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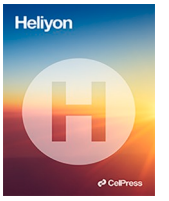

Research article

A comparative analysis of distracted driving behavior among drivers of different income levels: A case study in huainan, China

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ABSTRACT

This research aims to investigate the differences and causes behind distracted driving behavior among drivers with varying income levels. A comparative survey of 1121 drivers in Huainan City, China, was conducted, including 562 drivers from high-end communities representing the high-income group, and 559 drivers from general communities representing the low-income group. Employing social norms, risk perception, and experience as independent variables, the study further examines the role of in-group bias as a mediating variable, with distracted driving behavior serving as the dependent variable, through the construction of two structural equation models for analysis. The study found that among the high-income driver group, in-group bias significantly mediates the impact of social norms, risk perception, and experience on distracted driving behavior; however, this mediating effect is less pronounced in the low-income driver group. This finding is crucial for understanding the potential distracted driving behaviors induced by in-group bias within the high-income driver group and for effectively promoting driving safety. In summary, this research provides new insights into reducing distracted driving behavior among the high-income driver group, thereby enhancing road safety.

1. Introduction

According to data from the World Health Organization, about 1.35 million people die in road traffic accidents worldwide every year, and about 20–50 million people suffer unintentional and non-fatal injuries in road traffic accident [1]. In most countries, approximately 3% of gross domestic product is lost due to the costs that result from these accidents. As a result of the severity of road traffic accidents, road traffic safety has been receiving increasing attention. In China, motor vehicle accidents have been proven to be the main cause of injury and death in road traffic accidents, posing the most serious threat to driving safety [2]. At present, in the academic research on traffic safety, driver's distracted driving behavior has been regarded as a research focus.

Distraction is a diversion of attention from a critical task to another marginal activity through internal (psychological) and external (environmental) factors that affect people's attention [3–5]. Distracted driving is defined as completing a secondary task that diverts or captures attention away from the task of driving [6]. Gazder and Assi [7] noted that distraction can be categorized into three types: manual, visual, and cognitive distractions, all of which are exacerbated by key factors such as inadequate use of information and communication technologies; especially mobile phones [8,9]. At the same time, there are also some "traditional" sources of distraction, such as billboards, road obstacles, adverse weather conditions, and even the inner world of the driver [10,11]. Furthermore, Naumann & Dellinger [12] argue that distraction collisions are most likely to result in fatalities and/or serious injuries, and data supports this.

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For example, in the United States, about 14% of car accidents are caused by distracted drivers, of which 8% are fatal, and the remaining 15% involve seriously injured individuals [13]. Previous studies have found that social norms, risk perception and experience can directly affect distracted driving behavior [14–16]. Some researchers found that there may also be differences in distracted driving behavior among drivers of different income levels. For example, Tison [17] found that drivers in the high-income brackets (with an annual income of $100000 or more), compared to those in the low-income brackets, were more incline to underestimate the risk of distracted driving and were more likely to engage in distracted driving behavior. Li [18] found that compared to low-income drivers, high-income drivers have a lower rate of distraction and are more prone to frequent distractions while driving. The latter might be the reason for their lower distraction rate, as they have become accustomed to driving under distractions and may no longer consider these activities as attention-diverting. However, there is a lack of research on the possible antecedents to explain why high-income drivers are more prone to distracted driving behavior.

Liu et al. [19] and Xiao [20] insisted that it was crucial to explain distracted driving behavior from a social-psychological perspective. In-group bias is a social-psychological phenomenon in which people tend to naturally gather in different groups, either implicitly or explicitly, and their behavior is guided by these groups [21,22]. In Chinese society, face consciousness is widespread, especially for high-income earners. They are passionate about identity consumption and tend to improve their social status by consuming expensive goods such as luxury cars [23]. Luxury car clubs are common in Chinese cities, and these members who drive luxury cars will carry out various online and offline activities with more communications and connections, gradually forming a special and cohesive group. According to social recognition theory, people tend to have expectations about the success or failure of their group, as their self-esteem is closely linked to the performance of the group. Luxury cars with higher prices have better safety performance. When high-income drivers purchase luxury cars, they will become one member of this group, and often believe that their cars perform better than the cheap cars owned by the low-income individuals, and may create discrimination against the drivers in the low-income brackets, finally resulting in in-group bias. In this study, in-group bias refers to the fact that the high-income driver group, mostly owning and driving luxury/expensive cars, usually view the low-income driver group as heterogeneous and may discriminate against the low-income driver group. Lei and Vesely [24] indicate that in cases of income inequality, wealthy individuals tend to trust their group members more after receiving sufficient experience, and their trust in the rich is significantly higher than that of the poor. Accordingly, there were indeed differences in in-group bias among groups with different income levels. Furthermore, Lei and Vesely [24] assumed that poor individuals may not exhibit such in-group bias. However, they have not demonstrated it in detail. Therefore, this study conducts survey research in Huainan, China, introducing in-group bias as a mediating variable, to explain the distracted driving behavior of drivers with different income levels.

Current literatures discussed the mediating effect of in-group bias mainly occurred the medical field, but have not yet explored the distracted driving behavior of different income groups. Researchers have found that risk perception, social norms, and experience have direct relationships with in-group bias [25–27]. Some researchers have also demonstrated that social norms and experience can directly affect distracted driving behavior [14,15]. However, there is currently controversy in academia about the impact of risk perception on distracted driving behavior. Some researchers believed that risk perception has a direct impact on distracted driving behavior [16]. Other studies suggest that risk perception does not directly reduce distracted driving behavior [28–30]. More research has shown that risk perception affects distracted driving behavior through mediating variables [31,32]. In summary, it was assumed that social norms, risk perception, and experience can influence distracted driving behavior through the mediating variable, which is the in-group bias. To verify the above-mentioned assumptions, we designed a comparative survey study, selected driver samples living in Huainan, China, and conducted a structural equation model to explain distracted driving behavior among drivers of different income levels.

The contributions of this article are as follows: (1) The comparative research was introduced to explore whether to explore the group of high-income (or low-income) drivers may develop in-group bias, leading to distracted driving behavior. According to the author's current understanding, there have been no researchers exploring this field. (2) This article introduces in-group bias as an intermediary variable to predict the impact of independent variables on in-group bias, enriching the theoretical framework. (3) The relevant conclusions of this study provide a strong basis for industry management departments to promote the reduction of distracted driving behaviors caused by such psychology.

