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# 탑승자 및 보행자 안전



## 정면충돌 시 편이자세 승객의 거동 및 상해 연구

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### Behavior and Injury Investigation of Reclined Occupants in Frontal Crash

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**Key Words :** Frontal crash simulation(정면충돌해석), Reclined posture(편이자세), Occupant behavior(승객거동), Injury(상해), Autonomous vehicle(자율주행자동차)

#### ABSTRACT

While autonomous vehicles become more popular, vehicle occupant postures are anticipated to vary and current restraint systems are not expected to be suitable for a wide range of occupant postures. In particular, it is reported serious injuries occurred in frontal collisions in the reclined posture. Therefore, it is necessary to investigate the biomechanical occupant response in the reclined posture. This study analyzes the behaviors and injuries of dummy models (Hybrid-III and THOR) and human model (THUMS) in the reclined positions. Frontal crash sled simulations with semi-rigid seats and three-point seat belts with pretensioners are performed and model biofidelities are evaluated by comparing with post mortem human surrogate (PMHS) data. The results are applicable to the design of new restraint systems suitable for reclined postures.

#### 후기

본 연구는 ‘자율주행기술개발혁신사업, 주행 및 충돌상황 대응 안전성 평가기술 개발’의 연구결과로서 국토교통부와 국토교통과학기술진흥원의 지원 하에 수행되었으며, 이에 관계자 여러분께 감사드립니다.

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## 정면 충돌 시 요크 스티어링휠의 운전자 상해 영향성 연구

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### Research on the Impact of a York Steering Wheel on Driver Injuries in a Frontal Collision

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**Key Words :** Driver-side airbag(운전석에어백), Yoke steering wheel(요크스티어링휠), Driver injury(운전자상해)

#### ABSTRACT

Yoke steering wheel which cut upper rim is being adopted to enhance driver's visibility and make it look like future vehicles. This change can affect to driver's injury in frontal crash situations due to not enough support for an airbag cushion.

In the present study, influence of the yoke steering wheel is evaluated in sled tests. In the tests, hybrid-III 50%ile and 5%ile dummies are used. Belted and unbelted conditions are tested respectively. For belted condition a 56kph full frontal rigid barrier collision pulse is used and, for unbelted condition a 40kph full frontal rigid barrier collision pulse is used.

In unbelted condition, neck injury is got worse. Because upper rim of steering wheel is removed, a deployed cushion is moved to upper direction reducing coverage in dummy's chest area especially in unbelted condition. This cushion slide to upper direction causes severe injury on driver's neck. In unbelted condition with 5%ile dummy, Nte value was raised by 69% due to deployed cushion got stuck under chin while the cushion is moved to upper direction.

In all belted condition tests, injuries are got worse but not significant. The main injury is a neck tension for yoke steering wheel cases.

An improved design of a driver-side airbag cushion is suggested and tested which can reduce injuries in unbelted sled tests.

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## 야간 운전시 자동차 전조등에 의한 보행자 인지가능 거리 분석

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### Analysis of Pedestrian Perceivable Distance by Car Headlights

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**Key Words** : Pedestrian(보행자), Perceivable distance(가시거리), Traffic accident(교통사고)

#### ABSTRACT

About 41% of pedestrian traffic accidents occur at night after sunset, and the point or time which pedestrians can be recognized is used as important data for accurate traffic accident investigation. Although there are many data that have analyzed the visibility of vehicle drivers, research data by various variables, such as changes in the brightness of headlamps due to the development of vehicle technology should be continuously updated. In this study, pedestrian recognition distance experiments for each variable, such as vehicle speed, vehicle type, headlight light source, pedestrian clothing color, size, and posture are expected to be used as evidence to identify night drivers. Also, It is expected to contribute to raising public awareness of traffic safety and forming a healthy traffic safety culture.

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## 실차 실험을 바탕으로 한 PreScan 보행자 긴급제동장치 로직 개발에 관한 연구

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### A Study on the Development of PreScan Pedestrian Emergency Brake System Logic Based on Real Vehicle Experiment

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**Key Words :** ADAS(첨단 운전자 지원 시스템), AEBS(긴급 제동 시스템), Pedestrian(보행자), PreScan(프리스캔)

#### ABSTRACT

2019년 UNECE의 자동차 기준 조화 포럼에서 우리나라와 일본, 유럽연합 등 총 40개 나라에서 AEB 기능 탑재 의무화 합의와, 2022년부터 AEB 장착 의무화 대상을 초소형차를 제외한 모든 차종으로 확대함에 따라 운전자의 편의와 주행 안전을 높이기 위한 첨단 운전자 지원 시스템(ADAS, Advanced Driver Assistance System) 장착 차량의 보급이 늘어나고 있다. 첨단 운전자 지원 시스템 중 보행자의 안전과 관련된 기능은 보행자 긴급제동장치(Pedestrian Autonomous Emergency Braking System)로 차량 제조사는 해당 기능을 평가하기 위해 Euro NCAP(New Car Assessment Program)의 보행자 긴급제동장치 테스트 시나리오를 수행하고 있다. 본 연구에서는 Euro NCAP 보행자 긴급제동장치 테스트 시나리오 중 CPFA(Car to Pedestrian Farside Adult) 50, CPNA(Car to Pedestrian Nearside Adult) 25, 75와 CPNA 10, 25, 50 75, 90) 시나리오를 속도 10km/h부터 65km/h까지 수행하였으며, FCW(Forward Collision Warning) TTC(Time to Collision)와 Partial Braking TTC, Full Braking TTC를 각각 측정하였다. 실험 결과 CPNA와 CPFA는 좌우 대치의 경향을 확인하였으며, 측정된 결과를 바탕으로 PreScan 및 Matlab/Simulink 환경에서 레이더와 카메라 센서의 퓨전, MIO(Most Important Object) 판별 및 객체 추적 알고리즘을 구성하고 실험 환경과 같은 시나리오를 수행함으로써 실험 결과와 PreScan 시뮬레이션 결과를 비교하였다. 향후 다양한 차종에 대해 해당 실험을 수행할 예정이며 실험 결과를 바탕으로 PreScan의 보행자 긴급제동장치 로직을 개선해 나갈 예정이다.

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