Hybrid vehicles safety ranking by use of a multicriteria analysis method

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Objectives: This paper has the objective to evaluate 10 commercial hybrid and electric vehicles safety, available in north America, by ranking them using a Multicriteria Decision Method (MCDM). Vehicle safety characteristics are presented to customers through a five-star ranking, being difficult to compare their safety between them. Thus, it is important to evaluate them using a more consistent approach. All data are provided by the National Highway Traffic Safety Safety Administration (NHTSSA).

Methods: We evaluated their safety performance by using an additive model of MCDM called Multi-Attribute Value Theory (MAVT). MAVT helps decision makers to compare several alternatives considering multiple criteria at the same time, resulting in better choices. All selected vehicles are sedan or hatch passenger cars and passed with 4 or 5 stars on NHTSSA ranking. We assessed their performance considering 11 sub criteria related to 4 major criteria: Head, Neck, Thorax and Abdominal Injuries.

Results: Results show that vehicles are very different among each other. On the first analysis, considering that all criteria had the same importance (weight), the only pure electric vehicle selected had the best performance for driver safety, and both Toyota's vehicles had the worst evaluation. When evaluating different criteria weights, considering that Head Injury (w = 0,5) were the most important safety criterion, followed by Neck (0,25), Thorax (0,15) and Abdomen (0,1) criteria, the performance values changed, but the ordered ranking stayed the same.

Conclusions: MCDM have been used to evaluate different alternatives considering multiple criteria in very different scenarios. It was possible to evaluate performance, perform the usage of the method and obtain ranked result for selecting the safest vehicle.