Analysis of Psychological Factors Affecting Drivers' Driving Safety and Countermeasures

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Abstract: Road traffic safety has become an important social issue that many countries around the world urgently need to address. Accident causation theory shows that road traffic accidents are more caused by the interaction of people, vehicles, and roads, among which human factors play a key role. Drivers' internal psychological activities largely determine their driving behavior. Therefore, analyzing drivers' psychology helps to understand their behavioral logic and provide guidance for improving traffic safety. This paper adopts the questionnaire survey method, takes drivers' psychological state as the starting point, explores the bad psychological factors affecting driving safety, analyzes their impact combined with cases, and puts forward targeted countermeasures.

Keywords: Drivers; Driving safety; Psychological factors; Countermeasures

1. Introduction

With the development of social economy, the popularization of cars as a means of transportation has brought convenience, but also accompanied by safety risks [1-5]. Globally, road traffic accidents cause about 1.19 million deaths and 20 million to 50 million non-fatal injuries every year. More than half of the deceased are vulnerable road users such as pedestrians and cyclists. Road traffic injuries are the leading cause of death for people aged 5-29, and the working-age population aged 18-59 accounts for two-thirds of the total deaths [6]. It is worth noting that 90% of road traffic accident deaths in the world are concentrated in low- and middle-income countries, although these countries account for only about 60% of the world's vehicle ownership [7-9].

As the largest developing country, China also faces a severe situation in road traffic safety [10-15]. According to the statistics of the Ministry of Public Security's traffic management, by the end of 2024, the number of motor vehicles in China had reached 453 million (including 353 million cars), and the number of motor vehicle drivers was 542 million (including 506 million car drivers). In 2024, 35.83 million new motor vehicles and 22.26 million new drivers were added. In the same year, 61,703 people died and 250,000 were injured in traffic accidents in China. On average, 1 person died from a car accident every 7 minutes and 1 person was injured every half a minute [16]. Compared with 2021, the number of deaths increased by more than 5,000, and while the total number of deaths decreased, the mortality rate per 100,000 people continued to rise, with the number of road traffic deaths ranking second in the world. Therefore, reducing traffic accidents is a social issue of global

concern and an important subject that needs to be tackled with scientific and technological progress [17].

2. Research process

2.1. Preparation work

2.1.1. Research objectives

Collect first-hand data through questionnaires and interviews, analyze the common psychological states behind unsafe driving behaviors from the dual perspectives of drivers and traffic management personnel, summarize key psychological factors, explore their impact on traffic safety with case studies, and propose improvement measures to reduce accidents caused by psychological factors.

2.1.2. Research subjects

The research subjects are drivers and traffic management personnel in Jiaozuo City, Henan Province. Questionnaires are used to understand drivers' self-perceived psychological states and evaluations, while interviews are conducted to sort out the adverse psychological factors affecting driving safety from the perspective of traffic management personnel.

2.2. Compilation of questionnaires

2.2.1. Clarify "drivers" and "psychological factors" as core concepts, focusing on the impact of psychological states during driving on traffic safety.

2.2.2. Decompose "psychological factors" into dimensions such as attention, emotion, will, motivation, consciousness, and attitude to construct the questionnaire framework.

2.2.3. Transform psychological dimensions into specific psychological states (e.g., fluke mentality, arrogance, carelessness) and design behavioral options in different driving scenarios for drivers to match their own states.

2.2.4. The questionnaire consists of three parts

drivers' basic information, driving behaviors and psychological performance, and personal opinions.

2.2.5. The final version is determined after multiple rounds of review and revision by instructors (see appendices for the questionnaire and interview questions).

2.3. Implementation of the research plan

2.3.1. The research scope is Jiaozuo City, with a focus on private car drivers and taxi drivers.

2.3.2. A research team is set up to carry out questionnaire surveys and interviews, with research locations including Wanxin Mall, Longyuan Lake, Shanyang Mall, and Modern Street.

2.3.3. 225 valid questionnaires are collected. The data is classified, sorted, and statistically analyzed to ensure the information is systematic and organized, laying a foundation for subsequent research.

3. Statistical analysis of survey results

3.1. Basic information of drivers

Among the 225 valid questionnaires, 67.7% were male and 23.3% were female. The age distribution was balanced: 33.3%

were aged 18-25, 24.4% were 26-35, 24.4% were 36-45, and 17.8% were 46-60. In terms of driving experience, 32.2% had less than 1 year of driving experience, 14.4% had 1-3 years, 14.4% had 5-10 years, 21.1% had 3-5 years, and the remaining had more than 10 years of experience. Regarding educational background, the majority had a university/college degree (50%), while primary school, junior high school, senior high school, and postgraduate or above accounted for 6.7%, 14.4%, 17.8%, and 11.1% respectively (this distribution may be related to the high proportion of internet users in the survey sample).

