioeconomic factors may differ by education level, but these mechanisms were not directly measured or tested in the present analysis.

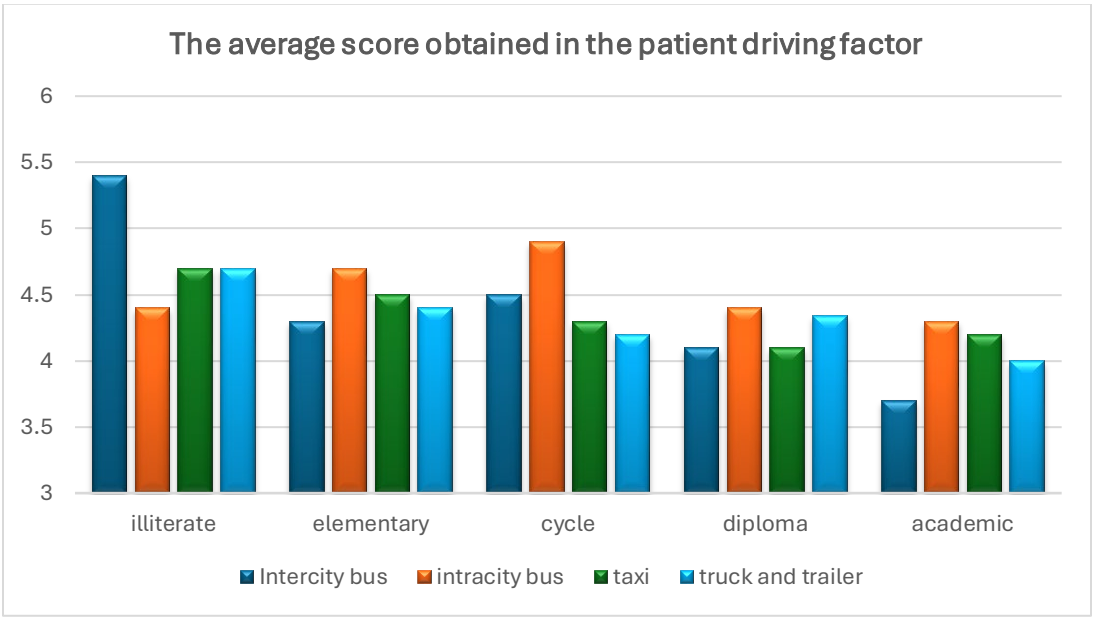


Figure 12. The relationship between education status and patient driving factor by driver group

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Previous studies have reported associations between education, driving anger, errors, and risky behavior, but the direction and magnitude of these relationships vary across populations and measurement instruments. The present study contributes an additional observation from professional drivers, while recognizing that the cross-sectional design does not establish the underlying mechanism.

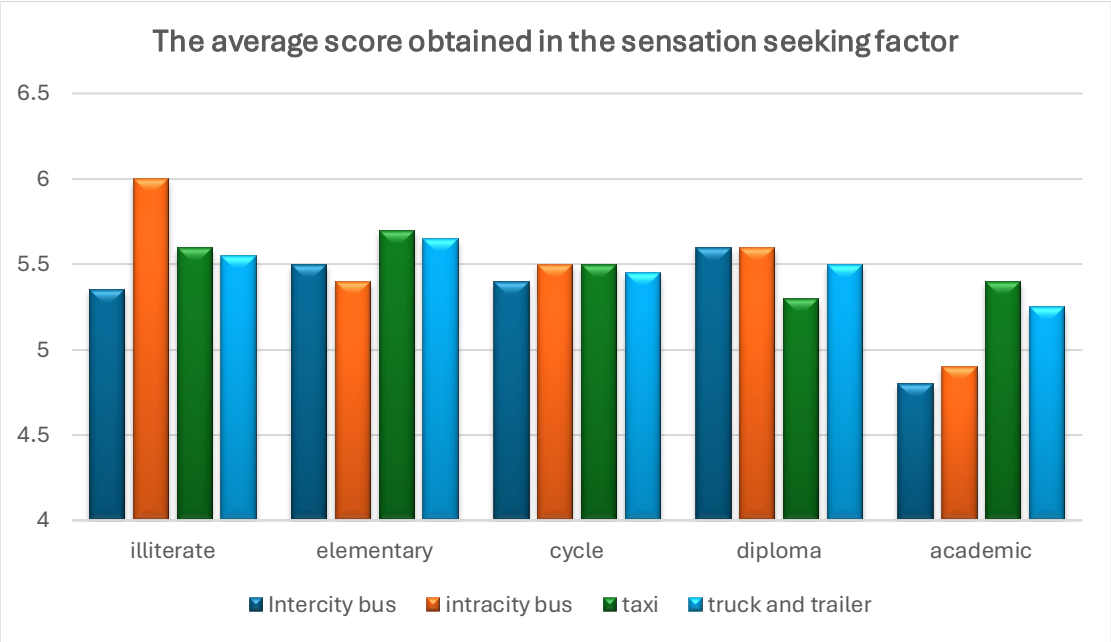


Figure 13. The relationship between education status and excitement seeking by the group of drivers

