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Injury patterns within clusters of seriously injured occupants comparing real-world crashes in the United States and the European Union

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Abstract-

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Objective:
Crashworthiness assessments in the United States (U.S.) and the European Union (EU) include a large number of safety regulations and consumer testing programs. However, safety standards and testing procedures differ between the two regions. Not much research has been done in relation to this topic, because it has always been assumed that the accident environments in the U.S. and EU are not comparable. The objective of this study is to compare how vehicle occupants are severely injured in motor vehicle collisions in the U.S. and the EU by applying unsupervised learning to accident data.
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Methods:
A new methodology to identify clusters of seriously injured occupants in NASS-CDS was proposed by the authors in previous research. The current study goes one step further and uses the clusters to compare the injury patterns at the Maximum Abbreviated Injury Scale (MAIS) 3þ level of passenger vehicle occupants in the U.S. and German accident environments. The clustering model developed with NASS-CDS data is applied in this study to German In-Depth Accident Study (GIDAS) data. A machine learning algorithm automatically assigned each GIDAS case to its most similar NASS-CDS cluster controlling for nine different parameters. Those included the injury severity at the body region level, biomechanical characteristics of the occupants, and technical severity of the crash.
Results:
Differences and analogies between GIDAS and NASS-CDS data within clusters of seriously injured occupants are highlighted. One of the clusters groups the collisions with the greatest mass incompatibility in NASS-CDS and GIDAS data. The injury patterns in the clusters that include elderly people match significantly between the U.S. and German data sets. The lack of younger population and elevated body mass index (BMI) values in the GIDAS sample make the injury patterns within these population groups less comparable than in the other clusters.
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Conclusions:
Remarkably similar injury patterns at the MAIS 3þ level have been found in U.S. and German accident data sets after controlling for nine different parameters. This research provides evidence to indicate that how belted vehicle occupants are severely injured in the U.S. and in the EU is not necessarily different.

Index Terms- Real-world crash data; serious injuries; GIDAS; NASS-CDS; cluster analysis

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