

ITARDA INFORMATION

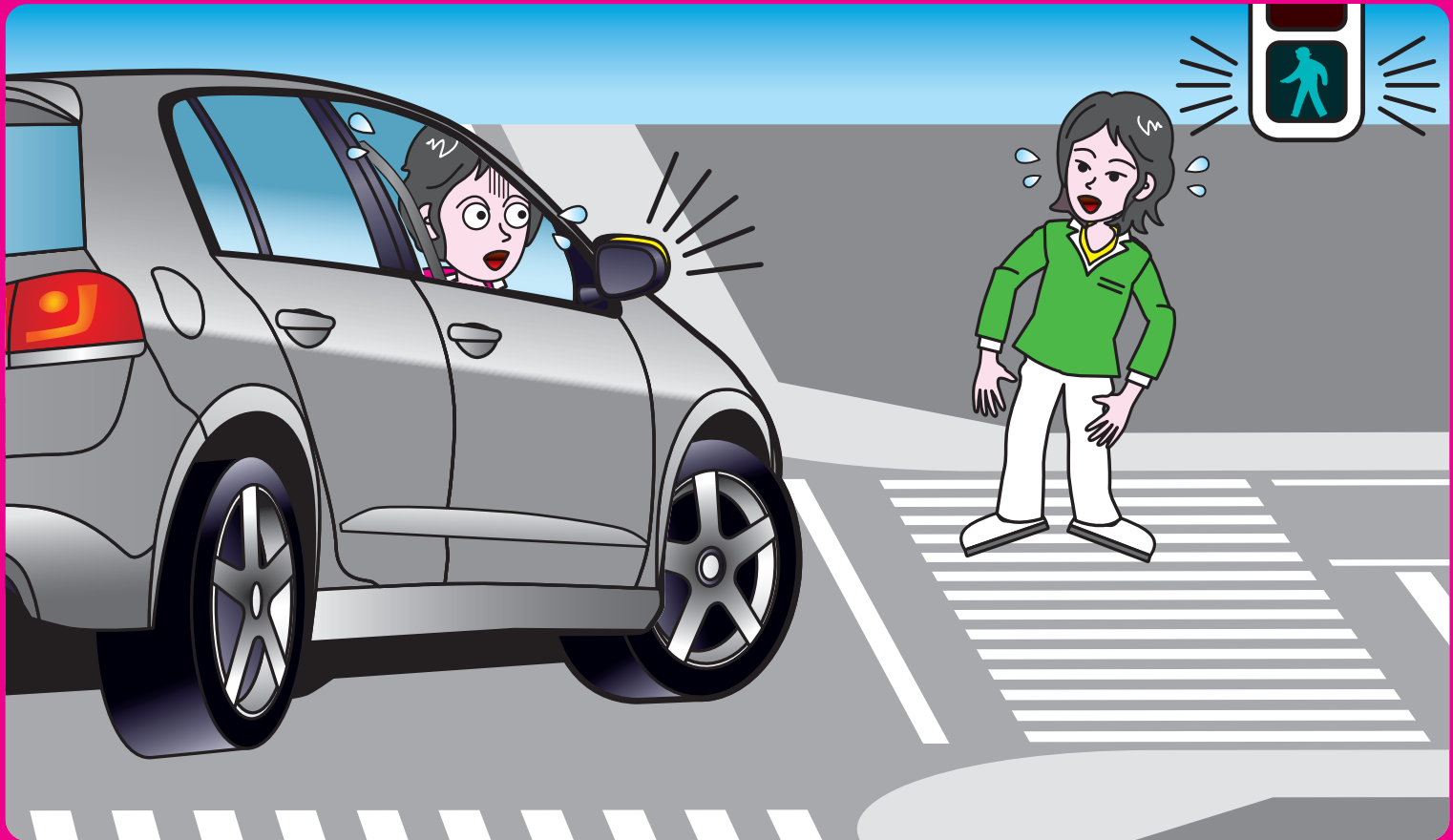
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Special
feature

**Accidents between vehicles with four wheels
that turns right and crossing pedestrians
at intersections with traffic signals**

~ Are you driving with priority given to pedestrians? ~



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1 Introduction

Although the number of traffic accidents (casualty accidents) is decreasing year by year, there are still approximately 310,000 accidents, and many people are victims of traffic accidents. In particular, there have been many serious accidents involving pedestrians crossing crosswalks (hereinafter referred to as "crossing pedestrians") and vehicles with four wheels*1, and interest in society has been growing up as the government has mentioned safety of pedestrians by recommending that drivers be reminded of the rules regarding crosswalks and that they give priority to pedestrians as part of their efforts to ensure pedestrian safety. Then, what are the actual accidents that occur at crosswalks?

