

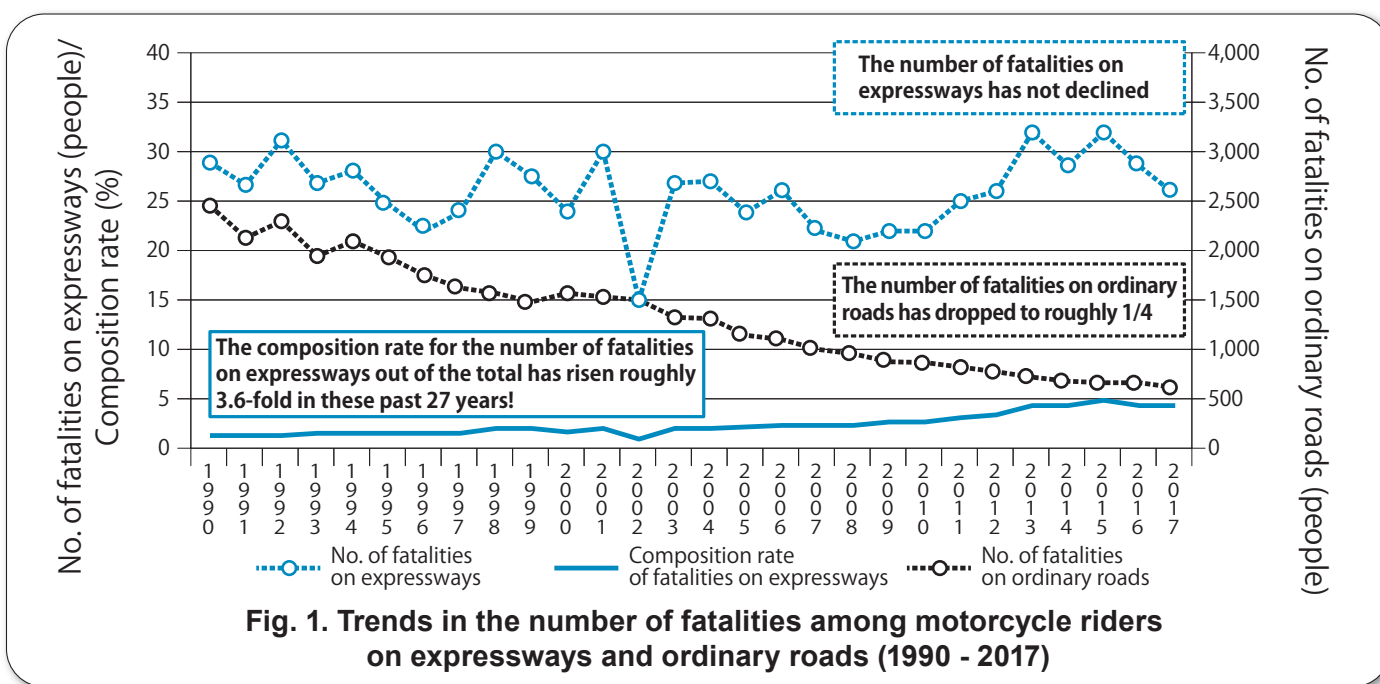
ITARDA INFORMATION

交通事故分析レポート No.129

Special feature

Motorcycle accidents on expressways

~ The number of fatalities among motorcycle riders on expressways has not declined ~



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1 Introduction

The total number of fatalities from traffic accidents that had surpassed 10,000 people in the early half of the 1990s has fallen below 4,000 people in recent years. The number of fatalities from accidents involving people riding motorcycles (including the total from both mopeds and automatic motorbikes) is similar, in that the number had been in excess of 2,000 people in this same time period, but has recently fallen to around 600 people (Fig. 2).

