A Study on the Differences in Driving Skills of Chinese Bus and Taxi Drivers

Zuobo Zhang,1 Xuxin Zhang,2 Nuoya Ji,2 Shanshan Lin,2 Kun Wang,3 Tianshan Ma,1 and Wenyiing Zhu1

1School of Economics and Management, Chang’an University, 710064 Xi’an, Shaanxi, China
2School of Automobile and Traffic Engineering, Hefei University of Technology, 230009 Hefei, Anhui, China
3College of Civil Engineering, Hefei University of Technology, 230009 Hefei, Anhui, China

Correspondence should be addressed to Zuobo Zhang; zzbime@chd.edu.cn

Received 26 March 2019; Revised 10 June 2019; Accepted 5 September 2019; Published 9 December 2019

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.

1. Introduction

The urban public transportation system is an important part of the urban passenger transportation system, and its main means of transport include subways, buses, taxis, and public bicycles. Among these means, buses and taxis are important parts of road passenger transportation, and they are also the most common modes of transport in the urban passenger transportation system. By the end of 2018, China had 673,400 buses that completed 61.7 billion city passenger trips, accounting for 55% of the total passenger traffic, and it had 1,380,900 taxis that completed 35.1 billion city passenger trips, accounting for 28% of the total passenger traffic [1].

Professional drivers constitute an important group of drivers who shoulder the responsibility of safely transporting passengers and cargo. Bus drivers and taxi drivers are an important part of the urban public transport system, and their driving safety affects road traffic safety. Therefore, the purpose of this paper is to explore the differences between bus drivers and taxi drivers in their driving behaviors and driving skills and to predict their traffic accident involvement based on these behaviors and skills. We conducted a field survey of 274 bus drivers and 178 taxi drivers in Hefei, China. The results revealed significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills. Aggression and violations had significant predictive effects on bus drivers’ traffic accident involvement, and memory lapses and a lack of safety consciousness had significant predictive effects on taxi drivers’ accident involvement.
factors related to the linear design of the road also affect the occurrence of accidents. A Danish study used an ordered logistic model to explore the risk factors influencing fatal bus accidents, and the results showed that age, gender, speed, intersection, distraction and risky driving significantly increase the severity of bus accidents [10]. A Chinese study used the same method and found slightly different results, namely, that the season, the accident time, the speed limit and other risk factors have a significant influence on the severity of fatal accidents for different drivers [11]. In terms of the driving behaviors of bus drivers, some Swedish studies use bus drivers' accelerating behavior and absence behavior to predict traffic accidents [12, 13]. In the United States, the frequency of bus accidents is correlated with driver demographics and behavioral characteristics [14]. Shi and Zhang [15] explored the influence of bus drivers' personality traits on their driving behaviors, and the results showed that drivers' altruistic traits were negatively correlated with job burnout and were significantly negatively correlated with abnormal driving behaviors, such as aggressive violations, common violations, error behaviors and lapse behaviors. Useche et al. [16] surveyed 524 Bus Rapid Transit (BRT) drivers in Colombia, and the results of suggest that stress-related working conditions (job strain, social support and ERI) are relevant predictors of risky driving in BRT operators and that fatigue is the mechanism that links another type of stress related to working conditions (job strain and low social support) with risky driving. Tan et al. [17] proposed a comprehensive steering system design aimed at changing bus drivers' fatigue driving behaviors, and the survey results showed that the system was feasible and could effectively reduce the accident rate. Davidović et al. [18] explored the influence of sleep, work and health factors on the fatigue driving of bus drivers and truck drivers. According to van Amelsvoort et al. [19], job strain in public transport drivers is be associated with negative physical (e.g., musculoskeletal and cardiovascular diseases and physical fatigue in general) and mental (e.g., psychological discomfort, sleep problems, and mental fatigue) health outcomes [20, 21].

