Connected Motorcycle Consortium

CMC Basic Specification

Accident Analysis

- Lane change

Advanced analysis of accident types: Lane change based on GIDAS (German In-Depth Accident Study) database.

Document Information

Document Title:	Accident Analysis – Lane change
Version:	1.0
Release Date:	17/1/2023

Disclaimer

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1. Background and Objectives

To pursue the goal "improving motorcycle rider safety", CMC has studied the most frequent PTW (Powered Two-Wheeler) accident scenarios in the GIDAS (German In-Depth Accident Study) database (Figure 1). Out of those accident scenarios, the lane change case accounts for 12.3% of the total of PTW accidents. CMC performed a study of this lane change case using the GIDAS database, which is explained in this report.
The analyses of the other accident scenarios are explained in the other reports.

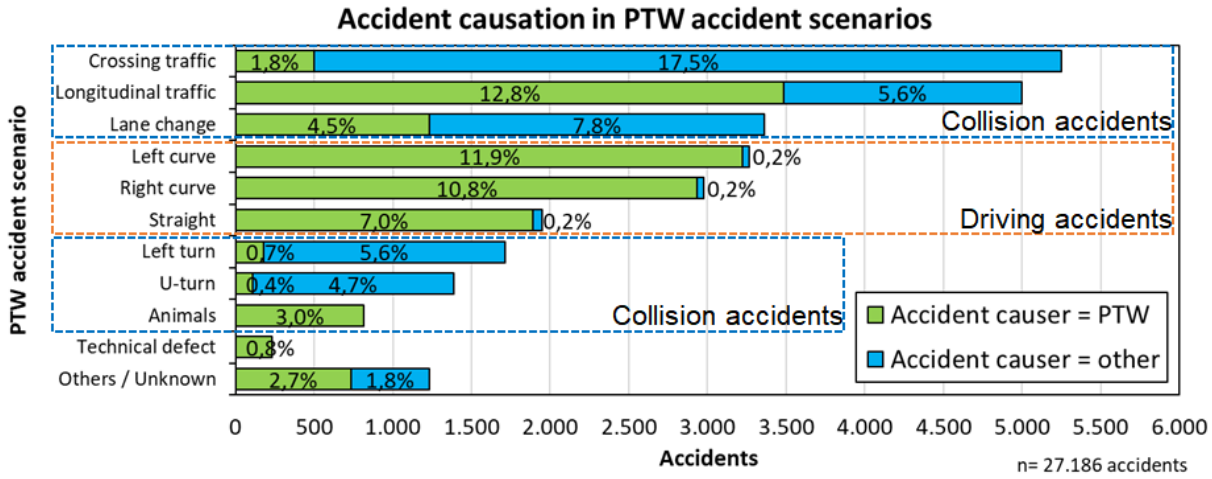


Figure 1: Accident causation in the PTW scenarios

2. Study structure

The study uses the GIDAS database which contains precise information about the actual accidents that occurred. From the database, the following fact-based data are extracted and studied.

a) Location of the accident: rural / urban
b) Accident scene: straight / bend / junction, etc.
c) Kind of traffic regulation: right of way / stop sign / traffic lights, etc.
d) Kind of road user: M1/N1, M2/N2, motorcycle, bicycle, etc.
e) Main accident causer
f) Main accident causation: mis-obeyed priority / turning, etc.
g) Types of speed limitation: local limit / traffic sign, etc.
h) Maximum permitted speed: 30 km/h, 50 km/h etc.
i) Speed limit and distribution
j) Speed before the accident and at the time of collision
k) View obstruction
l) Used lane when encountering an accident
m) Road surface: asphalt / cobble stone / sand, etc.
n) Precipitation at the time of the accident
o) Road condition: dry / wet / snow, etc.
p) Interview result: visibility limitation
q) Interview result: overlooked / distracted, etc.
r) Interview result: misjudgement
s) Interview result: accident-avoidance possibility by other action
t) Interview result: mistakes in executing the avoidance action
u) Interview result: influence from vehicle technology
v) Interview result: influence of road condition

Selecting the use cases for analysis

Within the selected lane change accident scenario, there exist more precise accident types as shown in Figure 2.

Which use case to first concentrate on has been decided from the frequency of the specific use case., i.e., accident type 202 which counts for 34.5% (n=1,160) of all lane change accident types, accident type 631 which counts for 14.7% (n=494), accident type 551 which counts for 6.3% (n=212).

Considering the similarity of the accident type 631 and 551, the analysis of these types was combined as one analysis.

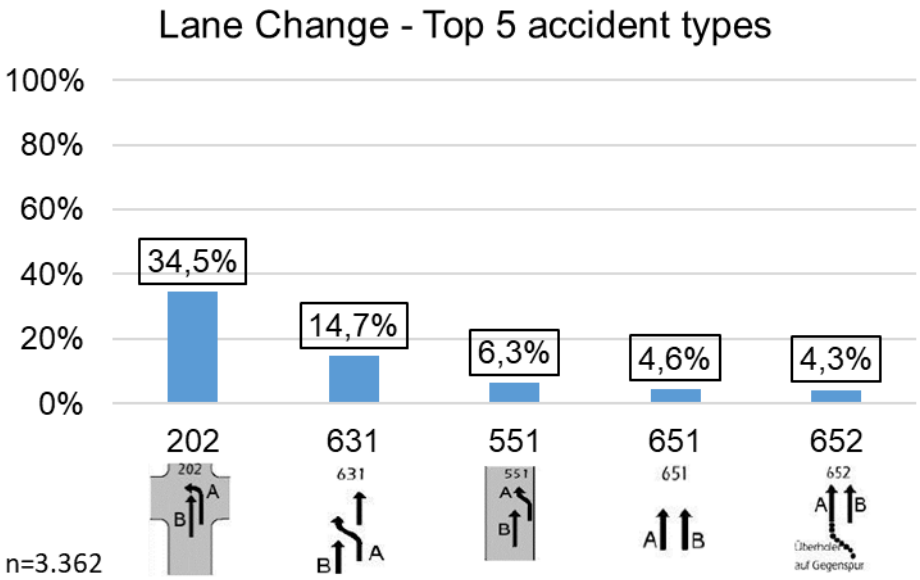


Figure 2: Selection of lane change accident type

3. Use case description

3.1 Lane change accident type 202

Lane change scenario 202 describes a conflict between two road users, where Participant A is turning left and Participant B is following / overtaking Participant A on its left side, regardless of the number of lanes in one direction. (Figure 3)

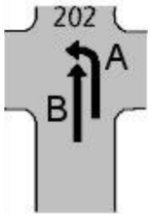


Figure 3: Lane change accident type 202

3.2 Lane change accident type 631

Lane change accident scenario 631 describes a conflict between a road user (Participant A) who is changing lanes to the left and a road user (Participant B) who is going straight on the left side lane. (Figure 4)

Figure 4: Lane change accident type 631

3.3 Lane change accident type 551

Lane change accident scenario 551 describes a conflict between a road user (Participant A) who is starting to dive or parking out longitudinal on the right and a road user (Participant B) who is driving in the same direction. (Figure 5)

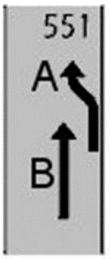


Figure 5: Lane change accident type 551

4. Summary of the analysis results

In this chapter, a summary of the analysis results of each accident type is given. Detailed analysis results can be found in the following chapters.
Lane change accident type 202

4.1 Lane change accident type 202

Main findings.

- The accident type 202 occurred most frequently on urban roads (58.8%), especially at junctions, crossings and property exits. In comparison, the average accident location for all PTW accidents is on urban roads in 56.9% of cases. (5.1.1)
- Participant A is an M1/N1 vehicle (passenger car / light commercial vehicle) in 67.7% of cases and a PTW in 20.9% of cases. Participant B is a PTW in 90% of cases. (5.1.4)

- The main accident causer is Participant A in 59.7% of cases, and Participant B in 40.3% of cases. When the Participant A is the main causer, it consists of M1/N1 vehicles in 61.8% of cases and of PTWs in 28.6% of cases. When Participant B is the main causer, a PTW is the main causer in most cases. (5.1.5)
- When the main causer is participant A, the main accident causation is error of this participant while making the manoeuvre (59.7%). When the main causer is participant B, the main accident causation is error of this participant while overtaking (32.4%), unadapted speed (4.8%) and unadapted distance (1.0%). (5.1.6)
- In total, approximately 22.4% of Participants B exceed the speed limit, and at 50 km/h 37.5% of Participants B exceed the speed limit. (5.1.9)
- On average, Participant A drives at lower speed (median=27 km/h) than Participant B (median=54 km/h) and both Participant A and Participant B decelerate before the collision. (5.1.10)
- In most of the accidents there was no view obstruction, neither for Participant A nor for Participant B. (5.1.11)

4.2 Lane change accident type 631 & 551

Main findings.

- The accident types 631 and 551 occurred most frequently on urban roads (65.4%), especially at straights. In comparison, the average accident location for all PTW accidents is on urban roads in 56.9% of cases. (5.2.1)
- Participant A consists mostly of M1/N1 vehicles (passenger cars / light commercial vehicles) (84.2%) and for Participant B this is mostly PTWs (88.7%). (5.2.4)
- The main accident causer is Participant A (90.8%) and in more detail, Participants A being M1/N1 vehicles (85.4%). (5.2.5)
- The main accident causation is an error of participant A while making the manoeuvre (90.8%). Only after that are situations where the main causer is participant B, with error during the manoeuvre (5.9%) and unadapted speed (3.2%). (5.2.6)
- Approximately 44.2% of Participant B exceed the speed limit, while 4.4% of Participant A exceed the speed limit. (5.2.9)
- In the median scenario, Participant A initially drives at a 19 km/h lower speed than Participant B. Participant B decelerates before the collision, but Participant A drives at almost constant speed. (5.2.10)
- In most accidents there was no view obstruction, neither for Participant A nor for Participant B. (5.2.11)
- From interview data: From interview data: Out of those who answered the question whether they overlooked important information or if they were distracted, 74.7% of Participants A answered yes. Among those who report such overlooking or distraction, 38.3% were focusing on other road users and 36.2% forgot or omitted to control their view. (5.2.17)
- From interview data: Out of those who answered the question whether they misjudged the situation or not, 16.7% of Participants A report they have misjudged the situation, and the most frequent reason was a misjudgement of speed / distance of other vehicles (70.7%). (5.2.18)

5. Analysis results in detail

5.1 Lane change accident type 202

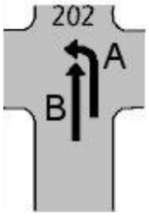


Figure 6: Lane change accident type 202

5.1.1 a) Location of the accident

The majority of PTW accidents for lane change accident type 202 occurred on urban roads, which account for 58.8% of cases. Accidents which occurred in rural areas account for 41.2% of cases. No accident type 202 occurred on motorways since motorways rarely have ways to turn left. (Figure 7). The accident type 202 occurred more frequently on urban roads than on rural roads, and the percentage of it is very close to average (For PTW accidents on average, urban roads account for 56.9% rural roads account for 40.1%, and motorways for 3.0%).

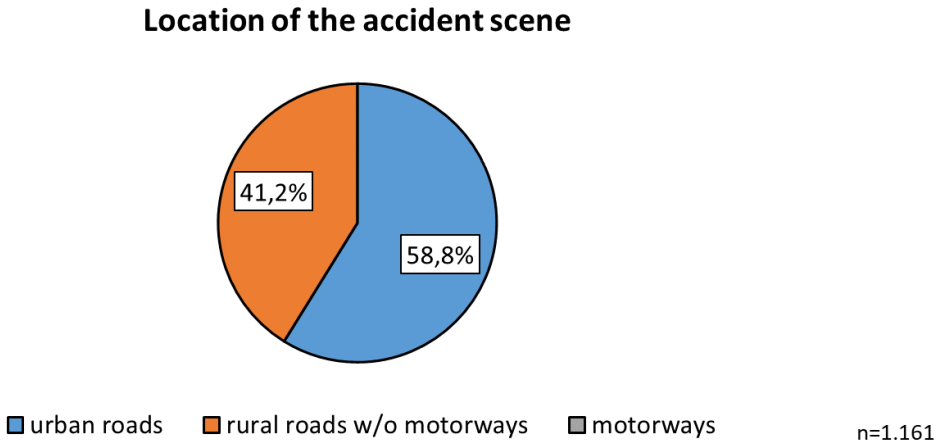


Figure 7: Location of the accident (202)

5.1.2 b) Accident scene: straight / bend / junction, etc.

Approximately half of PTW accidents for the lane change accidents occurred at junctions (Figure 8). The second frequent scene is at crossings (22.7%) and the third is at property exit (21.6%).

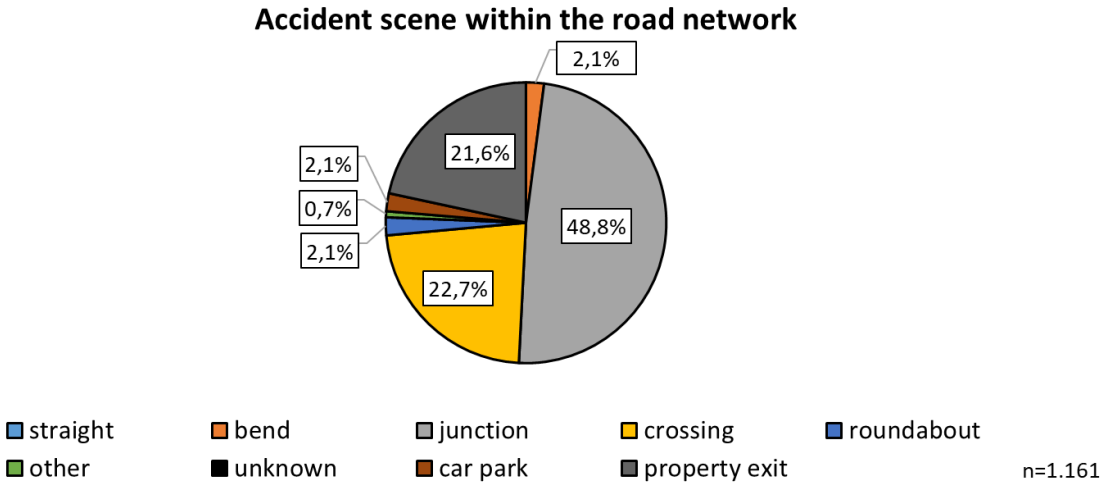


Figure 8: Accident scene (202)

5.1.3 c) Kind of traffic regulation

The predominant traffic regulation at the accident site was right-of-way, accounting for 62.2% of all 202 type accidents involving PTWs (Figure 9). In 11.4% of the cases, the regulation was 'vehicle out of / in property exit'.

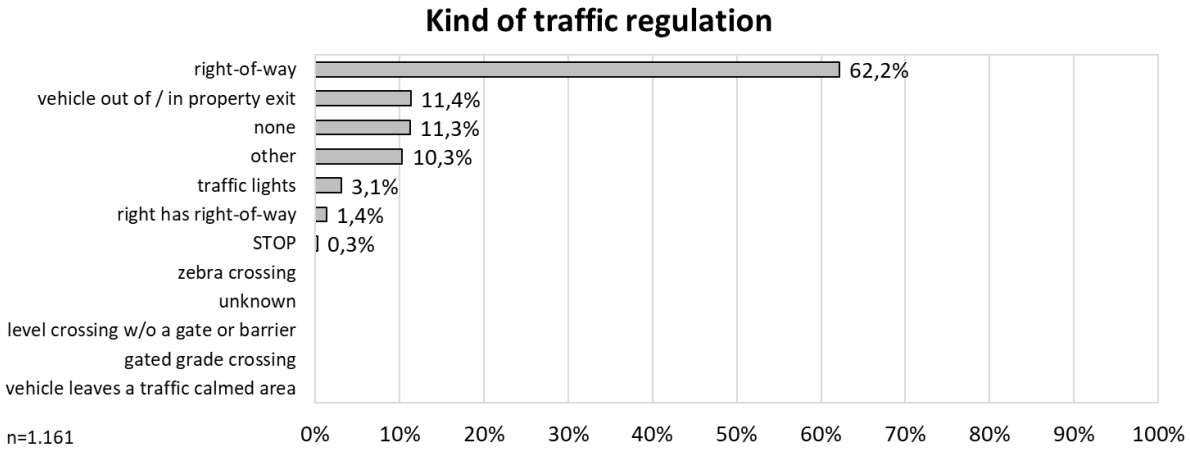


Figure 9: Kind of traffic regulation (202)

5.1.4 d) Kind of road user: M1/N1, M2/N2, motorcycle, bicycle, etc.

