

# **Behavioral determinants of motorcyclist personal protective equipment (PPE) use in five European cities**

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## **Abstract-**

### **Objectives**

Motorcyclists face high risk of severe and long-term injuries, yet the use of personal protective equipment (PPE) beyond helmets remains inconsistent across European cities. This study examined determinants of motorcycle PPE use to understand barriers and enablers influencing protective behavior.

### **Methods**

A cross-sectional survey was conducted in five European cities (Athens, Barcelona, Copenhagen, London, and Rome). Data were collected through an online questionnaire designed using the COM-B model of behavior (Capability, Opportunity, Motivation). The survey examined ownership and use of multiple motorcycle PPE types beyond helmets (protective jackets and leg protection). Additional measures captured riding context (e.g., urban/non-urban riding, trip purpose, and riding frequency), perceived barriers to PPE, and social norms. Statistical analyses examined associations between PPE use and behavioral determinants across the COM-B domains. Awareness and interest in innovative PPE were also analyzed.

### **Results**

Among the 905 respondents, helmet ownership and use were high, whereas ownership and use of non-mandatory PPE such as jackets and leg protection were lower. A gap emerged between access to PPE and consistent use, particularly for jackets and leg protection. Multivariable analyses showed that physical opportunity factors played a central role in PPE use: riders reporting greater comfort when wearing protective equipment and greater convenience in carrying it had significantly higher odds of consistent use. Among riders who did not always wear PPE, the most frequently reported barriers were heat, discomfort, and inconvenience when not riding. Reflective motivation also influenced behavior. Although most riders recognized the protective value of jackets and leg protection, many reported that such equipment is less necessary for short journeys or urban riding, indicating context-dependent risk perceptions. Social opportunity factors were also present: perceptions that other riders commonly use non-mandatory PPE were relatively low. Respondents also showed interest in innovative PPE, particularly upper-body protection, although affordability, comfort, and usability were identified as key considerations for adoption.

## **Conclusions**

**Among riders participating in the study, PPE use is shaped by interacting opportunity-, and motivation-related factors, with practical barriers such as heat, discomfort, and inconvenience playing a central role in limiting consistent use of non-mandatory equipment. The findings also highlight the importance of context-specific risk perceptions, as many riders consider PPE less necessary for short or urban trips, and of social influences linked to the perceived behavior of other riders. Improving PPE adoption requires behaviorally informed strategies addressing usability and comfort of protective equipment, strengthening risk communication in everyday riding contexts, and promoting social normalization of PPE use. Interest in innovative PPE concepts suggests opportunities for further uptake, prioritizing affordability, comfort, and ease of use alongside protection.**

**Index Terms-** Passive safety; motorcyclists; PPE; behavioral determinants; COM-B; innovation/adoption

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## **Citation:**

*Papafoti, L.; Pérez Avendaño, M.A.; Kontaxi, A.; Carroll, J.; Huster, D.; Auerbach, K.; López-Valdés, F.J. "Behavioral determinants of motorcyclist personal protective equipment (PPE) use in five European cities", Traffic Injury Prevention, , .*