3.2. Survey on driving behaviors and psychology

- Daily Driving Duration: 57.8% of drivers drove 1-2 hours per day (inclusive, mostly office workers), 27.8% drove 2-4 hours, and 14.4% drove more than 5 hours (**Figure 1**).
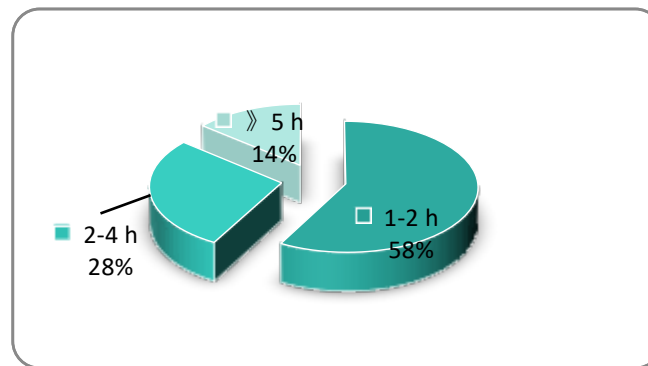

Figure 1. Average daily driving time of the surveyed drivers

- Traffic Violations: Only 30% had never violated traffic rules, 25.6% violated them occasionally or frequently, and 5.5% were rarely penalized after violations.
- Impact of Emotions: 92.2% believed that emotional changes had a significant or moderate impact on driving safety. When experiencing emotional fluctuations, drivers might engage in dangerous behaviors such as unstable steering (40%), wrong gear shifting (50%), forgetting to use turn signals (60%), and mistakenly stepping on the clutch/accelerator/brake (50%), which pose obvious safety hazards.
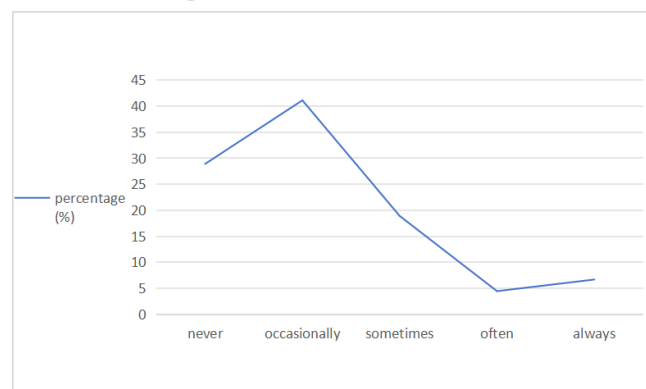

Figure 2. Behavioral manifestations of driver's emotional fluctuations

- Psychological Tension: Most respondents believed that tension affects driving behaviors, manifesting as frequent gear shifting, sudden acceleration/braking, and frequent mirror checks, which threaten safety.
- Speeding Behavior: 28.9% had never speeding, 60% speeding occasionally or sometimes, and 11.1% speeding frequently or always. Among the reasons for speeding, 60% were due to being in a hurry, while others included pursuing "style," "showing off," or seeking excitement (reflecting a competitive or arrogant mentality).
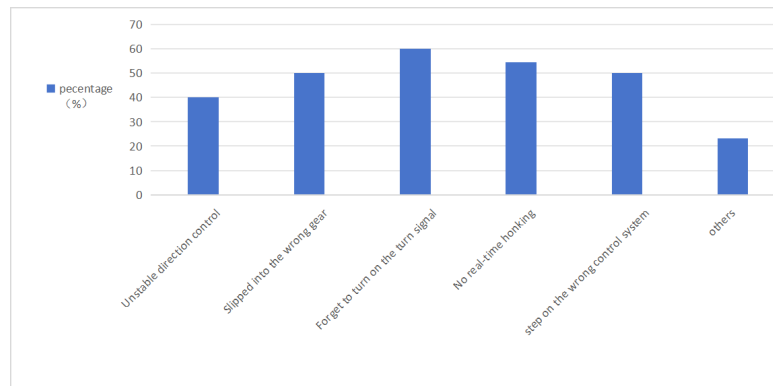
Figure 3. Frequencyofspeeding

- Coping with Traffic Jams and Cutting-in: 70% chose to wait patiently or adjust their waiting based on the situation during traffic jams, while 30% changed lanes or overtook due to profit-seeking psychology. When encountering others cutting in, 30% remained patient, and 70% showed anger (e.g., honking, blaming, or closing the distance tightly).
- Yielding When Meeting oncoming Vehicles: Approximately half of the drivers were unwilling to yield, citing reasons such as impatience to rush (60%), belief that the other party would yield (51.1%), and reluctance to show weakness.
- Mistakes on Familiar Roads: 63.3% had made mistakes on familiar or well-conditioned roads, mostly due to a careless mentality (overconfidence in driving skills or road safety), indicating the need to guard against "carelessness on familiar roads."