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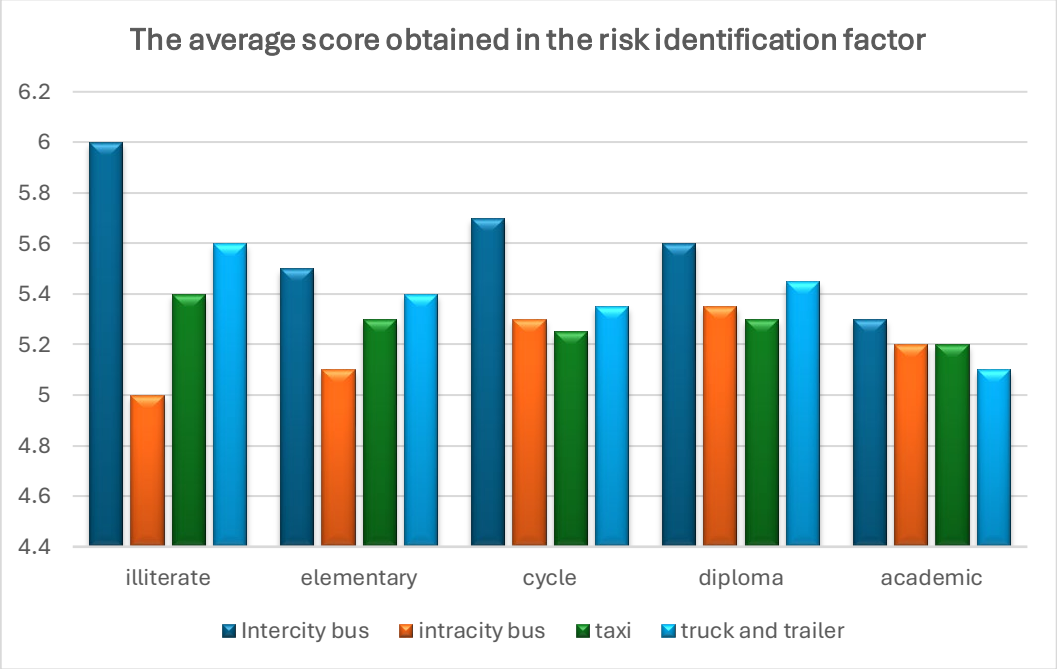


Figure 14. The relationship between education status and risk identification factor by driver group

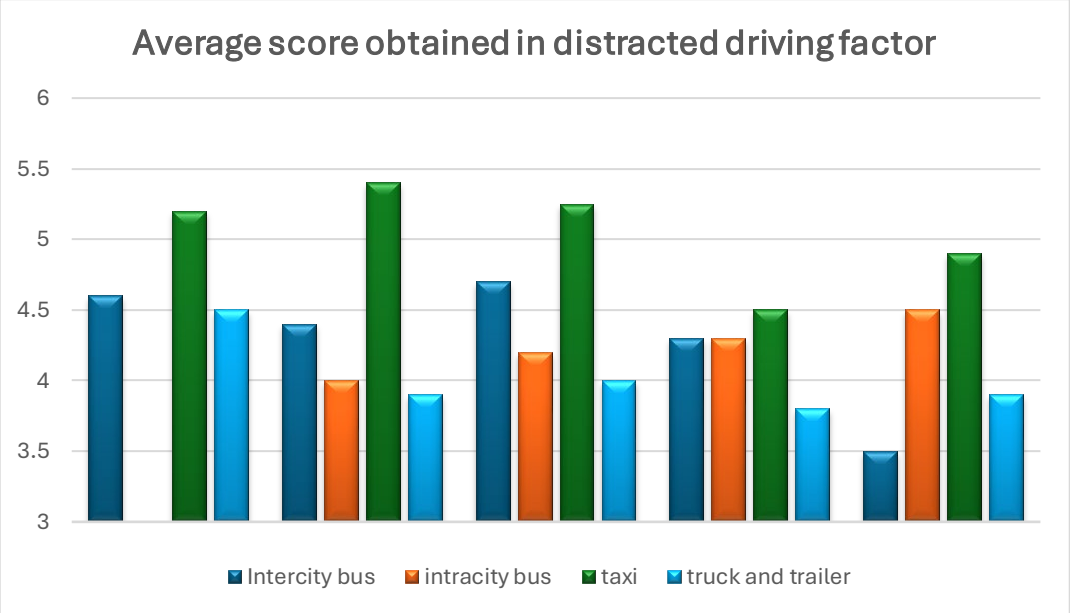


Figure 15. The relationship between education status and anxiety factor by driver group

Figures 13–15 provide descriptive comparisons of education level and the remaining behavioral factors. Where the correlation analysis is non-significant, visual differences between subgroup means should not be interpreted as a statistically established trend.