Research on taxi drivers can be broadly divided into driver decision-making behavior, bad driving behavior, accident rates and risk factors, and driver occupational health. Regarding research on taxi drivers' decision-making behavior, Li et al. [22] analyzed taxi drivers' behavioral preferences in route selection by using taxi track record data. Zhang et al. [23] used evolutionary game theory to explore the influence of passengers on taxi drivers' carpooling detour behavior. In research on taxi drivers' bad driving behavior, risky driving behavior, angry driving, and fatigue driving have been widely studied. In Wuhan, China, a survey among taxi drivers revealed that their attitudes towards traffic law violations affected their risky driving behavior [24]. Sullman et al. [25] found that taxi drivers who exhibited more passive-aggressive driving behaviors were easily distracted and had an increased crash risk. Cheng et al. [26] used an event-related potential (ERP) experiment to explore the differences in risk behaviors caused by impulsion between taxi drivers with traffic violations and those without. Vahedi et al. [27] explored the influence of the social economy, personal attributes and abnormal driving behavior on traffic accidents and traffic penalties. Bao et al. [28] investigated large-scale taxi GPS data to understand the impact of drivers' travel mode on spatial aggregation collision. Sullman et al. [25] used the Driving Anger Expression (DAX) Inventory to explore forms of anger expression in Turkish taxi drivers and their relationship with the drivers' personal characteristics, the results showed that verbal aggressive expression, personal physical aggressive expression, and use of a vehicle to express anger are the three most common forms of anger expression, which are related to age, driving experience, average annual mileage and other factors. Taxi drivers primarily drive in urban road environments with long driving hours and a high mental workload. A survey in Australia found that 67% of taxi drivers drove at least 50 h per week, and the time off in long shifts (up to 12 h) was often as short as 37 min [29]. Many factors contributed to driving fatigue for taxi drivers, among which prolonged driving time was likely to be the most common and important [30]. Meng et al. [31] found that the reason for the engagement in prolonged driving was neither a lack of awareness concerning the serious outcomes of fatigue driving nor poor detection of fatigue. The most probable reason was optimism bias, which led these professional drivers to think that fatigue was more serious for other drivers than for themselves and that they were effective in countering the effect of fatigue on their driving performance. A study of accident rates and risks for taxi drivers, [32] found that in Hanoi, Vietnam, approximately 22.7% of taxi drivers had accidents and that age, the type of driver's license, satisfaction with income, use of a seat belt and past traffic violations all had significant effects on traffic accidents. Ba et al. [33] found that taxi drivers' dangerous driving behaviors were significantly positively correlated with personal injury and collision risk. Estimates of the hybrid bivariate model reveal that increasing levels of fatigue, reckless behavior and aggressive behavior are positively related to a higher propensity for crash involvement [34]. In terms of occupational health, taxi drivers have a higher body mass index (BMI) and more unhealthy eating habits due to the extended hours of driving, this finding confirms previous findings that musculoskeletal problems are common in this occupation [35]. Taxi drivers are vulnerable to other occupational exposures that affect their risk of being involved in road crashes, these exposures include vision defects [36], mental stress [37], irregular shifts [38], lower income [39], and traffic congestion conditions [40].

Bus travel and taxi travel are the two most common modes of urban public transport. In general, in urban bus enterprises, bus drivers need to perform driving tasks according to the requirements of the scheduled departure schedule. Driving a bus is a repetitive and intense task. Drivers need to drive the same route for a long period of time every day, which increases the risk of driver burnout. In the Chinese taxi industry, taxi drivers can flexibly arrange their working hours according to the road traffic environment and the large number of potential factors, and taxi drivers differ significantly in their driving behaviors and driving skills of bus drivers and taxi drivers. (2) Bus drivers and taxi drivers differ significantly in their driving behaviors.
and driving skills. (3) The demographic variables, driving behaviors and driving skills of bus drivers and taxi drivers have a direct impact on their number of accidents. (4) The driving skills of bus drivers and taxi drivers can influence their number of accidents through their driving behaviors.

At present, research on professional drivers mainly focuses on the accident situation as well as drivers’ driving behavior and health conditions in the professional driving context. Additionally, research on different types of driver behavior mostly consists of comparisons between professional drivers and nonprofessional drivers; there is less research on the differences in driving behaviors and driving skills among different types of professional drivers. Since bus drivers and taxi drivers comprise the two largest proportions of professional drivers in the urban public traffic system, their driving behaviors affect residents’ travel safety. Therefore, this study focuses on bus drivers and taxi drivers to examine the differences in their driving behaviors and driving skills and to explore the influence of these behaviors and skills on their traffic accidents.

