Comparative Study on Driving Anger Groups: Statistical Analysis of Chinese Drivers

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Abstract. The study investigates driving anger (DA) among Chinese drivers. The author innovatively introduces the driving instructor (DI) as a type of driver into the study of DA in China. Online and offline questionnaire surveys were used to obtain 926 survey responses from China. Descriptive analysis and independent sample T-tests were conducted using SPSS 26.0. The findings of this study show that the DA of professional drivers (PDs) is significantly lower than that of private car drivers (PCDs) (P<0.01). There is no significant difference in DA between male drivers and female drivers. Inexperienced drivers had significantly higher DA than experienced drivers (P＜0.05). Drivers with higher education have significantly higher DA than those with lower education (P<0.01). The author also compared the differences in DA among different driver types in four sub-dimensions: discourtesy, traffic obstruction, slow driving, and illegal driving, and obtained some meaningful findings.

Keywords: Driving anger, group comparison of means, independent sample T test, Chinese drivers, driving instructor

1   Introduction

Road traffic accident is one of the leading causes of casualties. In 2022, China experienced a total of 157.4 thousand car accidents, resulting in over 42 thousand deaths and injuring more than 149 thousand people[1]. More than 90% of traffic accidents are caused by human factors[2], among which driver's aggressive behavior is one of the most common and widely studied human factors. Aggressive behaviors in driving include verbal attacks, physical attacks, and dangerous driving, such as frequently changing lanes, tailgating, sudden braking, and reducing deceleration rates near zebra crossings.

DA is stronger and more frequent feelings of anger experienced in driving than usual[3]. DA leads drivers to exhibit higher risk-taking tendencies, resulting in more dangerous driving[4] and more traffic violations[5]. To quantify DA, Deffenbacher et al. first proposed the 33-item DA Scale (DAS) and a 14-item short version[3]. The DAS uses six reliable subscales, including hostile gestures (HG), illegal driving (ID), police presence (PP), slow driving (SD), discourtesy (DC), and traffic obstruction (TO), to

measure DA and has been widely used worldwide. Chinese scholars found that the scale is not applicable to Chinese drivers and improved it. Cong et al. developed a 10-item scale to measure DA, which include four subscales: DC, TO, SD and ID[6]. Li et al. designed a DAS suitable for truck drivers[7].

The research on DA of different groups is one of the focuses that scholars pay attention to. Scholars found that there were differences in DA among different countries' drivers in both the overall and subscale self-scoring. Gender, age, and driving experience are often used as criteria for dividing driver groups in DA research[8]. However, the research results of different scholars are not consistent. For example, Brandenburg et al. found that gender and age were unrelated to DA[8], while Balzarotti et al. found that drivers of gender, driving experience, and age had different subscale or overall scores for DA[9].

Some researchers divide drivers into PDs and non-PDs[10, 11], while most scholars do not distinguish driver types in study. In Chinese context, Cong et al. studied DA without distinguishing driver types[6]. Feng, Lei, Liu et al.[6] and Li et al.[7]focus on bus drivers and truck drivers, respectively. Feng et al. compared DA among PDs (PDs) and non-PDs and found that non-PDs showed significantly higher self-scoring on the overall DA and on the subscales of TO and DC[11].

In conclusion, DA has been a hot topic of continuous attention from scholars in the fields of traffic safety and psychology for nearly 30 years, and remarkable achievements have been made. However, the author found that there are still two limitations in the field. First, most scholars do not distinguish between types of drivers. Even if some scholars distinguish between PDs and non-PDs, they do not study driving instructors (DIs) as a separate category in DA. Secondly, although there have been some studies on the differences in DA caused by demographic information, there is no widely recognized research conclusion, and research on Chinese drivers is still insufficient. To bridge above limitations, this study innovatively introduces DIs as a category of driver type and compares the DA between DIs, PDs, and private car drivers (PCDs). Furthermore, this study investigates the differences in DA Self-scoring brought by three demographic factors: gender, driving experience, and education of Chinese drivers.

2   Questionnaire Design and Analysis

This section analyzes the sample design, questionnaire distribution, and collection of the study. The sample distribution is analyzed according to driver categories, gender, age, education level, and driving mileage. descriptive statistics in SPSS26.0 is used to analyze the scores of each sub-dimension of driving anger, and the results are compared with previous research findings.

2.1   Questionnaire Design and Survey

The questionnaire consists of two parts. The first part consists of measurement items of DAS, and the second part collects driver's personal information. When selecting DAS, the author referred to the short DAS developed by Deffenbacher et al.[3], as well as the

DAS of Cong et al..[6] Through interviews with 22 drivers, I found that the DAS developed by Cong et al.[6] is more compatible with Chinese drivers. Therefore, the DAS includes 10 items, numbers ranging from DAS01 to DAS10 in this study. All items use a Likert 5-point scale, where 1=not at all angry and 5 = very much angry. The second part of the questionnaire collects information about the respondents' personal data, including driver type, gender, age, education and driving mileage.