Overall, education appears to be associated with selected behavioral dimensions in the present sample. However, because age, occupation, driving experience, and other characteristics may be interrelated with education, multivariable analyses would be required to determine whether education has an independent association with each behavioral outcome.

5. Discussion

The findings indicate that demographic characteristics, particularly age and education, are statistically associated with several self-reported behavioral dimensions among the sampled professional drivers. Vehicle ownership is also associated with selected factors. These results are broadly consistent with prior traffic-psychology research showing that demographic and individual characteristics can be related to driving behavior. The present findings should nevertheless be interpreted as associations because the data are cross-sectional and questionnaire based.

The main contribution of the study is comparative rather than causal. Four professional driver groups were examined within a common questionnaire framework, and several behavioral dimensions were analyzed simultaneously. This provides a broader descriptive picture than studies restricted to one driver group or one behavioral construct. The study does not, however, establish that any demographic or personality-related factor causes unsafe driving or predicts crashes.

From a practical perspective, the results support the value of considering behavioral characteristics in safety-training and occupational risk-management programs. However, self-reported behavioral scores should not be used as a stand-alone basis for recruitment, licensing, or disciplinary decisions. They are more appropriately used as supplementary information alongside professional driving records, training outcomes, objective safety indicators, and validated psychological assessments.

Table 8 summarizes the principal findings and their practical implications. The implications have been deliberately framed as evidence-informed management considerations rather than prescriptive licensing or recruitment rules.

Table 8. Main findings, research contributions, and practical implications of the present study

Study Findings	Interpretation	Practical Implications
Demographic characteristics significantly influence driving behavior.	Age, education level, and vehicle ownership are associated with differences in behavioral dimensions.	Driver recruitment and periodic evaluations should consider demographic characteristics to improve safety performance.
Personality-related factors affect behavioral dimensions.	Drivers with different personality characteristics exhibit different levels of fatigue, patience, stress, and thrill-seeking behavior.	Psychological assessment should be incorporated into driver selection and periodic health evaluations.

Multiple behavioral dimensions jointly describe driving behavior.	Driving behavior cannot be explained by a single psychological or demographic factor.	Safety management programs should adopt multidimensional assessment approaches.
Behavioral differences exist among professional driver groups.	Different categories of public transport drivers may require different management strategies.	Training programs should be tailored according to the characteristics of each professional driver group.
Integrated behavioral assessment improves transportation safety management.	Simultaneous evaluation of demographic and personality-related characteristics provides more comprehensive evidence for decision-making.	Transportation agencies can use behavioral profiling to design targeted interventions and reduce accident risk.

6. Conclusion

This study examined associations between demographic characteristics and personality-related behavioral dimensions among 678 professional drivers in four occupational groups. Six behavioral dimensions were considered: fatigue, risk identification, calmness, patience, stress, and thrill seeking. The results indicate that age, education, and vehicle ownership are associated with some of these dimensions, although the magnitude and significance of the relationships differ across factors.

The findings support the view that professional driving behavior is multidimensional and cannot be adequately represented by a single demographic or psychological variable. At the same time, the results should not be interpreted as causal evidence. The direction of some behavioral scores also depends on questionnaire coding, so substantive interpretations should be checked against the original scoring key.

A principal contribution of the study is the simultaneous comparison of four professional driver groups using a common analytical framework. This comparative approach can help identify areas where safety training, occupational monitoring, or further research may be warranted. The contribution is empirical and contextual rather than the development of a new predictive or causal model.

For practice, behavioral assessment may be useful as one component of broader safety-management systems, particularly when combined with objective driving records, fatigue-management procedures, training evaluation, and validated psychological instruments. The findings do not justify replacing technical driving examinations or established licensing requirements with questionnaire scores.

Several limitations should be acknowledged. First, the study is cross-sectional and based largely on self-reported responses, which limits causal inference and may introduce response bias. Second, field conditions were not fully standardized. Third, the numerical KMO values and complete factor-loading matrix were not available in the supplied manuscript, and some original correlation coefficients contained transcription errors. Fourth, the sample represents the investigated driver populations and should not automatically be generalized to other regions or occupational groups. Future studies should use longitudinal data, objective driving and crash records, validated psychological scales, and multivariable or structural models to test whether the observed associations remain after adjustment for potential confounders.

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