In summary, the negative psychological factors affecting driving safety mainly include fear, fatigue, carelessness, and competitiveness, suggesting that psychological quality education should be strengthened in driver's license examinations.

3.3. Discussion on survey results

Based on a systematic analysis of driving behavior data, nine types of adverse psychological factors show significant universality among drivers. Their impact on driving safety is not isolated; instead, they form a chain of systemic risks through the accumulation of long-term psychological inertia. The following is a detailed explanation from the perspective of their formation mechanisms and risk-inducing paths:

Fluke psychology: The cumulative reinforcement effect of risk miscalculation. The essence of fluke psychology is a cognitive bias towards the probability of traffic risks, and its formation mechanism stems from the experiential reinforcement of short-term violations without punishment. The risk-inducing characteristics of such psychology are as follows: each "lucky escape" reduces risk sensitivity, turning illegal behaviors from tentative adventures into habitual actions, and ultimately exceeding the safety threshold.

Arrogant psychology: Cognitive blind spots under the cover of technical confidence. Arrogant psychology is prominent among drivers with a certain length of driving experience. Its core feature is the overestimation of one's own driving skills and the selective rejection of external risk warnings. The danger of this kind of psychology lies in equating "no accident record" with "risk immunity", ignoring the restrictive effect of environmental variables on driving behavior, and easily losing the opportunity to avoid dangers due to empirical dogmatism in complex scenarios.

Lax psychology: The negative correlation between environmental familiarity and inattention. Most drivers have made operational errors on familiar roads. The underlying mechanism is the misallocation of attention resources caused by "environmental sense of security". Unlike active risk-taking, the paralysis mentality manifests as passive negligence resulting from an elevated threshold for risk perception, which significantly narrows the window for handling emergencies.

Impatient psychology: Inhibition of rational decision-making under time pressure. The intensity of impatient

psychology is positively correlated with driving duration and task urgency. Some drivers have behaviors such as "forced lane changing in congested environments". Psychological studies have confirmed that the impatient state will inhibit the risk assessment function of the prefrontal cortex, leading the decision-making model to tilt towards "priority to short-term gains", forming a vicious circle of "time pressure - radical operation - accident risk".

Competitive psychology: Risk confrontation behavior driven by social comparison. Among some young male drivers, there exist dangerous driving behaviors dominated by a competitive mentality, which are specifically manifested in confrontational operations such as "speed racing" and "lane grabbing". Such behaviors essentially alienate driving activities into a game field for social ability, resulting in the occupation of road condition perception resources by competitive goals and a significant decline in the sensitivity of identifying dangerous signals.

Entrustment psychology: The deadlock of road right game caused by responsibility externalization. Some drivers have a preset cognition of "the other party giving priority to avoidance" in the scene of meeting vehicles, which is essentially a psychological evasion of road right responsibility. The risk-inducing logic of this kind of psychology is: by completely transferring the responsibility of safety decision-making to others, a deadlock of "no one takes the initiative to avoid danger" is formed, eventually exceeding the spatial fault tolerance threshold.

Profiteering psychology: The lack of safety elements in cost-benefit accounting. The driving factors of profiteering psychology include economic benefits (overloading, speeding to save fuel) and time benefits (improvement of transportation efficiency). The decision-making defect of this kind of psychology is: stripping the safety cost from the benefit accounting model, falling into the irrational trap of "increasing marginal benefits - surging risk costs".

Performance psychology: The rule suspension effect in social scenarios. Some young drivers have the behavior of "showing off driving skills when carrying passengers", which essentially is the temporary suppression of safety rules by the need for social recognition. Studies have shown that performance psychology can activate the brain's reward circuit, significantly raising the risk aversion threshold, leading to the implementation of high-risk operations that are usually avoided.

Sulking psychology: Behavior derailment caused by emotional out of control. Most drivers will feel angry when encountering conflict events such as "cutting in line", and some will implement retaliatory driving behaviors. Neuroscience research has confirmed that the angry state will overactivate the amygdala, inhibit the prefrontal control function, significantly increase the rate of decision-making errors, and show significant resistance to external intervention.

4. Countermeasures to improve drivers' driving safety

4.1. Establish a hierarchical and progressive safety culture cultivation system

The core goal of safety culture construction is to realize the transformation of "safe driving" from being regulated by others to being practiced by oneself, which needs to be implemented through a three-stage path: cognitive reconstruction-emotional resonance-behavioral solidification.

