

Research on the Conflict Between Pedestrians and Right-turning Vehicles at Signal Intersections Based on Psychological Level

Xinyue Ma, Yingming Liu, and Yongqing Guo*

School of Transportation and Vehicle Engineering
Shandong University of Technology, Zibo, China

E-mail: mxymessi@163.com; liuyingming0502@163.com; guoyongqing319@163.com

*Corresponding author details: Yongqing Guo; guoyongqing319@163.com

ABSTRACT

Urban roads play an important role in daily life, and signal intersections, as an important nodes of urban roads, are the main place of traffic conflict. During turns, there are frequent traffic conflicts between right-turning vehicles and pedestrians at specific stages. This conflict will lead to the acceleration, deceleration, and parking of right-turning vehicles and the delay of right-turning vehicles, which will affect the efficiency of the entire intersection and threaten the personal safety of pedestrians crossing the street. This paper adopts the combination of video and questionnaire survey, by observing the signal intersection pedestrian and right driver behavior, then the questionnaire, analyzing the psychological traffic participants, find out the real reason for the connection between the behavior and the psychological, microanalysis signal control road intersection right and pedestrian traffic conflict principle.

Keywords: human-vehicle conflict; behavior and psychology; traffic safety

INTRODUCTION

Road traffic congestion and road traffic safety constantly restrict the development of road traffic and gradually become the core factors affecting road traffic efficiency. With the increasing number of motor vehicles in China and the continuous expansion of urban road traffic facilities, the main trend of urban road intersections is the right turn of the intersection without a specific phase. However, walking still occupies an important role in urban road traffic in China, and conflicts with right-turning vehicles in the process of pedestrian travel are extremely common [1]. This traffic conflict not only causes traffic delays for the vehicles on the right but also reduces the traffic safety of pedestrians. Improving the operational efficiency of road intersections, reducing the occurrence of traffic accidents at intersections, and ensuring the safety of pedestrian crossing are gradually becoming the focus of road traffic researchers [2].

In order to more accurately understand, control and manage human behavior, it's necessary to understand the inner psychological process. Knowing what stimuli are under what circumstances and in what personality causes responses to reasonably predict a person's behavior has a considerable impact on controlling one's behavior. Therefore, it is of great practical significance to analyze the conflict between right-turning vehicles and pedestrians for further study of the corresponding optimization methods.

BEHAVIORAL REACTION PROCESS AND MAIN PSYCHOLOGICAL ANALYSIS OF PEDESTRIANS AND DRIVERS

The Reaction Process and Influencing Factors Between Pedestrians and Drivers

The Behavioral Response Process of Pedestrians

Human psychology is a reflection of objective existence. In the process of perception, pedestrians perceive through the stimulation of the external traffic environment, the arrival distance, size, and speed of the vehicle, as well as other pedestrian behaviors and external traffic facilities. The brain then determines the environment based on the identification and comparison of previous stimuli to determine whether the external vehicle will harm itself and whether it should pass through the road now; eventually, the individual will respond to this judgment.

Factors Affecting Pedestrian and Driver Behavior

In the behavior of pedestrians and drivers, the stimulating effect of the travel environment, management system, and social and cultural environment on traffic participants affects the psychological process of traffic participants and then affects the behavior of traffic participants.

• Travel environment: As a vulnerable group among traffic participants, pedestrians often need a safe, comfortable, reliable, and convenient traffic environment. Pedestrians will have violations to meet their travel needs.

• Management system: Pedestrian violation is extremely common, most of which is due to the low cost of pedestrian violation, and there is no corresponding strict punishment. Long-term and strict traffic management systems can create a good discipline and legal atmosphere.

Social and cultural environment: In traffic activities, pedestrians will also influence each other. It may be that their own idea of violation is not strong, but seeing others violate will be shaken.

Easy to Cause Traffic Safety Accidents of the Psychology

The mental state is a characteristic of a person's mental activity during a certain period, such as distraction, fatigue, and tension. There are many factors causing traffic accidents, and the psychological state of pedestrians is often the main direct cause.

