

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. ■

How to consider the protection of the abdominal area of children: the CASPER's project contribution

Philippe LESIRE^a, Philippe BEILLAS^b, Alan KIRK^c, Sophie CUNY^d, Heiko JOHANSEN^e

^a Laboratoire d'Accidentologie, de Biomécanique et de Comportement Humain

^b Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux

^c Transport Safety Research Centre - Loughborough University

^d Centre Européen d'Etudes de Sécurité et d'Analyse des Risques

^e Institut für Land and Seeverkehr Kraftfahrzeuge Technische Universität Berlin

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. ■

Multinomial logit model of bicycle injury risk in Hong Kong

N N SZE^a, K L TRUI^b, S C WONG^a, F L SO^b

^a Department of Civil Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong

^b Department of Accident and Emergency Medicine, Tuen Mun Hospital, Tuen Mun, Hong Kong

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.

Acknowledgement We gratefully acknowledge Tuen Mun Hospital for providing the casualty data, and the Road Safety and Standards Division of the Transport Department of the Hong Kong Special Administrative Region (HKSAR) for providing the traffic accident data, for the research work that is reported in this paper. The views expressed are those of the authors and do not represent