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Motorcyclists' Preventive Riding and Visibility Through Intersections - A Qualitative Video Analysis

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This research is a collaborative project between the **riding teacher education program at Nord University** and the independent research institute SINTEF

NORD universitet

Educating Norway's motorcycle instructors — a national responsibility at Nord University

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Nord University holds a national responsibility for educating riding teachers across all driver's license categories, including:

- Educating driving teachers for the private sector across all driver's license categories, including motorcycle and moped.
- Educating moped teachers for the public school system.
- Training personnel from the Norwegian Public Roads Administration who assess motorcycle riding tests, with separate training components delivered by Nord University and the Norwegian Public Roads Administration.
- Developing research-based education through ongoing research in traffic safety and driving teacher education.

SINTEF

SINTEF Community

This project has received support and partial funding from the Norwegian Public Roads Administration, the Norwegian Ministry of Transport, and the Norwegian Council for Road Safety (Trygg Trafikk).

Samferdselsdepartementet

The Norwegian Ministry of Transport

Statens vegvesen

The Norwegian Public Roads Administration

TRYGG TRAFIKK

Norwegian Council for Road Safety

Developing research-based education

0 fatalities and severe injuries

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This research focuses on motorcyclists' behavior during everyday riding at road intersections, comparing **novice, experienced, and professional riders** to identify both effective and risky practices that can inform safer riding.

In the discussion, the **bow-tie model** is used as an analytical framework to interpret observed rider behavior and discuss potential **safety barriers**, while **Vision Zero** serves as a guiding policy goal rather than an empirical benchmark.

Norway has one of the lowest road fatality rates among IRTAD countries (Figure 2). Nevertheless, motorcyclists account for approximately 23% of road fatalities, highlighting a persistent safety challenge (Figure 6).

Figure 2. Road fatalities per 100 000 inhabitants in Norway compared to other IRTAD countries, 2024

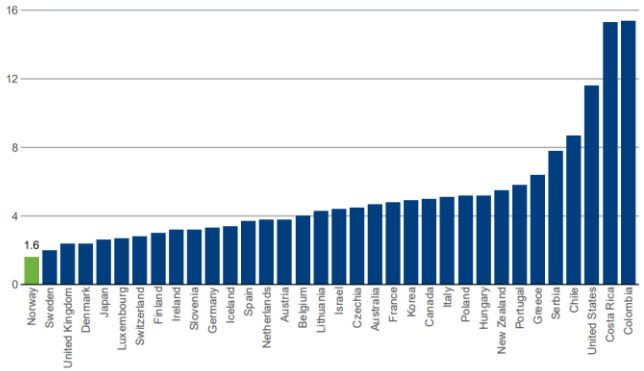
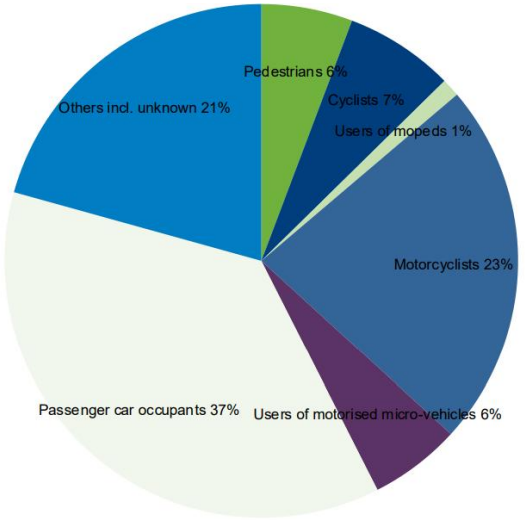
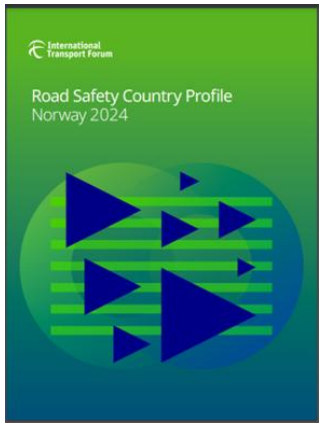


Figure 6. Road fatalities in Norway by user category, 2024





ITF (2025), "Norway: Road Safety Country Profile 2024", OECD Publishing, Paris.