Pedestrians are Prone to Cause Safety Accidents

- Conformity mentality: Pedestrians generally think that it is safer to live together and the law is not responsible, in the invisible safety responsibility decentralization. Have a decentralized effect, passing the responsibility on to others to reduce their own pressure.
- Fluke psychology: Pedestrian fluke psychology often ignores the importance of safety and is an opportunistic mentality, they think that the risk of an accident and the relevant punishment is a small probability event.
- The psychology of saving time: Pedestrians always want to reach their destination by consuming the least energy, mainly to worry about trouble and waste time, mainly manifested in running red lights, or crossing zebra crossings.
- Risk psychology: Pedestrians sometimes know that crossing the road with motor vehicles will cause safety risks and still do it.
- Good courage and strong psychology: People with this kind of psychology generally know traffic safety knowledge, but to show themselves, will ignore life safety and traffic rules blind violations.
- Dependence: When pedestrians cross the road, they are too high to trust the driver to obey the law, even when they hear the vehicle honking or approaching pedestrians.

Drivers are Easy to Cause Safety Accidents

- Strong psychology: Many young drivers are impulsive, and older drivers are full of confidence in their driving skills. When passing the right turn signal intersection, they should use all driving skills to pass the pedestrian.
- Imagine: The driver's endurance of impatience is very low, at the right turn, easy to lead to the occurrence of traffic safety accidents.
- Lucky psychology: Some drivers with a long driving age because of the environment, and their own driving technology confidence, the familiar road when driving often relax vigilance, such as right turn without a turn signal, and high-speed corners.

VIDEO INVESTIGATION AND ANALYSIS OF PEDESTRIAN AND RIGHT-TURN DRIVERS' CROSSING BEHAVIOR

Investigation Method

The video acquisition data method was used to obtain the actual coordinate data of pedestrians and motor vehicles. This paper selects the Zibo shop typical signal control intersection Nanjing road-communist youth League west road intersection, the Shandong University of Technology east gate intersection for the survey object, intersection after channelized standard cross intersection, there are many village residents, have enough right turn traffic and

pedestrian flow, motor vehicle average speed of about 20km/h to 30 km/h, the average pedestrian crossing speed of 4 km/h to 6 km/h, the two often conflict. Among them, the east entrance of the intersection and the west entrance of the right turn vehicles and east-west pedestrians to do the investigation and analysis.

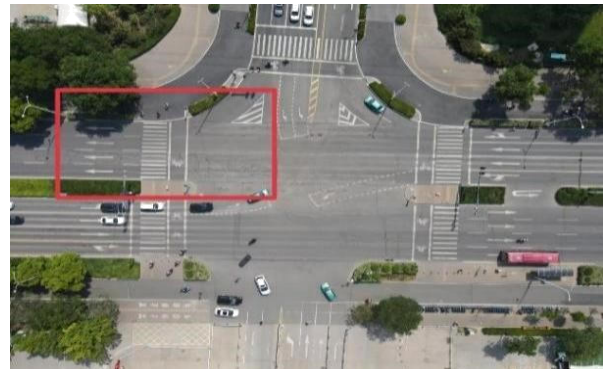


FIGURE 1: East Import Survey Area.

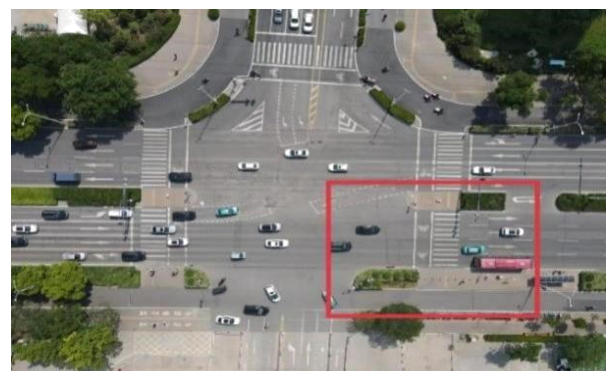


FIGURE 2: West Import Survey Area.