2. Method

2.1. Participants. A total of 452 drivers, including 274 bus drivers and 178 taxi drivers, participated in this survey in Hefei, China. Hefei, the capital of Anhui province, is one of the typical large cities in eastern China. By 2018, the city had a permanent population of 8,087 million and a total area of 11,445.1 square kilometers. In recent years, Hefei has achieved rapid economic development. Its GDP reached 782.291 billion yuan in 2018, representing an 8.5% year-on-year increase. The urban road public passenger transport system in Hefei is well developed and can meet people’s road traffic needs. Hefei has 4,427 operating buses and 170 routes. In 2015, the bus system covered a driving distance of 205 million kilometers and completed 617 million passenger trips. There are 9,402 taxis in Hefei. Of these, 2,001 taxis from Herui Taxi Company had 1,063 accidents in 2018. Thus far in 2019, taxis have been involved in 747 traffic accidents in which they were equally or primarily responsible, and buses have been involved in 402 traffic accidents in which they were equally or primarily responsible. The above accident data were obtained from the Hefei transportation management department. Among the participants in this survey, the average age of the bus drivers was 39.37 years (S.D. = 8.41), with an average of 14.96 years of driving experience and an average annual mileage of 43,800 km. The average age of the taxi drivers was 43.16 years (S.D. = 6.17), with an average of 16.09 years of driving experience and an average annual mileage of 90,700 km. In addition, the total number of accidents in the past three years was significantly higher for bus drivers than for taxi drivers, but bus drivers had significantly fewer driver’s license penalty points than taxi drivers in the last year. The basic statistical information on the drivers is shown in Table 1.

### Table 1: Participant demographics.

<table>
<thead>
<tr>
<th></th>
<th>Bus drivers (N = 274)</th>
<th>Taxi drivers (N = 178)</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean 39.37 S.D. 8.41</td>
<td>Mean 43.16 S.D. 6.17</td>
<td>26.70</td>
<td>0.000**</td>
</tr>
<tr>
<td>Driving experience</td>
<td>14.96 8.11</td>
<td>16.09 5.59</td>
<td>2.64</td>
<td>0.105</td>
</tr>
<tr>
<td>Average annual mileage (×10^4 km)</td>
<td>4.38 2.65</td>
<td>16.09 5.59</td>
<td>9.07</td>
<td>2.58</td>
</tr>
<tr>
<td>Number of accidents in the past three years</td>
<td>1.44 2.66</td>
<td>0.61 0.96</td>
<td>15.98</td>
<td>0.000**</td>
</tr>
<tr>
<td>Penalty points in the last year</td>
<td>0.50 1.77</td>
<td>3.39 4.53</td>
<td>90.59</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

**p < 0.01.

2.2 Materials. The data used in this study were obtained from field surveys of bus drivers and taxi drivers. The bus driver survey was conducted at the weekly meeting of drivers from six bus companies belonging to the Hefei Bus Group. The questionnaire included questions on the basic statistical information of the drivers, such as their gender, age, driving experience, annual average mileage, number of accidents, penalty points and working hours. In addition, to assess the drivers’ driving behaviors and driving skills, the Driving Behavior Questionnaire (DBQ) (Cronbach’s α = 0.852) and the Driving Skill Inventory (DSI) (Cronbach’s α = 0.750) in Zhang et al. [41], which were translated and revised, were selected, as shown in Tables 2 and 3, respectively. The DBQ contains 17 items, which are divided into four different dimensions: aggression (α = 0.763), violations (α = 0.731), lack of concentration (α = 0.669) and memory lapses (α = 0.644). The DSI contains 15 items, which are divided into three dimensions: safety consciousness (α = 0.819), technical driving skills (α = 0.674) and risk perception (α = 0.700). Before the subjects completed the questionnaire, the experimenters informed them that the survey was completely anonymous, that their personal information would not be collected and that the results of the survey would be used for academic research purposes only. In the process of completing the questionnaire, the drivers could ask questions at any time if there was something that they did not understand, and experimenters provided clarification.

The questionnaire data on the taxi drivers’ driving behaviors and driving skills come from the study by Zhang et al. [41] on taxi drivers. All participants were randomly sampled from three dining centers for taxi drivers (where taxi drivers can stop to rest and have lunch or dinner) in Hefei, China. These data include self-reported basic personal characteristics, driving behavior scores and driving skill scores. The items used to investigate each driver’s behavior and driving skills were chosen from the 27-item DBQ [42] and 29-item DSI scales [43].
Table 2: DBQ used in this study.