The participants in the lane change accidents involving PTWs, are shown in Figure 10. Participant A consists of M1/N1 vehicles (passenger cars / light commercial vehicles) in 67.7% of the cases and of PTWs in 20.9%. Participant B consists of PTWs in 90% of the cases.

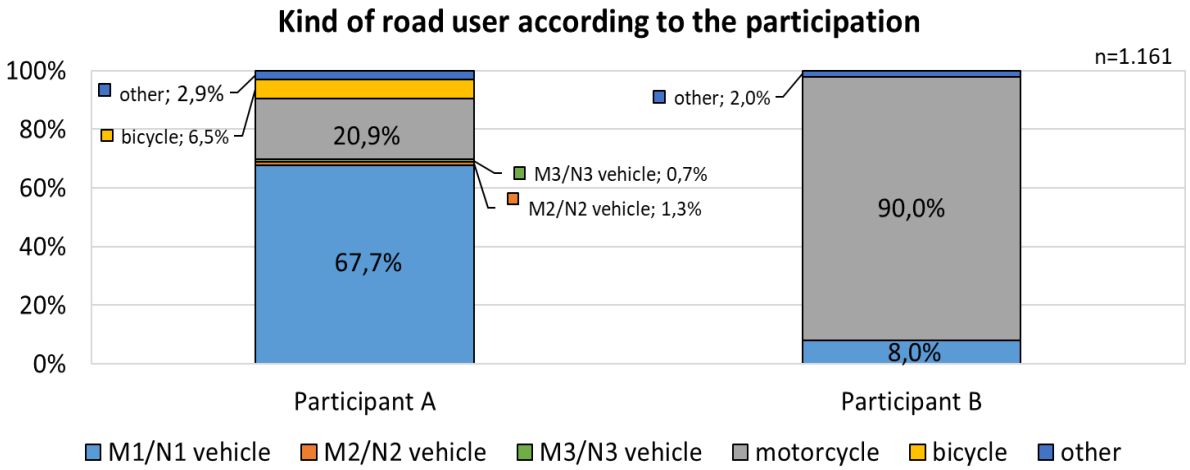


Figure 10: Kind of road user (202)

5.1.5 e) Main accident causer

The main accident causer in the lane change accidents involving PTWs is shown in Figure 11. The main accident causer is Participant A in 59.7% of the cases, and is Participant B in 40.3% of the cases. When the Participant A is the main causer, Participant A is an M1/N1 vehicle in most cases (61.8%), and secondly a PTW (28.6%). When Participant B is the main causer, Participant B is a PTW in almost all cases.

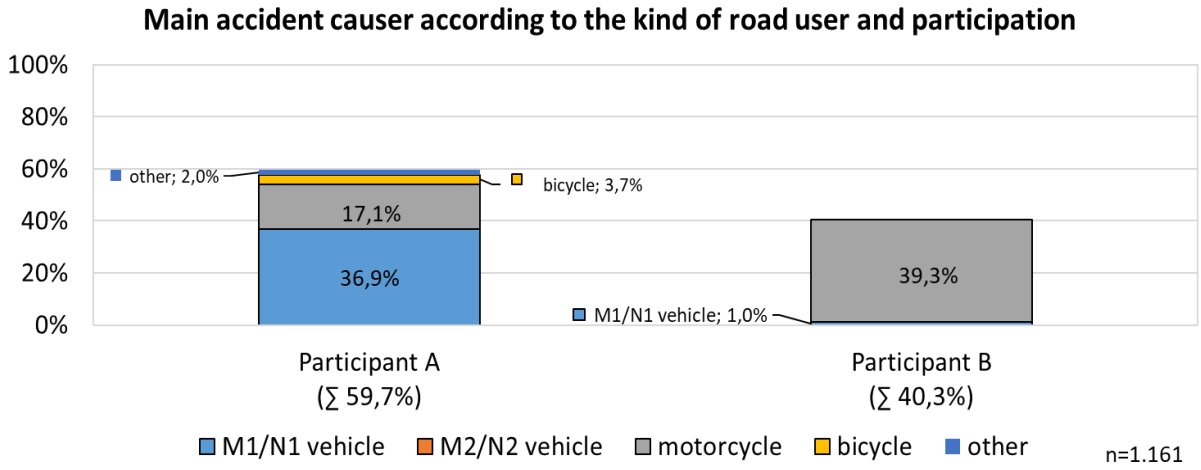


Figure 11: Main accident causer (202)

5.1.6 f) Main accident causation

The main causation of the accidents is studied and shown in Figure 12. The most frequent main accident causation for Participant A is ‘’Error while turning’ (36.6%), and the accident is also caused due to error while Participant B is overtaking (13.3%) and error while Participant B is driving past (6.4%). The most frequent main accident causation for Participant B is errors while overtaking (32.4%) and the accident is also caused because of their unadapted speed (4.8%).

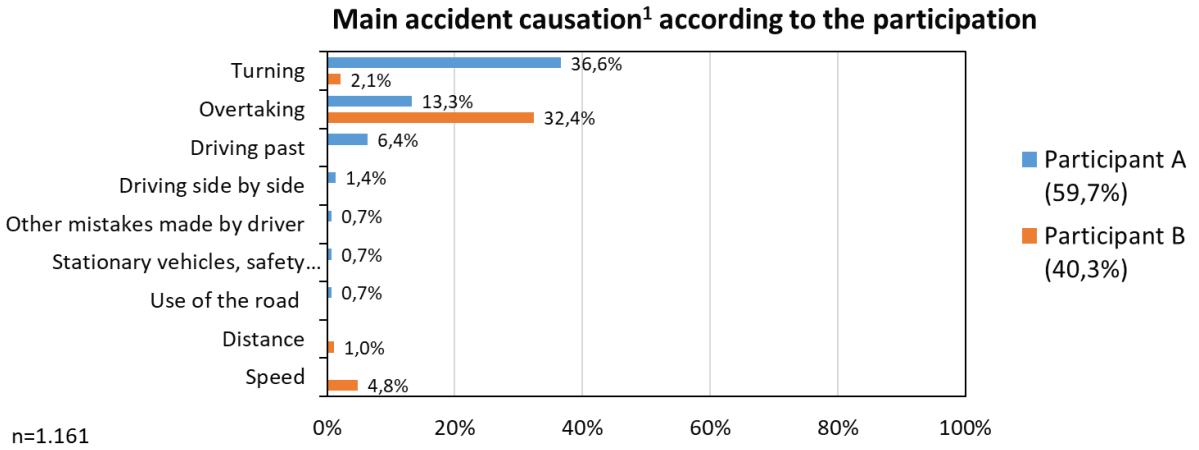


Figure 12: Main accident causation (202)

1: The police and also the technical investigation units in GIDAS have to assign a main accident causer with one main accident causation in each accident

Multiple accident causations according to the participant are shown in Figure 13. The order of frequencies of each causation is similar to the main causation in Figure 12, but 'Speed' is now the number two frequency. It could be said that sometimes speed was a contributing factor to the accident, even though the main causation was another reason.

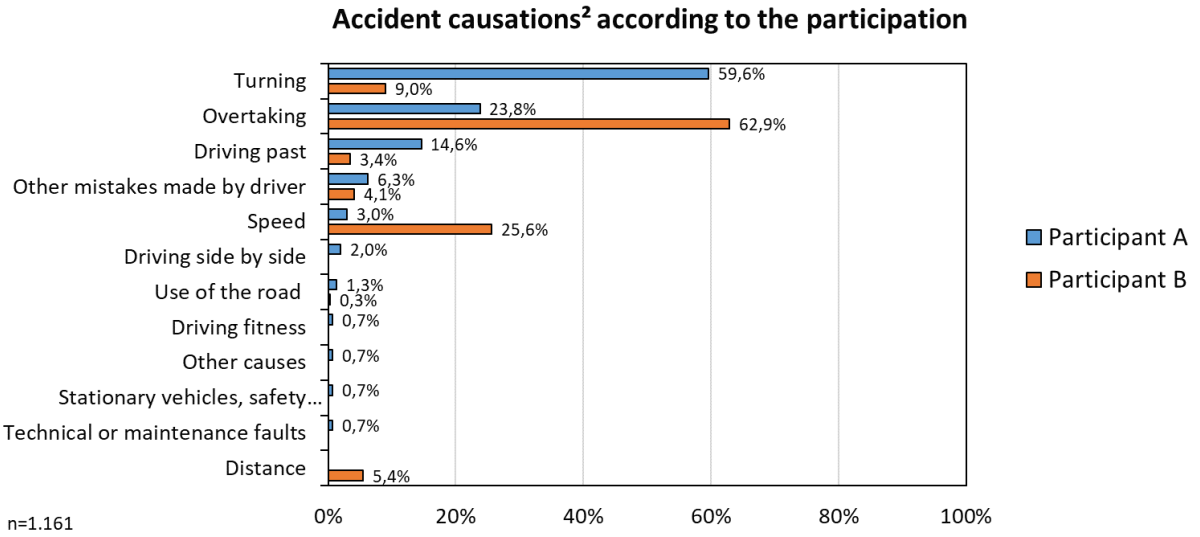


Figure 13: Accident causations (202)

2: The police and the technical investigation units in GIDAS can assign up to 3 accident causations for each accident participant. Consequently, one accident can have several accident causes depending on the participant and so the sum of the accident causations is ≥100%

5.1.7 g) Types of speed limitation

What provides the speed limit to the participant is shown in Figure 14. For both Participant A and B, the speed limit is mainly provided by local traffic rules (more than 70%), and secondly by traffic signs (20.9%).

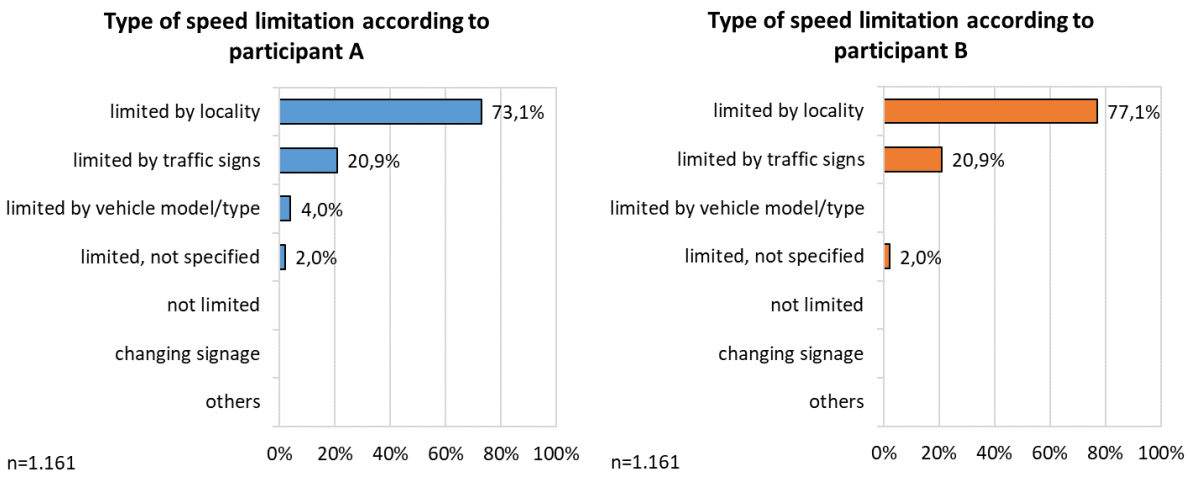


Figure 14: Types of speed limitation (202)

5.1.8 h) Maximum permitted speed

The maximum permitted speed on the accident site is shown in Figure 15. The most frequent permitted speed is 50 km/h and the second most frequent is 100 km/h. This distribution is in line with Figure 7 which indicates that approximately 60% of accidents occurred at urban roads and approximately 40% of accidents occurred at rural roads.

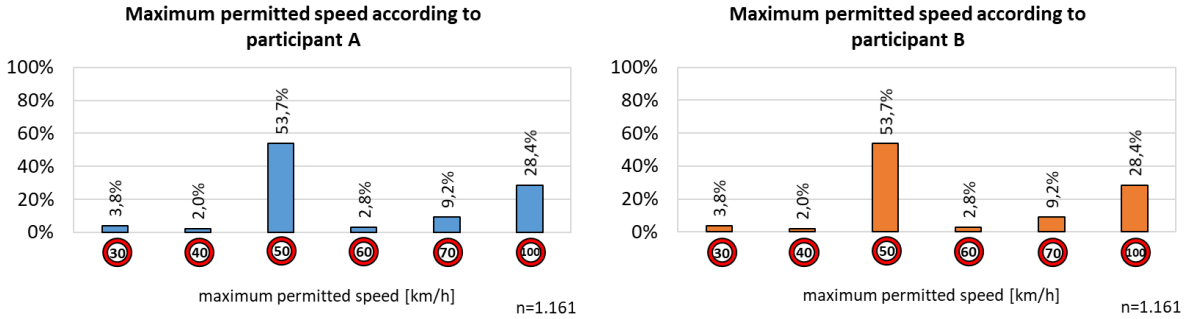


Figure 15: Maximum permitted speed (202)

5.1.9 i) Speed limit and distribution

Figure 16 shows the percentage of participants exceeding the applicable speed limit. Comparing Participants A and B, Participant B is more often seen to have exceeded the speed limit and most of these cases occur at 50 km/h.

Approximately 22.6% of Participants B exceed the speed limit, while 3.7% of Participants A exceed the speed limit. Participant B is on the left side of Participant A therefore usually the faster vehicle.

