



# ADAPTIVE SEAT TO REDUCE NECK INJURIES IN MALE AND FEMALE OCCUPANTS

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## THE ADSEAT CONSORTIUM



**VTI CHALMERS**



Automotive Seating



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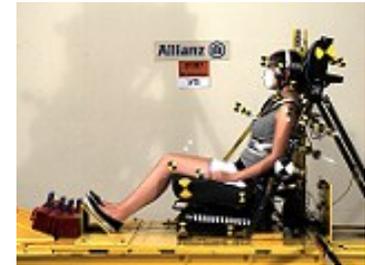
# ADAPTIVE SEAT TO REDUCE NECK INJURIES IN FEMALE AND MALE OCCUPANTS



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## BACKGROUND

Whiplash injury puts a significant social and financial burden on the European society and females have a higher risk of sustaining whiplash injuries in vehicle crashes than males. Despite many endeavors to reduce whiplash injuries, they still account for approximately 70% of the cost for the insurance companies of all injuries leading to permanent medical impairment following a collision.



Anti-whiplash systems for passenger vehicles on the market today can reduce the injury risk, however recent evaluation by the insurance industry has shown that males, more so than females, benefit from the recently developed protective performance of the seats. Current commercially available crash test dummies for rear impact testing, represents an average male.

## APPROACH

The project will provide different measures, considering the female injury risk in future (seat) development and thus extend current optimization processes which focus on male occupants.

## ADSEAT WORK PACKAGES

### WP1: REAL WORLD DATA

An extensive literature review and analysis of databases was carried out. Real world data analysis shows that existing whiplash protection concepts are more effective for males than females, with a 45% risk reduction in permanent medical impairment for females and 60% for males.

### WP2: BIOLOGICAL TESTS

Test data from volunteer tests using males and female volunteers in identical conditions were collected and analysed. Two test rigs for whiplash exposure have been manufactured and tested. A new acceleration sled test set-up with a high speed X-ray movie recording unit has been installed for testing.

### WP3: COMPUTATIONAL MODELLING

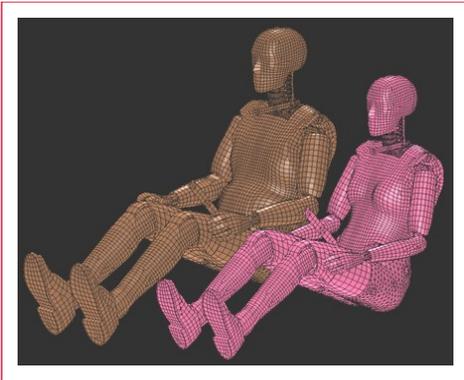
A first model of a finite element dummy model of an average female, called EvaRID, has been developed. A detailed evaluation against biomechanical requirements was made. The first evaluation showed that the model response correlates reasonably well with the test data, but further model refinement is needed.

### WP4: INJURY CRITERIA/THRESHOLDS

Analysing injury risk, assessing the usefulness of currently used neck injury criteria and comparing injury predictors for males and females based on computer simulations and sled tests. Theoretical suggestions were developed and will be complemented by sled testing and computer simulations to investigate their practical applicability.

### WP5: SEAT EVALUATION GUIDELINES

Developing an illustrator describing how the level of protection can be increased. Providing guidance on how to evaluate the protective performance of vehicle seat designs with female as well as male motor vehicle occupants in mind. The findings in WP5 will constitute a component of the final outcome of the ADSEAT project.



## VISION

Our vision is to improve safety for vehicle occupants by making recommendations for future evaluation of the effectiveness of anti-whiplash systems.

## OBJECTIVES

The major focus in ADSEAT, the European Commission funded project, is on Whiplash Associated Disorders (WAD), commonly called whiplash injuries. WAD injuries sustained in vehicle crashes are of great concern.

The overall objective of the ADSEAT project is to provide guidance on how to evaluate the protective performance of vehicle seat designs aiming to reduce the incidence of whiplash injuries for female as well as male motor vehicle occupants.

We will develop a finite element dummy model of an average female to be used as a research tool in conjunction with the current low severity rear impact model which is based on an average male. The model is used when evaluating enhanced whiplash injury protection.