International Co-operation on Theories and
Concepts in Traffic Safety

Reducing motorcycle rider injury by promoting the use of protective clothing with airbags: an examination of the potential for Israel

[1]Gitelman, V., [1]*Hakkert, S.
*lead presenter
[1] hakkert@technion.ac.il, Transportation Research Institute, Technion, Haifa, Israel

Background and Aim: In light of the increasing use of motorcycles as personal transportation, particularly in densely-populated urban areas, and the high rates of motorcycle rider injury in road accidents, there is a need to promote measures that can reduce rider injuries in accidents. One of the measures discussed in this context is the use of airbag clothing - vests/jackets by motorcycle riders (MRs). The purpose of this study was to summarize the existing knowledge in the literature regarding the effectiveness of such a measure and to assess the potential for reducing MR injury in Israel if riders were to use protective clothing with airbag technology.

Methodology: The research included an international literature survey on the effectiveness of MR protective clothing with airbags, an examination of data on MR injury in Israel, and an assessment of the potential contribution of this measure for reducing rider injuries. As a basis for the assessment in Israel, data from two sources were analyzed: summaries from the National Trauma Registry (NTR) and detailed records on MR casualties from the national accident files, for the years 2017-2021. The estimation of the potential contribution was performed using three scenarios with different reduction rates in MR casualties, as a result of adopting the measure, that were developed in the European study PIONEERS, but with the MR injury data in Israel.

The evaluation applied an economic model that compares the expected benefits - the costs of saved MR casualties resulting from the use of airbag clothing, to the measure's costs - the investment in subsidizing the purchase by MRs and in publicity campaigns, on a national scale. For each scenario, 20 estimates were conducted, with various assumptions regarding penetration rates, cost of the measure, and the economic framework.

Results: In the scientific literature, most studies that examined the effectiveness of airbag MR clothing were based on computer simulations or laboratory experiments, while accident studies under real-world conditions were rare. Overall, the studies indicated a potential reduction in MR injuries while using airbag clothing, but the tests were mostly conducted at low impact speeds, up to 40-50 km/h. A supplementary internet search revealed that the devices were successfully incorporated in motorcycle races, where they apparently contributed to reducing MR injury. However, regular MRs in Europe, so far, do not support the obligatory use of such means due to the lack of common regulation.

The NTR data demonstrated that the rate of thorax injuries was 28% among all hospitalized MRs, and higher, at 42%, among severe MR casualties. Further examinations of MR injuries according to the medical scale and hospitalization characteristics showed that when the thorax area was affected, higher severity levels were generally observed compared to other cases. The

accident files showed that, annually, 63 MRs were killed, 503 were seriously injured, and 1457 were slightly injured, in Israel. Leading characteristics of MR accidents were identified concerning riders' age groups, motorcycle size, accident sites and types.

The scenario estimations showed the investment in MR airbag clothing in Israel to be worthwhile: in the conservative scenario, the benefit-cost ratios were in the range of 1.0-1.3, with a feasible subsidy percentage for the device purchase up to 20%-25%. In the other scenarios (with higher MR reduction rates), higher benefit-cost ratios were obtained, in the ranges of 2.1-2.7 and 3.5-4.5, respectively, with feasible subsidy percentages up to 50% and over 80%.

Conclusions: The lack of findings on the device's effectiveness in real-world accidents and uniform regulations, reflects, as yet, an insufficient basis to promote the obligatory use of such means. However, the MR injury data in Israel indicate a significant scope of injuries to the thorax area and their high severity, while cost-benefit evaluations consistently demonstrate the expected feasibility of investing in the measure in Israel. Therefore, the use of airbag clothing among MRs in Israel can be encouraged, including a subsidy of its purchase and promoting the use in MR groups with a higher risk of the thorax injury.