

## **A study on airbag jacket use based on semi-structured interviews with riders of powered-two-wheelers**

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### **I. INTRODUCTION**

Powered-two-wheelers (PTW) have a high potential to reduce congestion and particle pollution in cities dominated by passenger cars and other types of relatively large vehicles. However, according to the latest official report of the French road safety observatory, the risk of sustaining a severe injury (MAIS3+) as a PTW rider in France in 2019 is 67 times higher than the risk of severe injury for passenger car occupants, when taking into account the time or distance travelled using these vehicles [1]. Fortunately, there are many solutions, and more emerging, to reduce the PTW user's risk of injuries. The proposal to fit cars and motorcycles with active and passive safety systems has a high potential [2-4] to reduce motorcyclists' injuries in crashes, but it needs to be complemented by promoting the use of personal protective equipment (PPE), like airbag jackets, which protect PTW users in a wider variety of crash configurations and not only against cars.

Airbag jackets exist in various formats and are designed to protect the PTW user's trunk (and neck, depending on the model) by inflating when a fall off or an imminent crash is detected (by wire or electronically). A very limited number of articles have addressed the effectiveness of airbag jackets in reducing motorcyclists' injuries, which is probably due to the low usage rates of these jackets. One study [5] shows a good level of protection for the motorcyclist's trunk when the impact speed on the trunk is less than 40 km/h. Another study [6] shows a potential reduction of one AIS level with regard to chest injuries.

This study provides a preview of the results of a survey of PTW riders, conducted through semi-structured interviews that sought to understand the acceptance and adoption of airbag jackets.

### **II. METHODS**

The survey was conducted in 2023 by interviewing 30 motorcyclists (including 16 airbag jacket users) and recording their answers to a pre-established questionnaire. The motorcyclists were recruited from among customers of motorcycle equipment stores to maximise the chances of interviewing airbag jacket users. The questionnaire, which didn't include any personal information, comprised two parts: a set of sociodemographic questions common to all interviewees; and a specific set of questions for users and non-users of airbag jackets.

#### ***Sociodemographic questionnaire***

This questionnaire consists of a series of questions that aim is to collect sociodemographic information such as gender, age, type and seniority of rider/driver license, as well as information about the use of the PTW and other vehicles (type of PTW, frequency of use, driving style, average time and kilometers travelled, etc.). The answers to this questionnaire were studied by the means of a Pearson correlation and a Principal Component Analysis (PCA) to understand the correlation between each of the variables, and their relationship to the fact of being a user or non-user of the airbag jacket. For this reason, the questions associated to categorical variables were converted to numerical, using a scale for each variable to ensure they are logically ranked.

#### ***Questionnaire for users and non-users of airbag jackets***

The aim of this questionnaire is to understand the knowledge and opinion of the interviewees about PPE and airbag jackets, their actual usage and the factors that might influence their willingness to use this equipment. It consists of two series of questions, with open answers for airbag jacket users and non-users. These answers were collected (vocal recordings) and analysed separately, in different themes, for airbag jacket users and non-users.

### III. INITIAL FINDINGS

#### *Sociodemographic questionnaire*

The correlation study between variables is illustrated as a correlation matrix (Fig. 1, left). The PCA results are illustrated in a plot using PC1 and PC2 as dimensions (Fig. 1, right), which explain, respectively, 40.2% and 18.4% of the variance of the sample. Some of the variables that are shown in the correlation matrix were dropped in the PCA, to ensure high variance explained in only two principal components. Even though both studies were undertaken on a small sample (30 interviewees), high correlation was shown (dark blue dots) between age and driver/rider license seniority. Age is inversely correlated with moto use (dark red dot), which means there is a high tendency for older people to use their motorcycle mostly for leisure. Gender was correlated to none of the other parameters, but this result is probably due to the small female sample (only two riders). While PPE use is mostly associated with professional and more frequent use of the PTW and with younger PTW riders, the airbag jacket use is not correlated to any other parameter. The PCA shows a dispersion of the different interviewees compared to all the parameters used. There is no notable difference between airbag jacket users and non-users, apart from a slight tendency for users to have professional use of their PTW and use their PTW for journeys of shorter duration.

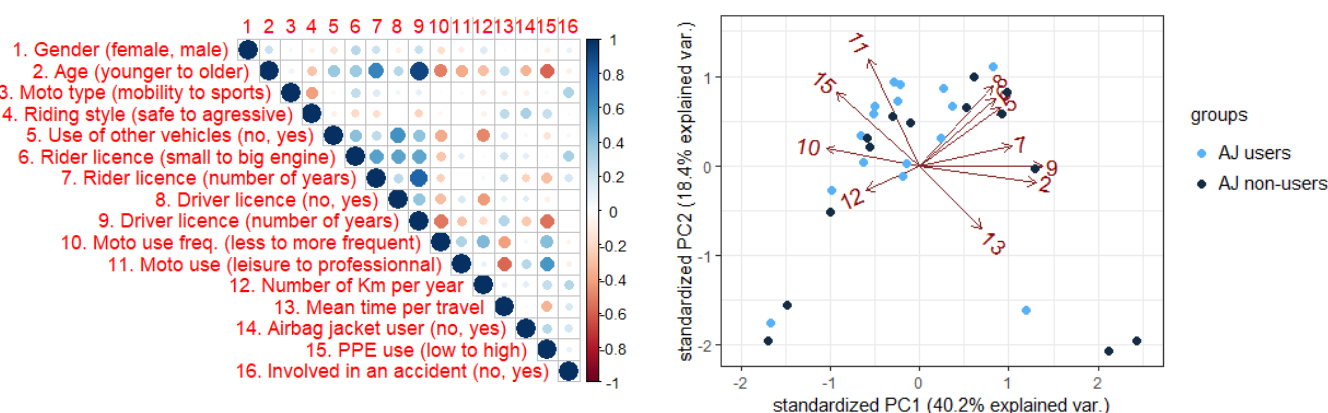


Fig. 1. Illustration of the correlation coefficients between variables (left) and the results of the PCA (right) distinguishing between airbag jacket (AJ) users and non-users.

#### *Questionnaire for users and non-users of airbag jackets*

All airbag jacket users interviewed had the electronic version. According to their statements, the level of protection and increased safety led them to purchase an airbag jacket. Motorcyclists who have been involved in accidents with an airbag jacket are convinced of its effectiveness, but the majority of them are reluctant to make it mandatory. Many of them admit using it only for longer rides. For the non-users, the obstacles to purchasing an airbag jacket are cost price and cost of maintenance, the perceived impracticality of this additional piece of equipment, and the aesthetic look of the jacket, which can be incompatible with some practices.

### IV. DISCUSSION

The survey had only 30 participants, a sample size too small to be representative of any population. Its purpose is to identify beliefs and information that can be used in future surveys carried out on a larger scale. The characterisation of the sample shows that there is no notable difference between users and non-users of airbag jackets in terms of sociodemographic parameters, apart from a slight tendency of airbag jacket users to have professional use of their PTW and for shorter journeys. This seems to contradict to the statements made in interviews where users claimed to use the airbag jacket mostly during long journeys. In the few literature studies that are available, it was demonstrated that airbag jackets are efficient at reducing injury severity during accidents at low collision speeds, which is more likely to correspond to short urban journeys. This topic certainly requires a more in-depth investigation.

## V. ACKNOWLEDGEMENTS

The authors would like to thank *Fondation Mutuelle des Motards*, Paris, France, a French foundation set up by an insurance company for motorcyclists, who funded this work.

## VI. REFERENCES

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