

A comparison between HIC and other head injury criteria in pedestrian headform tests

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ABSTRACT

The Head Injury Criterion (HIC) is almost exclusively used to measure the safety afforded to the head under test conditions. From time to time there have been calls to replace HIC with alternative measures of risk such as Head Impact Power, Gambit and the 3 ms criterion. The objective of this study was to examine the correlation between HIC and other criteria in pedestrian headform tests.

Linear acceleration was obtained, and angular acceleration computed, from all available pedestrian head impact subsystem testing performed for the Australasian New Car Assessment Program between 2006 and 2008 (n=247).

HIC and the other criteria were correlated in three ways. First, the ranking of test results according to HIC was correlated with the rankings of test results according to the other criteria. Second, the discrimination of tests according to accepted thresholds (i.e. pass/fail) were compared across criteria. Third, the numerical measures of severity (i.e. the magnitude of HIC, Gambit etc.) were correlated across all tests.

The minimum Spearman rank coefficient, rho, between the ranking of the tests according to HIC and the ranking according to other measures 0.65 (Gambit), the maximum rho was 0.94 (Head Impact Power). Overall, the Head Injury Criterion generated a similar ranking of test results to other criteria. However, a comparison of passes and fails across the criteria showed that HIC=1000 was less conservative than most other criteria. Finally while the study shows that HIC and Head Impact Power are strongly related for these types of impacts, the relationship is dependent on the headform mass.