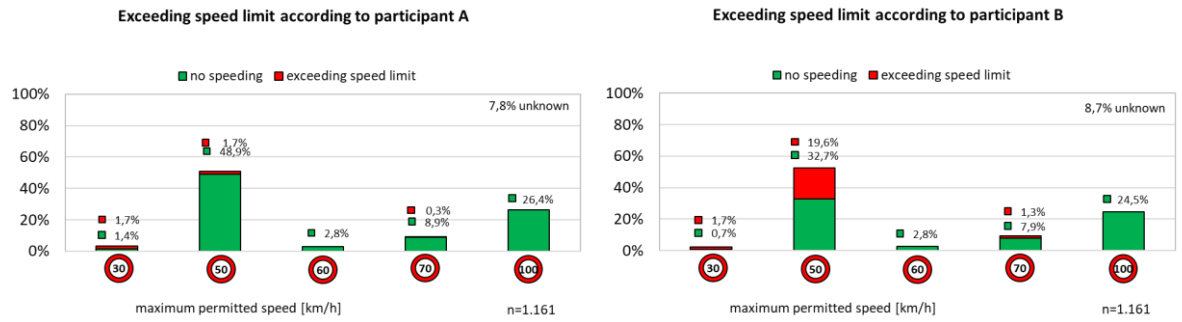
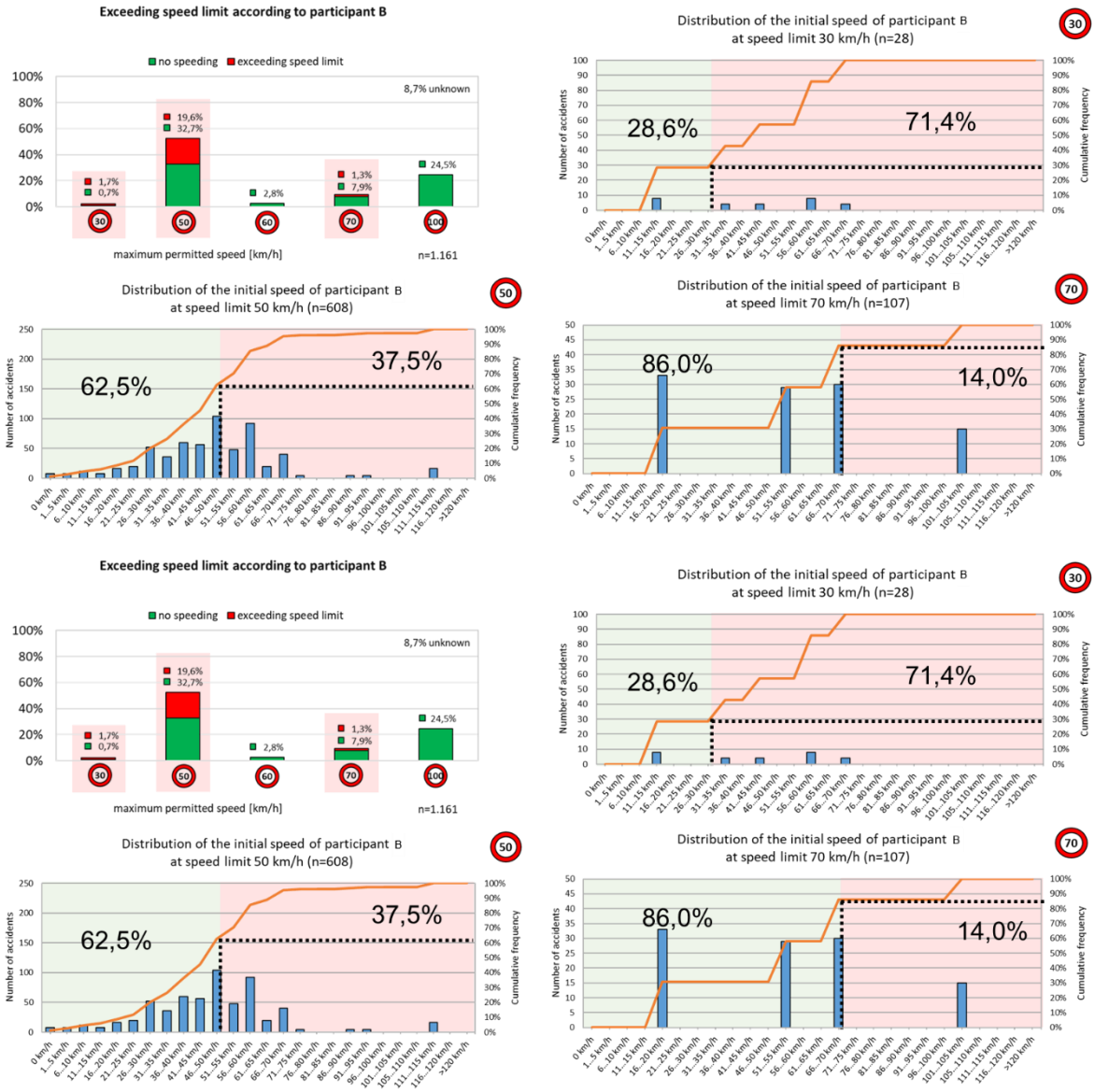


Figure 16: Exceeding Speed limit (202)

Figure 17 shows the distribution of the speed of the participants. From the figure we can deduct to what extent the participants exceeded the allowable speed limit before the accident.



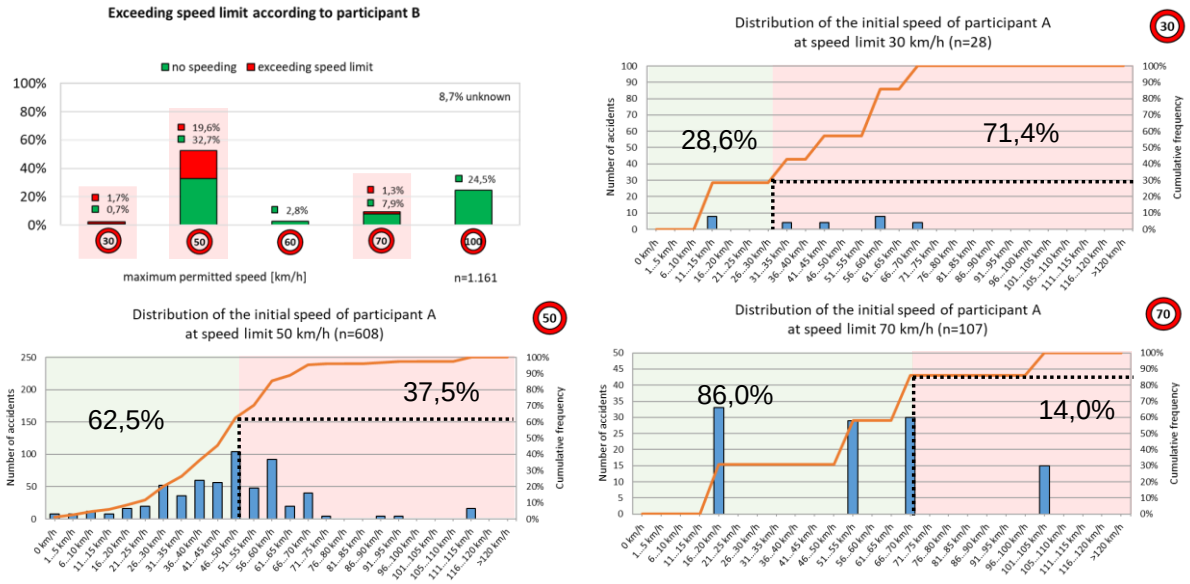


Figure 17: Speed distribution (202)

5.1.10 j) Speed before the accident and at the time of collision

Figure 18 shows the initial speed of the participants. The median of the initial speed of Participant A is 27 km/h and that of Participant B is 54 km/h. Participant A who is in the right lane has lower average speed than Participant B who is in the left lane.

Figure 19 shows the initial speed of the participants when the main causer is a PTW, and Figure 20 shows the initial speed when the main causer is another vehicle. Those speeds are very similar.

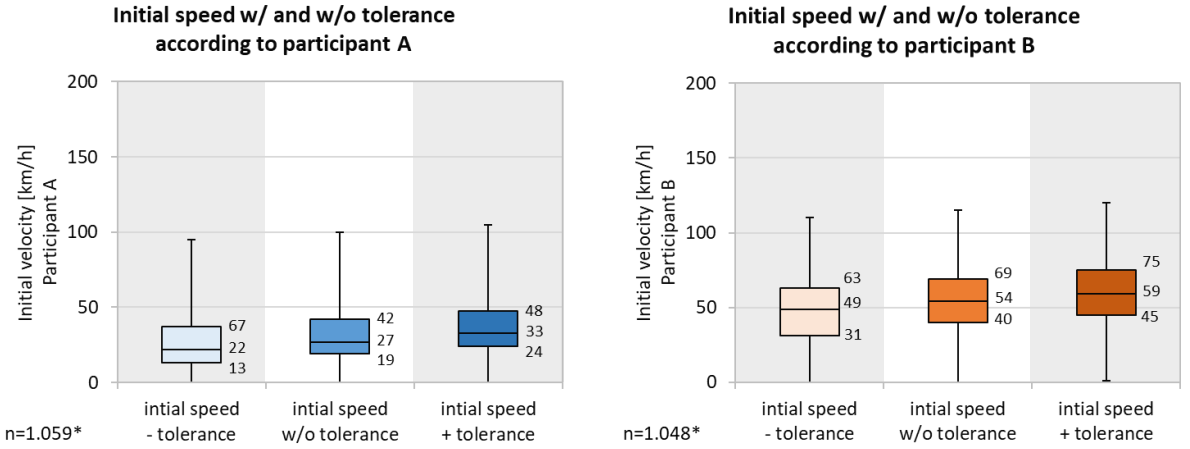


Figure 18: Initial speed (202)

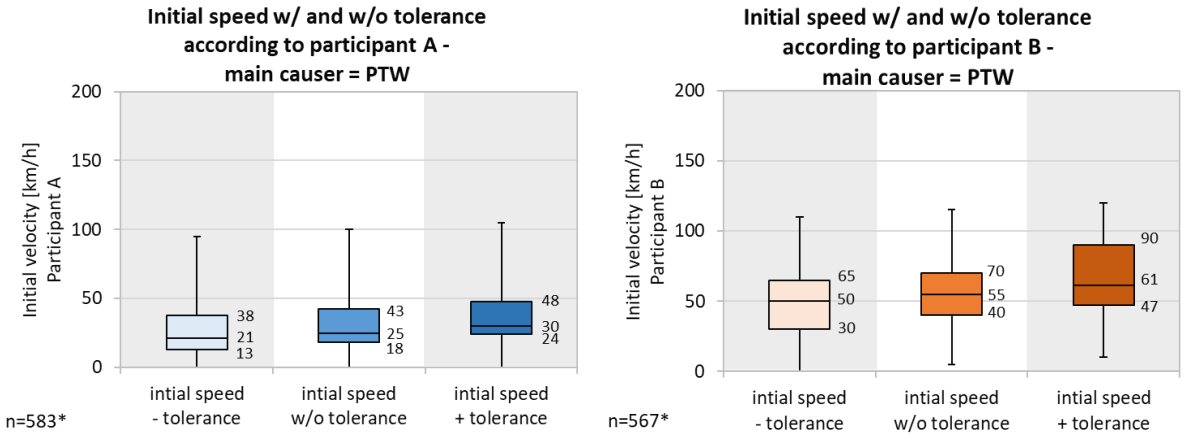


Figure 19: Initial speed - main causer is PTW - (202)

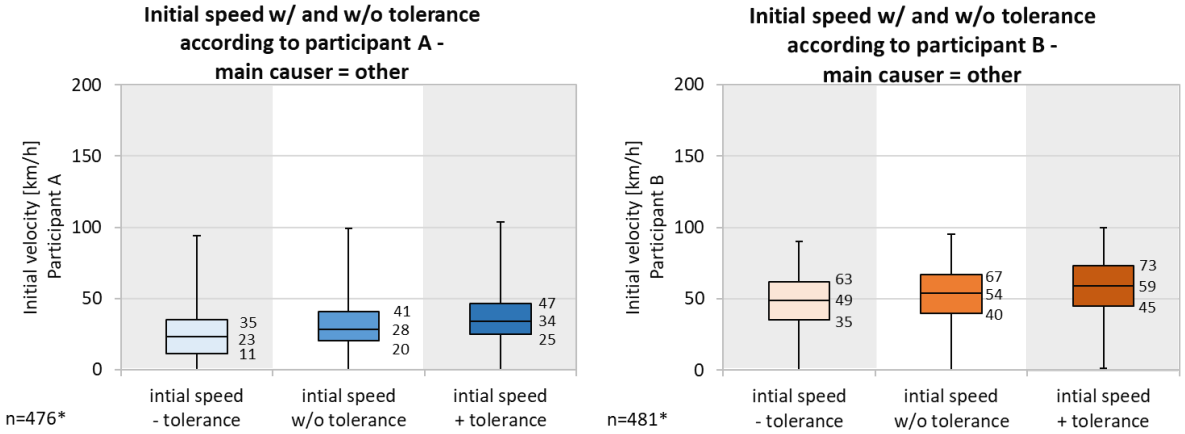


Figure 20: Initial speed - main causer is other vehicle - (202)

Figure 21 shows the collision speed of the participants. Figure 22 shows the collision speed of the participants when the main causer is a PTW, and Figure 23 shows this when the main causer is another vehicle. The collision speed of Participant B in case the main causer is a PTW, shows a higher deviation from the median than in case the main causer is another vehicle. That may mean the brake response of a PTW tends to rely more on the individual PTW rider.

Comparing the initial speed in Figure 18 and the collision speed in Figure 21, it can be observed that both Participant A and Participant B decelerate before the collision.

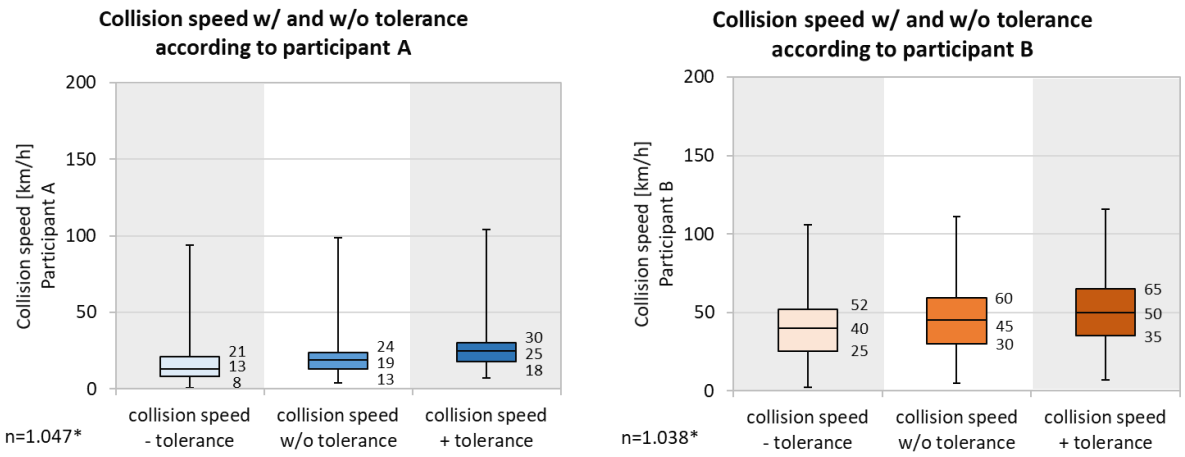


Figure 21: Collision speed (202)

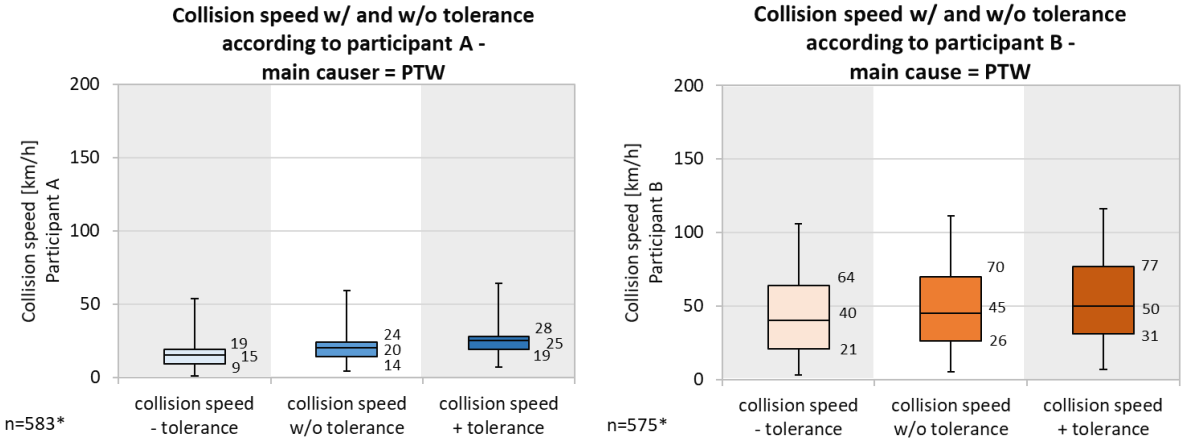


Figure 22: Collision speed - main causer is PTW - (202)

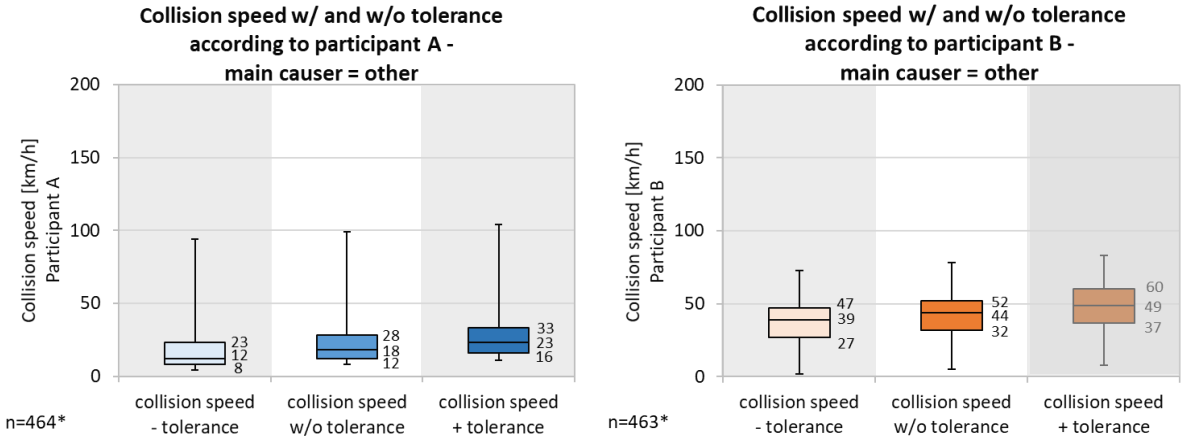


Figure 23: Collision speed - main causer is other vehicle - (202)

5.1.11 k) View obstruction

Figure 24 and Figure 25 show the existence of view obstructions and the types of obstruction respectively. It can be seen that around 90% of the cases had no view obstructions and the rest mostly had non-permanent obstructions, e.g., driving vehicles.