2. Hypothesis development

2.1. Social norms and distracted driving behavior

Social norms play a major role in how individuals change their behavior because of the influence of those around them; whether an individual adopts a new behavior or not is influenced by others. If the people around a person behave in a certain manner, it is often considered reasonable because the moral standards of most individuals are constantly revised according to the values of the general public [33]. A social norm is defined as an informal and shared rule of behavior that dictates what people should or should not do because of social expectations or underlying social pressure [34]. A social norm (SN) mentioned in this article refers to the cars that people expect to drive, which can fully protect the safety of drivers and allow them to engage in certain distracted driving behaviors. The role of the social norm in the field of driving behavior has been investigated in many disciplines for many years. It has also been proven that social norms based on different reference groups are important social factors that affect an individual's driving behavior change, and certain social norm will directly lead to distracted driving behaviors (such as using mobile phones while driving) [14,15]. In our study, it is believed that social norms implemented by high-income/low-income driver groups affected by special Reference group (such as parents and friends), will force drivers to adopt more distracted driving behaviors Therefore, it is hypothesized that.

H1. Social norms have a significant positive impact on distracted driving behavior.

2.2. Social norms and distracted driving behavior

2.2.1. User experience and distracted driving behavior

People's behavior can be influenced by the user experience. Results from a randomized controlled trial investigating battery-electric vehicle (BEV) adoption intentions showed that user knowledge and purchase intentions could be changed through information about BEVs and an experience (for example, a test drive), and the purchase of a large group of BEVs was largely (11%) increased by including a user experience (for example, a test drive) [35]. The same applies to studies on driving behavior; one survey on how to interact with fully autonomous vehicles showed that as the experience of using cars became more complete, drivers began to shift their primary attention to secondary tasks, giving up more control of the vehicle and engaging in non-driving-related tasks and distracted driving behaviors such as relaxation [36]. In our study, it is believed that the continuous development and improvement of the user experience (UE) of users of their cars will also have a direct impact on driving behavior. A driver who is more inclined to believe that their cars offer a sufficiently safe experience is more likely to pursue such cars, which may lead to more distracted driving behaviors. Therefore, it is hypothesized that.

H2. User experience has a significant positive impact on distracted driving behavior.

2.3. The mediating effect of in-group bias

2.3.1. Social norms and in-group bias

Schiller et al. [27] revealed the link between social norms and the generation of in-group biases. Their results showed that members who violated social norms would be punished upon doing this, resulting in two outcomes: in-group favoritism and out-group discrimination. In our study, this in-group bias is exacerbated by violations of social norms (social norms mentioned in this article refer to the cars that people expect to drive, which can fully protect the safety of drivers and allow them to engage in certain distracted driving behaviors.). The violation of social norms by such groups can lead to greater safety discrimination against members outside the group (safety discrimination refers to the belief that members outside the group have a low level of driving safety, leading to discriminatory psychology). On the contrary, there is more favoritism towards members of the group who violate social norms (favoritism refers to the tendency of drivers within the group to forgive their distracted driving behavior due to their trust in their strong safety protection ability to drive the car). Therefore, it is hypothesized that.

H3. Social norms have a direct positive impact on in-group bias.

2.3.2. Risk perception and in-group bias

Some studies have shown that risk perception is closely related to in-group bias; when a high risk is perceived by an outgroup, the potential outgroup will have an aversion response; because compared with the outside group, the risk of the inside group is lower, which emphasizes the superiority of one's own group over other groups [25,26]. Therefore, it is believed that the same situation may exist in our study. In-group members will perceive safety risks from out-group members to be high. As in-group members trust the protection of their cars, they will reduce their risk perception ability and think that their risk is low, thus strengthening the advantages of the in-group and leading to in-group bias. Therefore, it is hypothesized that.

H4. Risk perception has a direct negative impact on in-group bias.

2.3.3. User experience and in-group bias

According to social identity theory [37], individual psychological discrimination results from different group orientations, and a different group orientation occurs because an individual will separate themself or see themself as a member of a certain social organization to which they are classified. If the individual is cognitively similar to the group members, the individual will gain a sense of satisfaction; the higher the similarity, the more likely individual will continue to maintain or even strengthen their behavior and enhance a sense of identity. However, if the cognition between the individual and the group members is inconsistent, the individual will gain a sense of dissatisfaction. The level of dissatisfaction is related to the intensity of the conflict, and their behavior is then adjusted in order to reduce the dissatisfaction. Therefore, it is believed here that high-income/low-income drivers pursue a unique safety consumption experience, which is conducive to enhancing the cognitive similarity between individuals and group members, strengthening their behaviors to enhance their sense of identity, and may lead to an in-group bias. Therefore, it is hypothesized that.

H5. User experience has a direct positive impact on in-group bias.

2.3.4. In-group bias and distracted driving behavior

Attentional bias has been confirmed by some researchers and leads to distracted driving behavior [38]. Moradi et al. [39] showed that in-group members tended to have some kind of attentional bias; in other words, in-group members are psychologically more inclined to their own group, know that they are a member of a certain group, and have the emotional experience of such a group. Compared with out-group members, individuals pay more attention to the stimuli related to the in-group, and in-group members are given more identification and considered to be more reliable than out-group members. This may also be true in this research; for example, high-income/low-income drivers may pay more attention to their in-group and have a higher level of trust in their cars,

which may lead to distracted driving behavior. Therefore, it is hypothesized that.

H6. In-group bias has a direct positive impact on distracted driving behavior.

The model hypothesis diagram in this study is shown in Fig. 1.

3. Research design and methods

3.1. Procedure

The face-to-face and offline paper questionnaire survey was used to collect survey data in this study and was conducted in Huainan, China from October 2022 to December 2022. We selected high-end communities in the top 5% of real estate prices in Huainan City (including Wanchuang Yuxiangshan, Lvwan Community, Blue Bay, and Guobin Mansion) for our survey, as these areas are predominantly inhabited by high-income drivers. Additionally, we chose general communities priced at the bottom 50% (such as Meiguiyuan, Xiangzhangyuan, and Yinxingyuan), where more low-income drivers reside. This selection strategy aids in the rapid and effective collection of relevant survey data. Fig. 2 is the location map of the study area in Tianjia'an District, Huainan, and Fig. 3 is the specific map of the scope of the study area. Because high-income drivers may also purchase low-end cars, and low-income drivers may also purchase mid-range cars. In order to control the impact of car prices on the survey results, when conducting a questionnaire survey on high-income drivers in high-end communities, drivers are only allowed to fill out the questionnaire when the price of the car they purchased exceeds 400000 yuan; When conducting a survey on low-income drivers in low-end communities, drivers can only fill out the questionnaire when the purchased car price is less than 100000 yuan. (In Chinese society, cars priced above 400000 yuan are generally considered luxury cars; cars priced below 100000 yuan are generally considered low-end cars). After the questionnaire was collected and verified, 10 yuan was paid to the interviewee. In the process of completing the questionnaire, the respondents were provided with relevant guidance by the team leader (university teachers) and members (graduate students) so as to improve the effectiveness of the collection of questionnaire information.

All respondents voluntarily completed the questionnaire anonymously, and 1600 questionnaires were distributed in all (800 questionnaires for high-income drivers living high-end communities and low-income drivers living general communities each). Unqualified questionnaires (such as those with missing questions, the same checked options in the whole questionnaire, the checked options in the whole questionnaire having obvious regularity, and the answering time being too short) were excluded. 1121 valid questionnaires were collected (562 data for high-income drivers living high-end communities and 559 data for low-income drivers living general communities). The effective rate was 70.06%.