Involving 62 motorcyclists, divided into three groups based on their riding experience and driving competence.

1. **Novice:** Motorcyclists with less than three years of riding experience who use motorcycles for leisure and utility riding.
2. **Experienced Riders:** Motorcyclists with more than three years of riding experience who regularly use motorcycles for leisure and utility riding.
3. **Professionals:** Motorcyclists with extensive professional experience, such as police officers who ride motorcycles for emergency response, motorcycle traffic instructors, and examiners for motorcycle driving tests, as well as instructors at motorcycle driver development courses, specifically for track riding.

- The **driving route** lasted 30 minutes and included varied traffic conditions and winding turns on country roads.

Eye-Tracker system

In this **video analysis**, the video footage was reviewed together with eye-tracking data to examine where the rider was looking while riding.

– **The forward-facing** camera enables researchers to study how the rider anticipates and plans the ride in response to the traffic environment.

– **Additional cameras capture** the rider's visual gaze behavior, which was analyzed to determine visual attention during riding.

Associate Professor Jan Petter Wigum (Nord University) adjusts the eye-tracking glasses inside the helmet prior to riding, ensuring proper fit and system functionality in collaboration with SINTEF.

What do the riders in our study do in such situations?

Forward-facing camera captures rider anticipation and planning

Intersections Assessed

Typical situations with **risk of collision** for motorcyclists
Involves **crossing or oncoming traffic** that should yield
Applies to:

- **Road intersections**
- **Roundabouts**

Also includes selected:

- **Driveways**
- **Parking areas**

Focus: situations where **other road users have a duty to yield to the motorcyclist**

Video analysis identifies three key rider behavior categories:

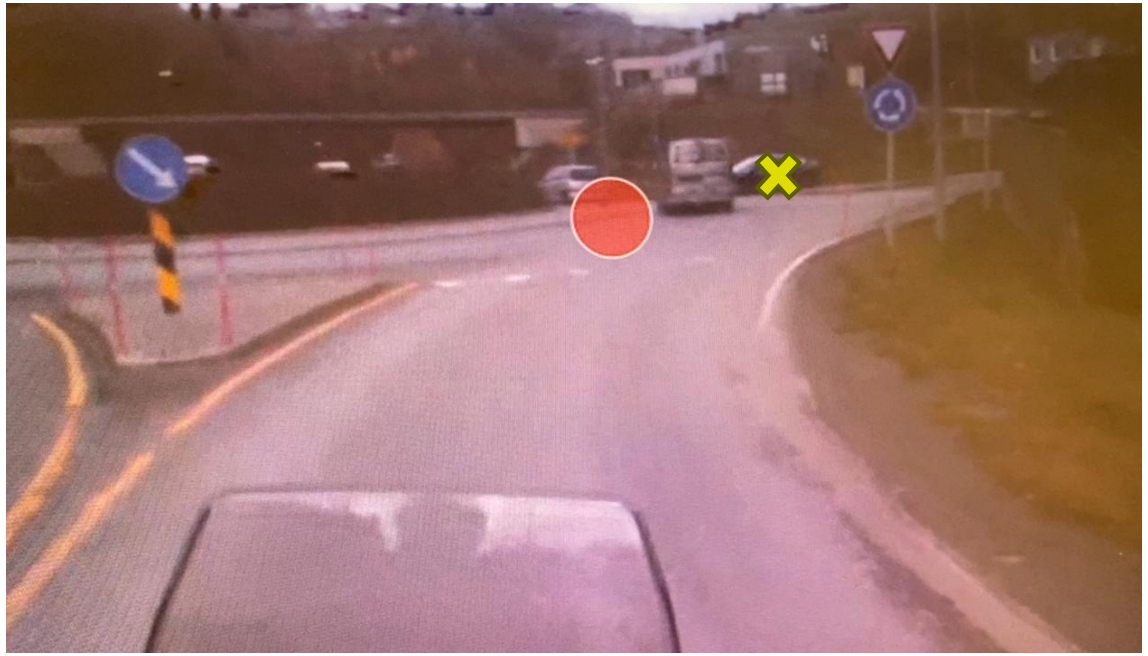
- **Visible position**
- **Preventive riding**
- **Attention and decision-making**