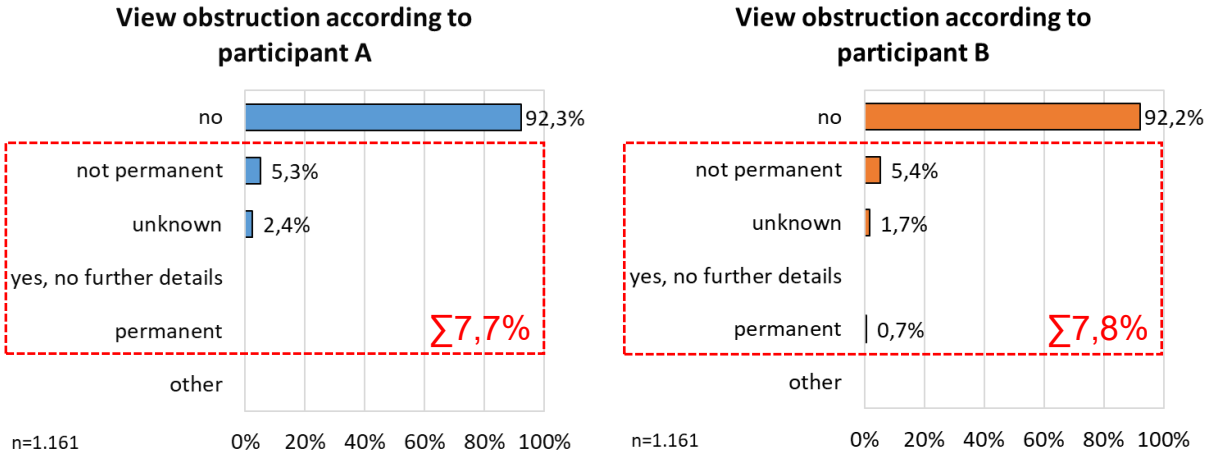


Figure 24: View obstructions (202)

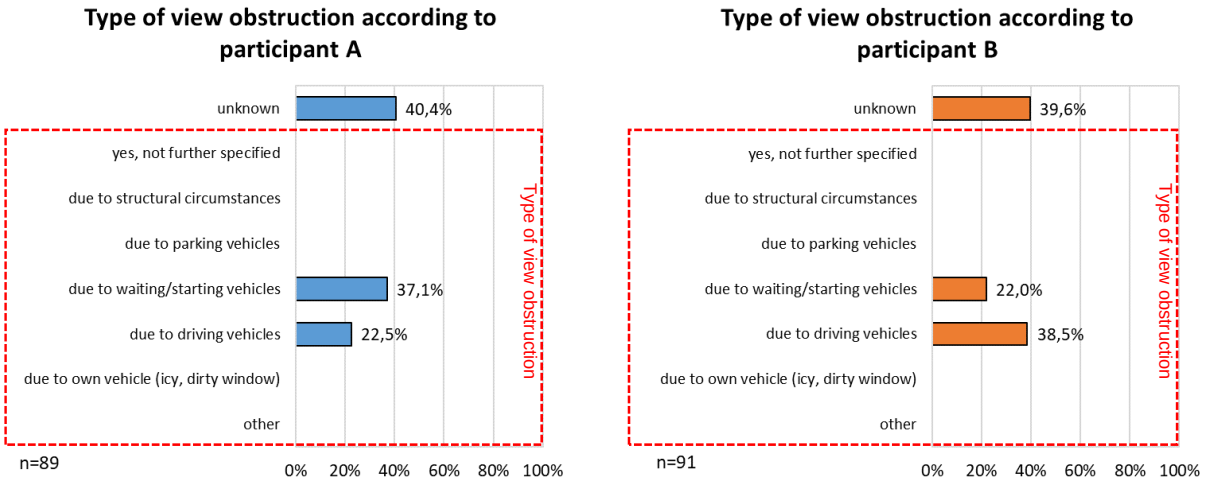


Figure 25: Type of view obstruction (202)

5.1.12 l) Used lane when encountering an accident

Figure 26 shows which lane the participants used when encountering an accident. In 69.7% of this lane change scenario, Participant A was driving at a single lane crossing and turning left. In 45.0% of this lane change scenario, Participant B was driving on the opposing lane on a single lane road, and in 25.8% driving at a single lane crossing and going straight. Figure 27 shows which lane the participants used when the main causer is a PTW, and Figure 28 shows this when the main causer is another vehicle. Comparing them, the most frequent used lanes are similar independent of the causer, but in case the main causer is a PTW, there is a slightly higher share of the Participant using the opposing lane on a single lane road.

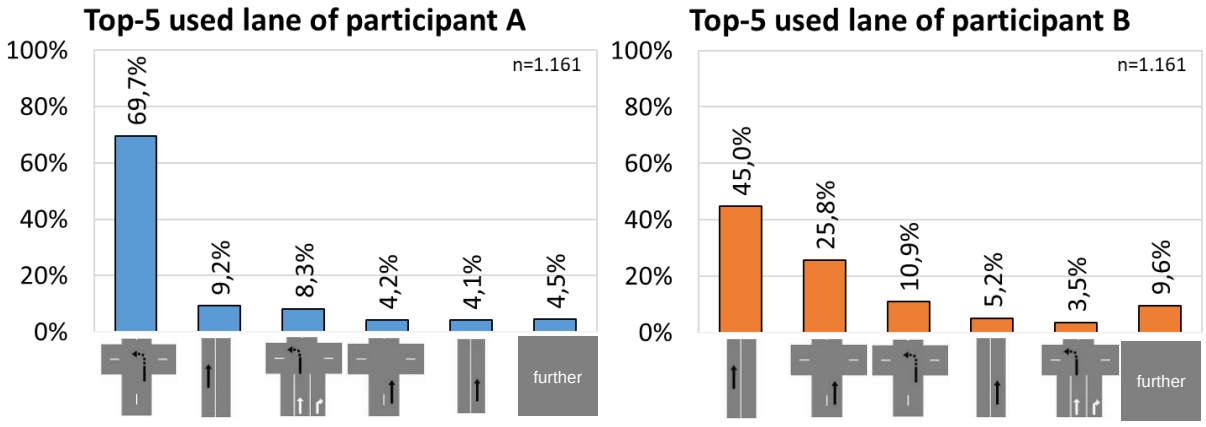


Figure 26: Used lane at an accident (202)

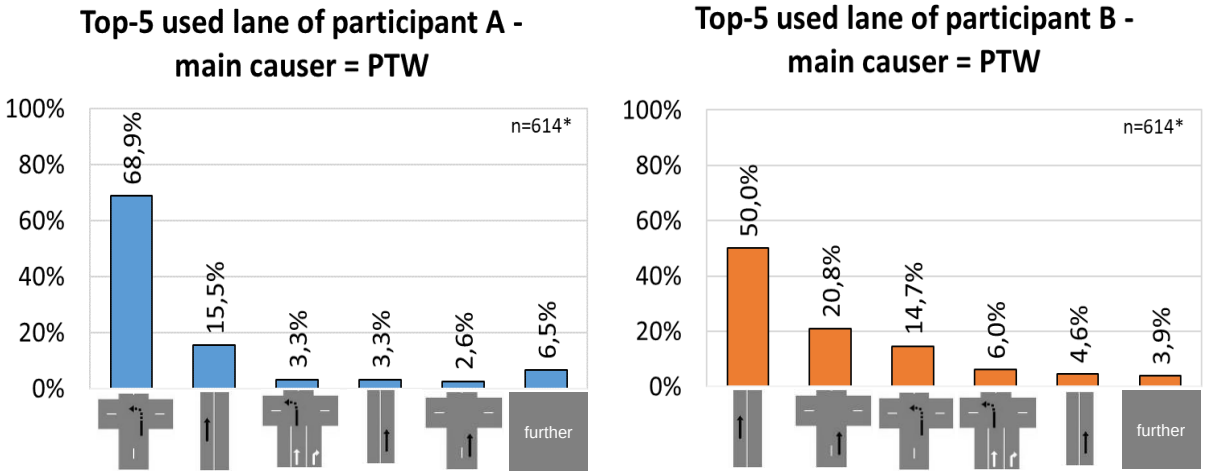


Figure 27: Used lane at an accident - main causer is PTW - (202)

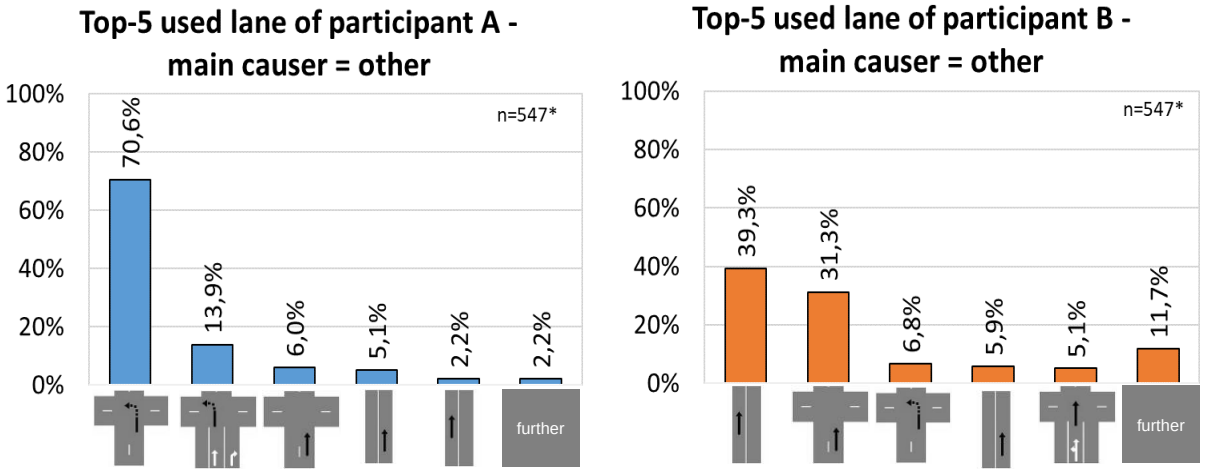


Figure 28: Used lane at an accident - main causer is other vehicle - (202)

5.1.13 m) Road surface

Figure 29 shows which kind of road surface it was when encountering the accident. It can be seen that most all accidents happened on asphalt.

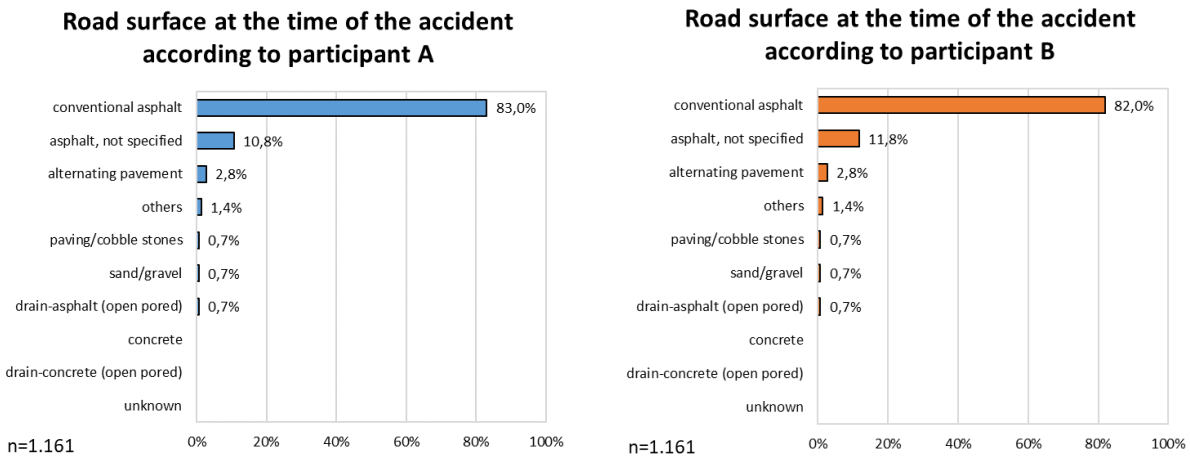


Figure 29: Road surface (202)

5.1.14 n) Precipitation at the time of the accident

Figure 30 shows the existence and type of precipitation at the time of the accident. In almost all accidents, there was no precipitation.

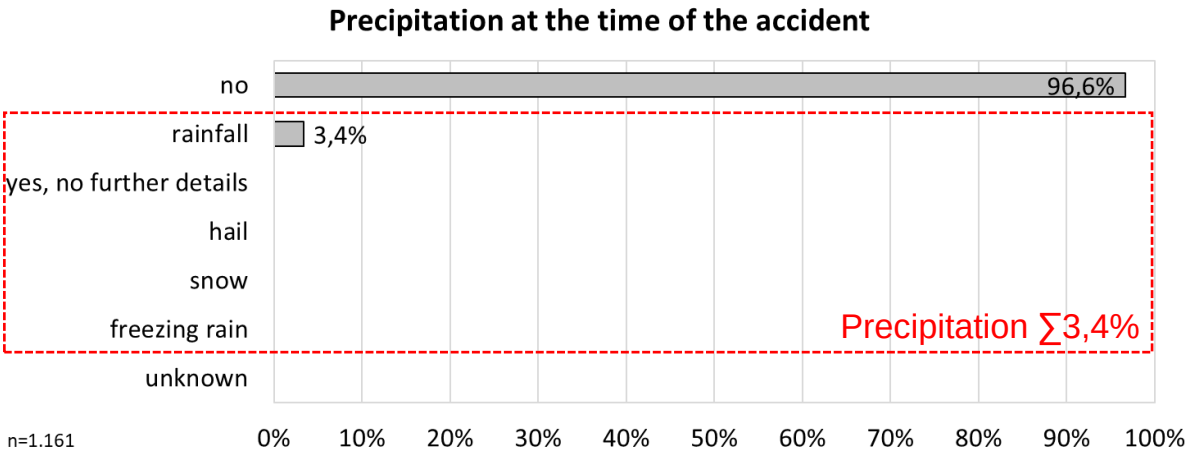


Figure 30: Precipitation (202)

5.1.15 o) Road condition

Figure 31 shows the road conditions at the time of the accident. From the figure, it can be observed that in around 94% of accidents there was a dry road surface which would allow full brake performance. In around 6% of accidents the road surface was damp or wet.