3.2. Questionnaire design

In order to meet the goals of this study, two relevant questionnaires were designed and questionnaire surveys were conducted. The two questionnaires are In-group bias questionnaire (IGBQ), Distracted driving behavior questionnaire (DDBQ). In the formal questionnaire, a 5-level Likert scale was used to measure social norms (3 questions), risk perception (3 questions), user experience (3

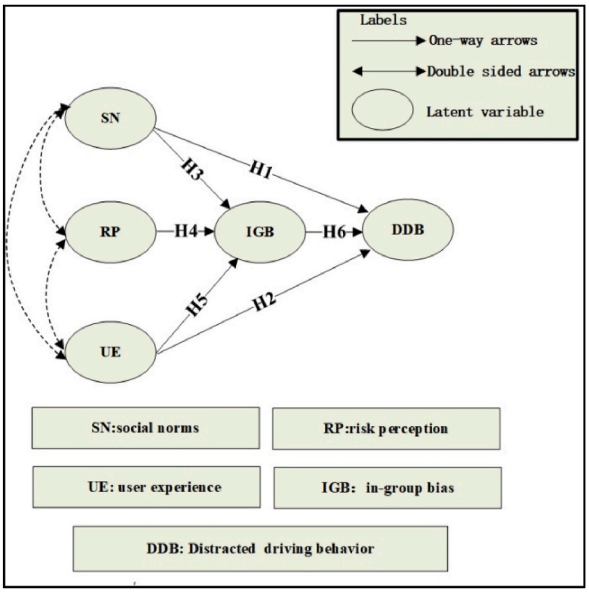

Fig. 1. Model hypothesis diagram in this study.

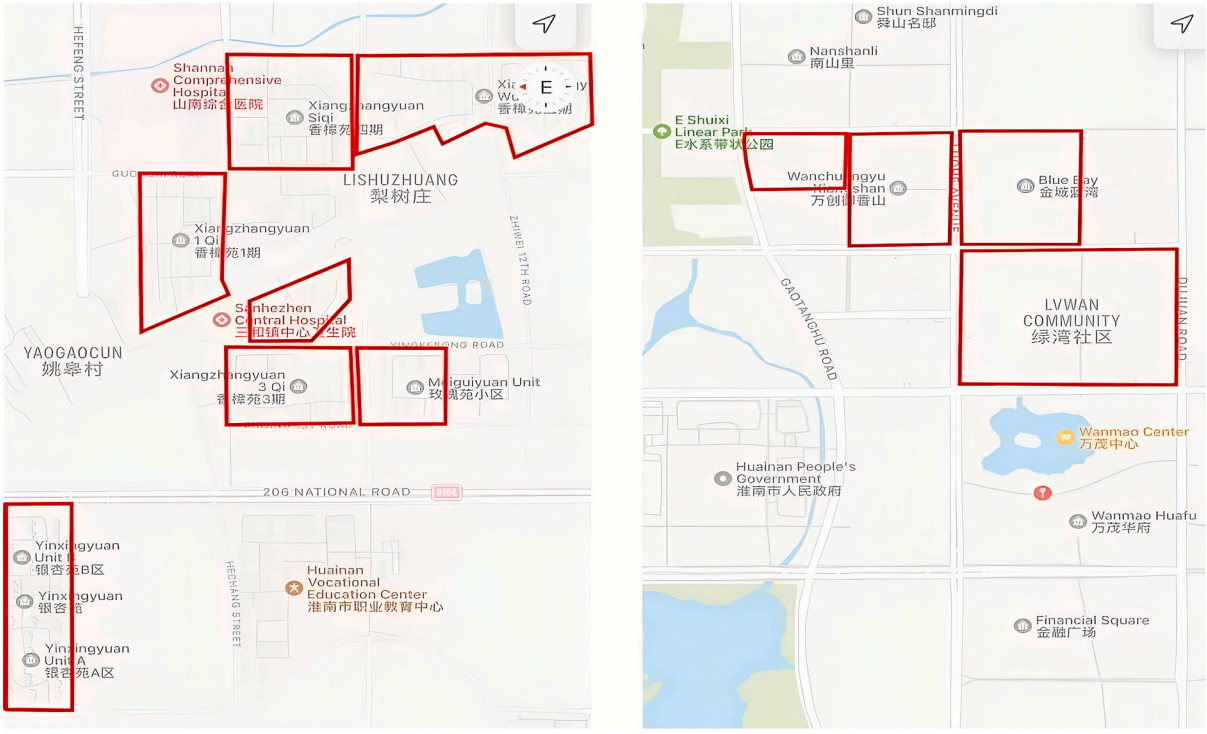

Fig. 2. Location map of the research area in Tianjia'an District, Huainan City.

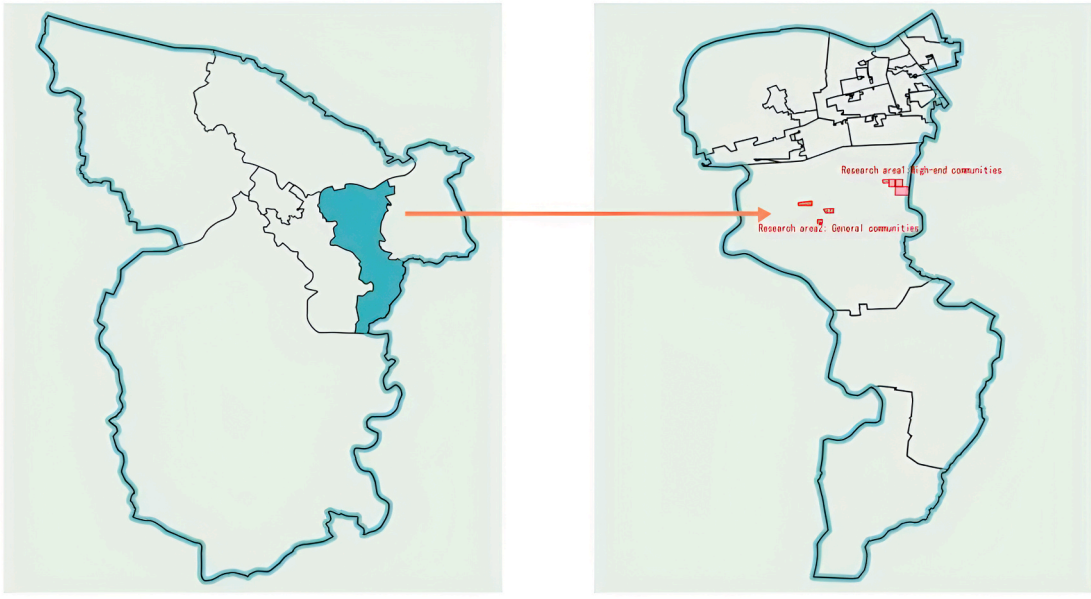

Fig. 3. Specific map of the research area scope.

questions), in-group bias (3 questions), and distracted driving behavior (9 questions), in addition to the five questions concerning basic information. The rating scale includes strongly disagree (1 point), disagree (2 points), unsure (3 points), agree (4 points), and strongly agree (5 points). See Table 1 for details.