These characterize motorcyclists' everyday riding at intersections and help explain how these behaviors affect traffic safety.

The video analysis is structured around three main categories developed by the research team.

- **Visible Positioning**
- Preventive Riding
- Attention and Decision

Category 1: **Visible Positioning** in Typical Intersection Situations



Visible Positioning: Whether the driver of the black Tesla can see the motorcyclist. **Time is not assessed**.

Dimensions:

A. **Visible** positioning to traffic required to yield
B. **Less visible** positioning to traffic required to yield

Visible Positioning

Preventive Riding

Attention and Decision

Category 2: **Preventive Riding**

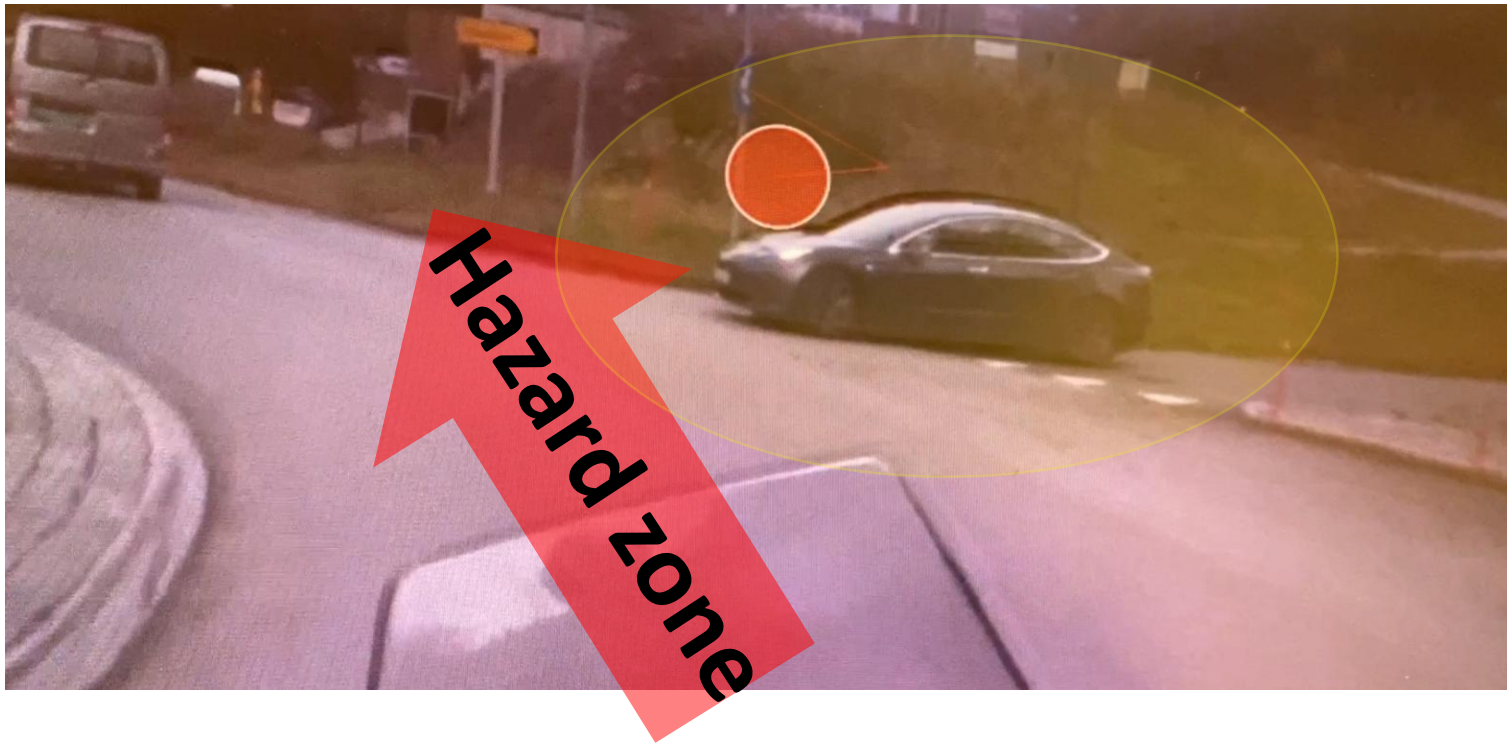
This category examines the extent to which motorcyclists avoid (**prevent**) or **create dangerous situations** at intersections where other road users are required to yield to the motorcyclist. The focus is on how riders adapt their behavior in such situations, independent of traffic outcomes.

