# Influence of the occupant position and interior properties on the injury outcome

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**Abstract**

*The goal of the study was to investigate the influence of arm position and the lateral crush properties of the door on the injury outcome measured using a conventional side impact dummy and a human thorax model.*

*Thoracic injuries resulting from side impact collisions continue to be a leading cause of fatality and severe injury in automotive collisions. These impact scenarios are challenging to address due to a limited space for the passive restraints to operate. Restraints and protective systems are tested for specific ATDs in a nominal driving position in current compliance testing, but do not address the effect of position on the response of the occupant.*

*An ES2re ATD LS-Dyna model (Dynamore) and University of Waterloo human thorax FE model were integrated into a mid-size vehicle FE model (2001 Ford Taurus, NCAC) and subjected to the NCAP moving deformable barrier side impact test scenario at 61 km/h. A parametric study was performed to evaluate the effect of arm position (horizontal, vertical, typical driving position) and interior material properties on the occupant response and injury outcome. The injury assessment was based on the thorax deflection and viscous criterion. Trends obtained with the ATD and the human thorax models were compared.*

*Differences in the injury predictions were observed between the two models. The ATD model was not sensitive to the arm position change, while the human thorax model predicted differences in both rib deflection and VC. Modification of the door crush properties had a stronger effect on the ATD VC values.*