3.3. Respondents

The basic information of respondents mainly includes basic information such as the driver's gender, age, education level, monthly income level, and age of driving (see Table 2 for details). In the sample of high-income car drivers living in high-end communities, the proportions of males and females were 49.8% and 50.2%, respectively; the monthly household income level of most households is above 30000 yuan (during the survey, we only selected one representative from each family to fill out the questionnaire). The male and female proportions in the sample of low-income car drivers living in general communities are 46.5% and 53.5%, respectively; the monthly household income level of most households is above 5000 yuan. Participants from both types of driver groups are concentrated between the ages of 25 and 44, with a high level of education, and over 70% have a bachelor's degree or above. Participants ' age of driving is mainly concentrated under 14 years.

3.4. Data analysis

In this study, we meticulously tested the latent factor structure of the questionnaire using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). During the EFA process, we decided to only retain items with factor loadings exceeding 0.4 and ensured that each dimension contained at least three items, following the recommendations of previous research [48,49]. To assess the reliability and internal consistency of the scale, we used Cronbach's alpha values. The results showed that the Cronbach's alpha values for each dimension were above 0.6, indicating the scale has acceptable reliability [50].

Further, we employed the maximum likelihood estimation method to test the fit of the factor structure, using various fit indices for evaluation, including the Chi-Square to Degrees of Freedom Ratio (CMIN/DF), Incremental Fit Index (IFI), Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). According to the general criteria, when CMIN/DF is less than 5, RMSEA is less than 0.08, and both IFI and CFI are greater than 0.90, the model fit is considered good, indicating a satisfactory match between the model and the observed data [49].

To explore the relationships between dimensions, this study applied Pearson correlation coefficients. Moreover, to detect differences in distracted driving psychology and behavior based on demographic information and situational factors, we used t-tests and one-way Analysis of Variance (ANOVA). Data processing was conducted using SPSS 25.0 and Amos 26.0.

In analyzing the complex interactions among variables, this study utilized Structural Equation Modeling (SEM). Based on the theoretical framework illustrated in Fig. 1, the SEM included three exogenous variables: Social Norms (SN), Risk Perception (RP), User Experience (UE), and two endogenous variables: In-Group Bias (IGB) and Distracted Driving Behavior (DDB). Fit indices including CMIN/DF, RMSEA, IFI, and CFI were also used to assess the acceptability of the hypothesized model, ensuring the model was well-established and suitable for further analysis.

4. Results

Figs. 4 and 5 show a summary of IGBQ and DDBQ results for high-income and low-income drivers, respectively.

Table 1
The following table lists the questionnaire items in this study.

Latent Variable	Observed variable	Source
In-group bias questionnaire (IGBQ)		
Social norms (SN)	SN1: The people around me highly expect me to trust the safety performance of my car	[40]
	SN2: People who are important to me expect me to believe in the safety performance of my car.	[40]
	SN3: If I trust the safety performance of my car and pay for it, my close friends and family will appreciate it.	[40]
Risk perception (RP)	RP1: I think with the protection of my car, the possibility of injury to me from the accident is very small.	[41]
	RP2：In the event of a personal accident, my car is sufficient to avoid the serious consequences of the accident.	[41]
	RP3: I′ m not worried about the potential impact of my car on safety, because it's safe enough.	[42]
User experience (UE)	UE1: Based on my driving experience, I am very satisfied with the safety performance of my car.	[43]
	UE2: Based on my driving experience, my car can help me drive safely.	[43]
	UE3: Based on my driving experience, my car makes it easy to drive safely.	[43]
In-group Bias (IGB)	IGB1: I will have absolute recognition of the safety performance of my car, because I am a member of the group that pursues my car.	[44]
	IGB2: When the safety performance of the out-group's car is poor, I become more safely hostile to that group.	[44]
	IGB3: I will firmly believe that I belong to my driver group, and refuse to communicate with people outside the group.	[44]
Distracted driving behavior questionnaire (DDBQ)		
Distracted driving behavior (DDB)	DDB1：eating/drinking	[45]
	DDB2：making/accepting phone calls	[45]
	DDB3：read or send text messages or e-mails.	[45]
	DDB4: interacting with children in the back seat	[46]
	DDB5：Change CDs, DVDs, tapes	[47]
	DDB6：Use smartphone for driving directions	[47]
	DDB7：Communicating with other passengers	[29]
	DDB8: Use portable music player with speakers	[29]
	DDB9: Unable to concentrate on driving due to navigation system operation	[29]

Table 2
Sample features (N=N1+N2 = 1121).

High-income drivers (N1 = 562)				Low-income drivers (N2 = 559)			
Feature	Category	Frequency	Percentage (%)	Feature	Category	Frequency	Percentage (%)
Sex	Male	280	49.8%	Sex	Male	260	46.5%
	Female	282	50.2%		Female	299	53.5%
Age/years	18–24	94	16.7%	Age/years	18–24	100	17.9%
	25–44	392	69.8%		25–44	390	69.8%
	45–64	68	12.1%		45–64	39	7.0%
	>64	8	1.4%		>64	30	5.4%
Age of driving/years	<4	364	64.8%	Age of driving/years	<4	377	67.4%
	4–14	160	28.5%		4–14	169	30.2%
	≥15	38	6.8%		≥15	13	2.3%
Monthly household income level/ yuan	≤30000	82	14.6%	Monthly household income level/yuan	≤5000	78	14.0%
	30001–50000	230	40.9%		5001–8000	130	23.3%
	50001–100000	166	29.5%		8001–12000	208	37.2%
	≥100001	84	14.9%		≥12001	143	25.6%
Education level	Junior high school and below	14	2.5%	Education level	Junior high school and below	13	2.3%
	Senior high school	48	8.5%		Senior high school	78	14.0%
	Junior college	104	18.5%		Junior college	78	14.0%
	Bachelor's degree	246	43.8%		Bachelor's degree	273	48.8%
	Master 's degree and above	150	26.7%		Master 's degree and above	117	20.9%

4.1. Reliability and validity analysis

4.1.1. Reliability test

In this study, the internal consistency method was used to test the reliability of the measurement of the variables, and the reliability of the questionnaire items was analyzed. The Cronbach's Alpha reliability coefficients of the measured variables are all higher than the acceptable value of 0.6, indicating that the scale has high reliability. (The Cronbach's Alpha for the IGBQ questionnaire is 0.708; the Cronbach's Alpha for the DDBQ questionnaire is 0.922)