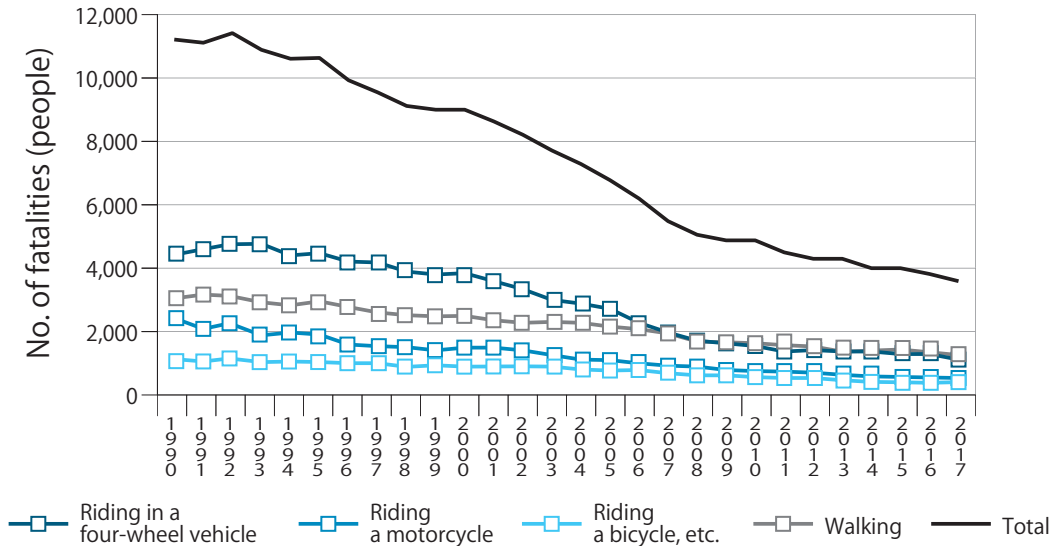


Fig. 2. Trends in the number of traffic accident fatalities (1990 - 2017)

However, looking at the number of fatalities while riding on a motorcycle by ordinary roads and expressways reveals that whereas there has been a clear downward trajectory in the number of fatalities on ordinary roads, the number of fatalities on expressways (national expressways and designated motorways) has fluctuated up and down. Yet compared with the early 1990s, there is no longer a clear downward trajectory with this (Fig. 1).

However, this is backed by the fact that the total extensions to expressways have been growing longer year by year. As such, when you look at the number of fatalities while riding motorcycles per the total extensions you see that while this downward trajectory has persisted, in recent years it has been holding steady, with the number of casualties (comprised of the total number of fatalities and injuries) continuing to trend downward. It also suggests that the risk of accidents is not growing (Fig. 3).

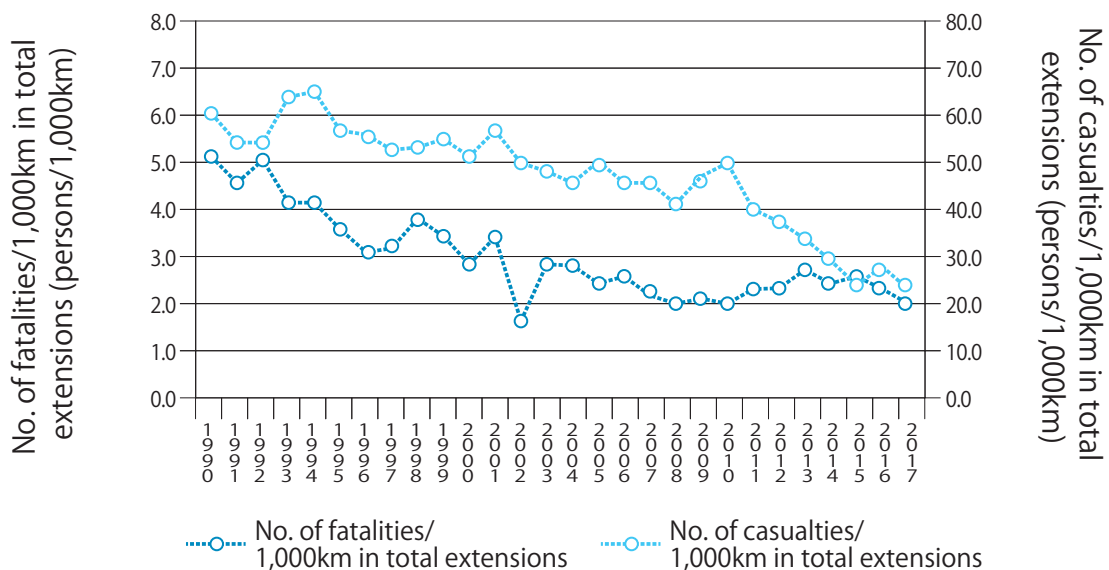


Fig. 3. Trends in the number of fatalities/casualties while riding motorcycles per total length of extensions to expressways (1990 - 2017)

Expressways are inherently organized in a manner that makes accidents difficult to happen, such as the fact that they are not travelled by pedestrians or bicyclists, and because they lack intersections. Looking at the types of accidents indicates that of the 148 people who died while riding a motorcycle over the five-year period from 2013 to 2017, a majority at roughly 60% died due to single-vehicle accidents. As opposed to this, of the 1,684 casualties over this same period, roughly 70% were due to vehicle-vehicle accidents (Fig. 4).

