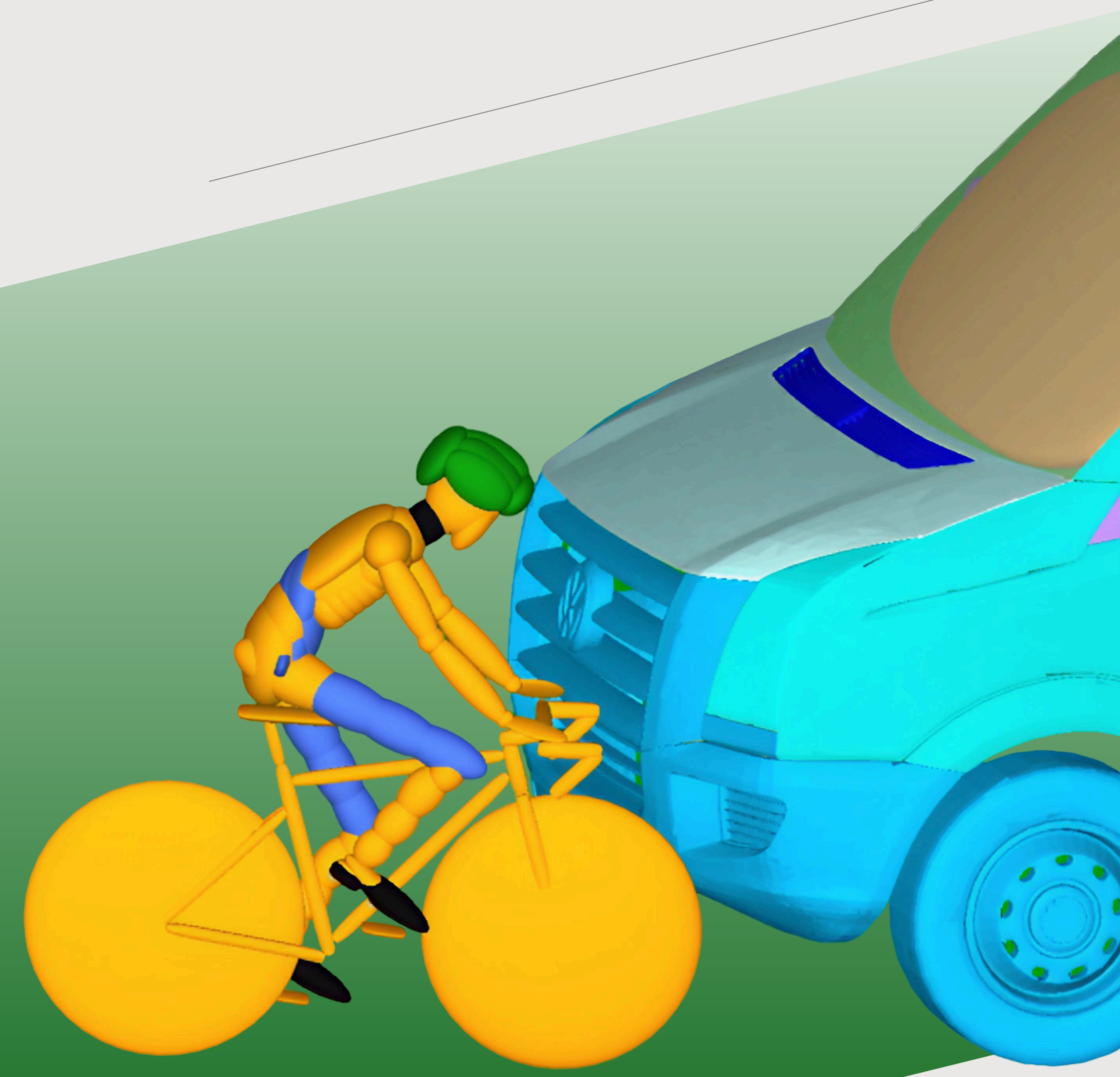


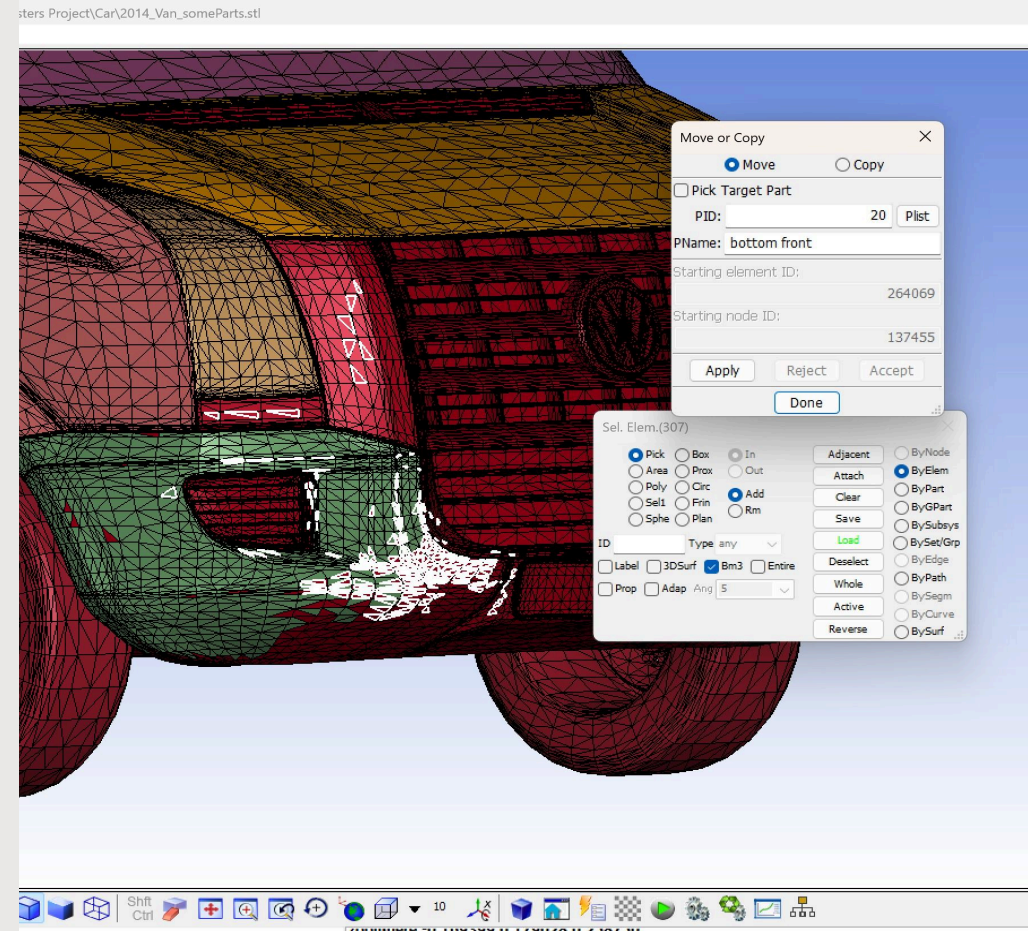
COMPUTATIONAL MODELLING OF
CHILD CYCLIST COLLISIONS TO
INFORM SAFER HELMET STANDARDS

2026



ABSTRACT

Existing cycle helmet standards are not designed around child-specific impact conditions, leaving a critical gap in child cycle safety. This project reconstructs a real-world child cyclist-vehicle collision using MADYMO multibody dynamics simulation, to extract head kinematics across a range of uncertain parameters, to demonstrate that computational reconstruction can inform future child cycle helmet safety assessment.



METHODS

A real-world child cyclist-vehicle collision was selected from the RAIDS database for reconstruction in MADYMO. Key model parameters were defined from the case documentation, incorporating a child human body model, bicycle, and vehicle, each configured to match the recorded collision conditions. Uncertainty in input conditions was addressed through systematic parameter variation, generating a range of head kinematic outputs across the resulting simulations.

CONCLUSIONS

Following validation against case documentation, the project demonstrates that multibody dynamics simulation can reconstruct real-world child cyclist-vehicle collisions and extract meaningful head kinematic outputs. The resulting range of impact conditions suggests that computational reconstruction can be used to inform child-specific helmet test conditions, contributing towards a more evidence-based framework for child cycle helmet safety assessment.