For ① and ②, Road Traffic Accident Statistics (macro data) were used to analyze accidents in which the crossing pedestrian was the first or second party (we call a party who has more serious faults in the accident the first party) and pedestrians were dead or injured.

Figure 1 shows the number of casualty accidents between vehicles with four wheels and crossing pedestrians by location of accident occurrence. As for the location of accidents, intersections account for about 91% of the total, with about 69 % occurring at intersections with traffic signals.

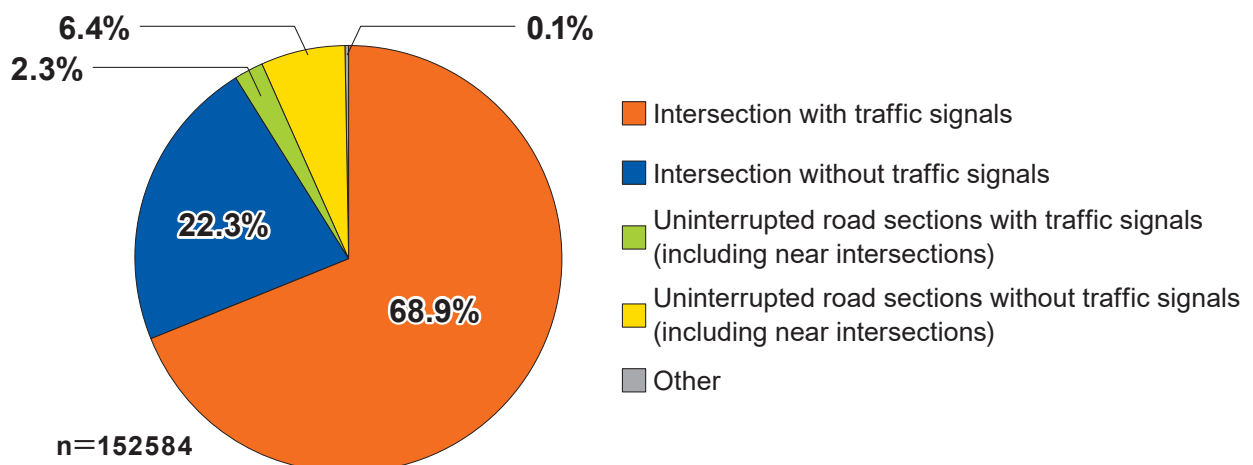


Figure 1: Number of accidents involving vehicles with four wheels and crossing pedestrians by location of accident occurrence (Total for 2011 to 2020)

Next, look at accidents at intersections with traffic signals between vehicles with four wheels and crossing pedestrians by type of movement of the vehicle with four wheels. Vehicles that turn right (hereafter "right-turning vehicles") accounted for more than 60% of all accidents, which shows the highest percentage (Figure 2).