How does the motorcyclist prevent the Tesla from becoming a safety risk?

The category is structured along three dimensions:

A. **Preventive**: Riding behavior that actively reduces risk and increases predictability.
B. **Not preventive** (just riding): Riding without explicit preventive adaptations, handling situations as they arise.
C. **Creates a risky situation**: Riding behavior that increases risk, making it more difficult for other road users to notice or interpret the motorcyclist.

Preparedness in the danger zone and the phenomenon of “false eye contact.”



If the black Tesla enters the roundabout, it violates the right of way and creates a hazard for the motorcyclist.

- **How well prepared is the motorcyclist for this situation?**

The hazard (or danger) zone is defined as the stretch of road where there is a potential risk of collision between the motorcyclist and other road users.

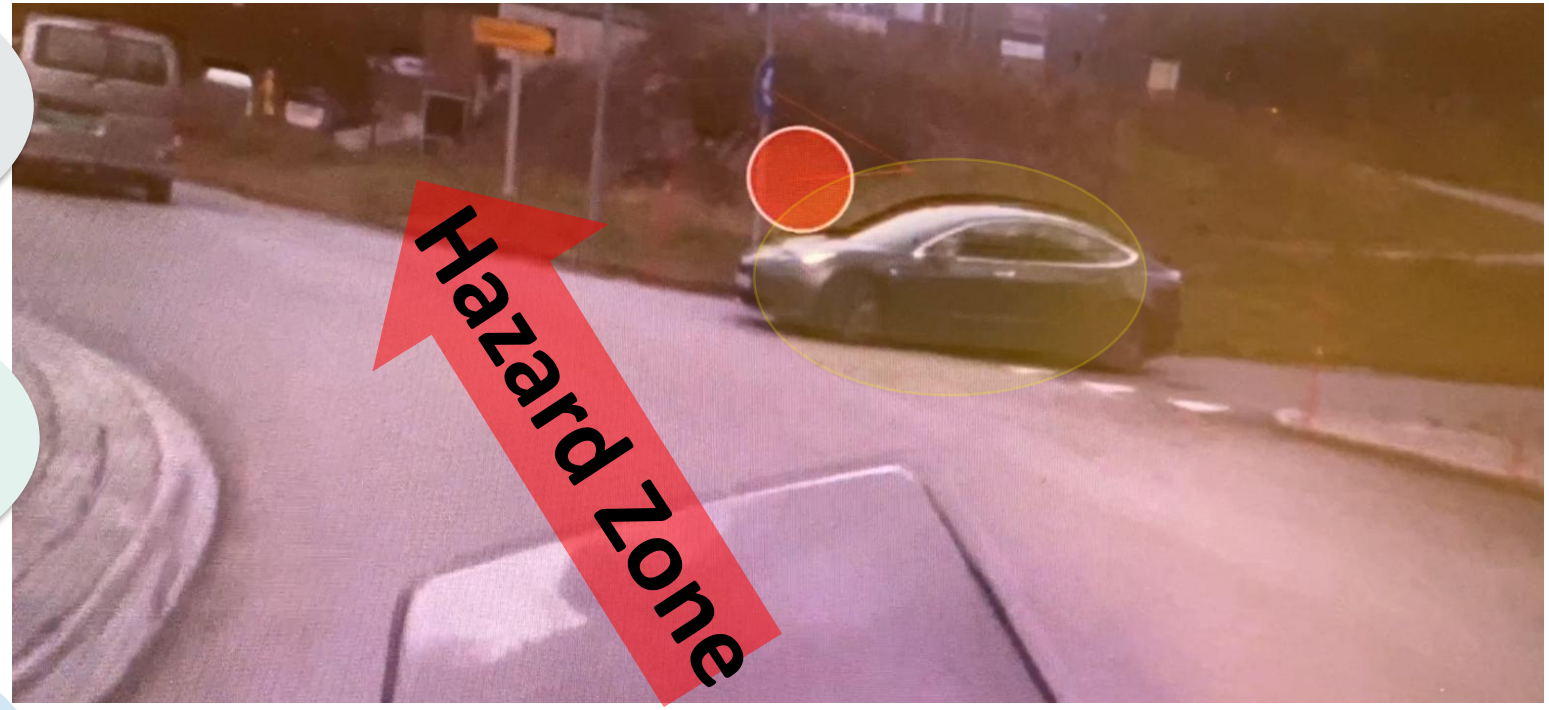
3. **Attention and Decision**

Attention and Decision Timing through Hazard Zone