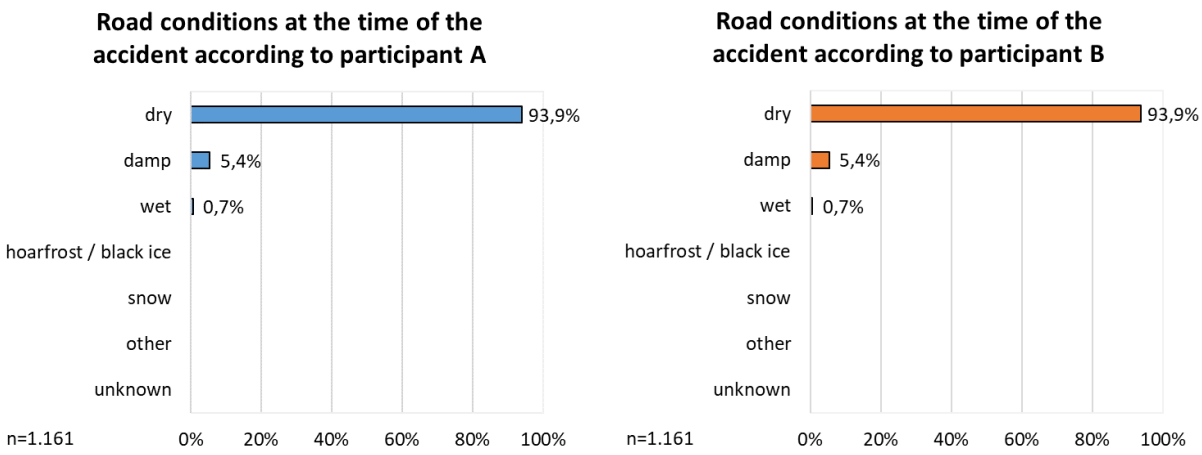


Figure 31: Road condition (202)

5.2 Lane change accident type 631 & 551

Figure 32: Lane change accident type 631 & 551

5.2.1 a) Location of the accident

The majority of PTW accidents in lane change accident type 631 & 551 occurred on urban roads which account for 65.4% of all those accidents. The accidents occurred in rural areas in 25.8% of cases, and on motorways in 8.8% of cases. (Figure 33) The accident type 631 & 551 occurred the most frequently on urban roads, and the percentage of it is higher than average (For PTW accidents on average, urban roads account for 56.9% rural roads account for 40.1%, and motorways for 3.0%).

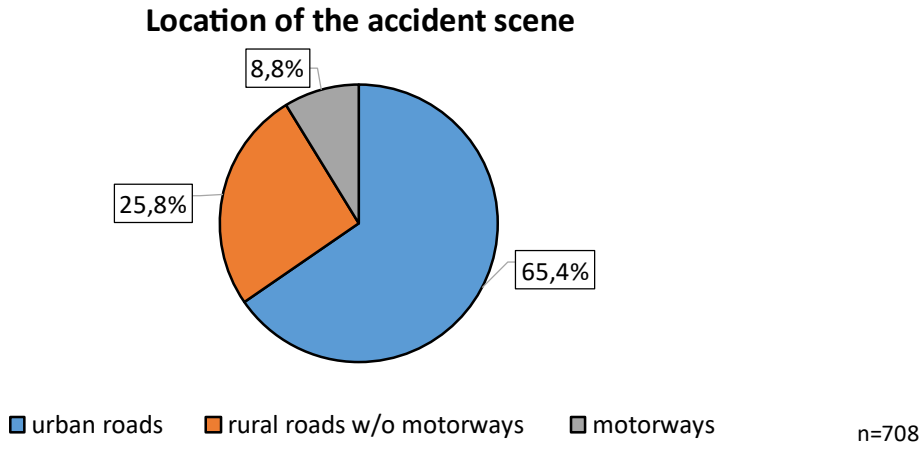


Figure 33: Location of the accident (631 & 551)

5.2.2 b) Accident scene: straight / bend / junction, etc.

The majority of PTW accidents for the lane change accidents type 631 & 551 occurred on straight roads which accounts for 71.8% (Figure 34). The second frequent scene is at curves which accounts for 15.0%.

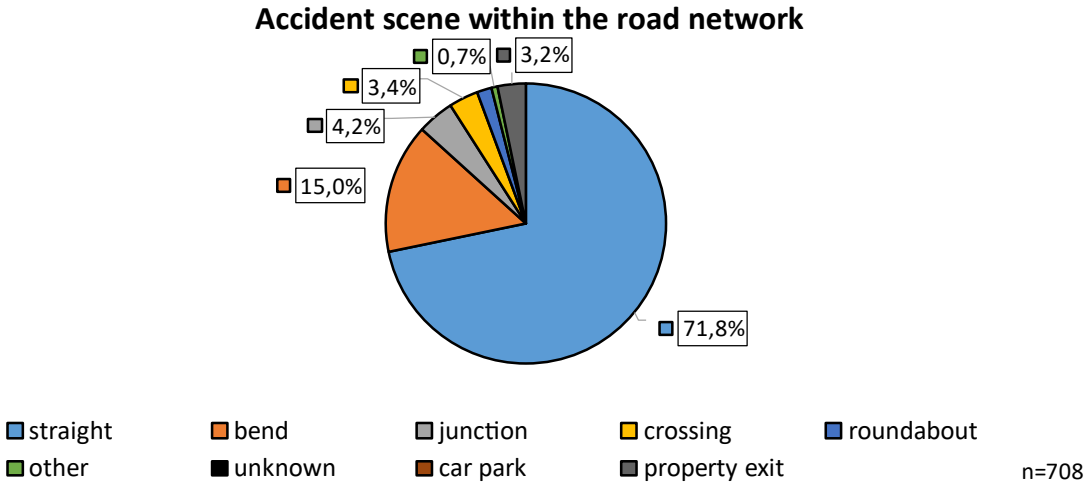


Figure 34: Accident scene (631 & 551)

5.2.3 c) Kind of traffic regulation

The majority (80.9%) of PTW accidents for the lane change accidents are not regulated (Figure 35). In 10.1% of the cases, a specific traffic regulation takes place, e.g., the right-of-way-rule (7.2%) or traffic lights (3.4%).

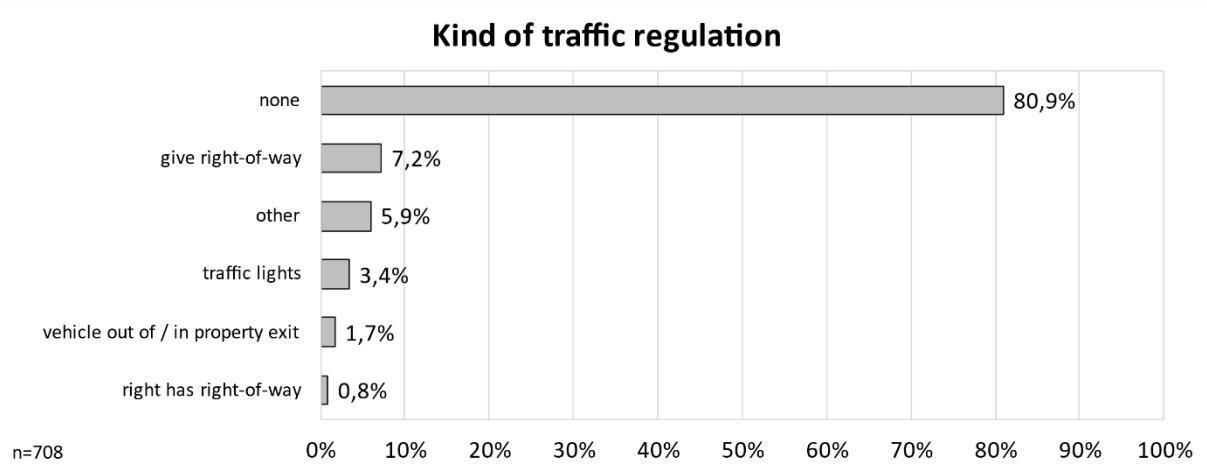


Figure 35: Kind of traffic regulation (631 & 551)

5.2.4 d) Kind of road user: M1/N1, M2/N2, motorcycle, bicycle, etc.

The participants in the lane change accidents involving a PTW, are shown in Figure 36. From the figure, it can be seen that in most cases, Participant A mostly consists of M1/N1 vehicles (passenger cars / light commercial vehicles), and Participant B mostly consists of PTWs.

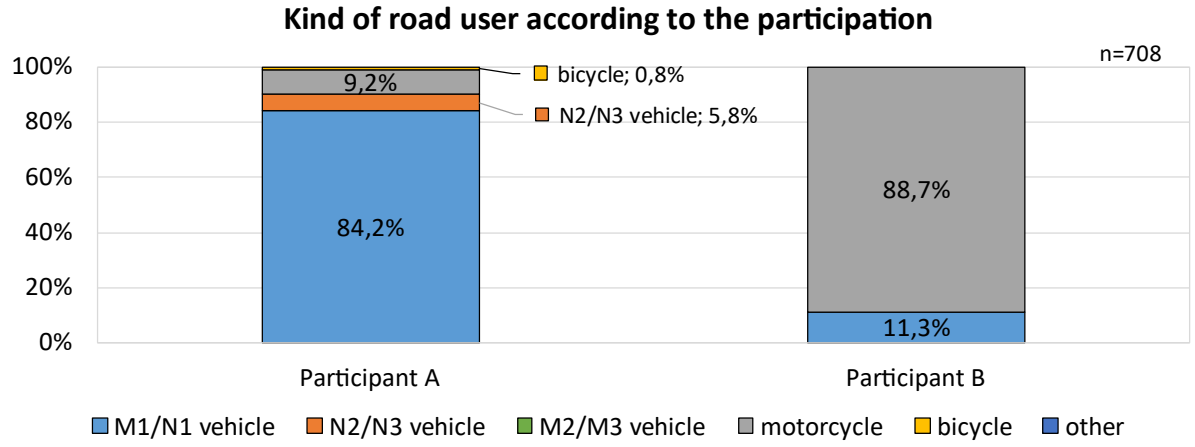


Figure 36: Kind of road user (631 & 551)

5.2.5 e) Main accident causer

The main accident causer in the lane change accidents is shown in Figure 37. It is clear from the figure that the main accident causer is Participant A and in only a small percentage Participant B. If the main accident causer is Participant A, in 85% of cases these are M1/N1 vehicles (passenger cars / light commercial vehicles).

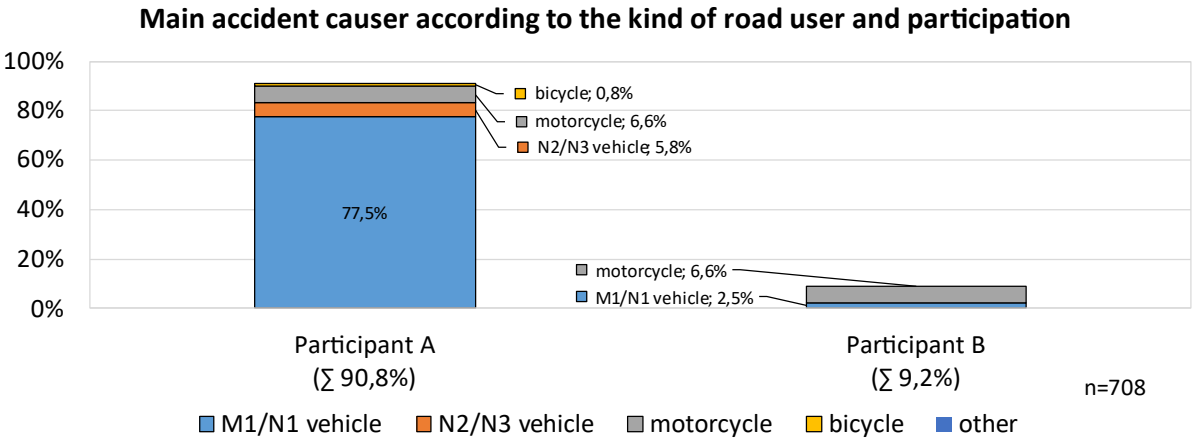


Figure 37: Main accident causer (631 & 551)

5.2.6 f) Main accident causation

The main causation of the accidents is studied and shown in Figure 38. The three most frequent main accident causations for accident type 631 & 551 are error while driving side by side (30.1%), error while overtaking (29,7%) and error while turning (26,8%), caused by Participant A. Only after that we can see accidents mainly caused by Participant B, for example their errors while overtaking (5.1%) and unadapted speed (3,2%).

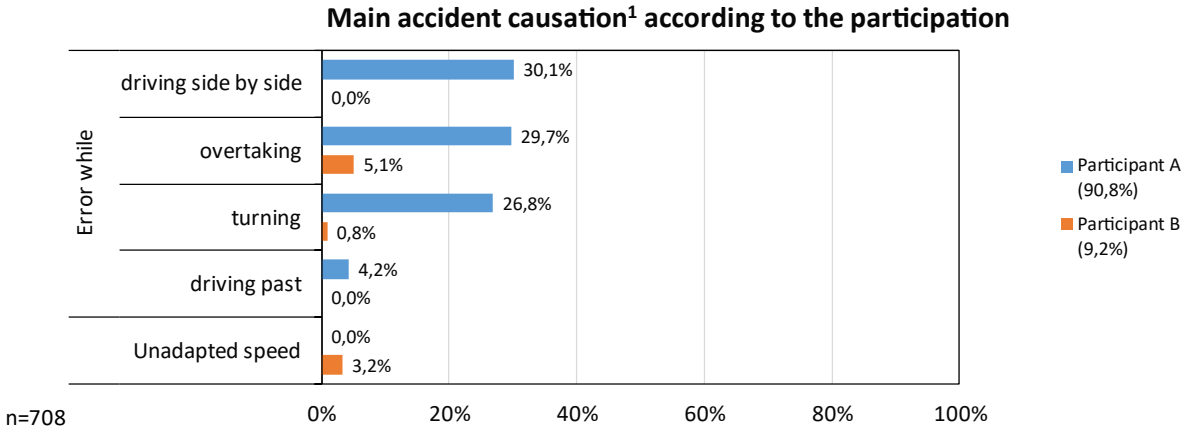


Figure 38: Main accident causation (631 & 551)

1: The police and also the technical investigation units in GIDAS have to assign a main accident causer with one main accident causation in each accident.

The multiple accident causations according to the participant are shown in Figure 39. For Participant B, 'Speed' is the most frequent causation. It could be said that speed was a contributing factor to the accident, even though the main causation was another reason.