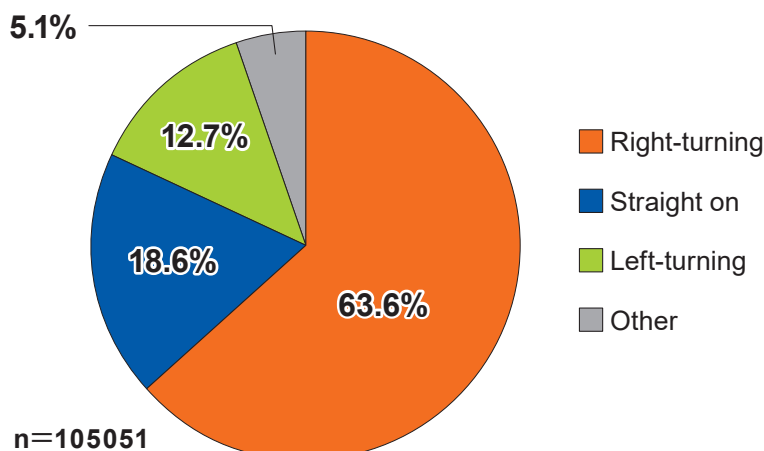


Figure 2: Number of accidents involving crossing pedestrians at intersections with traffic signals by type of movement of the vehicles with four wheels (Total for 2011 to 2020)

Now, take a closer look at why accidents between right-turning vehicles and crossing pedestrians at intersections with traffic signals occur.

*1 ITARDA Nishiyama, " Study of the Field of View (FOV) of AEB for Pedestrian When the Vehicle Turns Right ~ Targeting Pedestrians While Crossing the Road on the Crosswalk ~", ITARDA 24th Presentation Session for Traffic Accident Investigations, Analysis and Research

2 Characteristics of accidents between right-turning vehicles and crossing pedestrians at intersections with traffic signals

In this section, we will compare accidents involving right-turning vehicles and crossing pedestrians with those involving vehicles going straight on and crossing pedestrians.

First, in Figure 3, we compare the human factors of drivers as a factor in accidents. For vehicles going straight on, failure to pay attention forward, such as aimless driving or distracted driving, accounted for about 38 %, and failure to confirm safety factors, which refers to insufficient or no confirmation, accounted for about 46%. On the other hand, for right-turning vehicles, failure to pay attention forward accounted for only about 14 %, while more than 80 % of accidents involve failure to confirm safety factors. When turning right at an intersection, there is a wide range of areas to check, including the movement of oncoming traffic, crosswalks, and right-turn destination, and it is believed that the driver paid attention to the road ahead but did not sufficiently check for safety, resulting in the accident.

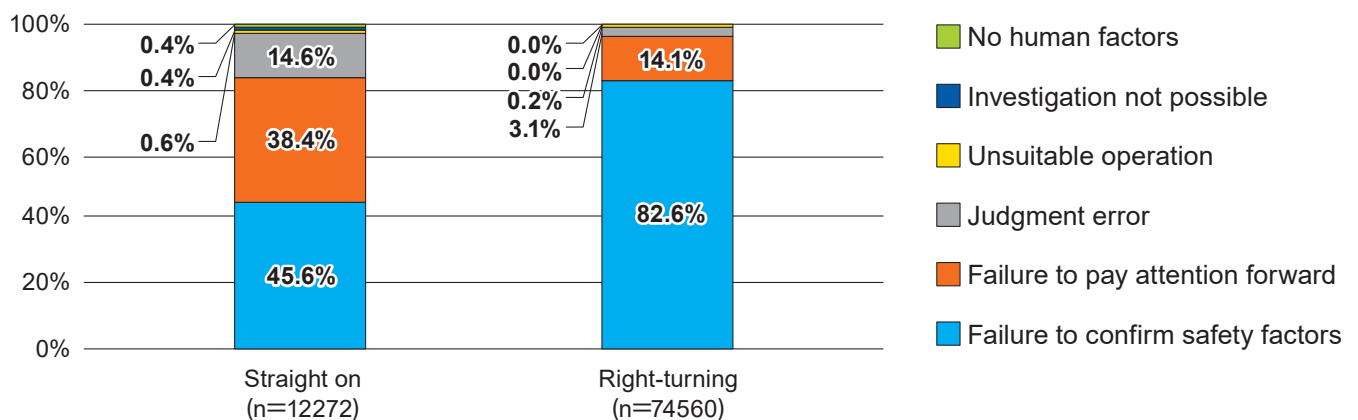


Figure 3: Number of accidents involving vehicles with four wheels and crossing pedestrians by human factors (Total for 2011 to 2020)

Next, Figure 4 compares for violations of crossing pedestrians. In accidents with vehicles going straight on, more than 40% of the violations such as disregarding a traffic signal occur, whereas in accidents with vehicles turning right, only about 2% of the pedestrians violate. When a pedestrian ignores a red light to cross the street, the signal for the vehicle going straight on is green, while the signal for right-turning vehicles often is red, so that ignoring of traffic signals occurs more frequently by pedestrians in case vehicles going straight on, and the fact that pedestrians rarely violate the law in regard to right-turning vehicles is considered a significant feature. Many right-turn accidents could be prevented if drivers would check carefully for pedestrians.