Visible Positioning

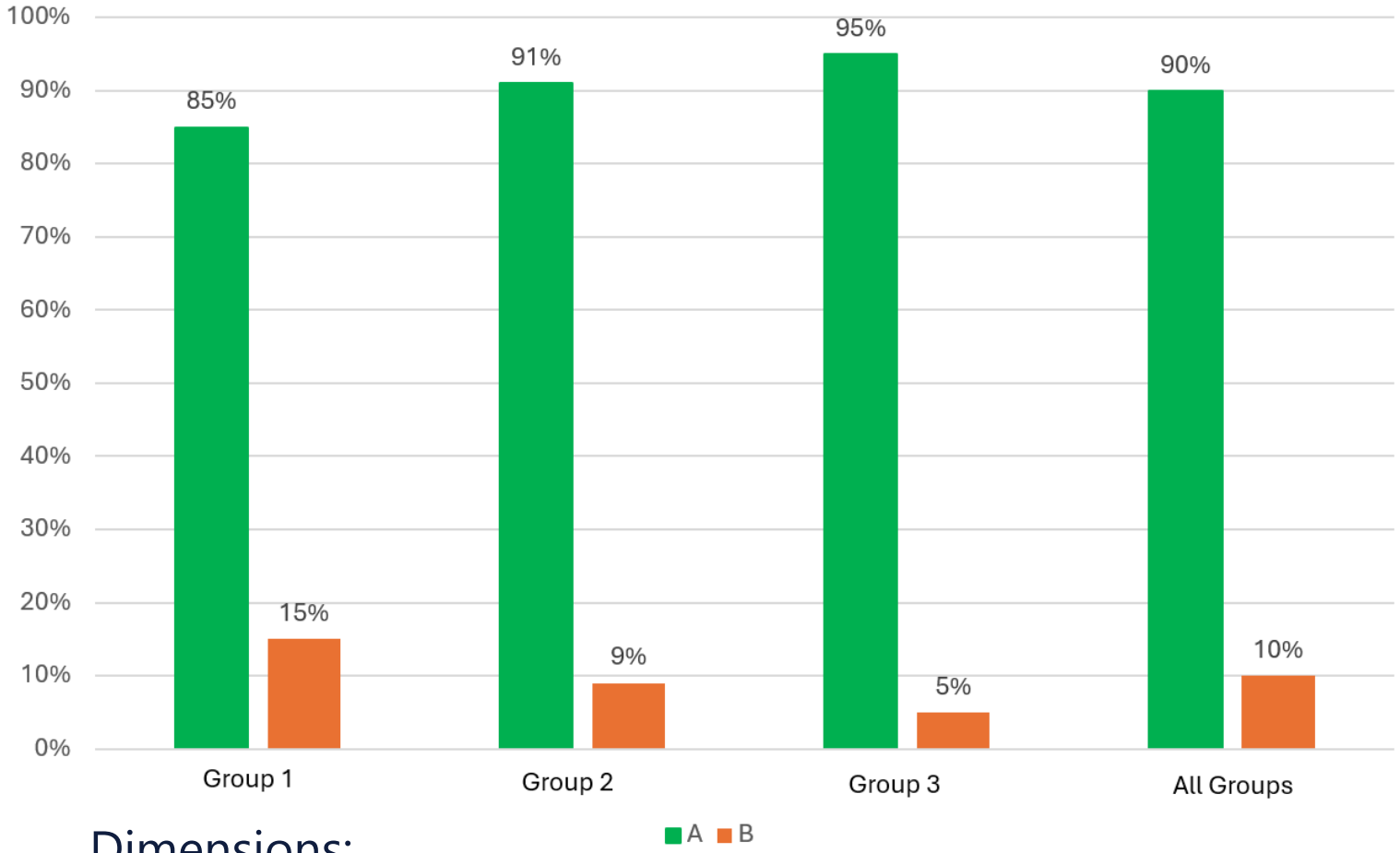
Preventive Riding

Attention and Decision



A. Does not trust road users in the hazard zone
B. Trusts road users who indicate they will stop in the hazard zone (too early clearance in the hazard zone)
C. Uncritical riding

Category 1: **Visible Positioning** in Typical Intersection Situations



Dimensions:

A. (green) Visible positioning to traffic required to yield

B. (orange) Less visible positioning to traffic required to yield

A key finding of this study is that visibility in traffic is not determined solely by where the motorcyclist is positioned, but also by how speed is adapted.

Speed adaptation influences how much time other road users have to detect and interpret the motorcyclist. This is most clearly reflected in the category of Preventive Riding.

Number of participants: N = 62

Category 2: **Preventive Riding**

This category examines the extent to which motorcyclists avoid (**prevent**) or **create dangerous situations**