<table>
<thead>
<tr>
<th>DBQ-Items (α = 0.852)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1-Aggression (α = 0.763)</td>
<td></td>
</tr>
<tr>
<td>DBQ-6 Become angered by a certain type of driver and indicate your hostility by whatever means are at your disposal</td>
<td></td>
</tr>
<tr>
<td>DBQ-12 Sound your horn to indicate your annoyance to another road user</td>
<td></td>
</tr>
<tr>
<td>DBQ-15 Overtake a slow driver on the inside</td>
<td></td>
</tr>
<tr>
<td>DBQ-10 Become angered by another driver and chase after the driver with the intention of giving him/her a piece of your mind</td>
<td></td>
</tr>
<tr>
<td>DBQ-11 Race away from traffic lights with the intention of beating the driver next to you</td>
<td></td>
</tr>
<tr>
<td>Factor 2-Violations (α = 0.731)</td>
<td></td>
</tr>
<tr>
<td>DBQ-16 Disregard the speed limit on a motorway</td>
<td></td>
</tr>
<tr>
<td>DBQ-2 Disregard the speed limit on a residential road</td>
<td></td>
</tr>
<tr>
<td>DBQ-5 Miss “Give Way” signs and narrowly avoid colliding with traffic that has the right of way</td>
<td></td>
</tr>
<tr>
<td>DBQ-1 Stay in a motorway lane that you know will be closed ahead until the last minute before forcing your way into the other lane</td>
<td></td>
</tr>
<tr>
<td>Factor 3-Lack of concentration (α = 0.669)</td>
<td></td>
</tr>
<tr>
<td>DBQ-13 Misread the signs and exit a roundabout onto the wrong road</td>
<td></td>
</tr>
<tr>
<td>DBQ-14 Drive so closely to the car in front of you that it would be difficult to stop in an emergency</td>
<td></td>
</tr>
<tr>
<td>DBQ-17 Get into the wrong lane when approaching a roundabout or a junction</td>
<td></td>
</tr>
<tr>
<td>DBQ-3 Attempt to overtake someone whom you did not notice was signaling a right turn</td>
<td></td>
</tr>
<tr>
<td>Factor 4-Memory lapses (α = 0.644)</td>
<td></td>
</tr>
<tr>
<td>DBQ-8 Realize that you have no clear recollection of the road along which you have just been travelling</td>
<td></td>
</tr>
<tr>
<td>DBQ-9 Hit something that you had not previously seen when reversing</td>
<td></td>
</tr>
<tr>
<td>DBQ-7 Forget where you left your car in a parking lot</td>
<td></td>
</tr>
<tr>
<td>DBQ-4 Intending to drive to destination A, you “wake up” to find yourself on the road to destination B</td>
<td></td>
</tr>
</tbody>
</table>

3. Results

3.1. Binary Correlation Analysis. Pearson correlation analysis was used to test the correlation between the personal characteristics of the bus drivers and taxi drivers (age, driving experience, annual average mileage, total number of accidents in the past three years and total penalty points in the last year) and their driving behaviors and driving skills. The results, shown in Table 4, show that among the taxi drivers, the total number of accidents in the past three years and the total penalty points in the last year are positively correlated with aggression, violations and memory lapses but negatively correlated with safety consciousness [44]. Among the bus drivers, their personal characteristics are significantly correlated with their driving behaviors and driving skills. Among their personal characteristics, age and driving experience are significantly positively correlated with the bus drivers’ safety consciousness, while driving experience is significantly negatively correlated with memory lapses. The average annual mileage is significantly positively correlated with aggression (r = 0.124, p < 0.05) and risk perception (r = 0.129, p < 0.05). The total number of accidents in the past three years is significantly positively correlated with aggression (r = 0.217, p < 0.01) but negatively correlated with safety consciousness (r = −0.123, p < 0.05). Thus, hypothesis 1 is supported.