Data Analysis

Motor Vehicles Crossing the Street

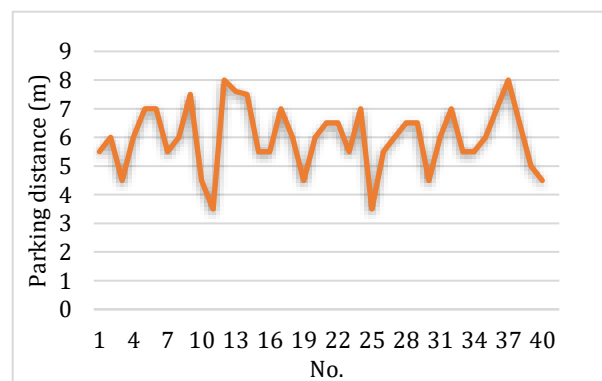


FIGURE 3: Line Chart Of The Average Parking Distance Of The Right-Turning Vehicles At The East Entrance.

As can be seen from Figure 1, the east entrance of Shandong University of Technology in the communist youth league west road belongs to the main road traffic is bigger, east-west technology, long, east-west pedestrian number and waiting quantity, turn right driver when driving after the intersection most not with pedestrians, parking distance generally with pedestrians in 5-8 meters.

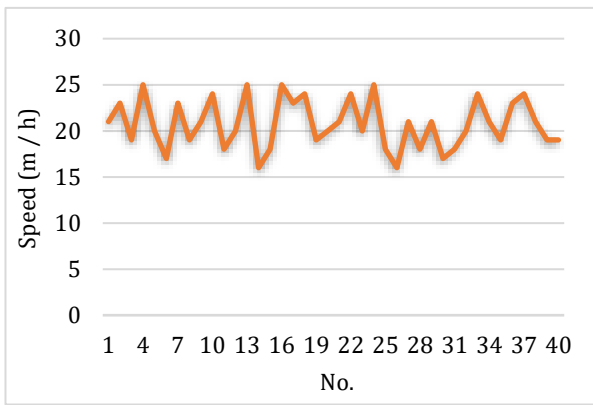


FIGURE 5: Speed Speed Line Chart Of Right-Turning Vehicles At The West Entrance.

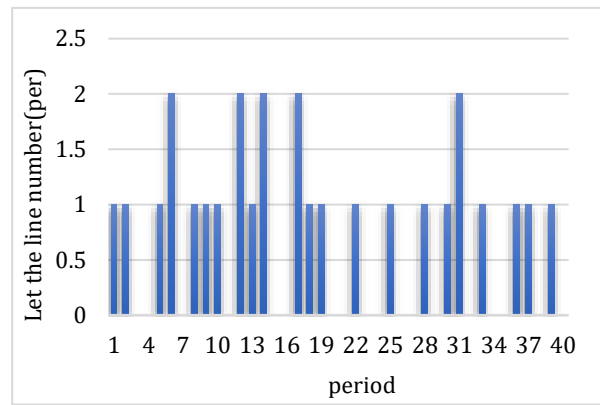


FIGURE 8: The Number Of Pedestrians With Green Light From The East Entrance.

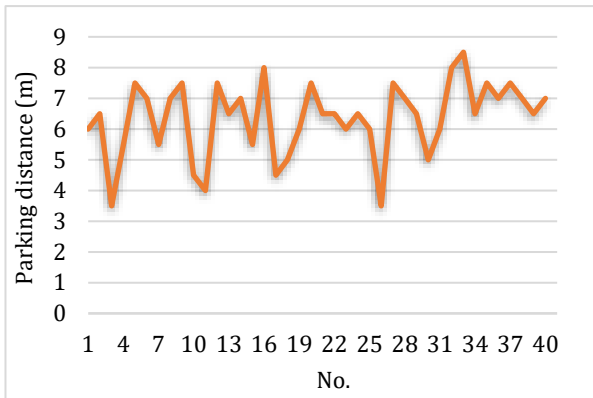


FIGURE 6: Line Chart Of The Average Parking Distance Of The Right-Turning Vehicles At The West Entrance.

As can be seen from Figure 6, the number of pedestrians in this section is the largest, and pedestrians are relatively concentrated. When motor vehicles pass again, they rarely cross the road, and pedestrians make fewer motor vehicles.