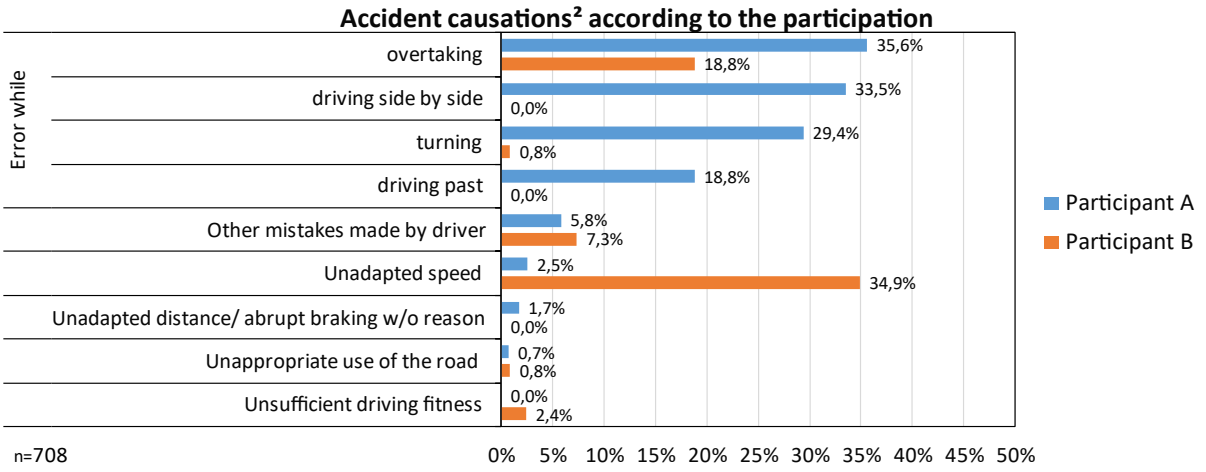


Figure 39: Accident causations (631 & 551)

2: The police and the technical investigation units in GIDAS can assign up to 3 accident causations for each accident participant. Consequently, one accident can have several accident causes depending on the participant and so the sum of the accident causations is ≥100%.

5.2.7 g) Types of speed limitation

What provides the speed limit to the participant is shown in Figure 40. Both for Participants A and B, the speed limit is mainly provided by local traffic rules (68.2%), and secondly by traffic signs.

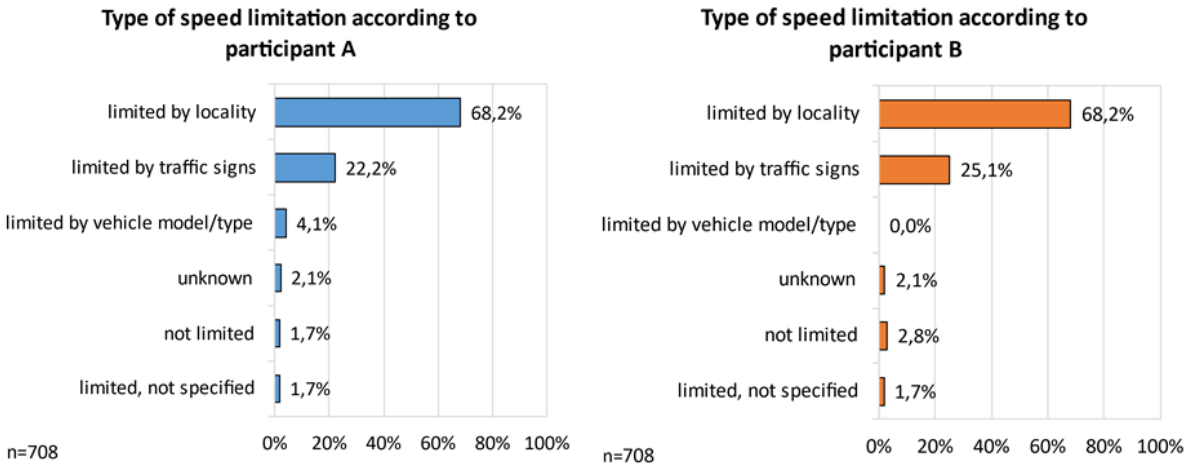


Figure 40: Types of speed limitation (631 & 551)

5.2.8 h) Maximum permitted speed

The maximum permitted speed on the accident site is shown in Figure 41. The most frequent permitted speed is 50 km/h. This is in line with Figure 33, that indicates that approximately 60% of accidents occurred at urban roads.

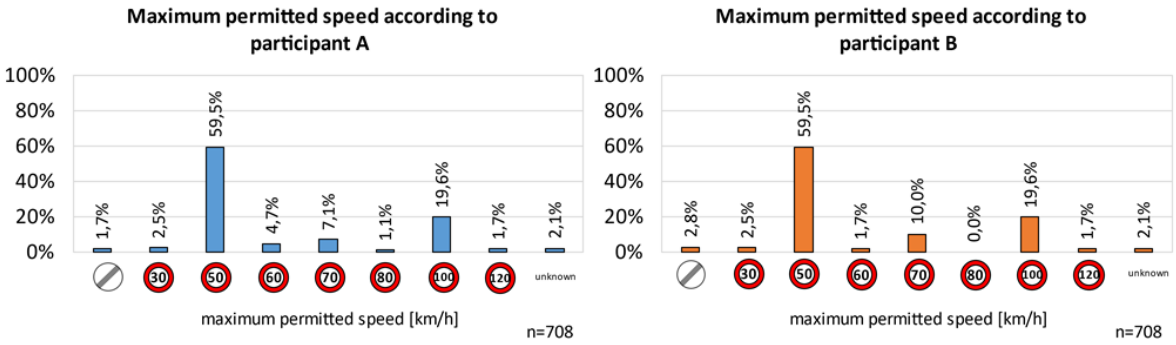


Figure 41: Maximum permitted speed (631 & 551)

5.2.9 i) Speed limit and distribution

Figure 42 shows the percentage of participants exceeding the applicable speed limit. Comparing Participants A and B, Participant B is more often seen to have exceeded the speed limit. Approximately 44.2% of Participant B exceed the speed limit, while 4.4% of Participant A exceed the speed limit. This is reflecting the scenario that participant B is in the left lane (overtaking lane) and driving faster than participant A which is in the right lane.

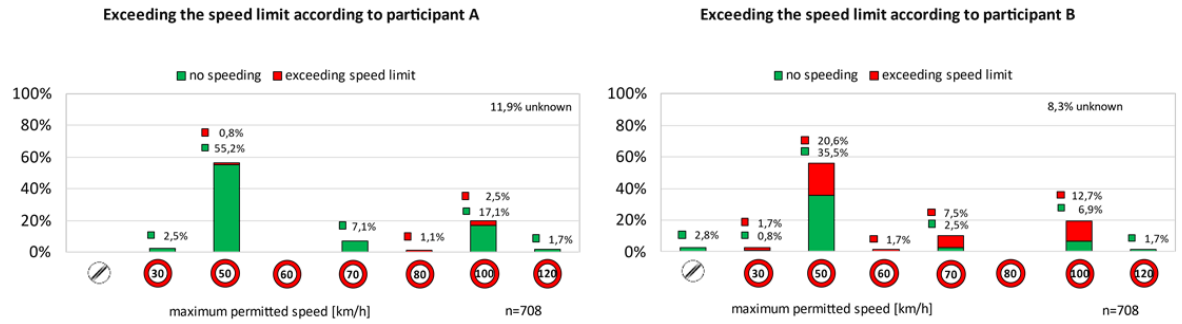


Figure 42: Exceeding Speed limit (631 & 551)

Figure 43 shows the distribution of the speed of the participants. From the figure we can deduct to what extent the participants exceeded the allowable speed limit before the accident.

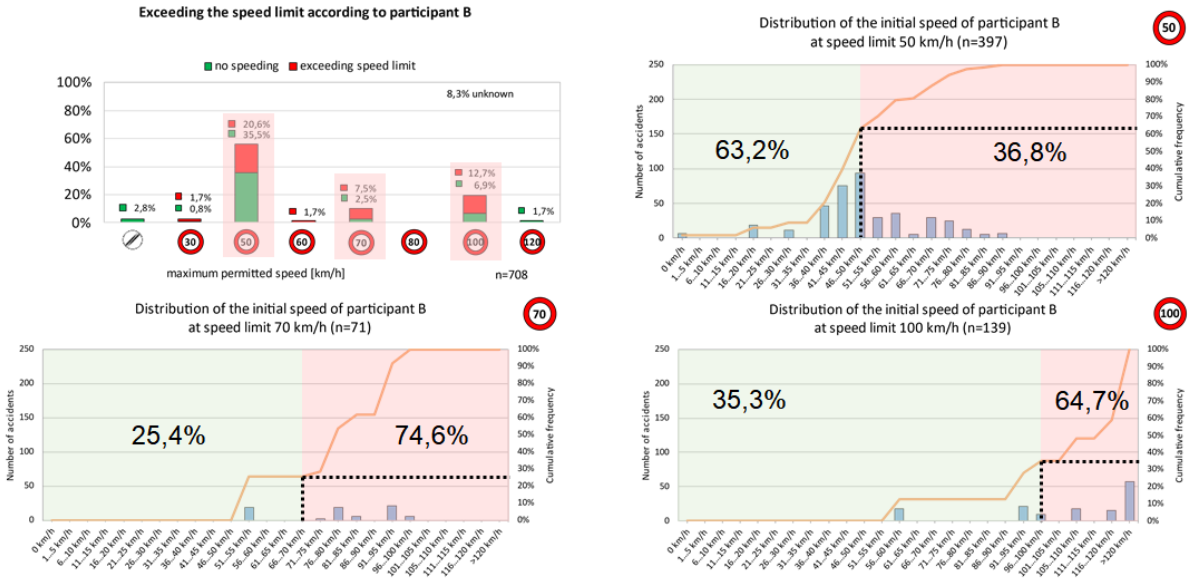


Figure 43: Speed distribution (631 & 551)

5.2.10 j) Speed before the accident and at the time of collision

Figure 44 shows the initial speed of the participants. The median of the initial speed of Participant A is 40 km/h and that of Participant B is 59 km/h. Participant A who is in the right lane has lower average speed than Participant B who is in the left lane.

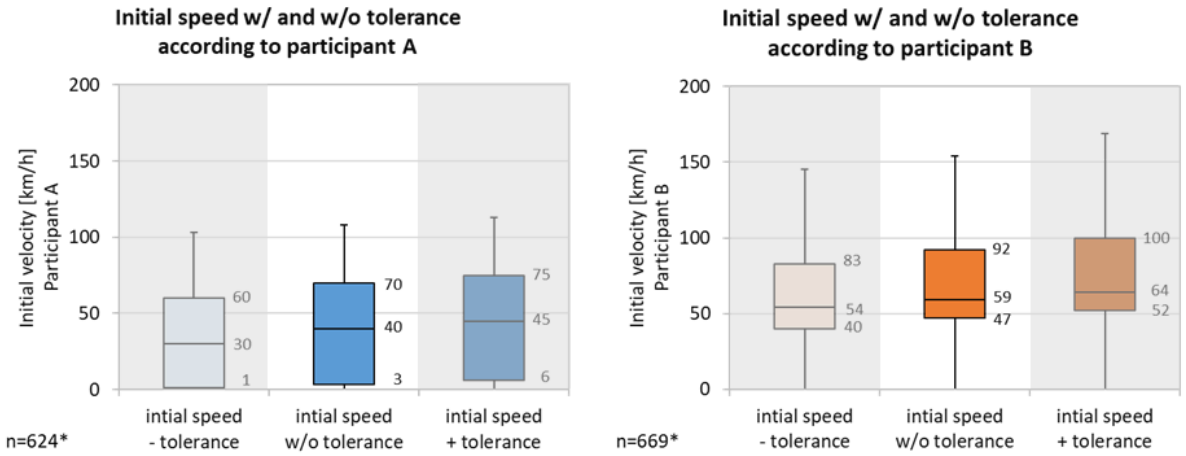


Figure 44: Initial speed (631 & 551)

Figure 45 shows the collision speed of the participants.
Comparing the initial speed in Figure 44 and the collision speed in Figure 45, it is seen that Participant B starts from 59 km/h initially and decelerates to 51 km/h for the median scenario while Participant A drives constantly at 40 km/h for the median scenario.

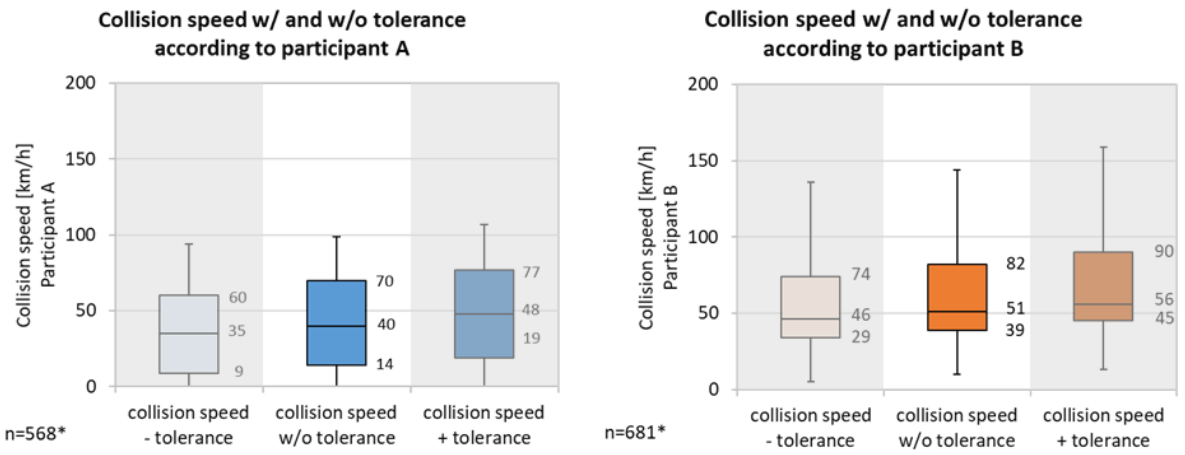


Figure 45: Collision speed (631 & 551)

5.2.11 k) View obstruction

Figure 46 and Figure 47 show the existence of view obstructions and the types of obstruction respectively. It can be seen that around 90% of the cases had no view obstructions and the rest had a non-permanent obstruction, e.g., a parking vehicle.

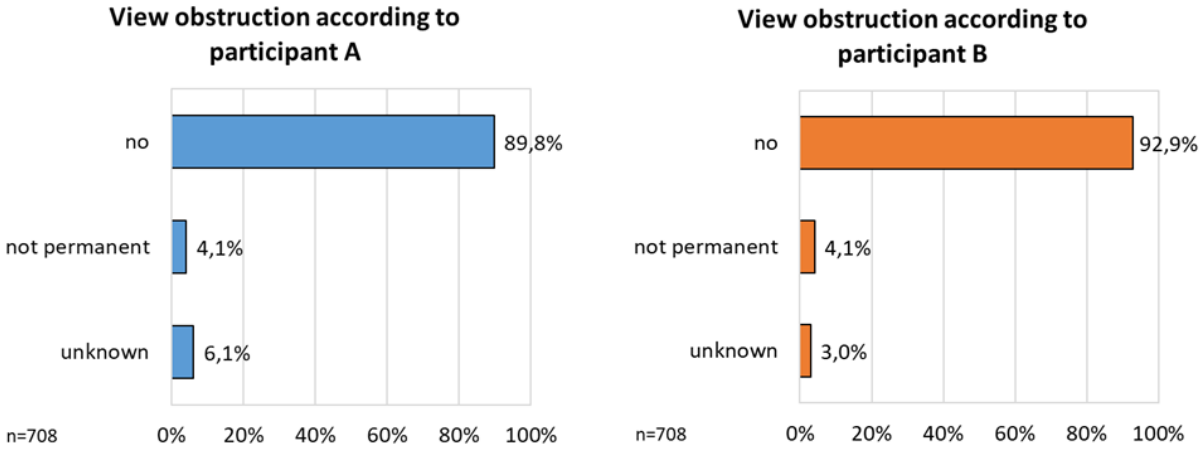


Figure 46: View obstructions (631 & 551)

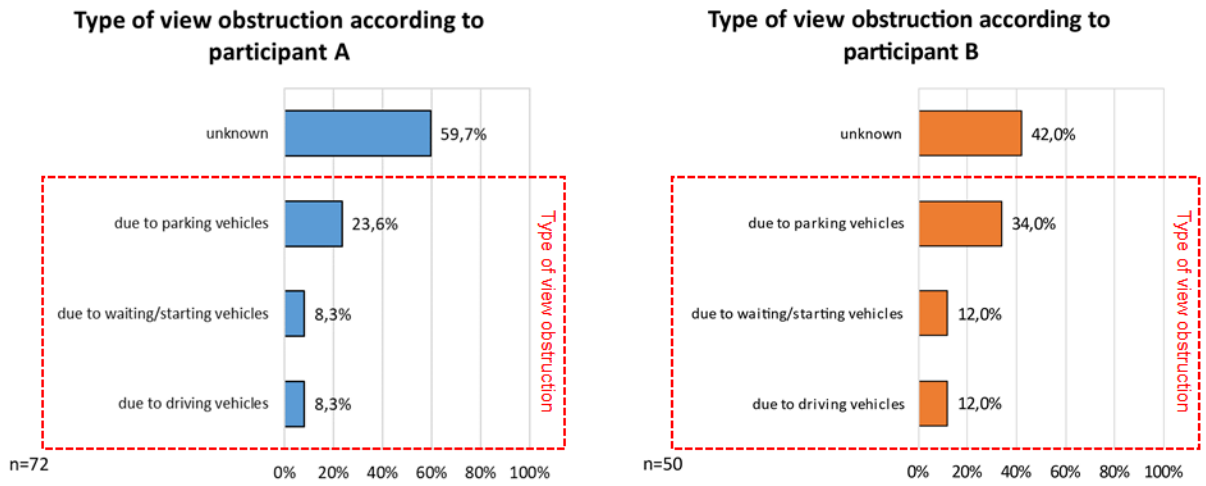


Figure 47: Type of view obstruction (631 & 551)

5.2.12 l) Used lane when encountering an accident

Figure 48 shows which lane the participants used when encountering an accident. In 39.4% of this lane change scenario, Participant A who was changing lanes was driving at a single lane road. In 22% of the cases, Participant A was driving at a single lane road.