The questionnaire survey was conducted from February to March 2022 in China. Two types of questionnaires were distributed: questionnaire on-site of paper and online. The paper questionnaire was distributed through family members contacting freight, passenger transport, taxi, and other companies, as well as driving schools. The online questionnaire was filled out in platform of Sojump. A total of 957 questionnaires were collected. After manually screening out 31 incomplete or identical answer questionnaires, 926 valid questionnaires were obtained, with a validity rate of 96.76%.

2.2   Statistical Analysis of Personal Information of Respondents

The following analysis is conducted for the three types of drivers from four aspects: gender, age, education and driving mileage. The detailed statistical data of the questionnaire is shown in Table 1.

Table 1. Respondents' personal information distribution.

Driver types		DIs		PDs		PCDs		ADs	
categories		Num	Per (%)	Num	Per (%)	Num	Per (%)	Num	Per (%)
Gender	male	288	85.21	346	98.30	133	56.36	767	82.83
	female	50	14.79	6	1.70	103	43.64	159	17.17
Age	≤30 years	77	22.78	44	12.50	82	34.75	203	21.92
	31-40 years	103	30.47	127	36.08	34	14.41	264	28.51
	41~50 years	120	35.50	129	36.65	110	46.61	359	38.77
	＞50 years	38	11.24	52	14.77	10	4.24	100	10.80
Education	junior high school or blow	202	59.76	309	87.78	53	22.46	564	60.91
	junior college or above	136	40.24	43	12.22	183	77.54	362	39.09
driving mileage	≤5000km	144	42.60	143	40.62	169	71.61	456	49.24
	≥200000km	194	57.40	209	59.38	67	28.39	470	50.76

Note: number (Num), percent (Per); all drivers (ADs).

From the perspective of gender, the 926 samples included 767 (82.83%) male drivers and 159 (17.17%) female drivers. The highest proportion of male samples was PDs, accounting for up to 98.30%, followed by DIs, accounting for 85.21%. The proportion of male and female PCDs is close, 56.36% and 43.64% respectively. Because of the high intensity of work and long working times, few women work as PDs or DIs. According to statistics, women accounted for 7.4% of Didi Platform's ride-sharing drivers, and the proportion of long-distance freight female drivers was even lower.

From the age distribution of the sample, drivers concentrate on the age range of 31-50 years old, accounting for 67.28%. Among them, PDs have a higher proportion of 72.73% in this age range, followed by 65.97% for DIs. The proportions of drivers under 31 years old for DIs, PDs, and PCDs are 22.78%, 12.50%, and 34.74%, respectively. The proportion of PDs under 30 years old is 12.50%. In education, 564 drivers (60.91%) have a senior high school diploma or lower, and 362 drivers (39.09%) have a junior college diploma or above. The education of PDs and DIs is lower, of which 87.78% of PDs and 59.76% of DIs have a senior high school education or less. Only 1.70% of PDs have a college degree or higher, while 18.64% of DIs have a college degree or higher. In driving mileage, the overall sample consists of approximately equal numbers of drivers with mileage above 100,000 kilometers and those with mileage below 100,000 kilometers, accounting for 50.76% and 49.24% respectively. Among them, 7.34% drivers have a travel distance of less than 5,000 kilometers. The proportions of PDs, DIs, and PCDs with driving mileage exceeding 100,000 kilometers are 59.38%, 57.40%, and 28.39%, respectively.

2.3   Descriptive Statistical Analysis of DA

Cong et al.[6] classified DAS03, DAS04, and DAS07 as DC, DAS01, DAS05, and DAS08 as TO, DAS06 and DAS09 as SD, and DAS02 and DAS10 as ID. The four-dimensional survey results obtained in this study are compared with the results of other scholars' results shown in Table 2.

