

throttle acceleration and violations×age on hard braking appeared. Male drivers with high errors scores speed up more abruptly than those with low scores while female drivers did not. High violations drivers in their 60s more frequently engaged in periods of hard braking than those with low violations scores. The relationships observed here are likely conservative since drivers having had accidents in the past year were excluded. ■

## **H**ow to consider the protection of the abdominal area of children: the CASPER's project contribution

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The European research project CASPER is dedicated to the improvement of the safety of restrained children in cars through improving the quality of use of the restraint systems and the development of new tools allowing the birth of a new generation of restraint systems. This paper shows the point of advancement of the work conducted in European research projects to improve the knowledge of injuries in the abdominal area sustained by restrained children in cars.

Field studies are conducted to have a good picture of the situation of traveling conditions of children in cars. In depth accident studies show that for children using the seatbelt of the car, with or without a booster system, severe or fatal abdominal injuries can be observed when they are involved in a severe frontal or side impact. An overview of the main abdominal injury mechanisms is proposed through a careful analysis of the detailed CASPER accident database. A comparison with the abdominal injuries and corresponding mechanisms sustained by adults under similar type of loadings has been performed and is reported in the

paper. These real world results were used to make steps in the area of the protection of the abdomen of children.

In dynamic tests, it is important that to approve child restraint systems or to evaluate their level of performance the child dummies used are able to reproduce abdominal injury mechanisms, to measure physical parameters linked to a corresponding injury criteria. In the current regulation tests, this risk is only covered by the use of pieces of clay that are deformed if the seatbelt intrudes the area.

For many years, research projects have been looking for solutions based on a more scientific basis. During previous European research projects, CREST and CHILD, a new set of dummies representing children of different ages were developed: called the Q family dummies. They are more biofidelic than the ones of the previous generation still used in the European regulation. At the beginning of the CASPER project, three prototype systems of abdominal sensors existed, all at the stage of being usable for research purposes. One main output of the project is to select the one that is best adapted to be widely used in crash test laboratories running intensive test campaigns, to modify it in order to make it easy to use in the Q dummies and that it can be industrialized. In addition to work on the sensor it has been necessary to improve the global kinematics of the child dummies to allow a better submarining behaviour. In the CASPER project, different proposals were made and tested. This paper describes the technical choices and the works carried out both on the dummies and on the selected sensor to improve the protection of the abdomen. The approaches taken to ensure that the abdominal protection is also considered on the child dummy models and child human models developed in the CASPER project are also explained. ■

## **M**ultinomial logit model of bicycle injury risk in Hong Kong

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**Background** More and more countries have been promoting bicycle transport mode, as one of the key strategies in sustainable transport development. In many European and American countries (e.g. Netherlands, Denmark and Canada), bicycle has been a popular commuter transport mode. In contrast, bicycle is mainly used for recreational purpose in Hong Kong. Well planned bicycle transport infrastructure was absent, except smallscale and isolated bicycle path network in suburban area. Unfavorably, proportion of bicycle crash to total road crash has been increasing, from 5.3% in 1997 to 12.7% in 2004. Therefore, factors contributing to bicycle injury risk are worth exploring.

**Study Design** An integrated database, Road Casualty Information System (RoCIS), was jointly developed by the Police, Transport Department and hospital, linking up the trauma records of casualties admitted to the accident and emergency department of hospital and the crash records maintained by the Police and Transport Department the advantage of RoCIS, information on bicyclist demographics, injury severity, injured body part, collision type, road design and vehicle attributes, of 682 bicycle casualties during the period 2004-2006 have been collected.

**Results** In this study, multinomial logit regression is applied to identify the significant factors contributing to the risk of severe and lifethreatening injury of bicycle casualties. Results indicate that middle age and elderly bicycle casualties are more likely to have severe injury. Besides, bicycle casualties with severe head injury and with motor vehicles involved are remarkably more likely to have lifethreatening injuries. Unfortunately, the helmet wearing rate is extremely low and at 2% only. Therefore, safety education, campaign and enforcement could be targeted to the middle age and elderly bicyclists. In particular, use of protective device and compliance to traffic rules should be promoted. Also, access of bicycle on the motorway should be scrutinized.

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## Neuropsychiatric consequences in obstructive sleep apnea syndrome & traffic safety

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**Introduction** Obstructive Sleep Apnea Syndrome (OSAS) lead to physical problems like hypertension and arrhythmias and mostly to neuropsychiatric consequences like Brain atrophy, Depression Anxiety and Insomnia. Apart from a multitude of physical complaints, OSAS patients suffer from excessive daytime sleepiness, reduced sustained attention, limited memory processes and cognitive functions. Among other aspects, such a decline in performance influences the persons affected in their ability to drive a car. Considering the poor knowledge of reliable facts of etiology in neuropsychiatric diseases could show unusually cleancut conditions of interference with the mechanism of mental and sensorymotor plasticity.