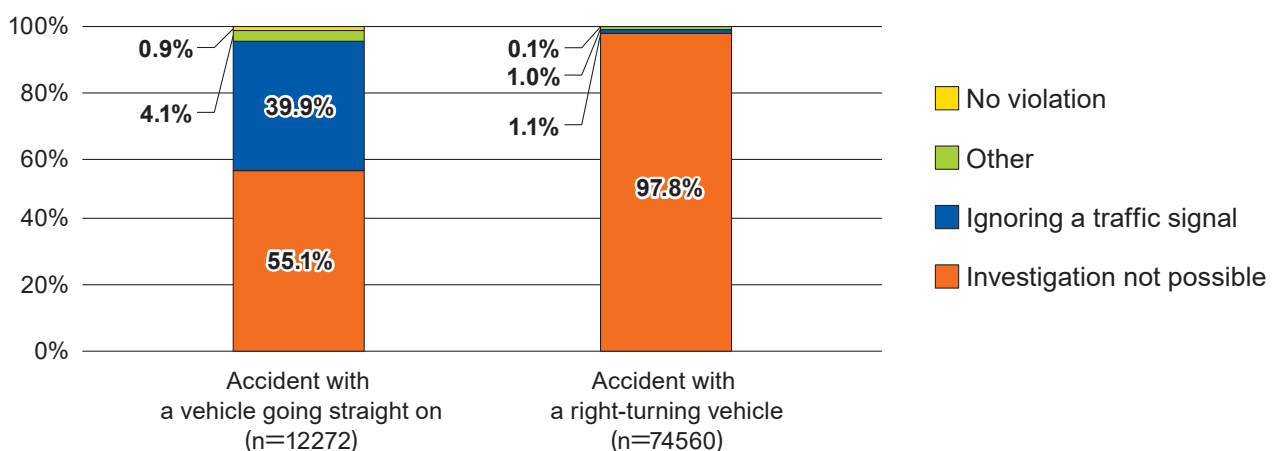


Figure 4: Number of accidents involving crossing pedestrians and vehicles with four wheels by violation (Total for 2011 to 2020)

3 Factors contributing to accidents between right-turning vehicles and crossing pedestrians at intersections with traffic signals

The Institute for Traffic Accident Research and Data Analysis (ITARDA) conducts in-depth case-studies in the Tsukuba City area of Ibaraki Prefecture. Based on the results of the 2005 to 2020 case-studies, there were 30 accidents that corresponded to accidents between right-turning vehicles and crossing pedestrians at intersections with traffic signals. In this section, we will use the results of these 30 cases to look at the specific human factors of drivers and the mental state of pedestrians.

First, we organized and categorized the specific human factors that we read from the driver's testimony (Table 1). As a result, "failure to check safety at crosswalks out of concern for oncoming traffic" was the most frequent response with 12 cases. Factors such as "failure to check for pedestrians because they thought there were no pedestrians" and "failure to check for pedestrians at crosswalks because they were concerned about the right turn destination" were also observed.

Table 1: Human factors of drivers (micro data)

Overall specific human factors	No. of cases
Failure to check safety at crosswalks out of concern for oncoming traffic	12
Failure to check for pedestrians at crosswalks because they thought there were no pedestrians	7
The driver look in the opposite direction from where the pedestrians in the accident was coming	4
Failure to check the safety at crosswalk out of concern for the right turn destination	3
Distracted by changes in the car, the driver failed to pay attention forward	2
Failure to check safety at crosswalks out of concern for proceeding traffic	1
Normal decisions were not possible because of drunk driving	1
Total	30

