



# Analysis of Influencing Factors of Traffic Safety and Countermeasures

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**Abstract.** With the continuous development of China's expressways and cities, the number of cars began to increase rapidly, and traffic accidents also increased year by year. As a major issue in today's society, it has an extremely important influence on economic development and social stability. The number of deaths caused by road traffic accidents has ranked first among those caused by unnatural factors. In particular, the high number of major traffic accidents has brought great threats to the economic development of society and people's living and working in peace and contentment, and affected the image of the government and social stability to a certain extent. First of all, in this paper, among these four kinds of factors, the human factor is the most important and significant. After all, the main body of road traffic is people. Therefore, the last four factors of the paper are the analysis of people, cars, roads and environment. Finally, a summary is made and corresponding countermeasures are put forward.

**Keywords:** traffic accidents · Traffic safety · Countermeasure research · driver

## 1 Introduction

The purpose of road safety research is mainly to count and analyze the occurrence, process and results of safety problems, and to effectively control the flow of people, cars and goods on the road, so as to realize the dynamic balance of the traffic system. Whether in developing countries or developed countries, it is of great significance to study traffic safety. Ensuring the safe driving of automobiles should be the fundamental goal pursued by people, especially the road traffic safety situation in developing countries is extremely severe, so it is of great importance and urgency to study road traffic accidents. Road safety research is a systematic project, involving many disciplines. This requires relevant researchers to have extensive knowledge reserves and theoretical basis. Relevant knowledge bases include: automobile engineering, road engineering, traffic psychology, behavior, meteorology, statistics and corresponding computer knowledge.

## 2 People and Road Traffic Safety

### 2.1 Driver's Characteristics

Driver's visual characteristics: vision. In traffic environment, vision is divided into dynamic vision and static vision. Visual acuity is related to people's age and relative speed. In general, when the speed of relative object increases or the driver's age increases, the dynamic vision will decrease. Static vision has nothing to do with people's age and the degree of motion of objects. It is the general state of people looking at things. Vision. When a person looks at a given target with both eyes, the range that can be seen on both sides of the gaze point is called the field of vision. It is divided into static field of vision and dynamic field of vision. When the head is fixed with the eyeball, the scope of seeing at the same time is called static field of vision; When the head is fixed and the eyeball is free to rotate, the range of vision at the same time is called the moving field of vision. The driver's field of vision is related to his own speed. As the speed increases, When the gaze point moves forward, the field of vision narrows, forming tunnel vision [1].

Reaction time refers to the time from stimulation to reaction. Perception and behavior process caused by stimulation of external factors. It includes four different psychological activities: perception, identification, judgment and reaction [2].

Psychological characteristics of drivers: Not everyone has the psychological conditions suitable for driving. Among drivers, there are always some people who are more likely to have traffic accidents than others, so it is very necessary to evaluate the psychological characteristics of individuals. These evaluation indicators include: feeling and perception. Feeling is the simplest psychological reaction of the driver, Generally speaking, it is the basis of forming various complex psychological processes. Personality and mood. Different types of drivers' personalities will lead to different ways to deal with problems. For example, when encountering unexpected situations, some drivers are very cautious, some careless, some decisive in dealing with traffic accidents, some hesitant, some pay great attention to traffic safety awareness, and some don't care. The driver's emotional factors will also affect the driving situation. Whether they are in a happy mood or in a concentrated state will affect the driver's ability to work [3].

### 2.2 Characteristics of Other Traffic Participants

The traffic characteristics of pedestrians are determined by the psychological characteristics of pedestrians, mainly as follows:

The main basis for pedestrians to decide whether to start crossing the road is the distance between themselves and approaching vehicles. According to the survey, if the speed is 30–39 km/h, the average distance between pedestrians and approaching vehicles is 45 m when they start crossing the road; When the vehicle speed is 40–49 km/h, the average distance is 50 m [4].

Riders often have the following psychology: timidity, luck, exclusion, transcendence and going it alone. Because cyclists are afraid of electric cars, they often feel timid during cycling. Because cyclists don't have a cab and a helmet, they are weak in traffic, so the closer they are to the motor vehicle, the faster the motor vehicle is, and the more afraid they are [5].