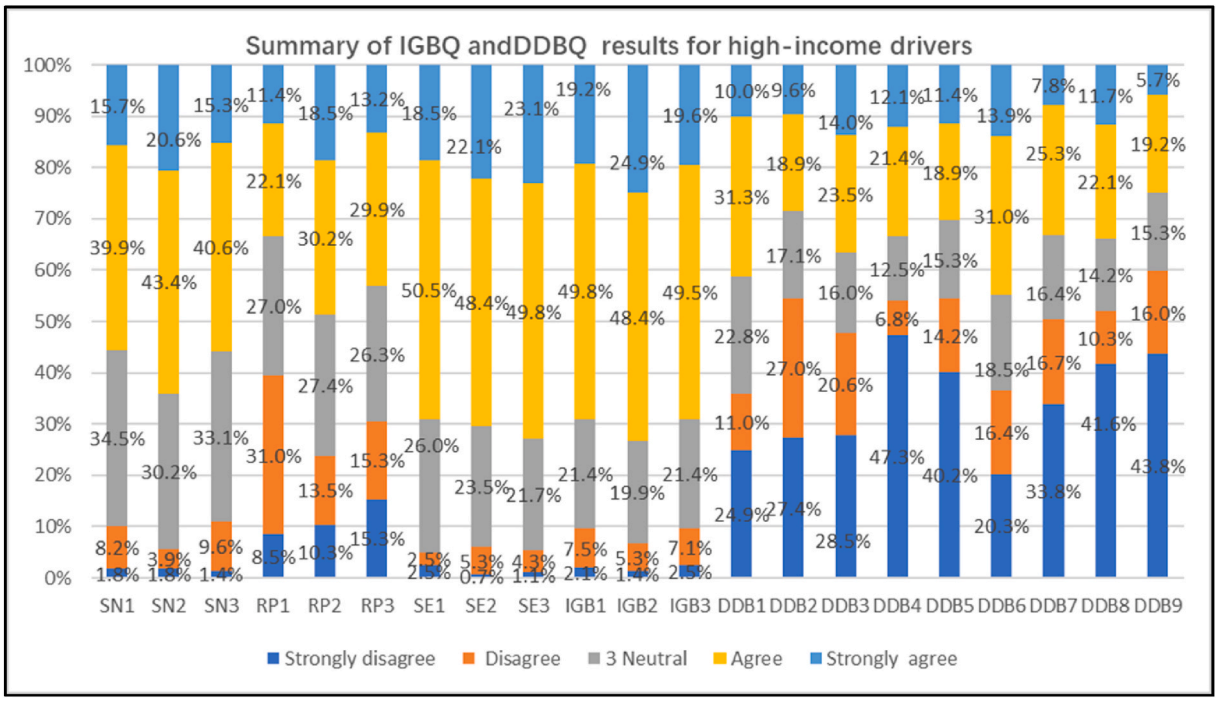

Fig. 4. Summary of IGBQ and DDBQ results for high-income drivers.

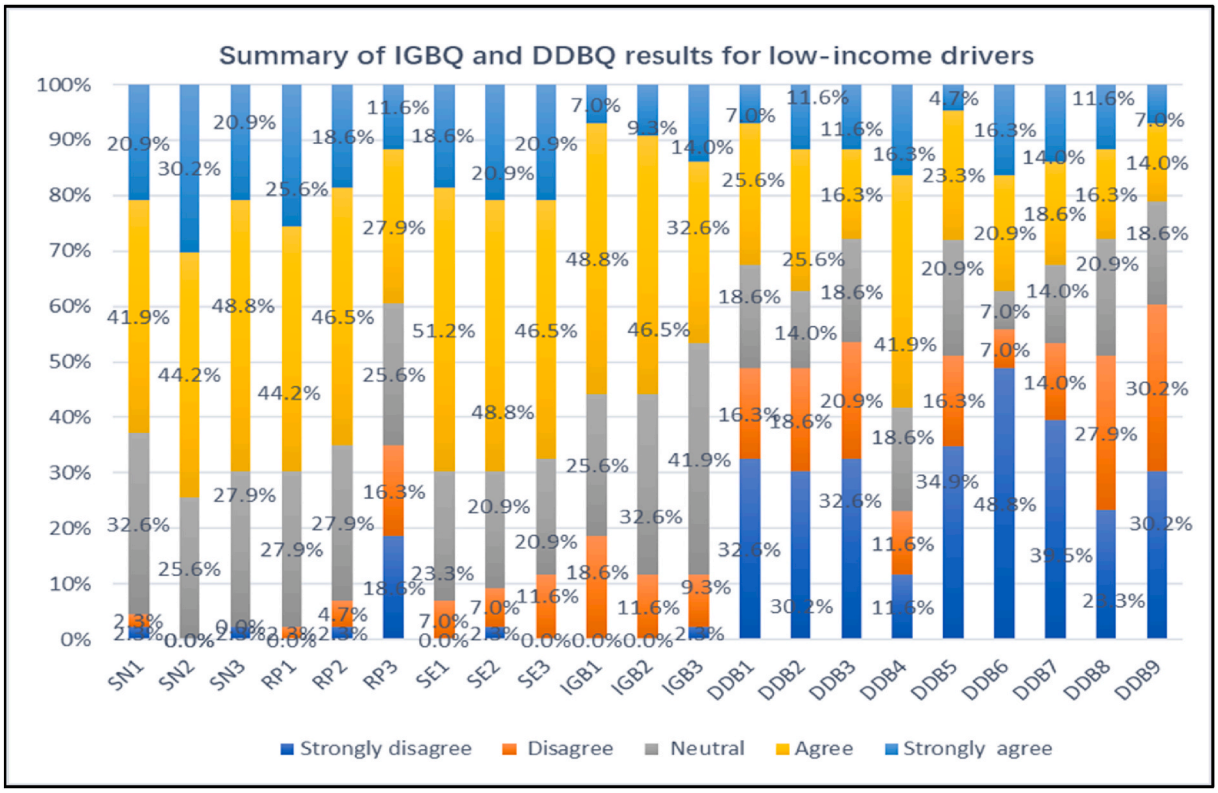

Fig. 5. Summary of IGBQ and DDBQ results for low-income drivers.

4.1.2. Validity test

Validity is the degree to which the measurement results reflect the expected content, which can be divided into content and construct validity. In order to ensure that the scale meets the content validity requirements, the author referred to a large number of survey theories and literature, and fully considered the real situation. The questions in the questionnaire were consistent with the indicators. In this study, a factor analysis was used to analyze the construct validity of the scale, respectively using the KMO and Bartlett sphericity tests. The results showed that the KMO value of the IGBQ questionnaire was 0.827, indicating that the sample size meets the requirements and the data were suitable for factor analysis. The significance level value of Bartlett's sphericity test was $P = 0.000 < 0.01$, indicating that the relationship between the original variables was significant, and scale data were suitable for factor analysis.

In conclusion, the questionnaire has good reliability and validity and can be effectively used in investigation and research.

Table 3
Correlation between dimension.