In eight of the 12 accidents where the driver was concerned about oncoming traffic and failed to check the safety of the crosswalk, the driver was thinking, "I'm going to turn right before the oncoming straight on vehicle passes through the intersection". When turning right at an intersection, the driver must check for oncoming traffic, crosswalks, and right-turn destinations, but it is believed that the driver instinctively becomes aware of the oncoming straight on vehicle, which is more likely to be a danger to him or her, and in order to avoid a collision with the oncoming vehicle, the driver rushes to turn right and overlooks the crossing pedestrians. As for the remaining four cases, two accidents were caused by being distracted by oncoming left-turning vehicles, one accident was caused by being distracted by an oncoming right-turning vehicle, and one accident was caused by being concerned about whether a following vehicle was or not behind an oncoming right-turning vehicle.

Next, we turn our attention to the mental state of the pedestrian. When confirmed if the pedestrian stopped at the traffic signal before starting to cross, the pedestrian stopped in 19 of the 20 cases (Figure 5), excluding 10 cases where it was unknown, and in all 19 cases the accident occurred after the pedestrian signal turned green and the pedestrian started to cross. The 10 unknown cases are accidents in which we could not obtain testimony from the crossing pedestrian or could not read from the testimony whether the pedestrian had stopped before crossing the street. When pedestrians were checked to see if they were aware of the right-turning vehicle before or immediately after they started crossing, they were not aware in 21 of the 30 total cases (Figure 6). Furthermore, in six of the seven cases where the crossing pedestrian recognized the right-turning vehicle, the crossing pedestrian's testimony shared the belief that since the pedestrian recognized the vehicle, the driver also recognized the pedestrian and would stop.

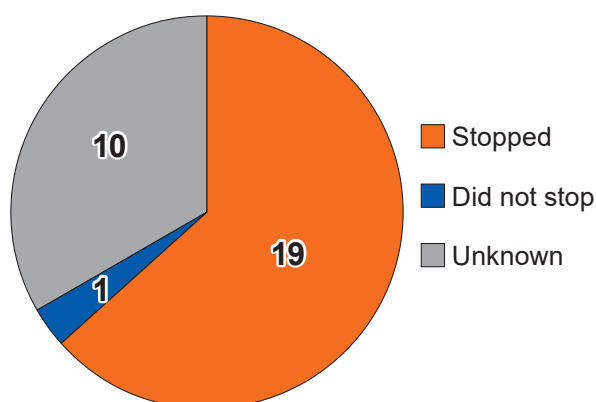


Figure 5: Crossing pedestrian stopped before crossing or did not stop

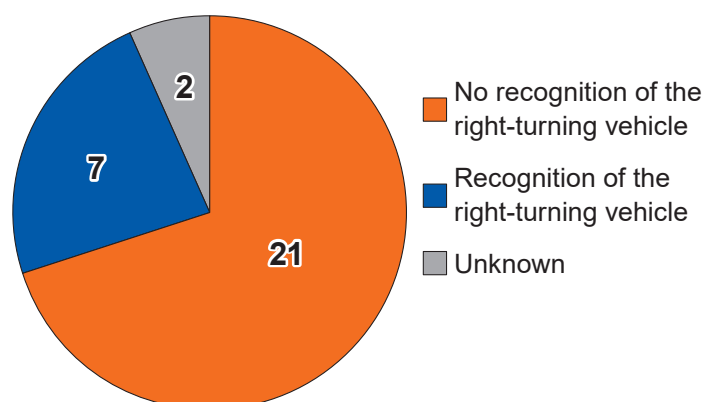


Figure 6: Recognition or no recognition of the right-turning vehicle by the crossing pedestrian

4 Accident cases

[Accident situation]

Driver A, driving a standard passenger car, attempted to make a right turn at an intersection with traffic signals. After entering the right-turn lane and stopping at a red light, the light turned green and the vehicle started off. At this time, an oncoming vehicle was stopped at a stoplight as A car was, driver A decided to make a right turn before the oncoming vehicle passed by, and while distracted by the car, he turned right at a speed of approximately 20 km/h. He did not check the safety of the crosswalk and collided with pedestrian B, who was crossing from right to left. Pedestrian B recognized car A before he started crossing, but he assumed that car A would stop and crossed the street.