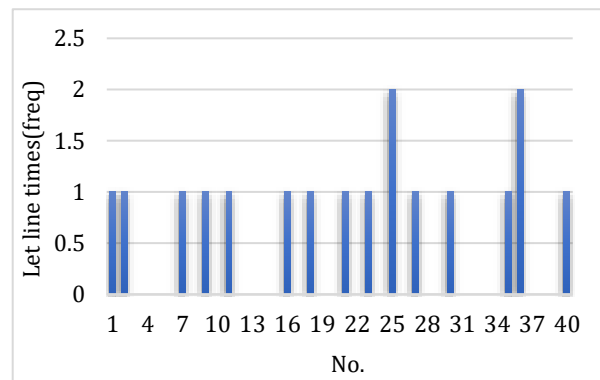


FIGURE 9: Pedestrians Crossing The Street Twice In The East-West Direction Of The West Entrance.

As can be seen from Figure 3 and Figure 4, the right-turn driver of the intersection is good to pedestrians. Most pedestrians can stop actively and wait at a distance of about 7 meters from the pedestrian. The right turn arc length of the intersection is about 13 meters long, and the driver has more time to react.

Pedestrians Crossing the Street

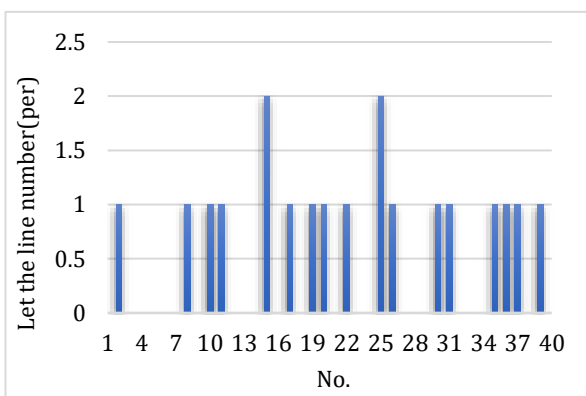


FIGURE 7: Pedestrians Crossing The Street Twice From The East Entrance To The East Entrance.

As can be seen from Figure 5, because this direction is connected with Shandong University of Technology and Orante, there are more pedestrians in this direction, and the accumulation of pedestrians is large. In the process of crossing the second street, there are more group behaviors, and the right turn cars will yield and wait, and fewer pedestrians let cars.

As can be seen from Figure 7, in the passage of motor vehicles by pedestrians crossing the street for the second time, when the passage is made once and the conflict is the second time, the motor vehicle can be allowed to pass first. After crossing the street and standing in the middle of the road, it is generally anxious to cross the motor vehicle for the second time.

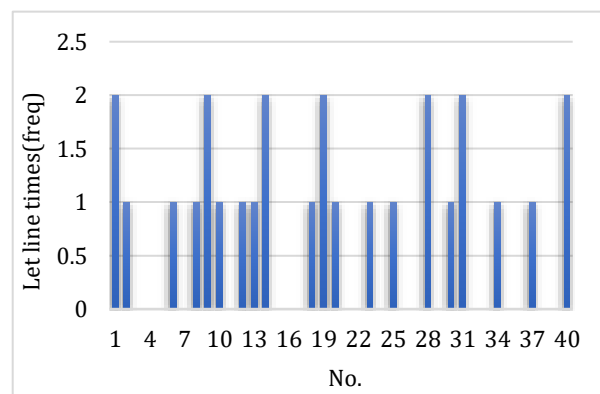


FIGURE 10: Traffic Allowed By Pedestrians From The East To West Of The West Entrance.

As can be seen from Figure 8, pedestrians happen in pedestrians crossing more, the driver waits for too long, and the driver at low speed forward empty, because the pedestrian belongs to vulnerable groups in traffic, in this case, pedestrians have to avoid, the second first pedestrian green light and the second light is still red when most pedestrians will choose to let the motor vehicle first.

QUESTIONNAIRE SURVEY AND ANALYSIS OF PEDESTRIANS AND DRIVERS

Questionnaire Survey Design

According to the illegal behavior characteristics of pedestrians and right-turning vehicles at the intersection in the video survey, a questionnaire was designed for pedestrians and drivers respectively to analyze the conflict between pedestrians and right-turning vehicles from the psychological level. According to the relevant questions and answers of the questionnaire, pedestrians were divided into three groups: young pedestrians, middle-aged pedestrians, and elderly pedestrians, and drivers were divided into three groups: 1 to 5 years, 5 to 10 years, and more than 10 years.