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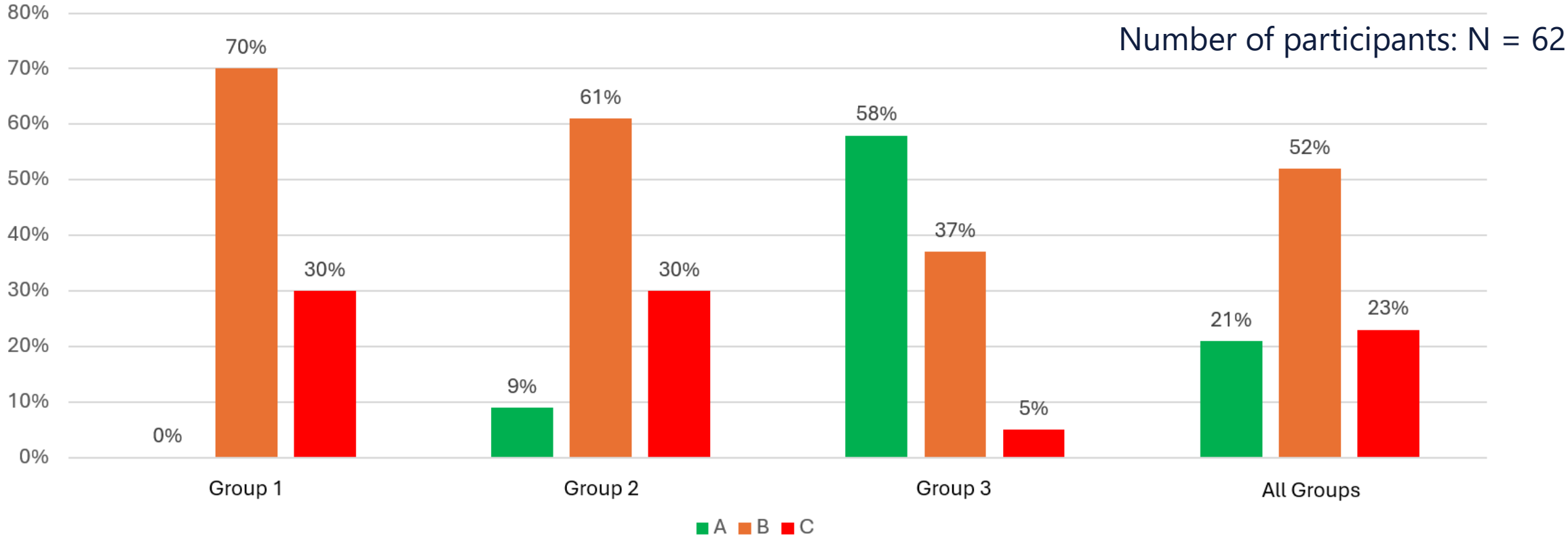
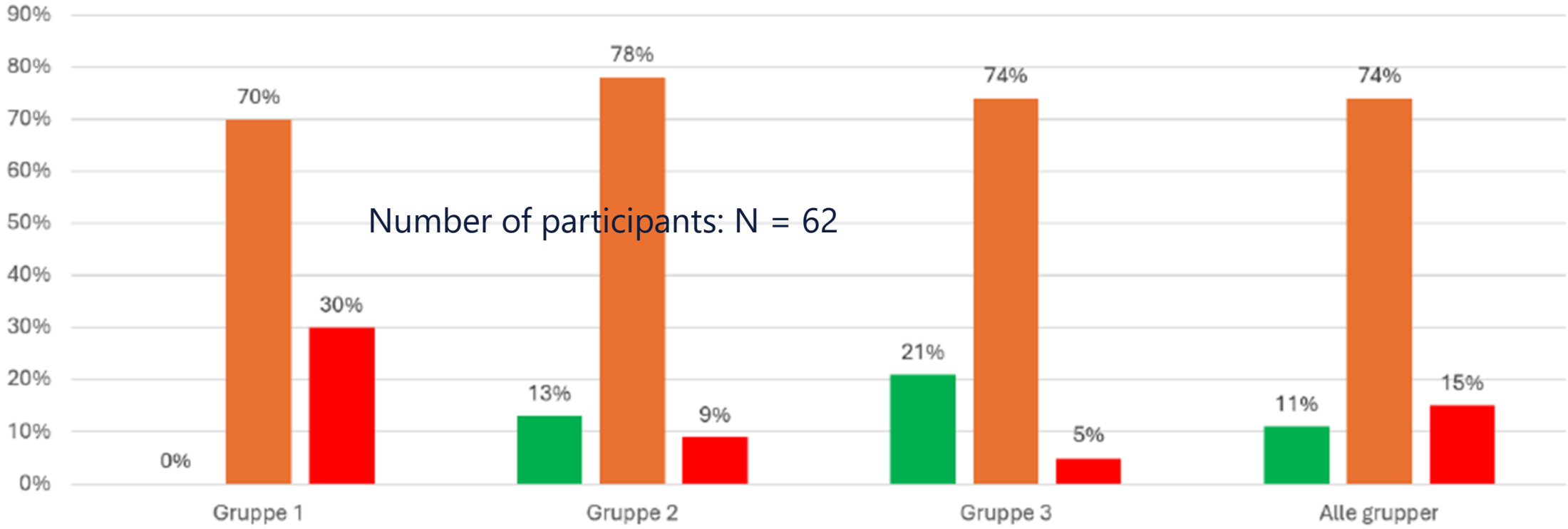