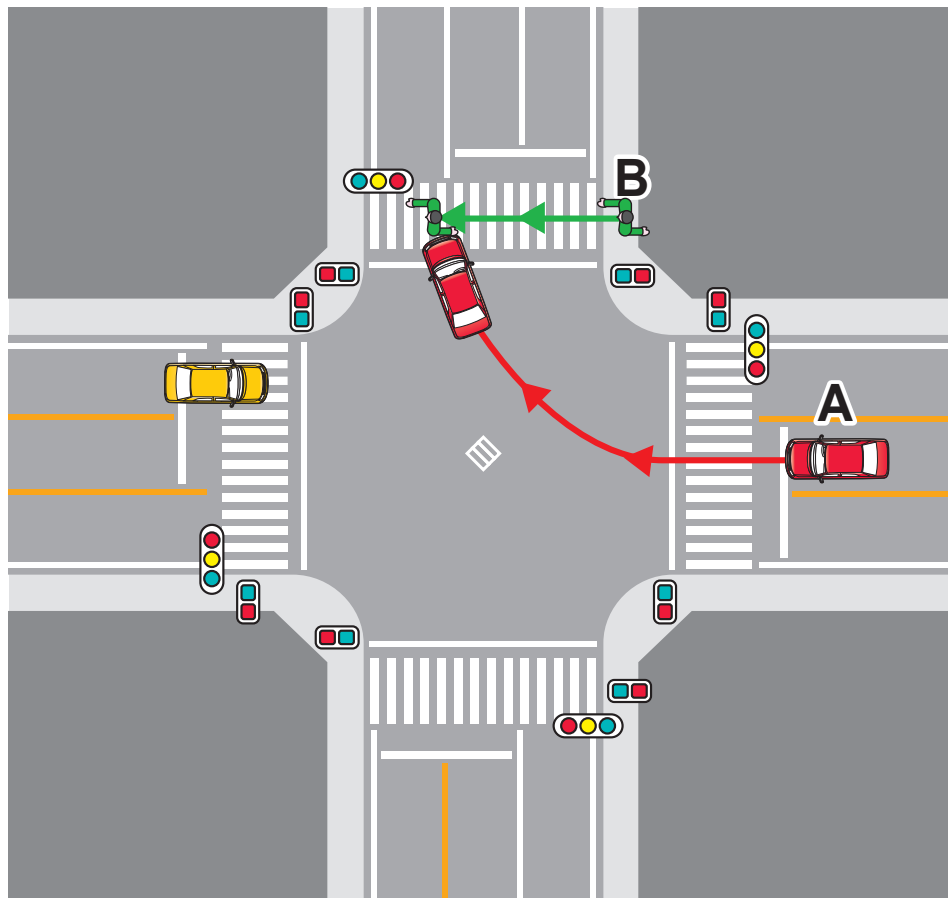


Figure 7: Diagram of the accident situation

[Factors of the accident]

This may be due to driver A's failure to check the area around the crosswalk when making a right turn. One reason for not checking was that the driver decided to make a right turn before the oncoming straight vehicle passed through the intersection and rushed to make the right turn, neglecting to check for pedestrians crossing the street. If the oncoming vehicle going straight on had been given priority, it would have been possible to fully check the area around the crosswalk before starting the right turn, and the pedestrian starting to cross the crosswalk may have been spotted.

On the other hand, pedestrian B recognized car A and thought that the other party also recognized him and would stop. Since he knew that there was a right-turning vehicle, he could have reduced the likelihood of an accident by paying attention to the left of his path (the direction from which the right-turning vehicle was coming).

[Discussion]

1. Stopping just before the crosswalk (including the bicycle crossing zone) would have been effective, as there was enough space for the standard-sized passenger car not to extend into the path of the oncoming vehicle going straight on. (Figure 8).