Psychoanalysis

Pedestrian Street-crossing Psychoanalysis

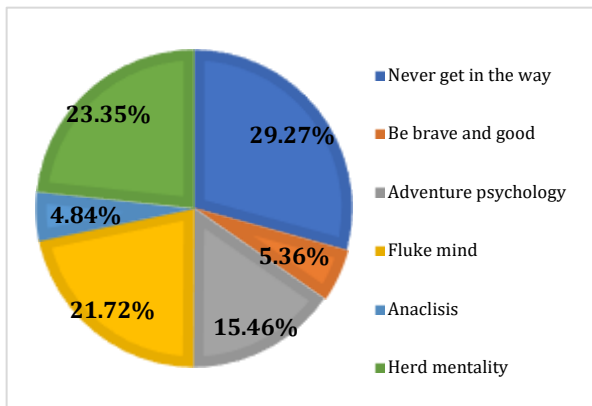


FIGURE 11: Psychological Situation When A Young Pedestrian Conflicts With A Right-Turning Vehicle.

The most common thing among young pedestrians is the herd mentality and fluke mentality. In traffic behavior, a large number of young people don't have their own ideas, and they should "follow the crowd" under the guidance of other pedestrians. And because of the road safety accidents although often reported but did not happen to their own body and the existence of lucky psychology.

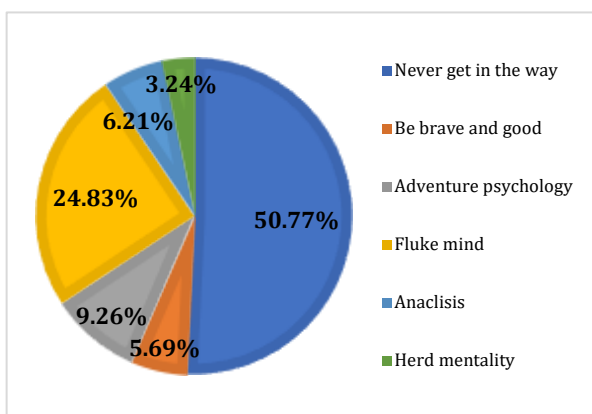


FIGURE 12: Psychological Conflict Between A Middle-Aged Pedestrian And A Right-Turning Vehicle.

Half of the middle-aged pedestrians will choose never lane, to ensure their own safety, but there are still half people who have a variety of choices and emotions, that part of the middle-aged traffic participants have their own "original" for traffic environment, and its own habits have been formed, in front of the right turn arrived, lucky through has become a part of the middle-aged pedestrians crossing the street.

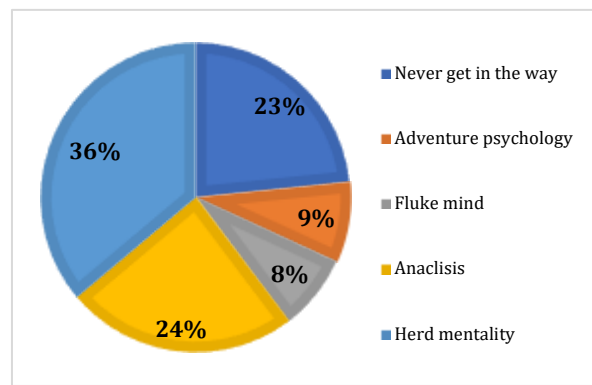


FIGURE 13: Psychological Conflict Between Elderly Pedestrians And Right-Turning Vehicles.

Older pedestrian groups because of their age and physical condition, are more likely to produce herd mentality, they feel with you for their own security, and the survey found that some elderly pedestrians feel older, motor vehicles make way, thus producing psychological, ignore motor vehicle according to the street of their own ideas.

Right-turn Driver Psychoanalysis

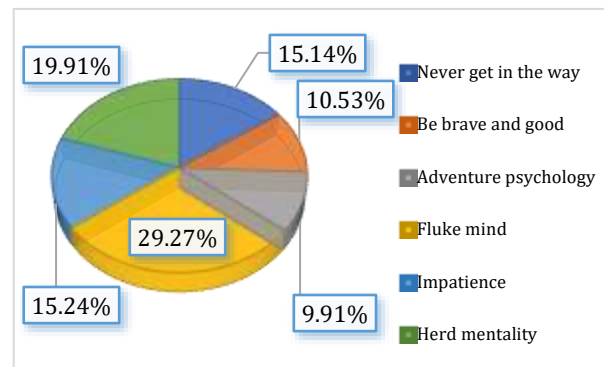


FIGURE 14: Psychology Of Drivers Who Conflict With Pedestrians When Turning Right With 1 To 5 Years Of Driving Experience.