Cognitive level: Precision risk cognition intervention

Design differentiated educational content for different groups: For new drivers, focus on analyzing the "cumulative risk effect of fluke psychology" in combination with the characteristics of the high-incidence period of accidents among new drivers; For experienced drivers, strengthen the "hidden hazards of the paralysis mentality" with the common law that accidents on familiar roads account for a high proportion as evidence. Cooperate with driving training institutions to develop a "psychology-accident correlation map", establish the corresponding relationship between nine types of bad psychology and typical accident types, and simulate the accident evolution process of psychological mistakes through VR technology to deepen the cognitive construction of "psychology determines behavior".

Emotional level: Scenario-based empathy experience design

Carry out the "accident witness narrative project", and establish the value connection between "safe behavior and family responsibility" through the statements of drivers who caused accidents due to bad psychology about the consequences.

Set up "traffic safety experience halls" in communities and transportation enterprises, and use simulation equipment to reproduce the psychological-physiological related states such as "blurred vision after drinking" and "delayed reaction due to fatigue" to enhance drivers' embodied cognition and empathy ability for risks.

Behavioral level: Community-based norm formation mechanism

Promote the construction of "safe driving communities" to suppress fluke, profit-seeking and other psychology through peer supervision; Add a "psychological quality assessment module" to the driving test system, and include emotional management and emergency decision-making into the qualification standards. Establish a "safety points system" to incentive drivers with long-term non-violation records, forming a reinforcement cycle of "safe behavior - positive feedback".

4.2. Establish a full-cycle psychological quality intervention mechanism

In view of the dynamic changes in drivers' psychological state, build a closed-loop management system of "pre-job screening- on-the-job monitoring- post-job repair".

Pre-job stage: Psychological adaptability assessment system

Introduce the "driving psychological quality scale" into driver training, identify high-risk groups with high irritability tendency and strong aggressive characteristics through scenario simulation tests, and implement targeted emotional management training. Add "pressure tolerance assessment" for professional drivers, establish a post psychological competence model, and avoid mismatching between high-pressure posts and personnel with low psychological adjustment ability.

On-the-job stage: Dynamic psychological state monitoring

Deploy intelligent vehicle-mounted monitoring systems: Identify impulsive behavior patterns such as "sudden steering" and "hard braking" through steering wheel operation sensors, triggering voice warnings; Use visual recognition technology to capture fatigue or paralysis characteristics such as "frequent blinking" and "distraction from lowering head", and activate seat vibration early warning. Transportation enterprises set up full-time "psychological counselors" to regularly carry out group counseling and individual interviews, and timely ease negative emotions such as anger and impatience caused by family conflicts and work pressure.

Post-job stage: Post-accident psychological reconstruction plan

Implement "psychological traceability analysis" for accident drivers, distinguish the causal weight between technical errors and psychological errors, and correct cognitive biases such as fluke and arrogance through professional psychological counseling. Establish "accident driver mutual aid groups" and use narrative therapy to promote the transformation of traumatic experience, prevent operational withdrawal caused by "post-accident fear" or risk escalation caused by "breaking the pot", and rebuild confidence in safe driving.

4.3. Innovating the content and carrier forms of safety publicity

Break through the limitations of traditional "slogan-style publicity" and build a new publicity system featuring "precision reach, immersive experience, and interactive participation".

Content Innovation: Constructing story-based risk narratives

Produce a series of micro-documentaries on "accidents caused by psychological errors" to analyze the evolutionary trajectory of accidents triggered by different negative psychological states. Launch a topic collection on "practical guides for psychological adjustment" on short-video platforms, encouraging drivers to share experiences such as "emotion management in congested environments" and "skills to cope with road rage," thereby forming a user-generated content communication matrix.

Carrier Innovation: Building scenario-based information penetration networks

Set up "psychological prompt systems" at high-frequency contact points such as gas stations and parking lots. For instance, push suggestions on reasonable rest for drivers with fatigue psychology; display conversion information between

"rush driving and accident handling time" for those with impetuous psychology. Develop a "psychologically adaptive broadcasting function" for navigation software, which triggers targeted safety reminders when passing through accident-prone sections.

Method Innovation: Designing interactive participation experiences

Develop an "H5 psychological challenge system" that simulates conflict scenarios to test drivers' response patterns and generate personalized "emotion management prescriptions." Organize "family safety contract" activities, where drivers and their families jointly sign safety agreements to strengthen the supervisory role of social support networks, thereby building a collaborative safety guarantee mechanism involving "individuals, families, and society."

Through the above multi-dimensional measures, full-process intervention in drivers' psychological factors can be realized, fundamentally blocking the transformation path from negative psychology to dangerous behaviors, and promoting a strategic shift in road traffic safety governance from "post-accident disposal" to "pre-accident prevention."

Disclosure statement

The author declares no conflict of interest.

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