Table 2. Comparison of DAS scores among different studies

Studies	Sample	DC	TO	SD	ID	Source
This study	DIs	2.52(0.98)	2.26(0.95)	2.40(0.99)	2.41(1.00)	China
	PDs	2.69(0.96)	1.93(0.70)	2.51(0.84)	2.05(0.76)	China
	PCDs	2.74(0.91)	2.27(0.92)	2.48(0.97)	2.47(0.98)	China
	ADs	2.64(0.96)	2.14(0.87)	2.46(0.93)	2.29(0.93)	China
Feng, Lei, Zhou et al.[13]	ADs	2.12(1.18)	2.76(1.27)	2.03(0.99)	2.69(1.32)	China
Cong et al.[6]	ADs	1.85(1.12)	1.63(1.00)	1.71(0.92)	1.84(0.98)	China
Balzarotti et al.[9]	ADs	3.57(0.73)	3.58(0.08)	2.87(0.07)	3.91(0.08)	Italian
Youssef et al.[5]	ADs	3.34(0.83)	3.39(0.74)	3.01(0.92)	3.62(0.57)	Lebanon

Feng, Lei, Liu et al.[12]	Bus drivers	2.02(0.89)	2.78(0.89)	1.89(0.67)	2.64(0.93)	China
Damjanović et al.[10]	PDs	2.75(0.93)	2.57(1.05)	2.00(0.74)	2.25(1.11)	Serbia
Hussain et al.[14]	taxi drivers	2.09(0.96)	1.99(0.92)	--	1.80(1.04)	Qatar

The mean self-rating scores of drivers for DC, TO, SD, and ID were 2.64±0.96, 2.14±0.87, 2.46±0.93, and 2.29±0.93, respectively. The results are close to those of Feng, Lei, Zhou et al.[13], higher than those of Cong et al.,[6] and lower than the self-scoring of drivers from Italy and Lebanon[9,5]. In terms of PDs' anger self-scoring, this study is close to the survey results of Feng, Lei, Liu et al. on Chinese bus drivers[12], with higher scores in DC and SD, and lower scores in TO and ID. Compared with the PDs living in Serbia[10], the scores are lower except SD. The DC, TO, and ID scores obtained in this study are higher than those of taxi drivers in Qatar[14].

3   Comparative Analysis of Mean Differences in DA

This section compares the mean differences in driving anger and its four subscales according to four criteria: driver type, gender, driving mileage (driving experience), and education. The data processing tool is the independent sample T-test in SPSS 26.0.

3.1   Comparison of Mean Differences Among Driver Type Groups

DA and subscale self-ratings of DIs, PDs, and PCDs are shown in Table 3. The self-score of DA of all drivers is 2.382±0.797. Independent sample t-tests were used to compare the mean differences among DIs, PDs, and PCDs. The results showed that PDs had significantly lower self-score of DA than PCDs (P<0.01). There was no significant difference in self-score of DA between DIs and PDs. There was no significant difference of DA between DIs and PCDs. In four subscales, the self-score of DC of DIs was significantly lower than that of PCDs (P < 0.01), and DIs had a significantly lower self-score than PCDs. The self-scores of TO and ID among PDs were significantly lower than those of PCDs (P<0.001). The results were consistent with those of Feng et al.[11] regarding the self-ratings of PDs and non-PDs in TO, but the finding that PDs had significantly lower self-ratings than non-PDs in driving DC was not supported in this research.

Table 3. DAS grouping statistics of driver types

variables	Driver types	N	Mean	SDS	variables	Driver types	N	Mean	SDS
DC	DIs	338	2.518	0.979	ID	DIs	338	2.408	1.005
	PDs	352	2.688	0.963		PDs	352	2.051	0.764
	PCDs	236	2.736	0.906		PCDs	236	2.470	0.978
TO	DIs	338	2.258	0.950	DA	DIs	338	2.394	0.867

	PDs	352	1.931	0.704		PDs	352	2.297	0.711
	PCDs	236	2.270	0.918		PCDs	236	2.492	0.804
	DIs	338	2.399	0.990		ADs	926	2.382	0.797
SD	PDs	352	2.506	0.835					
	PCDs	236	2.483	0.966					

We can see that the overall self-score of DA among PDs, as well as TO and ID subscales, is lower than that of the other two types of drivers. This may be related to the following two reasons: On the one hand, PDs such as bus drivers and truck drivers are more prone to major traffic accidents caused by the anger. On the other hand, PDs need to obtain qualification certificates before starting their careers and need to regularly receive driving safety training. DIs have a higher tolerance for DC than the other two types of drivers, but there is no significant difference in DA and the other three subscales compared to PCDs. This is not conducive to road driving safety, as the DA of driver coaches may be spread to prospective drivers.