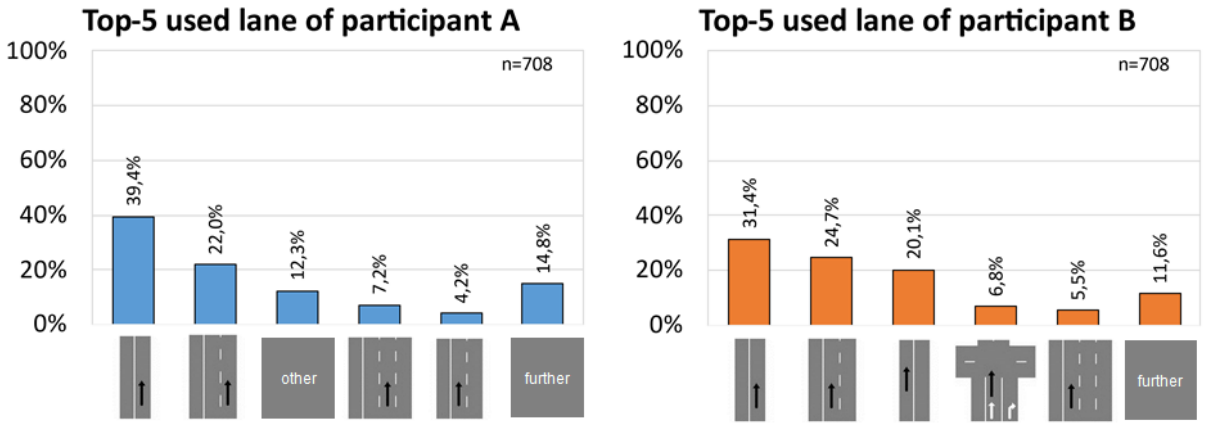


Figure 48: Used lane at an accident (631 & 551)

5.2.13 m) Road surface

Figure 49 shows which kind of road surface it was when encountering the accident. It can be seen that almost all the accidents happened on asphalt.

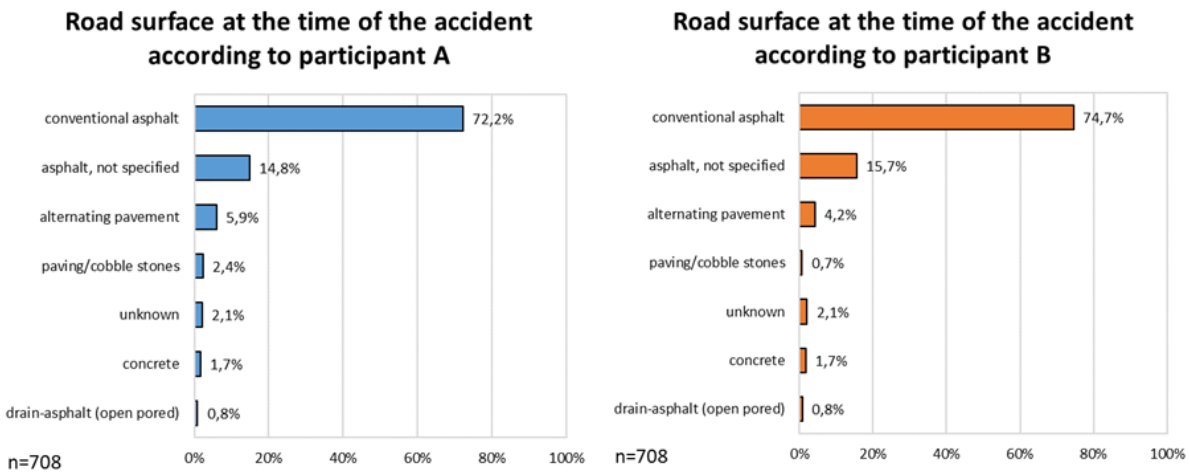


Figure 49: Road surface (631 & 551)

5.2.14 n) Precipitation at the time of the accident

Figure 50 shows the existence and type of precipitation at the time of the accident. In almost all the accidents there was no precipitation whatsoever.

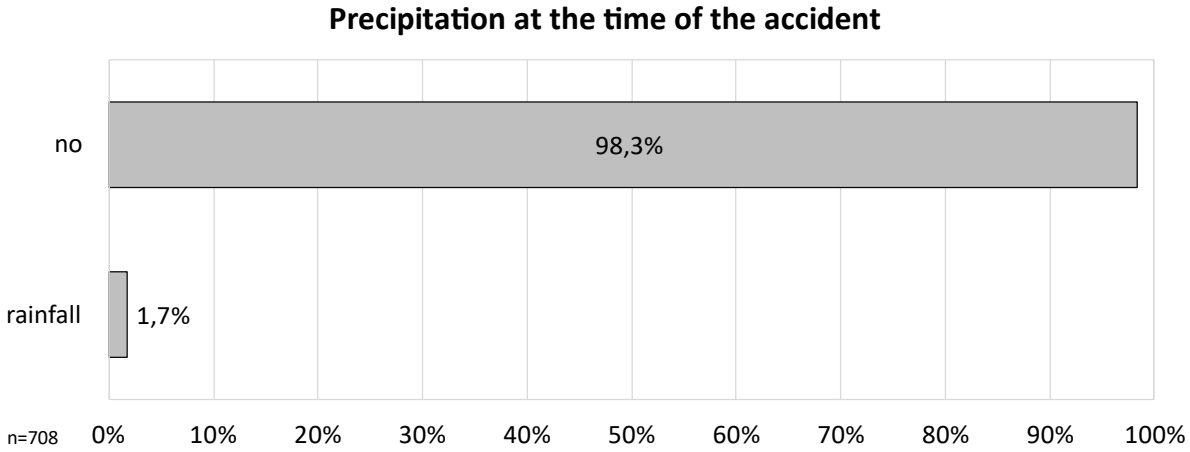


Figure 50: Precipitation (631 & 551)

5.2.15 o) Road condition

Figure 51 shows the road conditions at the time of the accident. From the figure, it can be observed that in around 90% of accidents there was a dry road surface which would allow full brake performance. In around 10% of accidents the road surface was damp or wet.

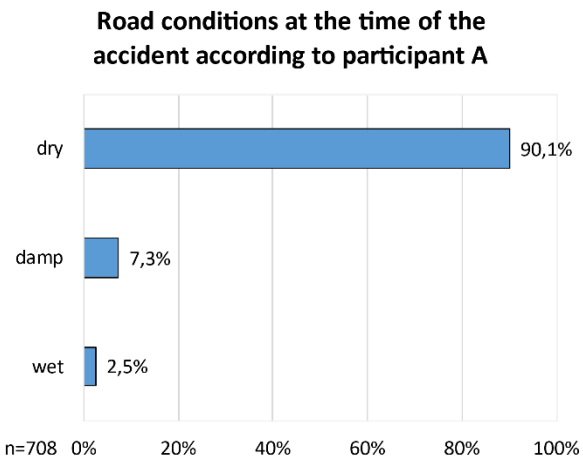


Figure 51: Road condition (631 & 551)

5.2.16 p) Interview result: visibility / audibility limitation

Figure 52 shows the participant interview results about visibility and audibility limitations. Among those who answered the question, (so taking out the unknown cases), 16.9% (=5.9/(5.9+29.0)x100) of Participants A reported that visibility or audibility was limited at the time of accident. There was no Participant B who reported that visibility or audibility was limited.

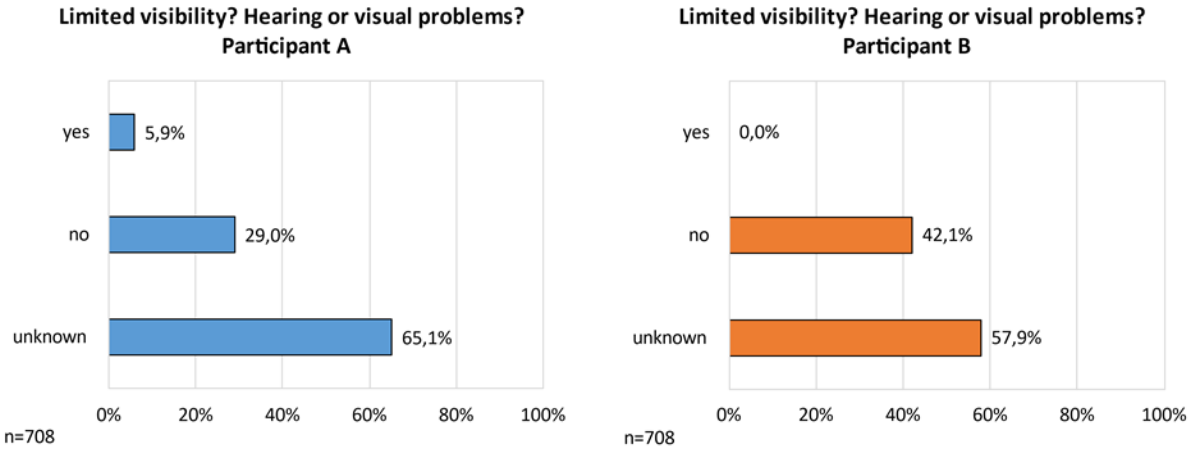


Figure 52: Interview - visibility / audibility limitation (631 & 551)

5.2.17 q) Interview result: overlooked / distracted, etc.

Figure 53 shows the participant interview results whether they overlooked important information or if they were distracted. In 74.7% (=26.6 /(26.6+9.9)x100) of the known cases, the interviewed Participants A report overlooking or distraction. The interviewed Participants B report overlooking or distraction in only 3.7% (=1.6 /(1.6+41.4)x100) of the known cases.
Figure 54 and Figure 55 shows further insight into the “yes” cases of Participants A. Figure 54 shows the interview results about the influencing factors of overlooking, and among the “yes” cases, 16.0% stated that they were distracted from outside of the vehicle. Figure 55 shows the interview results about the items they were concentrated upon, and among the “yes” cases,

38.3% were focusing on other road users and 36.2% forgot or omitted to control their view properly.

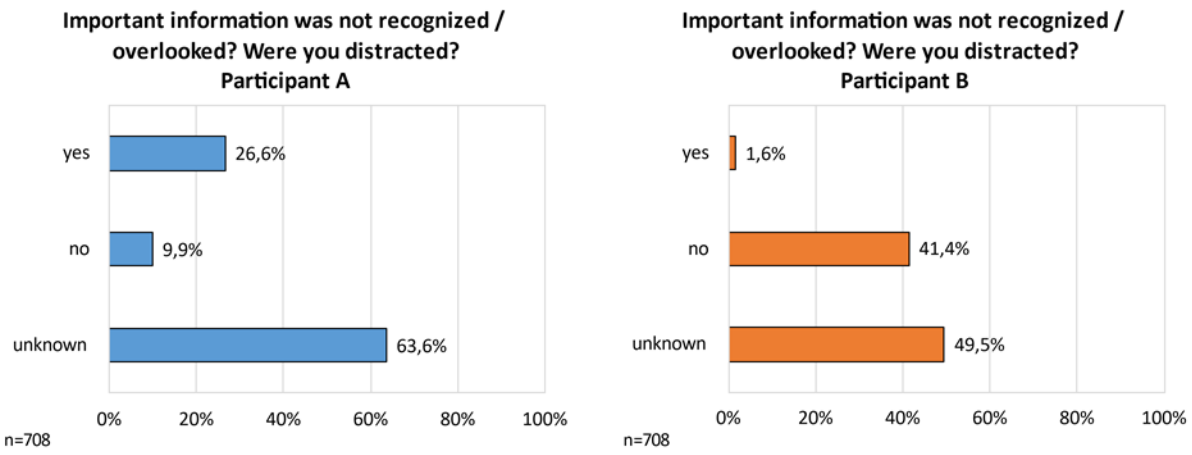


Figure 53: Interview - overlooked / distracted (631 & 551)

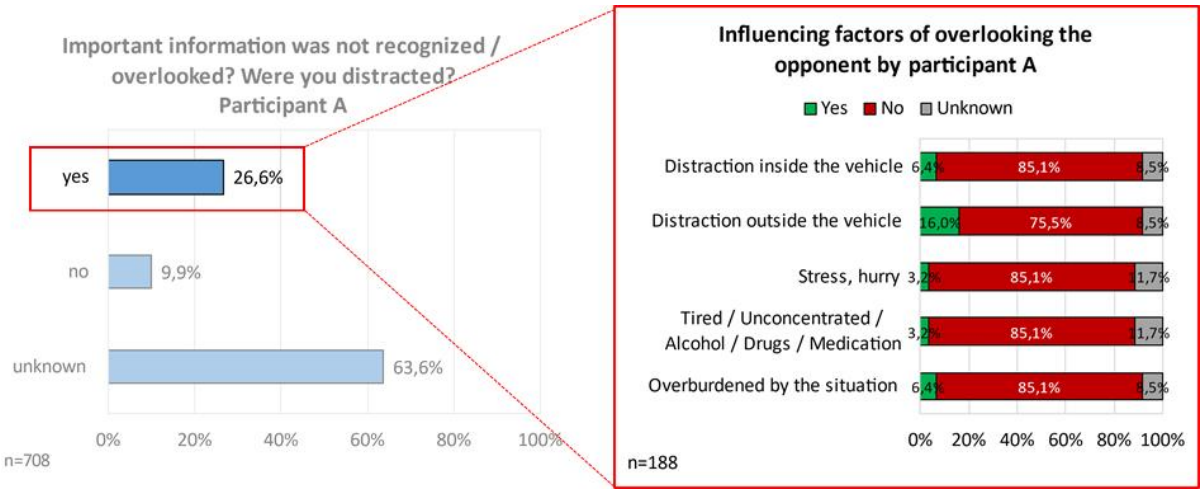


Figure 54: Interview – Influencing factors for overlooking (631 & 551)

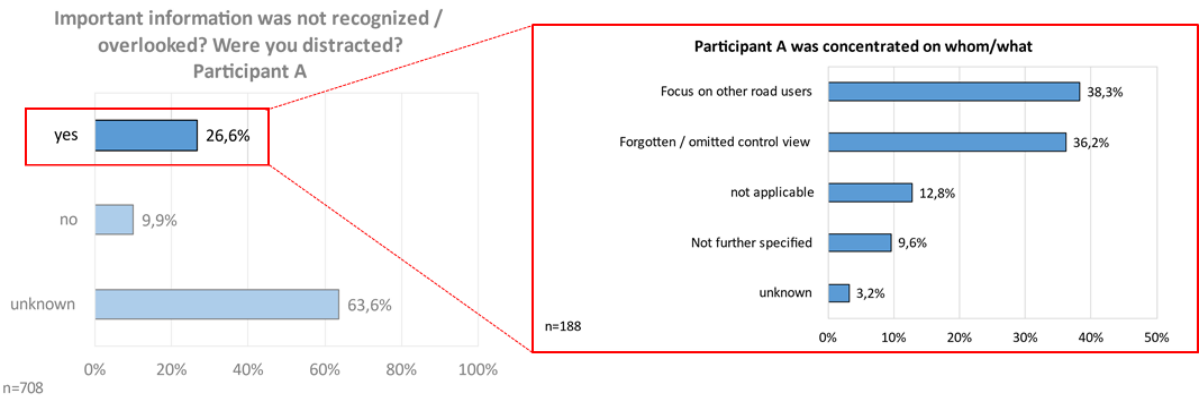


Figure 55: Interview – Influencing factors of concentration (631 & 551)

5.2.18 r) Interview result: misjudgement

Figure 56 shows the interview results of Participant A as to whether they misjudged the situation / course of events or not. In 16.7% (=5.8/(5.8+29.0)x100) of the known cases, the participants report they had indeed misjudged this.
Figure 57 shows further insight into the influencing factors of those who have misjudged. This chart shows that the most frequent reason was a misjudgment of speed / distance of other vehicles (70.7%).