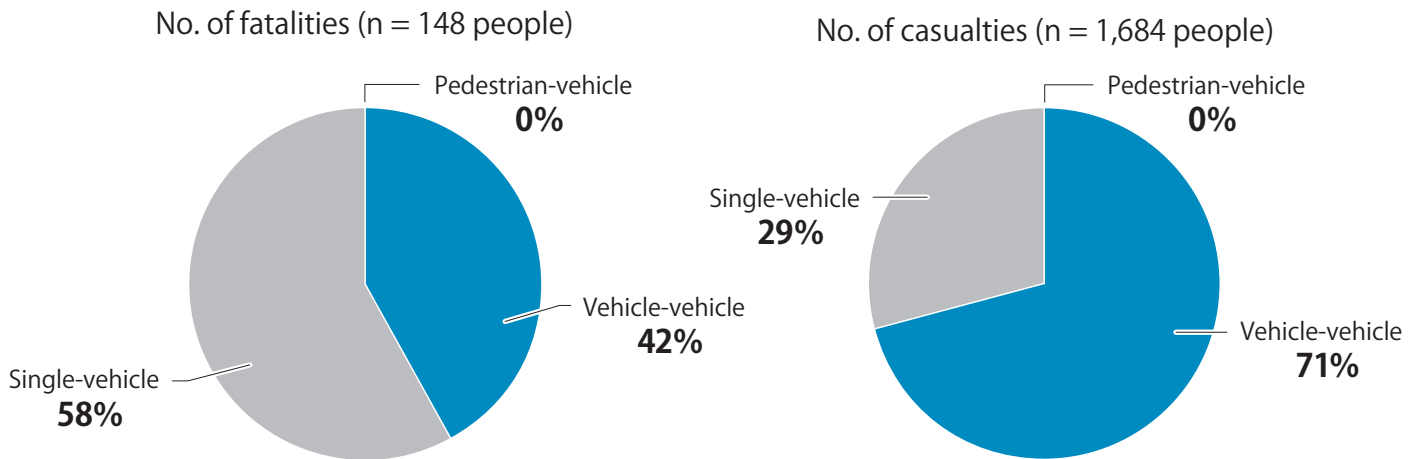


Fig. 4. Composition rate for the types of accidents involving fatalities/casualties while riding a motorcycle on expressways (total from 2013 - 2017)

In terms of the other parties to vehicle-vehicle accidents involving motorcycles on expressways, four-wheel vehicles (FWV) account for the vast majority in terms of both the number of fatalities and casualties (Fig. 5).

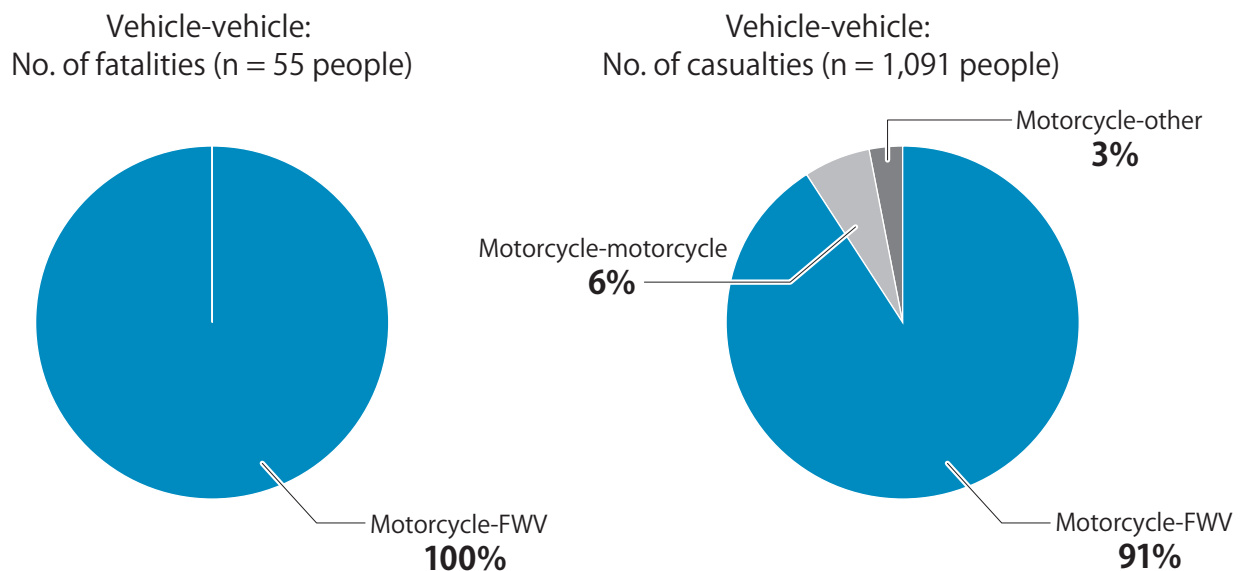


Fig. 5. Composition rate for the other party for fatalities/casualties from vehicle-vehicle accidents while riding a motorcycle on expressways (Party 1 and 2; total from 2013 - 2017)

Therefore, this issue will focus on vehicle-vehicle accidents between motorcycles and four-wheel vehicles on expressways out of a desire to analyze what sorts of characteristics these accidents have.