Novice drivers driving motor vehicle right turn is easy to have luck psychology, and comity, have a serious dependence on psychology. If you hope to pass through the front car together when you turn right, but in the process of follow-up, you will have tension, which is manifested as emotional tension.

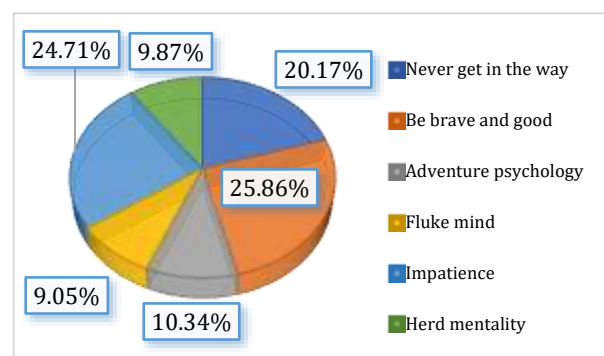


FIGURE 15: Conflict Psychology With Pedestrians When Drivers Turn Right For 5 To 10 Years.

Drivers with 5~10 years of driving experience have some driving experience and have great confidence in their driving skills. In the process of driving, they will inevitably take themselves the lead and produce considerable impatience. They also want to highlight their driving skills around their peers, resulting in strong and good psychology.

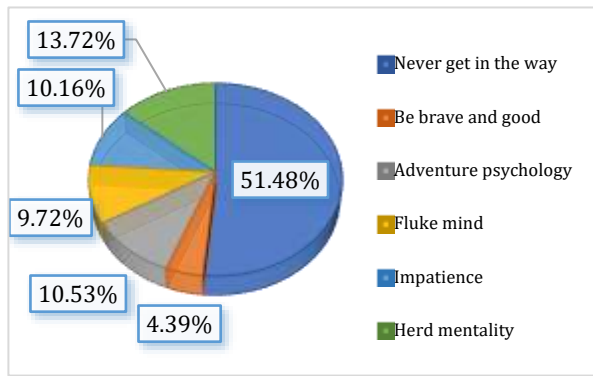


FIGURE 16: Right Turn Conflict With Pedestrians For Drivers With More Than 10 Years.

More than 10 years of driving age driver has rich driving experience, driving age the longer the courage the smaller, driving mentality is more peaceful, rarely produces negative psychology such as impatience, in their have larger mood swings will avoid their driving, so this paper is easy to cause traffic accident psychology in more than 10 years of driving age driver is not obvious.

CONCLUSIONS

1. When there are more pedestrians and they can cross the street relatively centrally, the driver is more patient at this time, the right-turning motor vehicle lane-blocking behavior is not obvious, and pedestrians rarely avoid the motor vehicle. When the motor vehicle has avoided a pedestrian once, it starts again at a moderate speed.

2. Violation in red light street pedestrian proportion is larger, in the case of long-term safety accidents produced fluky psychology prompted eye six trots during the red light, feel about the road is very familiar with can also observe around all vehicles, oneself is fully prepared to red light street, some of the elderly in the questionnaire survey said because their age young people should be comity to us, the motor vehicle also dare not put it, have a serious dependence.
3. Individual right motor vehicle in front of the car into the pedestrian flow after excessive pedestrians cannot normal driving, start slowly even stop after car urged, after analysis reason should be the driver driving age is low, in pedestrian intersection more I do not know how to deal with herd psychology with a car into people, but after entering the lack of driving experience cause nervous panic irritable mood and make the operation error and slow, at this time, the driver's reaction to sweaty forehead palms, visual distance reduction, can observe the range is only a small part of the distance, the heart is very anxious nervous.

To sum up, pedestrians and drivers generally have a fluke mentality and herd mentality, among which young people and drivers with low driving age have an adventure mentality, and the elderly have a strong dependence mentality.

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