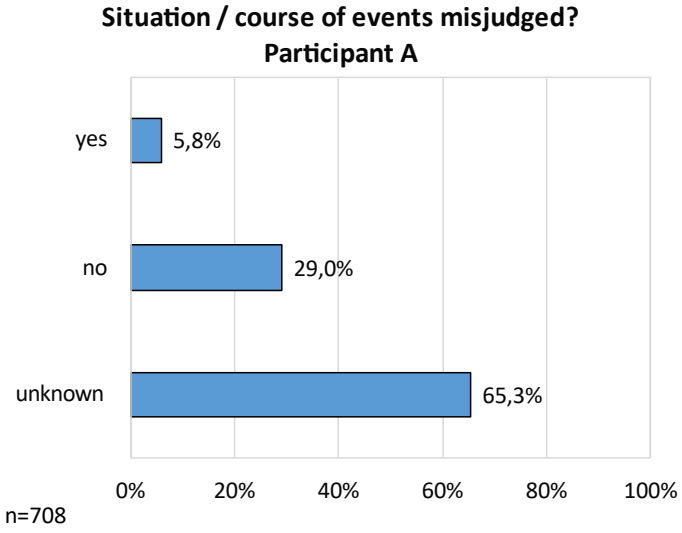


Figure 56: Interview - Misjudgement (631 & 551)

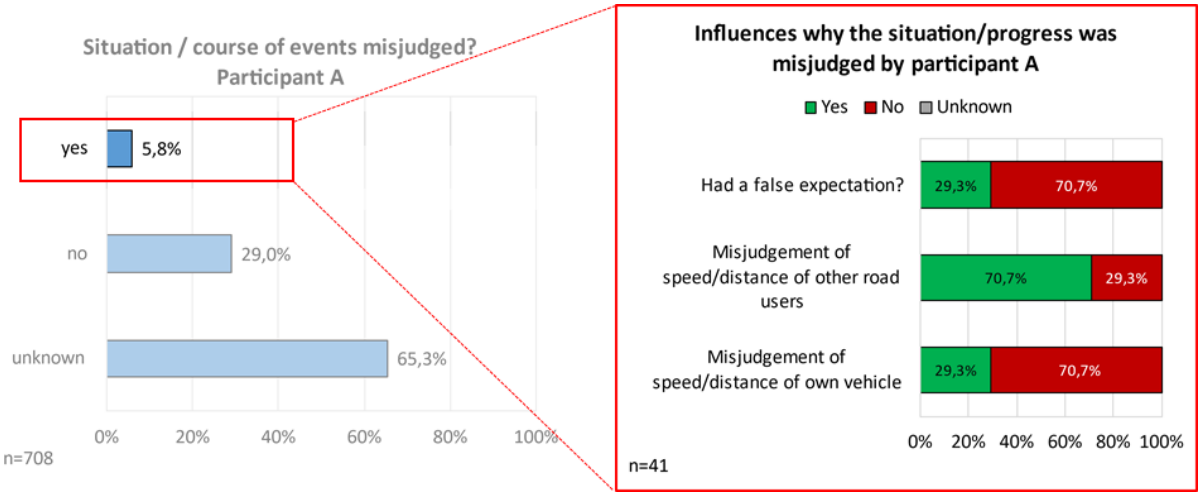


Figure 57: Interview – Influences why misjudged (631 & 551)

5.2.19 s) Interview result: accident-avoidance possibility by other action

Figure 58 shows the interview results of Participant A as to whether the accident would have been possible to be avoided by some other reaction / action. In 80% (= 8.1/(8.1+31.2)x100) of the known cases, the accident seemed to be difficult to be avoided with other actions taken.

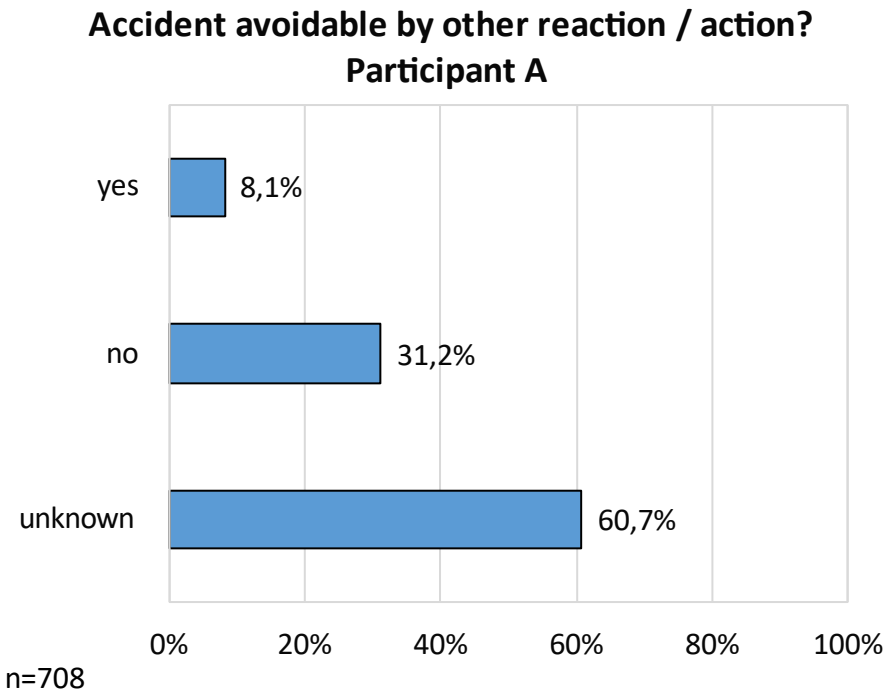


Figure 58: Interview - Accident avoidance possibility (631 & 551)

5.2.20 t) Interview result: mistakes in executing the avoidance action

Figure 59 shows the interview results of Participant A about difficulties / mistakes in taking the planned action (e.g., mixing up the brake pedal with the accelerator pedal). None of them answered that they had difficulties / errors in executing the planned action.

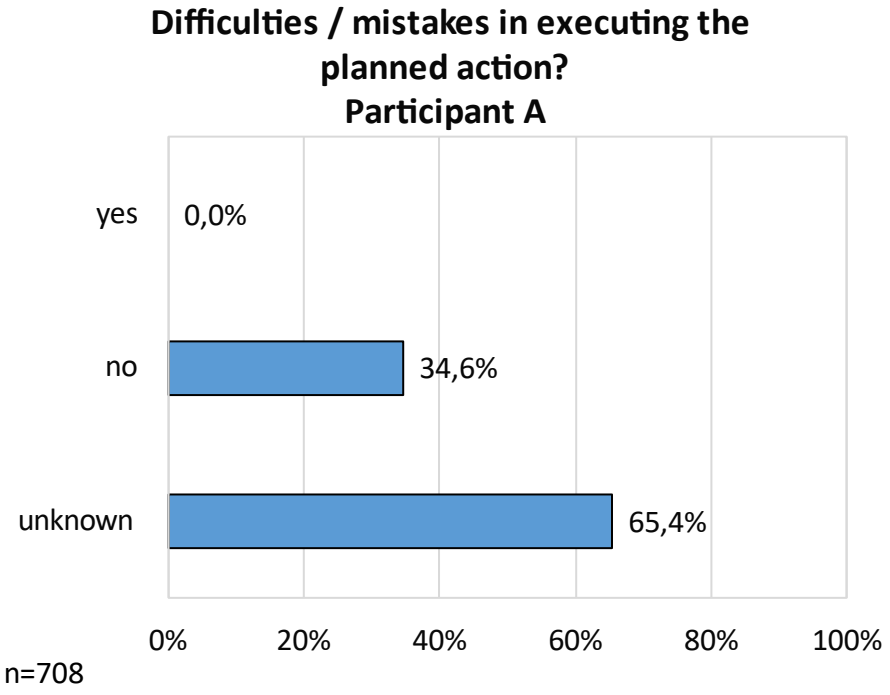


Figure 59: Interview - Mistakes in executing the planned action (631 & 551)

5.2.21 u) Interview result: influence from vehicle technology

Figure 60 shows the interview results of Participant A about any influence of the vehicle technology. This query is asking whether the participants had difficulty in operating a certain function provided by the vehicle or whether they were distracted by any function on the vehicle. There is no Participant A answering "yes" meaning that there was no influence from the vehicle technology leading to an accident.

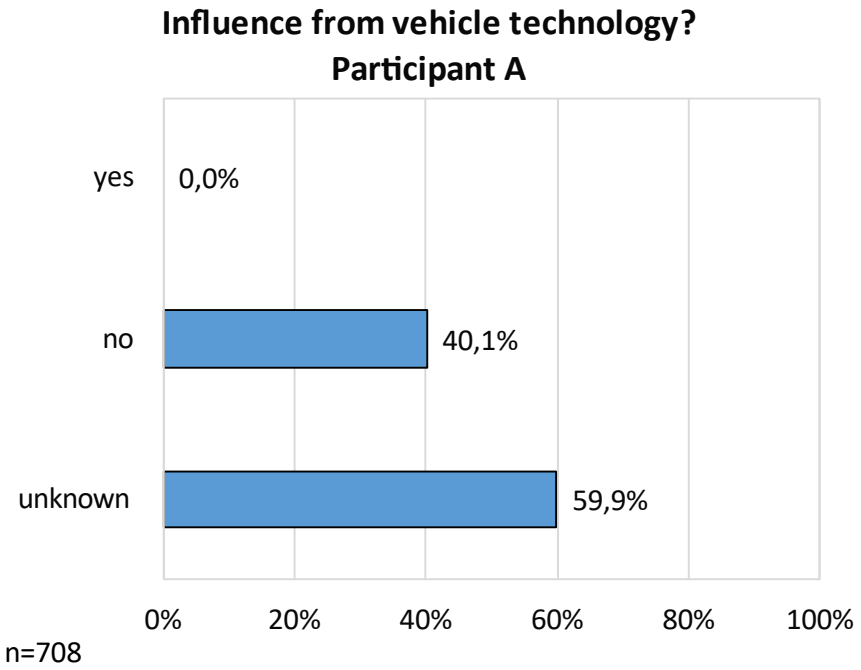


Figure 60: Interview - Influence from vehicle technology (631 & 551)

5.2.22 v) Interview result: influence from the condition of the road

Figure 61 shows the interview results of Participant A about any influence from the condition of the road. There is no Participant A answering "yes".

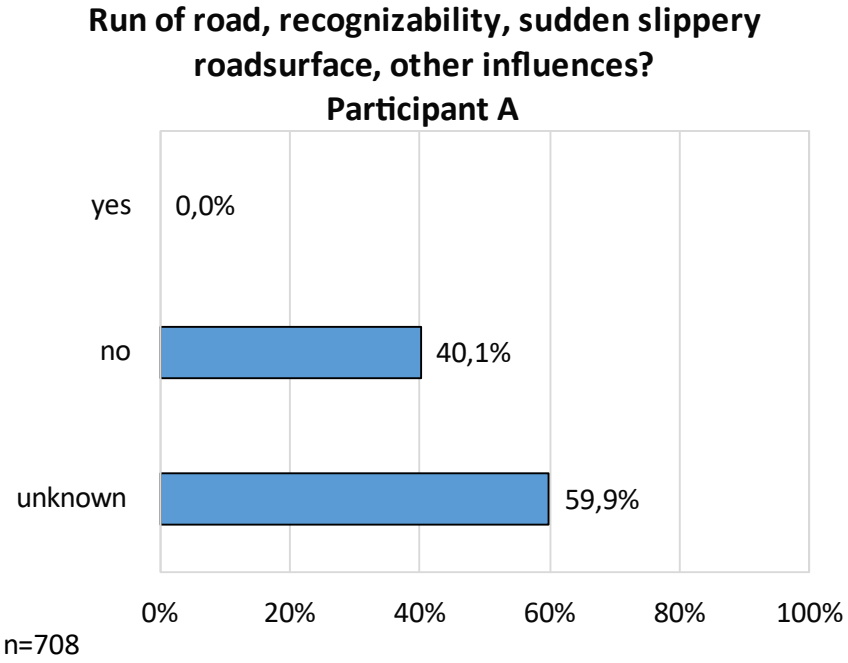


Figure 61: Interview - Influence of road condition (631 & 551)

6. Conclusion

In this document, CMC analysed lane change accidents type 202, 631 and 551, for the future improvement of PTW rider safety with technology. Lane change accidents (n=3.362) account for 12.3% of the total of PTW accidents. Among them, accident type 202 is one of the most common accident types in lane change accidents (n = 1.161) and accident types 631 and 551 combined are the second most common accident type (n=708)
From the analysis, an important outcome of these three types is that there was no view obstruction in most of the cases, but Participant A (the lane changing vehicle) and Participant B (the going straight vehicle) ended up in a collision.

<Accident type 202>
The main accident causer is Participant A in 59.7% of cases and it consists of 61.8% of M1/N1 vehicle and 28.6% of PTW. The main accident causer is Participant B in 40.3% of cases and almost all of them are PTWsmotorcycles (90%). Even though there were no view obstructions for both Participant A and Participant B in approximately 92% of the cases, and both Participant A and Participant B decelerated before the collision, they crashed. When the main causer is Participant A, the main accident causations are error while turning (36.6%) and error while Participant B is overtaking (13.3%). When the main causer is Participant B, the main accident causation is error while overtaking (32.4%) and unadapted speed (4.8%).

<Accident type 631 & 551>
The main accident causer of this case is mostly Participant A in 90.8% of cases and 85% of them are M1/N1 vehicles. Participant B consists mostly of PTWs (88.7%). When the main causer is Participant A, the three most frequent main accident causations are error while driving side by side (30.1%), error while overtaking (29,7%) and error while turning (26,8%). In the participant interview results, 74.7% of the known cases of Participants A report overlooking or distraction. This is remarkable, given there was no view obstruction for Participant A in 89.8% of the cases. From the participant interview results, the most frequent reasons for the overlooking are focusing on other road users and forgetting or omitting to control the view.

Abbreviations

CMC	Connected Motorcycle Consortium
GIDAS	German In-Depth Accident Study
PTW	Powered Two-Wheeler