3.2. Variance Analysis (Differences in Driving Behaviors and Skills between the Two Types of Drivers). One-way ANOVA was conducted, and the differences in driving behaviors and driving skills between the two different types of professional drivers were evaluated. The results, shown in Table 5, indicate significant differences between the two different types of drivers in violations (F = 6.540, p < 0.05), lack of concentration (F = 6.371, p < 0.05) and technical driving skills (F = 8.517, p < 0.01). Moreover, the average violation and lack of concentration scores of the taxi drivers are higher than those of the bus drivers. At the same time, the technical driving skills of the taxi drivers are also higher than those of the bus drivers. Thus, hypothesis 2 is supported.

3.3. Accident Prediction of Bus Drivers and Taxi Drivers. To explore the influence of the driving performance of taxi drivers and bus drivers on accident prediction, structural equation model analysis is conducted for the two types of drivers. Combined with the above assumptions and analysis, the number of traffic accidents is taken as the dependent variable of the model, and demographic variables, driving behaviors and driving skills are taken as the independent variables included in the model. The corresponding model path is set, and the accuracy of the model is tested by the following evaluation indexes: root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), incremental fit index (IFI) and comparative fit index (CFI). The statistical summary of the goodness of fit of the SEM model is shown in Table 6. The GFI, AGFI, IFI, and CFI values of this model are all greater than 0.90, and the
4. Discussion

In this paper, the driving behaviors and driving skills of bus drivers and taxi drivers were investigated by means of questionnaires with the purpose of exploring the behavioral differences between these two types of professional drivers. The results of the binary correlation analysis of bus drivers' and taxi drivers' personal characteristics and driving behaviors and driving skills show that the average annual mileage of bus drivers is significantly positively correlated with aggression. Bus drivers tend to be bored and listless due to their fixed work routes and long-term, long-distance, repetitive work, which may lead to more aggression, such as frequent honking. Taxi drivers' total number of accidents in the past three years is significantly correlated with violations; however, in this regard, bus drivers do not show a significant correlation. Compared with buses, taxis are smaller in size; thus, it is easier for drivers to change lanes, overtake other vehicles and perform other operations, resulting in an increased frequency of speeding, illegal lane changes and other behaviors. Regarding safety consciousness, with increases in age and driving experience, bus drivers' consciousness of laws and regulations also improves. Safety consciousness, with increases in age and driving experience, bus drivers' consciousness of laws and regulations also improves. The beta coefficient between safety consciousness and memory lapse is not significant, indicating that safety consciousness cannot affect the number of accidents through memory lapse, this finding is contrary to hypothesis 4.

ANOVA of the two types of professional drivers found that the violations, lack of concentration and technical driving skills of taxi drivers were significantly different from those of bus drivers, and taxi drivers' scores were all higher than bus drivers.

RMSEA value is less than 0.05, indicating that the structural equation model constructed is acceptable.

Figure 1 shows that bus drivers' penalty points in the last year and violations have a significant impact on their number of accidents, which confirms hypothesis 3. The beta coefficient shows that violations are more significant than the number of accidents caused by penalty points in the last year. The beta coefficient between safety consciousness and violations is 0.34, indicating that safety consciousness can affect the number of accidents through violations, thus, hypothesis 4 is supported.

Figure 2 shows that bus drivers' driving experience, penalty points in the last year and memory lapse have a significant impact on their number of accidents, which confirms hypothesis 3. The beta coefficient shows that memory lapse is more significant than driving experience and penalty points in the last year. The beta coefficient between safety consciousness and memory lapse is not significant, indicating that safety consciousness cannot affect the number of accidents through memory lapse, this finding is contrary to hypothesis 4.
The results show that drivers who have been more frequently involved in traffic accidents have less awareness of laws and regulations and more memory lapses. In summary, this study used a self-reported questionnaire to investigate the differences in driving behaviors and driving skills between bus drivers and taxi drivers. The results show that the violations and lack of concentration of bus drivers are significantly lower than those of taxi drivers, while the technical driving skills of taxi drivers are significantly better than those of bus drivers. In terms of accidents, aggression and violations significantly predict the occurrence of bus driver accidents. For taxi drivers, both memory lapses and safety consciousness can predict accidents, and safety consciousness can significantly predict the results of accidents.