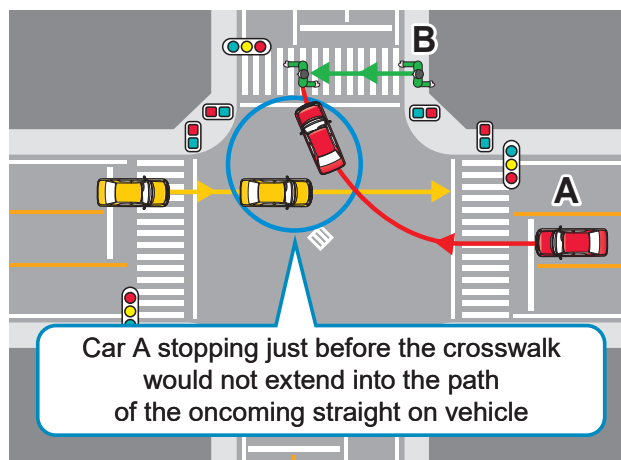


Figure 8: Assuming car A stopped before the crosswalk

2. While turning right, it is necessary to slow down and pass near the center of the intersection, but in this case, the vehicle is not passing near the center of the intersection. It is believed that the driver did not give priority to the oncoming straight on vehicle and made a hasty right turn, resulting in a diagonal straight on trajectory. Now let's see what happens if we change the actual trajectory of car A so that it passes near the center of the intersection (Figure 9).

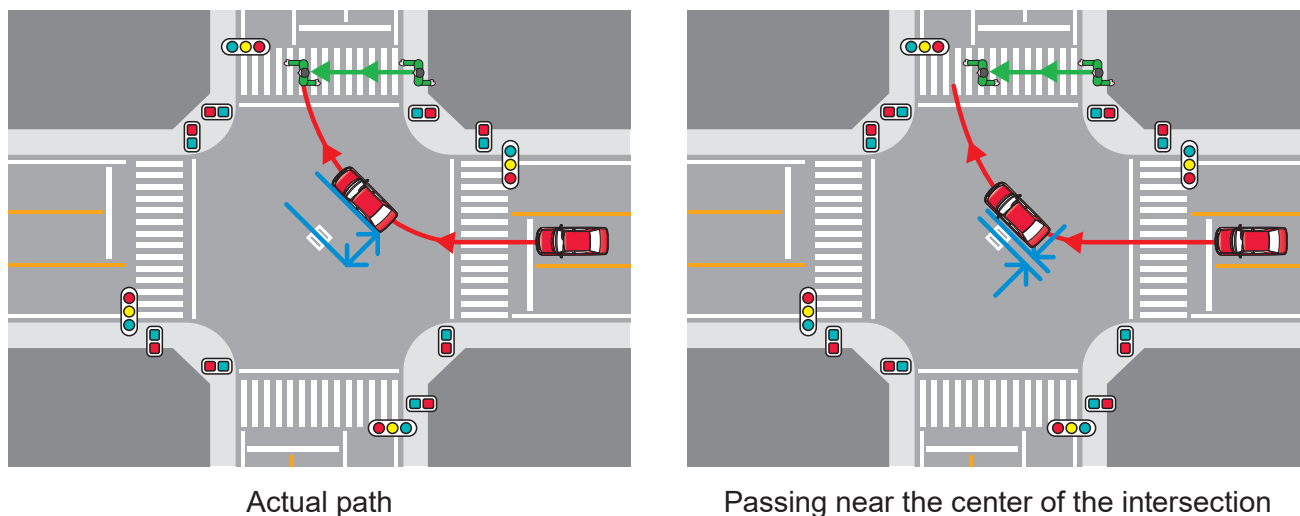


Figure 9: Actual path of car A and passing near the center of the intersection

Because of the following advantages, passing near the center of an intersection is considered effective in preventing accidents at crosswalks when right turns are made.

- As the radius of the path is smaller, the speed of traffic is reduced, making it easier to respond to emergent situations.
- After making a right turn, the vehicle proceeds at an angle nearly perpendicular to the crosswalk, so the left and right sight angles become more even, making it easier to check the safety of pedestrians, especially those crossing from the right.
- The distance to cross the oncoming lane is shortened and the time required to cross is shortened, allowing the driver to make a right turn with more time.