**Methods** In our study we used neuropsychological and neuropsychiatric methods: in different patient groups in a sleep laboratory. Over the past five years we have been testing more than 2000 patients. During admission to the clinic, all patients were selected according to their clinical diagnosis (ICD10) and all patients were examined neurologically, neuropsychologically and psychiatrically. All test presons must not suffer from any severe psychiatric disorders. The study was carried out involving all groups of randomly selected patients with OSAS on a number of neuropsychiatric parameters,

**Results** Testing of neuropsychiatric diseases and difficulties and quality of life revealed a highly significant difference between healthy persons and OSAS patients ( $p < 0.05$ ). Examination of specific domains of neuropsychiatric diseases and quality of life, untreated

OSAS patients had inferiority scores than those who had undergone therapy. After more than 6 weeks nCPAP therapy, the neuropsychiatric diseases of the OSAS patients, and quality of life improved to a significant degree ( $p < 0.05$ ). Analysis of the degree of severity showed for OSAS that on the whole, there is a significant difference concerning neuropsychiatric diseases and quality of life.

**Discussion** The study revealed that patients with OSAS whos neuropsychiatric problems and deficits concerning their vigilance achievements, their memory processes and their quality of life. The improvement if vigilance achievements and memory processes show a lower driving fitness (traffic safety) in untreated patients and increasing traffic safety in treated patients. In summary, based on our results, it is to be said that although a continuous nCPAP therapy improves the OSAS symptoms; neuropsychiatric consequences and the quality of life require longerterm degeneration. ■

## Sudden onset of disease while driving a fourwheeled vehicle: a retrospective analysis for commercial driver in Japan

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Recent progress in automotive technologies and continuous upgrades in global safety standards have considerably improved automotive collision safety. Sudden onset of the signs and symptoms of the diseases while driving fourwheeled vehicles is a crucial cause of traffic accidents. Because such accidents are not due to a human error, and can endanger the lives of other road users, detailed analysis and preventive measures are required to enhance road traffic safety. We retrospectively analyzed 211 commercial drivers (taxis, 70; trucks, 53; buses, 88) in whom the sudden onset of any signs and symptoms of the diseases had obliged them to stop driving, from data collected by the Ministry of Land, Infrastructure, Transport and Tourism, Japan from 2004 through 2006.

Cerebrovascular disease was a major cause of trafficrelated incidents (28.4%), followed by cardiac diseases (23.2%),

syncope (8.5%), and digestive diseases (8.1%). Of the 76 fatalities, cardiac disease was the most frequent (50.0%), followed by cerebrovascular (32.5%) and aortic (7.9%) diseases. Of the 187 drivers in whom sudden onset of signs or symptoms of a disease occurred while in control of a moving vehicle, 66 (35.3%) avoided collisions by attempting avoidance maneuvers (breaking or steering). However, subsequent traffic accidents occurred due to drivers losing control (64.7%), also resulting in injury to passengers and other road users. In 76 of 88 incidents involving bus drivers, an average of  $13.9 \pm 14.1$  passengers traveled by bus and of those, an average of  $5.2 \pm 5.6$  passengers in 10 buses became injured. Seventeen of 70 taxi drivers caused subsequent accidents that resulted in injury to passengers or road users of  $1.7 \pm 1.5$  (mean  $\pm$  SD) per accident. Ten of 53 truck drivers also caused accidents with a mean injured person among road users of  $5.6 \pm 6.7$ . The persons had enough holidays (7 to 9 days) within one month of the onset. Those who had caused accidents had been on 7-9 days of holiday within one month of onset.

Concern for the health of commercial drivers is important because driving a vehicle often constitutes significant emotional stress. Furthermore, when driver lose control of a moving vehicle due to sudden signs or symptoms of diseases, other road users and passengers can become injured due to subsequent accidents. Therefore, to minimize the likelihood of such incidents, we investigated the actual condition of professional drivers in Japan. The data are based on comprehensive and highly reliable reports obtained according to Japanese law. To predict the risk of sudden disease onset while driving from annual routine medical checkups is difficult. Prventive safety measures that address the physical condition of employees, particularly of commercial drivers should be implemented at the government level. Furthermore, findings indicate that active preventive safety measures should also be promoted to prevent secondary accidents. ■

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