High-income drivers					
	SN	RP	UE	IGB	DDB
SN	1				
RP	−0.190**	1			
UE	0.556**	−0.105	1		
IGB	0.463**	−0.128*	0.563**	1	
DDB	0.205**	0.017	0.186**	0.278**	1
Low-income drivers					
	SN	RP	UE	IGB	DDB
SN	1				
RP	0.519**	1			
SE	0.618**	0.363**	1		
IGB	0.022	−0.519**	0.618**	1	
DDB	0.299**	0.344**	0.262**	0.297**	1

4.2. Correlation analysis

Pearson correlation analysis was used to test the correlation of each dimension, and the results are shown in Table 3. The results of the group of high-income car drivers elated with IGB and DDB; (3) IGB were positively correlated with DDB; and (4) RP was negatively correlated with IGB. The results of the group of low-income car drivers showed that (1) SN was positively correlated with DDB; No correlation between SN and IGB (2) UE was positively correlated with IGB and DDB; (3) IGB were positively correlated with DDB (4) RP was negatively correlated with IGB; RP was positively correlated with DDB.

4.3. Difference analysis of demographic factors

4.3.1. Demographic differences about high-income drivers

By employing t-tests and one-way Analysis of Variance (ANOVA), we meticulously examined the demographic differences within the high-income drivers. The analysis revealed that there were no significant statistical differences between in-group bias and factors such as gender and age of driving within the high-income drivers. Similarly, no significant differences were found in distracted driving behavior in relation to gender, monthly household income level, and driving age. However, a significant difference was observed in the psychology of in-group bias relative to the monthly household income level ($F(3,561) = 4.391$, $p < 0.05$, $\eta^2 = 0.031$), indicating notable differences in in-group bias among high-income drivers with different income levels.

Moreover, a significant relationship between distracted driving behavior and age was identified ($F(3,561) = 6.711$, $p = 0.000$, $\eta^2 = 0.035$), highlighting significant differences in distracted driving behavior across different age groups within the high-income driver cohort. This result emphasizes the importance of the age factor in influencing distracted driving behavior, suggesting that preventive measures against distracted driving should consider age differences among drivers.

These findings provide deep insights into the internal differences within the high-income driver group, especially regarding in-group bias and distracted driving behavior. Identifying the key factors influencing these differences offers valuable information for the design and implementation of targeted intervention measures. The specific statistical data and analysis results are displayed in Fig. 6, serving as a basis for further discussion and analysis.

4.3.2. Demographic differences about low-income drivers

Through t-tests and one-way Analysis of Variance (ANOVA), this study analyzed demographic differences within the low-income drivers. The analysis results revealed a significant difference in distracted driving behavior in relation to household monthly income level ($F(3,558) = 34.677$, $p = 0.000$, $\eta^2 = 0.059$). This indicates that low-income drivers with different household monthly income levels exhibit significant differences in distracted driving behavior. However, no significant differences were found between in-group bias, distracted driving behavior, and other demographic variables such as age and gender within the low-income driver group. The details are shown in Fig. 7.

4.4. Structural equation model analysis

4.4.1. Structural equation model analysis about high-income drivers

Using AMOS 26.0, a model was constructed to examine the mediation of in-group bias in distracted driving behavior among high-income drivers, as depicted in Fig. 8. The model demonstrates a good fit with the data (CMIN/DF = 2.326, RMSEA = 0.069, IFI = 0.911, CFI = 0.910), and the path relationships and their significance are detailed in Table 4.

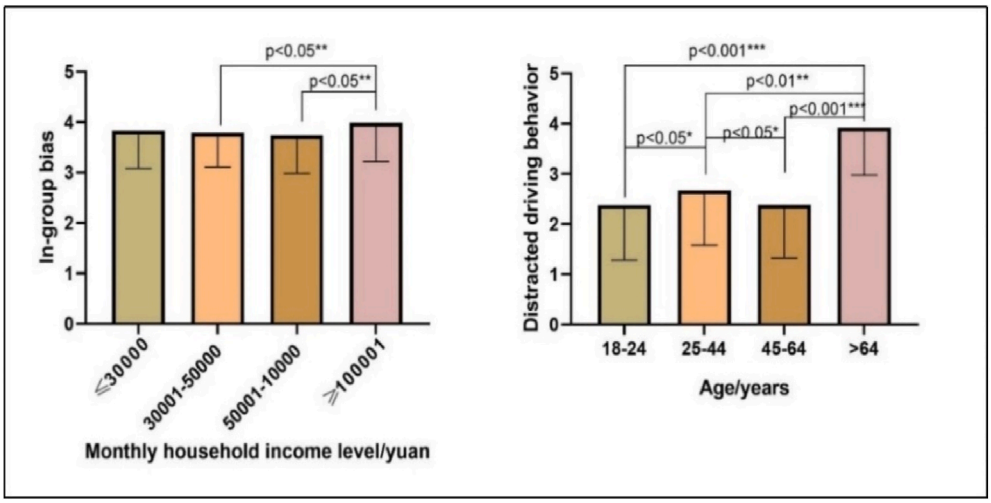

Fig. 6. T-test and ANOVA results for demographic differences analysis of high-income drivers.

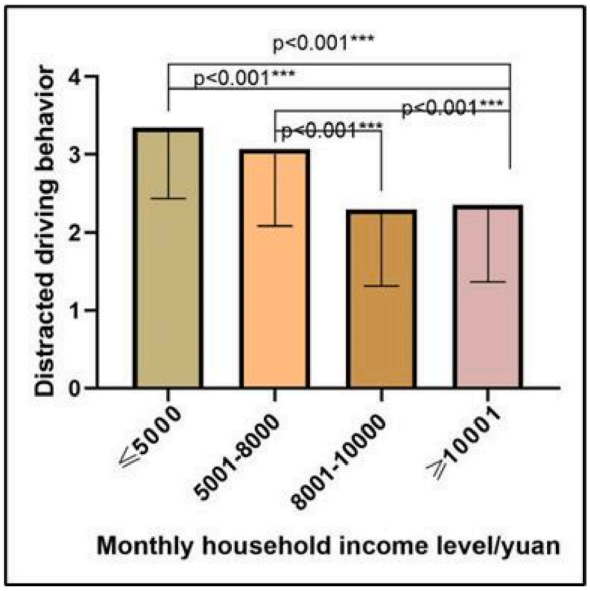

Fig. 7. T-test and ANOVA results for demographic differences analysis of low-income drivers.

The analysis revealed that SN have a significant positive effect on IGB ($\beta = 1.050$, $p < 0.001$), indicating that the more the high-income drivers adheres to social norms, the stronger their in-group bias becomes. This suggests that when social norms are violated, the group is more likely to tolerate distracted driving behaviors among its members, leading to increased safety discrimination against those outside the group.

RP significantly negatively impacts IGB ($\beta = -0.297$, $p < 0.01$), implying that perceiving lower safety risks from one's own car strengthens the in-group bias among high-income drivers.

UE has a significant positive influence on IGB ($\beta = 1.768$, $p < 0.001$), showing that the better the user experience provided by high-end cars to high-income drivers, the stronger their in-group bias.