5 Comparison with crosswalks without traffic signals on uninterrupted road sections

Under consideration of the results of the study based on micro data, Table 2 compares the situation of drivers and pedestrians when turning right at an intersection with traffic signals and when going straight on an uninterrupted road section.

Table 2: Comparison with crosswalks on uninterrupted road sections without traffic signals

Crossing location	Vehicle behavior	Driver's psychological state	Pedestrian's psychological state
Crosswalk at an intersection with traffic signals	Right-turning	Giving priority to the own passage (paying attention to oncoming traffic but not enough attention to pedestrian safety)	Checking for a green light and paying little attention to vehicles
Crosswalks on uninterrupted road sections without traffic signals	Straight on	Giving priority to the own passage (rather than crossing pedestrians)	Checking carefully for vehicles approaching from left and right before crossing the street

Micro data showed that drivers neglected to check the area around crosswalks when turning right at intersections with traffic signals as the result of giving priority to their own traffic. In addition, a study*2 found that approximately 70% of vehicles did not stop even when pedestrians were present at a crosswalk on an uninterrupted road section. Despite differences in the presence or absence of traffic signals and vehicle behavior, drivers tend to disregard the main principle that pedestrians have priority at crosswalks, and tend to give priority to their own traffic without adequately checking for pedestrian safety.

At crosswalks on an uninterrupted road section, pedestrians would look both ways before crossing to avoid accidents. On the other hand, at crosswalks at intersections with traffic signals, people cross the street thinking that vehicles will naturally stop because they are following the signal. However, as shown in Table 2, drivers do not always pay the attention they should pay to pedestrians, so as with crosswalks without traffic signals, awareness of self-defense can reduce the likelihood of an accident.

*2 Japan Automobile Federation "National survey: How many vehicles stop when pedestrians cross on crosswalks without traffic signals?"
<https://jaf.or.jp/common/safety-drive/library/survey-report/2021-crosswalk>

6 Conclusions

In this study, the characteristics of accidents between vehicles turning right at intersections with traffic signals and crossing pedestrians were confirmed from macro and micro data covering crosswalks.

■ Summary of accidents between right-turning vehicles and crossing pedestrians at intersections with traffic signals

- The macro data confirmed that human factors of drivers account for 80 % or more of safety confirmation failures. The micro data showed that the reason for this was that in many cases, drivers tried to make a right turn before an oncoming car, were distracted by the oncoming car, and neglected to check the crosswalk.
- The macro data confirmed that pedestrians crossing the street were obeying the rules in most cases. The micro data showed that most accidents occurred after the traffic signal turned green and crossing began, and that most crossing pedestrians either did not recognize the right-turning vehicle or, if they did, they thought the vehicle with four wheels would stop.

■ To prevent accidents between right-turning vehicles and crossing pedestrians

Pedestrians must be given priority at crosswalks, regardless of whether there is a traffic signal or not, and regardless of the actions of the own vehicle. When turning right and driving through a crosswalk, it is important to keep the following in mind:

- It is considered effective to pass near the center of the intersection and turn right. Be aware that passing near the center of an intersection when turning right has numerous benefits for accident prevention and should be made a habit. The rule of the Road Traffic Act is the basis of safe driving: "To make a right turn and exit the road, a driver must bring a vehicle as close as possible to the center of the road beforehand and reduce speed."
- If there are no vehicles traveling in the oncoming lane or if stopping before a crosswalk does not extend into the oncoming lane before turning right, the driver shall pause before the crosswalk as necessary. Many transport operators instruct drivers to stop shortly before passing through a crosswalk when making a right or left turn at an intersection.
- Wait for pedestrians to cross the street until they have completed their crossing because pedestrians think "the vehicle will stop".

When crossing a crosswalk as a pedestrian, with or without a traffic signal, the following items are considered valid:

- The "Instructions on Traffic Methods," state that "When the light turns green, make sure the vehicles and trams on your right and left have stopped before crossing". One should have a sense of self-preservation rather than a sense of priority, such as making sure that no vehicles are attempting to pass through the pedestrian crossing before starting to cross.
- Parents should teach their children to check both sides of the road when crossing at a green traffic light, and make it a habit for them to learn how to cross in a way that prevents accidents.

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