With regard to bus driver management, to avoid aggression and violations, more effective management measures should be taken to improve drivers' driving safety consciousness. First, it is important to strengthen the regular training and education of drivers and driving behavior interventions to enhance their awareness of safe operation. For example, when individual passengers attack bus drivers through verbal abuse, physical assault and other serious actions that cause harm to public safety, bus drivers should cease driving and notify the police. This is a painful lesson learned from accidents in China. Second, it is important to regularly adjust bus drivers' scores. The results show that taxi drivers have a higher frequency of violations and a lack of concentration than do bus drivers, and their technical driving skills, such as overtaking other vehicles and reacting rapidly, are better than those of bus drivers. Bus drivers drive larger vehicles with more passengers, and buses are equipped with more sophisticated monitoring equipment; these factors may play a supervisory role in drivers' behaviors and decrease the frequency of their violations and lack of concentration. Taxi drivers navigate more diverse daily driving routes and more complex road conditions; thus, they are more experienced in dealing with different traffic environments, which may improve their technical driving skills.

The accident prediction model results of the two types of professional drivers show that for bus drivers, penalty points in the last year and violations play a significant role in predicting the occurrence of traffic accidents, with violations having the most serious impact on traffic accidents. Due to the large size of buses, bad bus-driving behavior has a serious impact on surrounding vehicles. For example, when forcibly changing lanes or illegally overtaking other vehicles, drivers' vision behind the bus is blocked. A reaction that is not made in time can easily cause a collision or rear-ending. For taxi drivers, memory lapses, driving experience and penalty points in the last year can significantly predict the occurrence of traffic accidents. The results show that drivers who have been more frequently involved in traffic accidents have less awareness of laws and regulations and more memory lapses.

In summary, this study used a self-reported questionnaire to investigate the differences in driving behaviors and driving skills between bus drivers and taxi drivers. The results show that the violations and lack of concentration of bus drivers are significantly lower than those of taxi drivers, while the technical driving skills of taxi drivers are significantly better than those of bus drivers. In terms of accidents, aggression and violations significantly predict the occurrence of bus driver accidents. For taxi drivers, both memory lapses and safety consciousness can predict accidents, and safety consciousness can significantly predict the results of accidents.

With regard to bus driver management, to avoid aggression and violations, more effective management measures should be taken to improve drivers' driving safety consciousness. First, it is important to strengthen the regular training and education of drivers and driving behavior interventions and to enhance their awareness of safe operation. For example, when individual passengers attack bus drivers through verbal abuse, physical assault and other serious actions that cause harm to public safety, bus drivers should cease driving and notify the police. This is a painful lesson learned from accidents in China. Second, it is important to regularly adjust bus
standards. Third, we should strengthen the installation of video surveillance in taxis and adopt information technologies to prevent taxi drivers from using mobile phones and engaging in other risk behaviors while driving so that they can concentrate on driving and improve their safety awareness.

For the safety management of the urban public transportation system, the strength that comes from drivers' families is also very important. Chinese people focus strongly on family harmony. Illegal driving behavior not only endangers traffic safety but also negatively affects family harmony. Family members can play a crucial role in urging bus drivers to take adequate rest, maintain a good working mood and stay in good physical condition, which is a neglected part of driver management.

This study contains some limitations. Because there may be a certain level of social desirability bias in the drivers' self-report surveys, there may be some discrepancies between the drivers' responses to the questionnaire items and reality. Future studies may consider incorporating driving simulators to further measure driver behavior and to evaluate the differences between bus drivers and taxi drivers in their driving behaviors and driving skills. In addition, the subjects of this study were limited to bus and taxi drivers in Hefei; thus, the results may not fully represent the driving behavior of all professional drivers in China. Future research may further expand the sample size to explore the behavioral differences of professional drivers in a manner that is more in line with Chinese national conditions.

Figure 2: Taxi driver structural equation model path coefficient.
5. Conclusions

The results of the study show that (a) there are significant differences between bus drivers and taxi drivers in terms of violations, lack of concentration and technical driving skills, and (b) penalty points in the last year and violations can significantly predict the traffic accidents of bus drivers, while memory lapse and safety consciousness can significantly predict the accidents of taxi drivers.

Data Availability

The questionnaire data used to support the findings of this study have not been made available because a confidentiality agreement is signed with the participants during collection process. So the data that has been used is confidential.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References