Furthermore, SN significantly positively affects DDB ($\beta = 2.888$, $p < 0.01$), suggesting that following social norms more closely makes high-income drivers more prone to distracted driving behaviors.

IGB significantly positively influences DDB ($\beta = 2.167$, $p < 0.01$), indicating that the stronger the in-group bias within the high-income driver group, the higher the frequency of distracted driving behaviors.

Lastly, UE significantly positively impacts DDB ($\beta = 4.434$, $p < 0.01$), meaning that the better the user experience their own car provides to high-income drivers, the more susceptible they are to engaging in distracted driving behaviors.

4.4.2. Structural equation model analysis about low-income drivers

A model was developed using AMOS 26.0 to explore the mediation of in-group bias in distracted driving behavior among low-income drivers, as shown in Fig. 9. The established model demonstrates a good fit with the data (CMIN/DF = 2.595, RMSEA = 0.075, IFI = 0.896, CFI = 0.895).

The analysis shows that Social Norms (SN) significantly positively influence Distracted Driving Behavior (DDB) ($\beta = 2.178$, $p < 0.01$), indicating that the more closely high-income drivers follow social norms, the more likely they are to engage in distracted driving behaviors.

User Experience (UE) also has a significant positive effect on DDB ($\beta = 3.735$, $p < 0.001$), meaning that the better the user experience provided by their own vehicle to high-income drivers, the more frequent the occurrence of distracted driving behaviors.

However, the path from "SN to In-Group Bias (IGB)" is not significant ($p = 0.383$), the path from "UE to IGB" is not significant ($p = 0.777$), the path from "Risk Perception (RP) to IGB" is not significant ($p = 0.677$), and the path from "IGB to DDB" is not significant ($p = 0.864$), indicating that in the model for low-income drivers, in-group bias does not significantly mediate the relationship between social norms, user experience, risk perception, and distracted driving behavior.

The model fitting results suggest that in the study of distracted driving among low-income drivers, the mediating effects of social norms, risk perception, and experience on the relationship of in-group bias with distracted driving behavior are not significant. Therefore, it can be inferred that the difference in distracted driving behavior between high-income and low-income drivers is primarily due to the variations in in-group bias between the two groups.

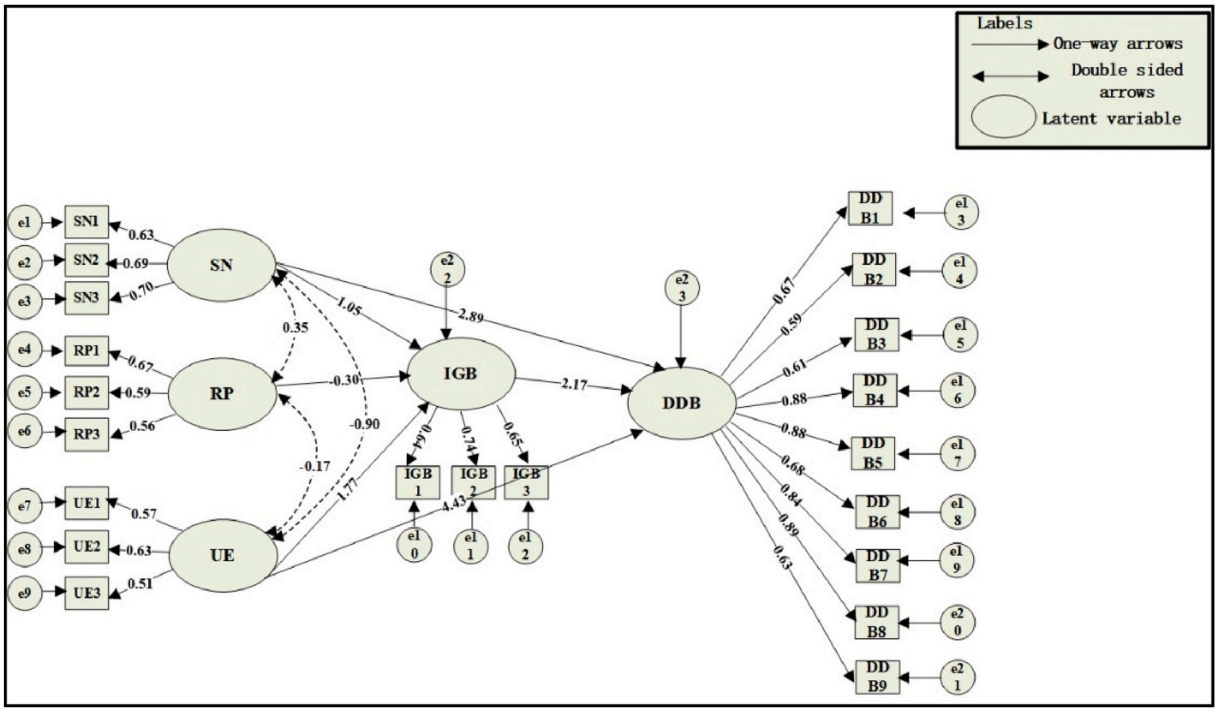

Fig. 8. Structural equation model analysis among high-income drivers.

Table 4
Path effect relationships among independent variables, mediating variables, and dependent variable.

Path			Estimate	P
Structural equation model analysis among high-income drivers				
IGB	←	SN	1.050	***
IGB	←	RP	−0.297	0.006**
IGB	←	UE	1.768	***
DDB	←	IGB	2.167	0.012**
DDB	←	SN	2.888	0.001**
DDB	←	UE	4.434	0.003**
DDB	←	UE	4.434	0.003**

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, $p > 0.05$ indicates no significant path relationship.

5. Discussion

5.1. Theoretical significance

In previous studies, most research has confirmed that compared to low-income driving groups, high-income driving groups are more prone to distracted driving behaviors. However, few studies have explored the reasons for this difference. This article delves into this issue.

Firstly, many scholars have studied the direct impact of social norms and user experience on driving behavior, which is unrelated to income level. This is consistent with our comparative study results of low-income and high-income driver groups. That is, the distracted driving behavior of different income driver groups is influenced by social norms and user experience. Secondly, through comparative research, it was found that the mediating role of in-group bias in distracted driving behavior is not significant within the low-income group, while it is significant in the high-income group. Therefore, we understand that the difference in distracted driving behavior between high-income and low-income driver groups may be due to the role of in-group bias. In existing driving behavior research, there is little study on the impact of in-group bias on distracted driving behavior. Cruwys et al. [51] believe that shared group membership and the resulting trust may play a role in promoting risky behaviors. In other words, team members may sometimes lead us to make more dangerous behaviors. Therefore, we believe that in-group bias also affects distracted driving behavior. Lei and Vesely [24] pointed out that in the case of income inequality, the rich tend to trust their group members more after gaining enough experience, and their trust in the rich is significantly higher than that of the poor. Therefore, there are indeed differences in in-group bias among different income level groups. In addition, Cruwys et al. [51] and Lei and Vesely [24] jointly proved that there are differences in