2 Vehicle-vehicle accidents between motorcycles and four-wheel vehicles on expressways

Since expressways are organized in a manner where they lack intersections, with the exception of service areas (SA) and parking areas (PA), they are essentially free of occurrences of accidents like crossing collisions and collisions between a vehicle turning right and a vehicle going straight. Rather, accidents caused by the mutual movement of multiple vehicles traveling in the same direction account for the majority of such accidents. This mutual type of movement (movement pattern) for vehicle-vehicle accidents between motorcycles and four-wheel vehicles was analyzed using the number of casualties from Parties 1 and 2.

The most common accident type involved a motorcycle going straight and a four-wheel vehicle changing lanes, which accounted for 35% of the total. The second most common type involved both the motorcycle and four-wheel vehicle going straight (its composition reveals that rear-end collisions accounted for more than three-fourths of the total) at 25%. Other patterns aside from these two accounted for a relatively small number (Fig. 6).

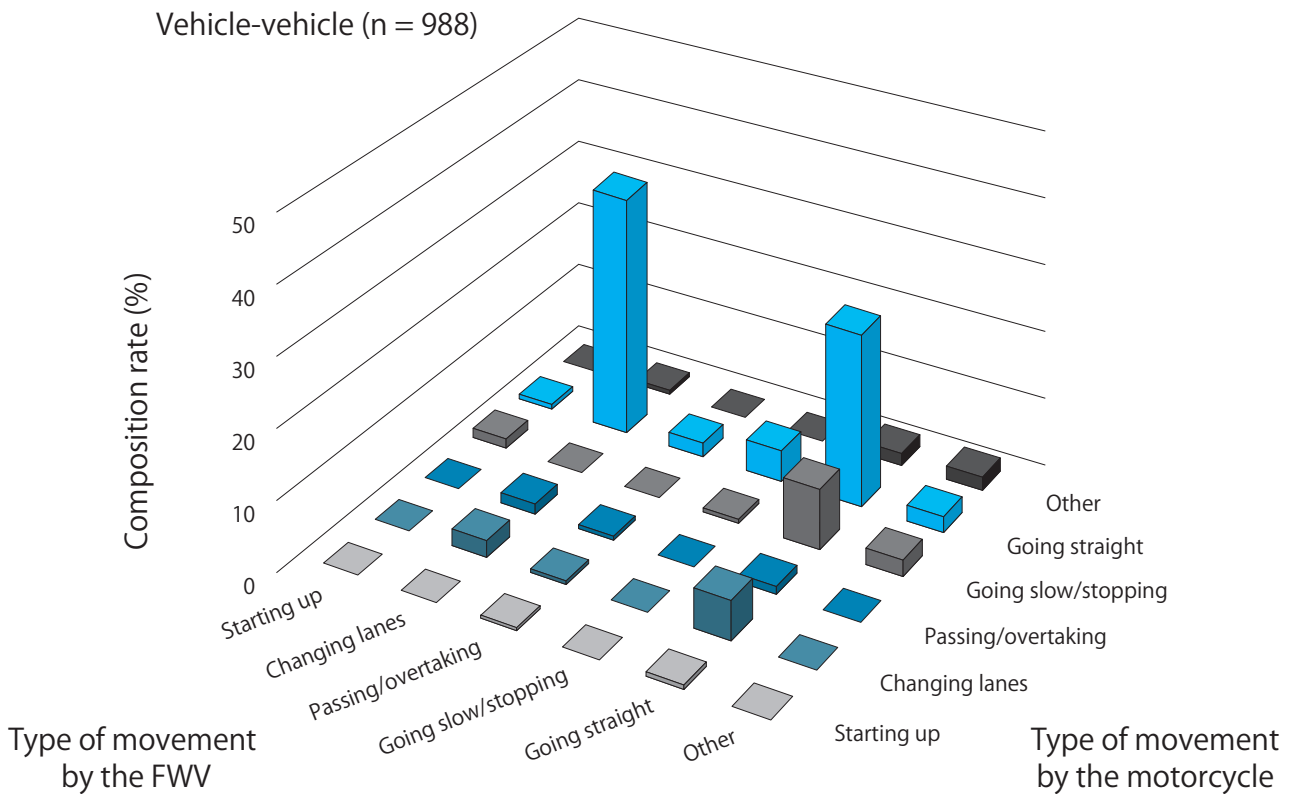


Fig. 6. Composition rate for the type of movement for casualties from vehicle-vehicle accidents between a motorcycle and a four-wheel vehicle on expressways (Party 1 and 2; total from 2013 - 2017)

Based on the number of casualties indicated in Fig. 6 and from the fact that vehicle-vehicle accidents between a motorcycle and a four-wheel vehicle accounts for 91% of the total number of vehicle-vehicle accidents involving motorcycles, the percentage of accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes accounts for roughly one-third of the total number of vehicle-vehicle accidents involving motorcycles.