A. **(green) Preventive**: Riding behavior that actively reduces risk and increases predictability.
B. **(orange) Not preventive** (just riding): Riding without explicit preventive adaptations, handling situations as they arise.
C. **(red) Creates a risky situation**: Riding behavior that increases risk, making it more difficult for other road users to notice or interpret the motorcyclist.

3. **Attention and Decision**

Attention and Decision Timing through Hazard Zones



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Bow-tie diagram

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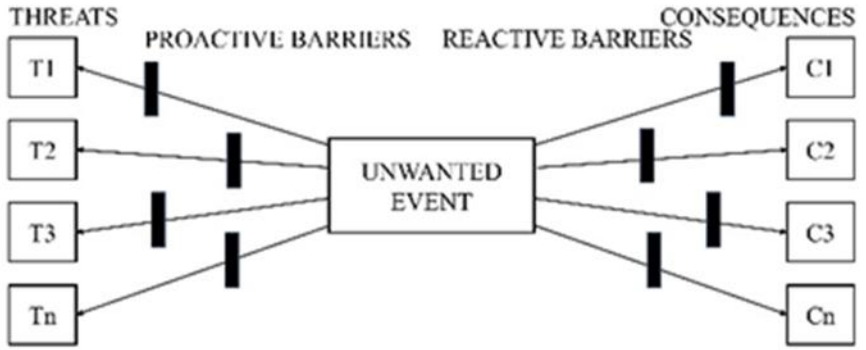
The Bowtie model (Rausand and Utne, 2009) frames everyday motorcycle riding within a proactive safety perspective.

Threats → **Proactive Barriers** → **Unwanted Event** → Reactive Barriers → Consequences



The Bowtie model (Rausand and Utne, 2009)

Interpretation in this study:

- Preventive riding acts as a key proactive safety barrier
- Speed adaptation and preparedness reduce risk in the hazard zone
- Visibility alone does not prevent accidents
- Experience is not a safety barrier unless it leads to preventive behavior

The main safety challenge is not visibility, but insufficient preventive riding — particularly failures in speed adaptation and preparedness throughout the entire hazard zone. Experience alone does not guarantee safer riding; preventive behavior and preparedness must be actively maintained.

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Visibility alone is not the main problem.

Many riders who otherwise ride riskily are still well positioned and visible in traffic.

The critical weakness is speed adaptation and preventive riding.

Accident risk is primarily linked to how speed is adapted in intersection situations where others must yield, not to positioning alone.

Preventive riding functions as a key safety barrier.

From a Bowtie perspective, preventive riding represents a barrier that is often missing or insufficiently applied.

Experience alone does not guarantee safer riding.

Even experienced riders may fail to apply preventive riding strategies; safety depends on actively maintained preventive behavior and preparedness.

Many riders lose preparedness inside the hazard zone.

Riders tend to be alert initially but prematurely trust other road users once traffic slows or eye contact is made.

Uncritical riding through the hazard zone is common.

A substantial proportion of riders pass through the entire hazard zone without maintaining preventive behavior, leaving no barrier if the motorcyclist is overlooked.

This points to a training and education gap.

Preventive riding and risk-based thinking appear underemphasized in driver training, testing, and traffic education curricula.

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Thank you for your attention

"The doctor sees human weakness,
the lawyer wickedness,
—**and the traffic researcher sees dangerous driving**."

After Arthur Schopenhauer; adapted by Petter Helmersen Bogfjellmo


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