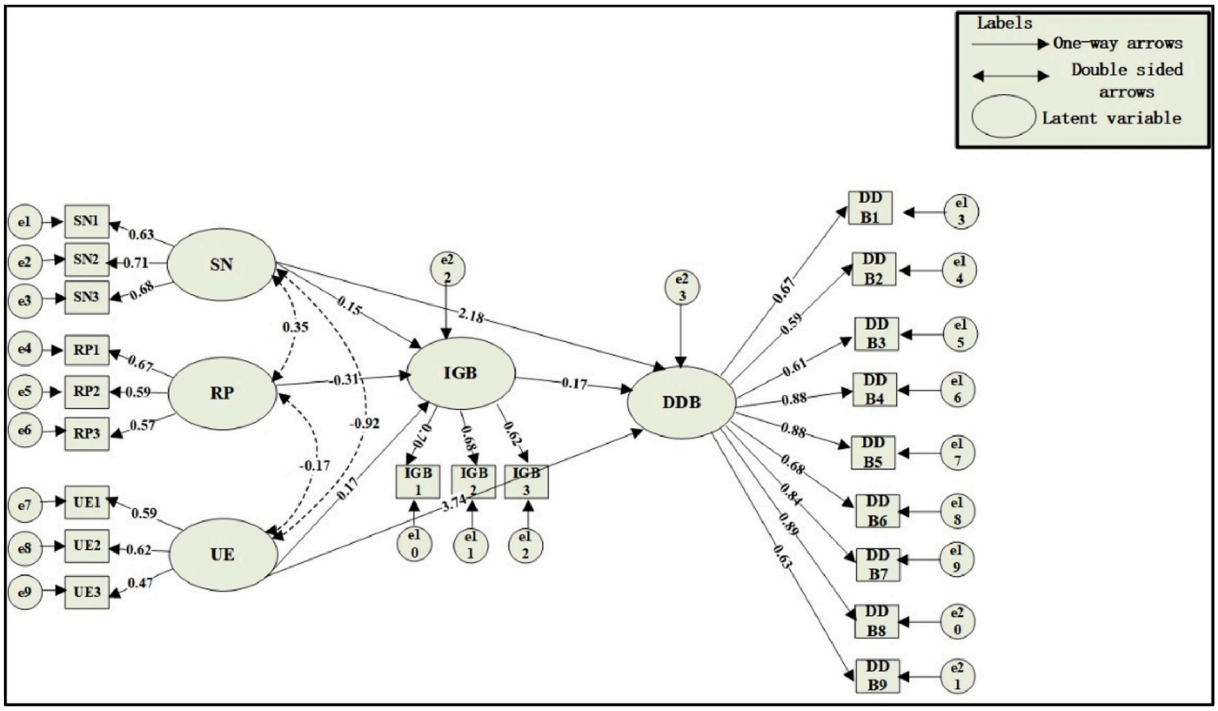

Fig. 9. Structural equation model analysis among low-income drivers.

in-group bias among different income groups, and in-group bias has an impact on risky behaviors. This is very similar to our research results, which further confirms that the difference in distracted driving behavior between high-income and low-income driver groups is due to the difference in in-group bias.

Furthermore, this study also found that in terms of demographic variables, there is a significant difference in the psychology of in-group bias between high-income car drivers and their family monthly income level. There is a significant difference between the high-end community group with a family monthly income of more than 1,000,001 yuan and the high-end community group with a family monthly income of 30,001–50,000 yuan and 50,001–100,000 yuan. Boonmanunt and Meier [52] showed that in-group bias in cooperation and regulatory enforcement only exists in situations with less economic constraint. This is consistent with our research results. In addition, we also found significant differences between the car driver group living in high-end communities and their distracted driving behavior. Haerani et al. [53] showed that age is a key factor affecting drivers' driving behavior. This is partially consistent with our research results. There is a significant difference between the family monthly income level and distracted driving behavior of the low-income driver group. This is similar to Tison's study [17].

5.2. Limitations of the study and further research

There are several limitations in this research that merit attention. Initially, the issue of an inadequate sample size is apparent. The investigation was limited to drivers within the Huainan region of China, which restricts the generalizability of the sample. Furthermore, this study predominantly utilized self-reported measures as its research instrument. This approach makes the data vulnerable to social desirability bias, meaning participants' assessments could be influenced by their desire to be perceived favorably, which in turn may affect the objectivity of the data. Additionally, the exploration into the variance in distracted driving behaviors among different income groups of drivers could also be impacted by various other factors, such as stress, yet this study focused exclusively on in-group bias. These areas present significant challenges and should be the focus of further research. Moreover, given that this study was conducted in Huainan, China, cultural differences may limit the applicability of its findings in other regions. As such, it is recommended that future research efforts should be expanded to include a variety of geographical areas to broaden the relevance of the results.

6. Conclusions

In this study, a comparative survey was conducted among 1121 drivers, including 562 high-income drivers and 559 low-income drivers, to investigate the reasons behind the differences in distracted driving behavior between high-income and low-income drivers in Huainan city. Questionnaire data were collected and analyzed using Structural Equation Modeling (SEM), which confirmed the questionnaire's acceptable internal consistency structure, adequately reflecting drivers' in-group bias and distracted

driving behavior during the driving process. The SEM results indicated that for the high-income driver group, social norms, risk perception, and experience significantly influence distracted driving behavior through the mediation of in-group bias. Conversely, in the low-income driver group, the mediating role of in-group bias between social norms, risk perception, experience, and distracted driving behavior was not significant. Furthermore, both high-income and low-income drivers are directly influenced by social norms and user experience, leading to an increase in distracted driving behavior. This study provides insights into the impact on driving behaviour, emphasizing the need for targeted interventions to address distracted driving across different income groups.

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Ethical approval

This study was conducted according to the requirements of the Ethical Code of Counseling and Clinical psychology and the Chinese Psychological Society. The protocol has been approved by Health Association and the Ethics Committee of the School of Economics and Management of Anhui University of Science and Technology. All subjects have given written informed consent according to the Declaration of Helsinki. All materials and procedures are safe for participants.

Researchers participating in psychological experiments have a responsibility to protect the life, health, dignity, integrity, autonomy, privacy, and confidentiality of personal information of the research subjects. They also have a responsibility to provide special protection for vulnerable populations based on the characteristics of the research subjects.

The main survey method adopted in this paper is questionnaire survey, which does not involve psychological experiment. Therefore, when conducting questionnaire survey, we have obtained the oral consent of the respondents during the survey, agreeing to publish the data in this paper.

Data availability statement

The data associated with my study has not been deposited into a publicly available repository. Data will be made available on request.

CRediT authorship contribution statement

Jichao Geng: Writing – review & editing, Supervision, Conceptualization. **Junan Yu:** Writing – original draft, Software, Methodology, Formal analysis. **Junqi Zhu:** Validation, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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