3 Characteristics of accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes

When it comes to the most common accident pattern of a motorcycle going straight and a four-wheel vehicle changing lanes, these were analyzed with respect to what sorts of accidents this resulted in (type of accident), what caused them (human factors), and what speeds the vehicles were traveling at (danger perception speed). The results of this are indicated below.

■ Trends with the types of accidents

In cases where an accident occurred due to a motorcycle going straight and a four-wheel vehicle changing lanes, most of these cases resulted in collisions and contact accidents, while only a small number resulted in rear-end collisions, despite still being present (Fig. 7).

While rear-end collisions are a subcategory under collisions and contact accidents, here a distinction will be drawn in which collisions and contact accidents are to be read as excluding rear-end collisions.

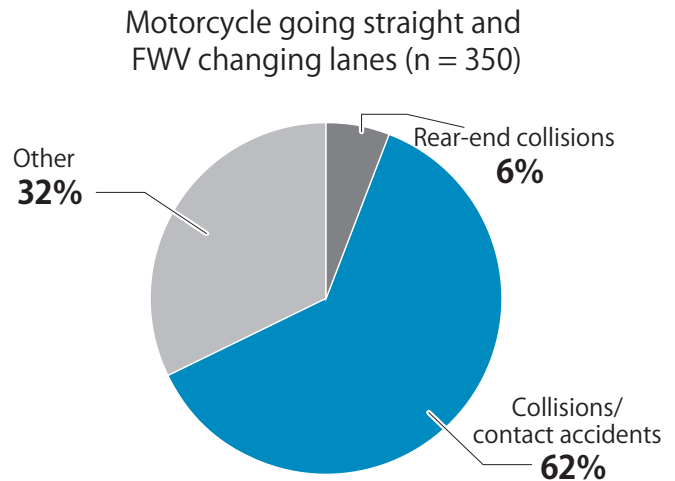


Fig. 7. Composition rate for the type of accident involving casualties while riding a motorcycle in cases involving a motorcycle going straight and a four-wheel vehicle changing lanes (Party 1 and 2; total from 2013 - 2017)

■ Trends with human factors

Trends with the human factors among motorcycle drivers and four-wheel vehicle drivers differ for rear-end collisions and other accident types.

Characteristic factors that could be mentioned for rear-end collisions are the fact that there were “No human factors” with motorcycles causing rear-end collisions, but that with four-wheel vehicles that suffered rear-end collisions there was frequently a “Failure to confirm safety factors” (where the driver failed to confirm safety, or did so inadequately). In ordinary cases, it is rare for there to be no human factors on the side causing the rear-end collision and human factors on the side suffering such collisions, and so rear-end collisions caused by a motorcycle going straight and a four-wheel vehicle changing lanes could be described as a special case.

For other accident types aside from rear-end collisions, there were no human factors on the motorcycle side roughly half the time. Of these human factors, “Failure to observe surrounding traffic movement” (where the driver was aware of the presence of the other party to the accident, but neglected to observe them carefully due to the belief that there was no danger) accounted for the majority of cases. In addition, “Failure to confirm safety factors” accounted for the majority of cases with four-wheel vehicles (Fig. 8).