There are also many occasions for lucky psychological performance. For example, when turning from alleys and branch roads to streets, they don't slow down, but suddenly jump out, often riding while watching the fun. There are also many places where the psychology of exclusion is manifested, such as knowing to obey the traffic rules but not obeying them, taking people, carrying heavy objects and going downhill at high speed during cycling, etc. Because the bicycle is small and flexible, convenient and labor-saving. It is very convenient for people who arrive at their destination within a certain time. Therefore, except for the elderly and women, ordinary cyclists have the mentality of racing for time and competing for each other. Bicycle is a vehicle that is ridden by one person. Often, cyclists will have the psychology of going it alone, and there are many occasions for performance, such as multiple cars driving on the same road, and cyclists interspersed back and forth. From the slow lane to the fast lane, from many places to few places, especially at intersections without traffic police management [6].

### 2.3 Human Behavior and Road Traffic Safety

Drunkenness means that the alcohol content in blood is greater than or equal to 80 mg/100 ml after drinking, that is, the alcohol content in 100 ml blood of vehicle drivers is 80 mg or more, while drinking means that the alcohol content in blood is less than 80 mg/100 ml [4]. According to calculation, 80 mg/100 ml is equivalent to 3–2 low-alcohol liquor or 2 bottles of beer. No matter whether it is drunk driving or drunk driving, it is extremely dangerous and not allowed, and the consequences are self-evident.

Fatigue driving refers to the fatigue caused by the driver's continuous driving for a long time. Actually, there are many factors that cause fatigue, including life (such as sleep, environment), society (such as interpersonal relationship, salary, work attitude) and work (such as the environment inside and outside the car, operating conditions). Among them, lack of sleep, long driving time, Social psychological factors have the greatest influence on driving fatigue.

Overspeed means that the speed of the vehicle exceeds the speed allowed by certain road conditions, rather than simply driving at high speed. Speeding will bring a lot of harm, which can be summarized as follows: it will affect the driver's operation stability, and easily lead to tire puncture, brake failure and other failures; It is easy to cause accidents such as collision and rollover, and most of them are vicious incidents; When speeding, the driver is extremely nervous, consumes a lot of mental and physiological energy, and is prone to fatigue. Affect the timeliness and accuracy of driver operation; When driving in a curve, the higher the speed, the greater the lateral centrifugal force that the car is subjected to, which makes the operation more difficult, and a traffic accident will happen if you are not careful [7].

## 3 Vehicle and Road Traffic Safety

The handling stability of automobile has two aspects, that is, maneuverability and stability. Maneuverability means that drivers don't feel too nervous and tired during driving, and they can ride normally. Stability refers to the ability to resist the interference and

keep driving stably when riding a bike encounters external interference. Handling stability contains many contents, involving many physical quantities. Its main contents are: steady-state response, transient response, linear stability, steering portability, rollover resistance and reversion. Here, the next two-state response and reversion are briefly introduced.

The so-called steady-state response means that if the steering wheel is rapidly turned to a certain angle when the car is driving in a straight line at a constant speed, the car will stop turning the steering wheel and keep the angle constant, and then enter the state of constant-speed circular driving after a short time. In this state, the response of the vehicle caused by interference such as uneven road surface and crosswind is called steady-state response. Transient response refers to the transient motion response between the two steady-state motions of constant-speed straight-line driving and constant-speed circular driving, which directly affects the handling stability of cycling. After the car changes lanes, gives way, and turns, it is required that the car can return to alignment automatically, that is, when the driver releases the steering wheel, the steering wheel can return to alignment quickly.

Braking refers to the ability of a car to stop in a short distance while driving, maintain the stability of driving direction and maintain a certain speed when going downhill. Braking performance includes three aspects: braking efficiency, braking efficiency constancy and braking vehicle direction stability. Braking efficiency refers to the braking distance from the vehicle braking at a certain initial speed to parking on a good road surface. It is the most basic evaluation index of braking performance. When the car brakes under frequent working conditions, the brake temperature can reach over 300 °C. When the temperature of the brake rises, its friction torque will drop significantly. This phenomenon is the thermal decay of the brake, and the constancy of braking efficiency is the thermal decay resistance. The ability of a car to keep driving in a straight line or according to a predetermined curve during driving is called the directional stability of braking car. Generally speaking, the directional stability of a car during braking mainly includes braking deviation, sideslip and loss of steering ability of the front axle. No matter what kind of braking situation it is, it has a great influence on the driving safety of the car.

