

Mechanical Response and Risk Assessment of Occupant Head and Neck Injuries in High-Speed Train Rear-End Collisions (Postprint)

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Abstract

A train-dummy integrated finite element model for passive safety simulation analysis was constructed based on a dummy model representing the 50th percentile male anthropometric characteristics of China, analyzing occupant kinematic behavior during train rear-end collisions, investigating head/neck biomechanical response characteristics, revealing the influence mechanism of seat row on head/neck injury response, and establishing a head/neck injury risk prediction model based on biomechanical parameters. The results show that: collision contact between the occupant's face and the front seat in a rear-ended train may cause primary brainstem injury; both forward and backward neck bending can lead to large stresses in the lower cervical vertebrae; forward and backward neck bending respectively cause large stresses in the upper and lower neck intervertebral discs; and the Nij tolerance limit specified in current standards significantly underestimates neck injury severity for occupants in train rear-end collisions.

Full Text

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Note: Figure translations are in progress. See original paper for figures.

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