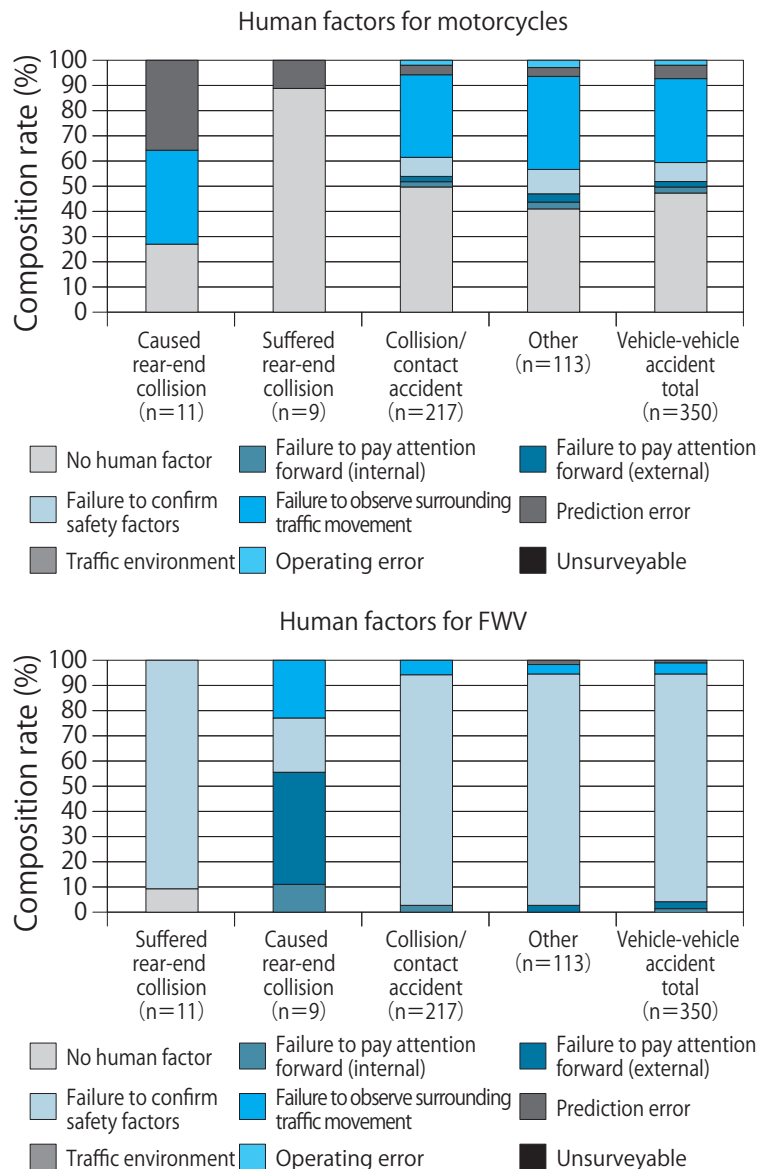


Fig. 8. Composition rate for human factors among the casualties of motorcycle riders in accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes (Party 1 and 2; total from 2013 - 2017)

■ Trends with the danger perception speed

The speed at which the parties were traveling when they perceived that there was the danger of an accident occurring is referred to as the danger perception speed. A graphical representation of the combined danger perception speeds of motorcycles and four-wheel vehicles is shown in Fig. 9.

This reveals that two types of situations account for the majority of situations in which accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes occur:

- (1) Situations in which a motorcycle is overtaking a four-wheel vehicle traveling at low speeds
- (2) Situations in which a motorcycle is traveling parallel to or overtaking a four-wheel vehicle traveling normally.

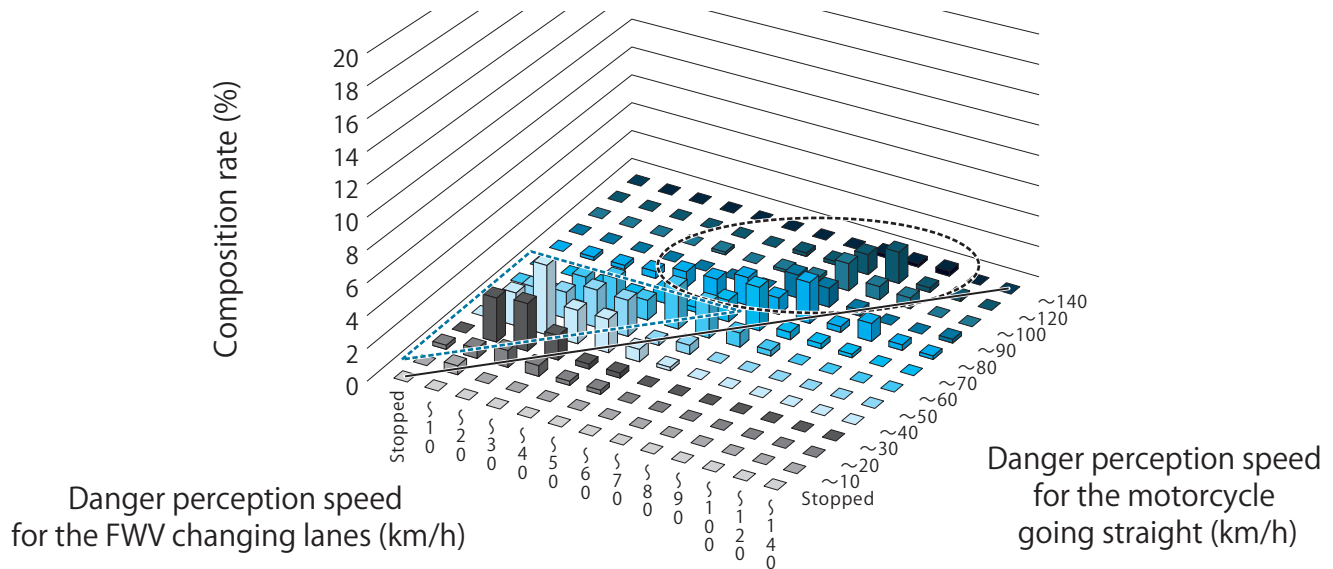


Fig. 9. Composition rate for the danger perception speed among the casualties of motorcycle riders in accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes (Party 1 and 2; total from 2013 - 2017)