3.2   Comparison of Mean Differences Between Gender Groups

The overall and subscale self-scoring statistics of DA on gender are shown in Table 4. The results of the independent sample T-test analysis showed that there was no significant difference in the overall self-rating of DA between male and female drivers. In terms of subscale, female drivers' ID self-ratings were significantly higher than male drivers ($P<0.05$), which is consistent with the results of Italian driver samples[9]. Furthermore, this study found no significant differences between male and female drivers in self-ratings for DC, TO, and SD. Among them, the self-rating of DC of female drivers was significantly higher than that of male drivers, which was consistent with the results reported by Balzarotti et al..[9]

Table 4. DAS grouping statistics of gender

variables	Gender	N	Mean	SDS	variables	Gender	N	Mean	SDS
DC	female	159	2.727	0.879	ID	female	159	2.456	0.947
	male	767	2.619	0.973		male	767	2.254	0.925
TO	female	159	2.195	0.890	DA	female	159	2.482	0.774
	male	767	2.125	0.866		male	767	2.362	0.801
SD	female	159	2.572	0.943					
	male	767	2.438	0.924					

3.3   Comparison of Mean Differences Among Driving Experience Groups

Drivers with greater driving mileage have more driving experience. In this study, driving mileage was used as an evaluation indicator for driving experience, and drivers were divided into two groups: those with a driving mileage of no more than 100,000 kilometers (inexperienced drivers) and those with a driving mileage of more than

100,000 kilometers (experienced drivers). The overall and subscales self-rating statistics of DA distinguished by driving mileage are shown in Table 5. Further, an independent sample T-test method was used to compare the DA between the two groups.

As can be seen from table 5, The median comparison of overall self-rating scores revealed a significant difference between inexperienced and experienced drivers in terms of DA, with the former scoring higher ($P<0.05$). The comparison of subscale means showed that experienced drivers were significantly lower on DC and SD self-rating than inexperienced drivers ($P<0.01$). In other words, with the increase of driving experience, drivers' tolerance for DC and SD increases, but the tolerance for traffic jams and ID does not change.

Table 5. DAS grouping statistics of driving experience

variables	Driving experience	N	Mean	SDS
DC	inexperienced	456	2.731	0.955
	experienced	470	2.548	0.953
TO	inexperienced	456	2.168	0.902
	experienced	470	2.106	0.837
SD	inexperienced	456	2.550	0.927
	experienced	470	2.375	0.923
ID	inexperienced	456	456	2.320
	experienced	470	470	2.257
DA	inexperienced	456	456	2.444
	experienced	470	470	2.323

3.4   Comparison of Mean Differences on Education

The overall and subscale self-rating statistics of DA according to education are shown in Table 6. Drivers are divided into two groups according to education: junior college or above (high-educated group) and senior high school or below (low-educated group). 564 samples came from the high-educated group, and 362 samples came from the low-educated group. The mean difference comparison analysis shows that the overall DA self-rating of the high-educated group is significantly higher than that of the low-educated group ($P< 0.01$). The independent sample T-test showed that high-educated group had significantly higher self-ratings in the TO ($P < 0.01$) and ID ($P < 0.001$) than low-educated group. There was no significant difference between the two groups in the self-ratings for DC and SD. This may be related to the stronger rule awareness and greater work pressure among higher education drivers.

Table 6. DAS grouping statistics of education

variables	Driving experience	N	Mean	SDS
DC	high-educated	564	2.595	0.964
	low-educated	362	2.705	0.946
TO	high-educated	564	2.065	0.809

	low-educated	362	2.249	0.948
SD	high-educated	564	2.424	0.883
	low-educated	362	2.519	0.994
ID	high-educated	564	2.187	0.858
	low-educated	362	2.446	1.017
DA	high-educated	564	2.320	0.757
	low-educated	362	2.479	0.849

4   Conclusion

Driving anger is an important factor in road traffic safety. This study investigates and statistically analyzes driving anger in the Chinese context. The self-rating scores for driving anger of the samples were 2.382 ± 0.797. The mean self-rating scores of drivers for DC, TO, SD, and ID were 2.64 ± 0.96, 2.14 ± 0.87, 2.46 ± 0.93, and 2.29 ± 0.93, respectively. Independent sample t-tests found that the overall self-rating scores of driving anger, as well as the self-rating scores for TO and ID, were significantly lower for PDs than for DIs and PCDs. DIs only performed better in terms of DC, and there were no significant differences between them and PCDs in the overall self-rating scores of driving anger and the remaining three subscale scores. There were no significant differences in driving anger between male and female drivers, but female drivers had significantly higher self-rating scores for ID than male drivers Drivers with more driving experience had significantly lower ratings in driving anger, as well as the subscales of DC and SD, than drivers with less experience. Drivers with higher education had significantly higher overall self-rating scores for driving anger, as well as higher subscale scores for TO and ID, than drivers with lower education.

This study innovatively introduces DIs as a driver type into the research on driving anger, refining the study of driving anger. In the future, research can be conducted on the relationship between driving anger and dangerous driving among DIs. Practically, government regulatory authorities and related enterprises can adopt targeted measures, such as providing driving safety training, psychological counseling, and training on driving anger-related knowledge, based on the overall and subscale scores of driving anger obtained from this study, to reduce driving anger among driver groups.

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