## **4 Road and Traffic Safety**

### **4.1 Road Geometry and Traffic Safety**

Whether the composition of road geometric alignment elements is reasonable and whether the alignment combination is coordinated is an important factor affecting traffic safety. If the straight road section is too long, the driver will be tired due to monotonous vision, distracted attention and slow reaction; Linear combination. The reliability of traffic safety is not only related to the horizontal alignment and longitudinal slope, but also to the coordination of alignment combination, Although the alignment standards are in line with the specifications, the accidents will increase if the combination is not good; Vertical curve. If the radius of road vertical curve is too small, the driver's field of vision will become smaller, the sight distance will be shorter, and accidents will occur. With the decrease of sight distance, the accident rate increases gradually. Slope. According

to the survey data, the traffic accident rates of plain, hilly and mountainous roads are 8%, 185% and 30% respectively. The main reason is that it is too late to brake or brake failure when going downhill. When the slope is more than 4%, the accident rate increases sharply; The greater the curvature of road plane curve is, the smaller the turning radius is, the greater the lateral eccentricity of motor vehicle is, and the more prone to sideslip. At the same time, the driver's sight distance is smaller, and the blind area of vision is larger.

## 4.2 Road Structures and Traffic Safety

Cross-section refers to the section along the width direction of the road and perpendicular to the road centerline. The cross section is divided into four types: one board, two boards, three boards and four boards. Table 1 shows the accident rates of different cross-sections corresponding to 79 roads in a city in northern China.

Traffic accidents also change with the number of lanes. Table 2 shows the accident rate of different lanes in a city road.

**Table 1.** Cross-sectional accident rate of 79 roads in a city in northern China

Cross-sectional form	Number of accidents	Accident rate (Times/100 million vehicle kilometers)	Number of roads	Average accident rate (times/100 million vehicle kilometers)
A board	1191	10011	61	164
Two boards	111	520	4	130
Three boards	273	1341	10	134
Four boards	220	415	4	104

**Table 2.** Accident rate of different lanes of roads in a city

Lane number type	Number of accidents	Accident rate (Times/100 million vehicle kilometers)	Number of roads	Average accident rate (times/100 million vehicle kilometers)	Number of lanes accident rate (times/100 million vehicle kilometers)
2 lanes	169	1584	18	88	88
4 lanes	511	2075	25	83	86
6 lanes	357	1078	11	98	83
8 lanes	109	273	3	91	81

**Table 3.** Relationship between road width and number of traffic accidents in a city of China

Road width	night	Composition rate	daytime	Composition rate	total	Composition rate	Accident per kilometer frequency
Under 3.5 m	4342	2.1	20773	4.7	25075	3.9	0.1
3.5–5.5 m	21958	10.7	78881	18.0	100839	15.7	0.1
5.5–9.0 m	103347	50.2	217775	49.8	321122	49.9	1.8
9.0–13.0 m	36285	17.6	60766	13.9	97051	15.1	1.8
13.0–19.5 m	32165	15.2	45120	10.3	76385	11.9	5.5
Over 9.5 m	7762	3.8	10632	2.4	18394	2.9	7.0

By analyzing the data in the table, it can be seen that the accident rate decreases with the increase of the number of lanes. The accident rate of eight lanes is the lowest and the safety is the highest, and the accident rate of one lane and two lanes is the highest.

Some research and surveys show that the narrower the lane width, the less traffic accidents. Table 3 shows the relationship between road width and the number of traffic accidents in a city in China.

It can be seen from the table that with the increase of road width, the number of day and night accidents decreases and the accident rate decreases. However, when the road width increases, it will increase the vehicle speed and traffic flow, thus increasing the average number of accidents per kilometer.

Shoulder refers to the strip part with a certain width from the outer edge of the carriageway to the edge of the subgrade. Its main function is to increase the surplus width of road width, protect and support the pavement structure for temporary parking. Although it has little influence on vehicles, it is also an indispensable part.

Zoning is a facility for vertically separating vehicles of different types, speeds or directions on the road to ensure the driving speed and safety. According to its position and function in cross section, the car-dividing belt is divided into central car-dividing belt and two side car-dividing belts.

## 5 Conclusion

Strengthen the popularization and education activities of traffic safety driving. In order to significantly improve the awareness of traffic safety laws and regulations of the majority of drivers, we must first improve the overall quality of our country's automobile drivers and the level of road traffic safety, and we must strengthen and attach importance to the popularization and education activities of automobile safety driving. Learn from the advanced experience of other countries, Under the supervision of relevant government departments, carry out the popularization education of automobile safety driving; Strengthen the psychological quality of drivers. In order to reduce accidents caused by psychological quality, first of all, drivers should strengthen their study, pay attention to

ideological cultivation, sum up experience in practice, accept lessons, constantly exercise and improve themselves, and develop excellent character. Improve the driver's technical level.

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