■ Conceivable typical accident scenarios

Typical accident scenarios derived from the trends concerning the danger perception speed and human factors that could be mentioned include:

- (1) For situations in which a motorcycle is overtaking a four-wheel vehicle traveling at low speeds
 - Accidents involving a motorcycle traveling down an open lane next to a column of traffic due to congestion without paying sufficient attention to the movement of the vehicles stuck in said congestion colliding with a four-wheel vehicle changing lanes without noticing the motorcycle
 - Accidents involving a motorcycle traveling between lanes or on the road shoulder that is not acknowledged under ordinary circumstances and without paying sufficient attention to the movement of vehicles stuck in congestion and a four-wheel vehicle changing lanes without noticing the motorcycle
- (2) For situations in which a motorcycle is traveling parallel to or overtaking a four-wheel vehicle traveling normally
 - Accidents involving a motorcycle traveling or overtaking another vehicle without paying sufficient attention to the movement of the surrounding vehicles and a four-wheel vehicle changing lanes from the next lane without realizing that a motorcycle was present

In order to avoid these

The drivers of motorcycles should:

- Pay attention to the movement of vehicles in surrounding lanes even when going straight ahead in their own lane
- Operate based on the assumption that they have not been noticed by the drivers of the surrounding vehicles
- Refrain from weaving through traffic in between lanes or on road shoulders
- Refrain from overtaking other vehicles when there is a large difference in their speeds

As for the drivers of four-wheel vehicles:

- Soundly checking for the presence of motorcycles behind them and to their side when changing lanes would presumably be an effective approach to this

4 Introducing and considering an accident case example

Roughly 60% of accidents involving a motorcycle going straight and a four-wheel vehicle changing lanes end up being collision or contact accidents. However, there are also cases aside from these that cannot be classified as rear-end collisions or any other type. One example of an accident where a motorcycle rear-ended a four-wheel vehicle because the four-wheel vehicle carelessly changed lanes will be taken up by touching on the causes leading to the accident and the conceivable possibilities derived therefrom.

■ Accident case example: Case involving a motorcycle rear-ending a four-wheel vehicle changing lanes

In the morning of a clear day, Mr. A (motorcycle/over 1,000 cc) was traveling at roughly 100 km/h in the second lane of an expressway with three lanes in each direction. At the same time, Mr. B (large truck) was traveling at roughly 85 km/h ahead of Mr. A. Even though Mr. A was riding in the second lane, he planned to change lanes to the third lane as he drew close to Mr. B, who was driving at a slower speed than his own, in an attempt to overtake Mr. B. However, there was a series of several passenger vehicles in the third lane that was also passing Mr. B. Therefore, Mr. A waited for these vehicles to pass before changing lanes to the third lane, where he accelerated to over 100 km/h in order to pass Mr. B, following along with the vehicle ahead of him.

However, when Mr. B, who had been traveling in the second lane, wanted to change lanes to the third lane in an effort to overtake a dump truck traveling at a slower speed than himself, he noticed that a number of passenger vehicles were moving at considerable speed from farther back in the third lane. So he waited for them to pass before changing lanes. However, Mr. B failed to notice that Mr. A was coming after a group of said passenger vehicles. Realizing that the lane was now blocked off, Mr. A applied the brakes, but was unable to do so in time and ended up getting into a rear-end collision with the back of Mr. B's large truck. The front part of Mr. A's motorcycle suffered severe damage, and Mr. A suffered serious injuries as well (Fig. 10).

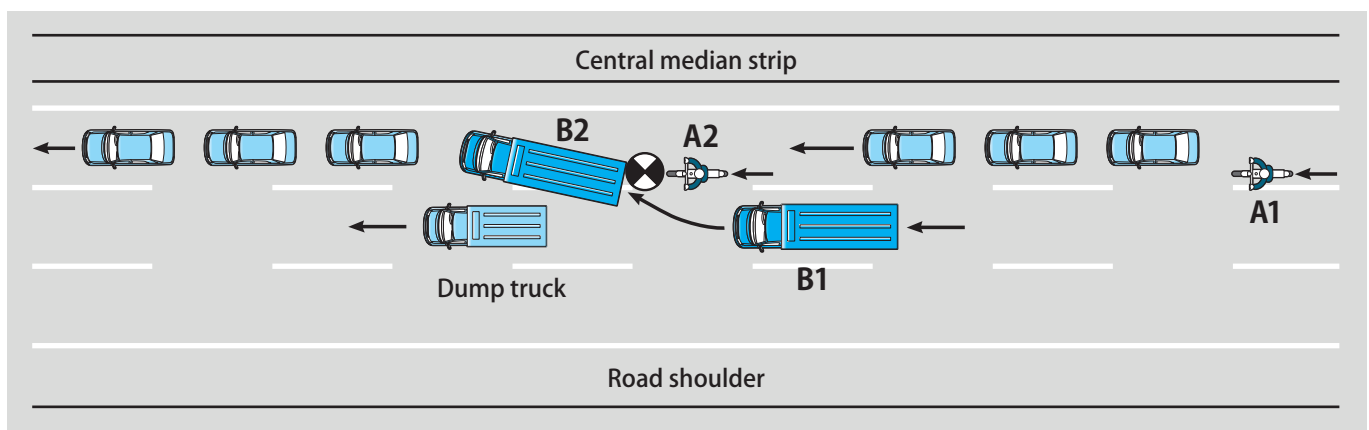


Fig. 10. Example of a four-wheel vehicle rear-ended by a motorcycle when changing lanes

■ Assumed causes and considerations

The human factor that led Mr. A (motorcycle/caused the rear-end collision) to get into the accident could be considered a failure to observe surrounding traffic movement. Despite realizing that a large truck was traveling ahead of him, he neglected to pay attention due to a failure to recognize the hidden danger. As such, it could be pointed out that he was unable to adequately decelerate or take evasive action when Mr. B changed lanes.

The human factor on the part of Mr. B (large truck/suffered the rear-end collision) could be considered a failure to confirm safety factors. It could be pointed out that he failed to recognize Mr. A coming at the end of a group of passenger vehicles that were passing by in the third lane. Since he changed lanes under such conditions, this ultimately resulted in him interfering with Mr. A's forward passage.

With rear-end collisions involving a motorcycle going straight and a four-wheel vehicle changing lanes, roughly 90% of the time the human factors for the four-wheel vehicles suffering such collisions involved a failure to confirm safety factors, and presumably there exist other cases that are similar to the case example presented here.

In addition, the fact that Mr. A was speeding is a conceivable background reason that led to the accident. As a result of speeding up to overtake the other vehicle, he presumably reached a considerable speed of over 100 km/h.

This resulted in a sizable difference in speed with Mr. B, who was traveling at roughly 85 km/h. As a result, this conceivably led to the possibility that it was difficult for Mr. B to detect Mr. A, as well as the possibility that it was difficult for Mr. A to sense Mr. B changing lanes, as he was located in Mr. A's side view.

However, there is also the conceivable possibility that had circumstances been slightly different, this would have resulted in a different type of accident. Had Mr. A been farther ahead or moving at a higher rate of speed than he was in the accident case example, it could have conceivably resulted in a collision or contact accident caused by Mr. B against Mr. A.

Moreover, had Mr. A been farther behind or moving at a lower rate of speed than he was in the accident case example, this would have opened up the conceivable possibility that he could have initiated evasive actions before getting into a rear-end collision. Yet had he tried to avoid an accident by instantaneously applying the emergency brake, this could have potentially resulted in a single-vehicle accident. For example, had his front wheel locked up it could have led to the motorcycle overturning, or had he lost control of the motorcycle this could have resulted in a collision with the central median barrier or a guard fence.

5 Conclusion

Compared with ordinary roads, expressways allow drivers to quickly and safely travel the same distance with minimal effort. However, traffic accidents do occur on them, albeit rarely, and they carry the potential to produce serious accidents as a result of the fact that vehicles travel at high speeds.

- The number of fatalities from accidents while riding a motorcycle on expressways has not decreased that much compared with the number from the first half of the 1990s
- Whereas roughly 60% of single-vehicle accidents end up being accidents involving the death of a motorcycle rider, roughly 70% of vehicle-vehicle accidents result in casualties
- Vehicle-vehicle accidents frequently involve cases where an accident occurs when a four-wheel vehicle changes lanes while a motorcycle is going straight
- The major causes for this are estimated to be a failure to confirm safety factors when four-wheel vehicles change lanes, insufficient attention paid by motorcyclists, and motorcyclists weaving between vehicles and traveling on the road shoulder that are not acknowledged under ordinary circumstances

The drivers of motorcycles should strive to not weave between vehicles and drive on the road shoulder, make every effort to notice the movement of vehicles in the next lane over when they are traveling down an empty lane, and refrain from driving with substantial speed differences with other vehicles, among other efforts, while the drivers of four-wheel vehicles should soundly check to confirm safety with the awareness that motorcycles could be coming up from behind them when they are changing lanes, so as to reduce the number of accidents with motorcycles on expressways.

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