EDITORIAL
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AGING, TRANSPORTATION AND MOBILITY: CURRENT ISSUES

VIEILLISSEMENT, TRANSPORT ET MOBILITÉ : QUESTIONS ACTUELLES

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The elderly population within the Organization for Economic Co-operation and Development (OECD) member countries is constantly increasing due to both the decline in birth rate and steady increase in life expectancy. By 2030, the number of elderly people aged 65 and over should reach 264 million *i.e.* 21.5% of the population *versus* 14.6% in 2009 (OECD, 2009). Over the same period, the number of people aged over 80 will have doubled, if not tripled, in some member countries. As a result, the number of public transport users and car drivers getting old or very old will increase.

For sensory, locomotive and cognitive reasons, mobility is becoming increasingly difficult with age. For the elderly category of the population, the possibility of maintaining or recovering mobility in satisfactory conditions of effectiveness, comfort and safety is a major challenge to sustain the social bond and meet the most elementary needs for autonomy. To succeed, it is absolutely necessary to take the needs and anatomical and functional characteristics of the elderly into account in the design of infrastructure, equipment and services, which is a challenging issue in a physical and informational environment becoming increasingly complex. However, the development of new technologies in all the fields may be an opportunity provided that these are suitably adapted and play a genuine palliative role with respect to age-related declines.

The number of publications dealing with aging has significantly increased over the past thirty years and most cited articles deal primarily with age and driving (Charness, 2008). This phenomenon comes along with unprecedented progress in knowledge about the fundamental changes affecting human abilities with age. Indisputably, such knowledge sheds light on the difficulties that the elderly encounter in terms of mobility. However, the incidence of age-related physical, perceptive and cognitive

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limitations upon the design of systems dedicated to mobility and transportation cannot all be deduced from fundamental research; they further require suitable methods enabling the understanding of the actual needs and difficulties as well as of the operating procedures spontaneously implemented by the populations whose mobility is at stake.

Mobility encompasses a large field and may take numerous forms. Moreover, it may take place within the private or public space, in a free or instrumented manner, with an active or passive subject. Amongst the means of such mobility, the car plays a major role considering the strong dependence that it entails and the difficulty that the elderly have to do without. As shown by some studies, the elderly whose health has deteriorated are often induced to stop walking or using public transport before stopping driving (Taylor and Tripodes, 2001). Using public transport further raises specific problems for the elderly, in particular in terms of locomotive accessibility, feeling of safety, and management of the frequently associated informational complexity.

The thematic research group, called "Aging, Handicap and Experience" of the "GDR 3169-CNRS: Psycho-Ergo" (*Research Group on Psychology and Human Factors Issues*) has recently initiated reflection about the scientific context including mobility and public transport (http://www.gdr-psychoergo.org/). Based on these grounds as well as on the current state of progress in knowledge and the needs developing in our societies in this field, some research directions seem to be particular topical and urgent, and should be given priority. The first direction deals with safety (Dickerson *et al.*, 2007), which remains one of the major conditions for elderly mobility. The issue is that of the risks for the elderly themselves and for the others, related to the mobility of elderly pedestrians, cyclists or car drivers. Research in this field enables not only the development of transportation-related public policies but also to fight possible stereotypes likely to improperly alter the image of the elderly as public transport users. In terms of risk prevention, the principle of regular assessment of the medical ability to drive, from a certain age, is either already in place or being discussed in several countries. Besides the absence of consensus on the age from which such assessment would be necessary, there is still a long way to go before reaching some agreement regarding the relevant criteria for the driving ability and the related methods of assessment. The question is to determine which health deteriorations impact upon driving while taking account of the adjustments that car drivers spontaneously make in response to such changes so as not to unduly put them at a disadvantage. Who are the best actors to perform such a medical assessment and, if those are physicians, which supporting tools should they be provided with? The cognitive processes specifically involved in elderly-specific car crash configurations should also form part of such assessment.

Another research direction deserving to be taken into consideration involves the optimization processes at play during travel (compensation, accommodation according to objectives and means, compilation, remediation; see Marquié and Isingrini, 2001). Many optimization strategies are spontaneously enacted by the elderly to counteract age-related declines (self-regulations). Their identification is useful for the implementation of

supporting and complementing measures. Such processes play a major role if one considers that the elderly do not have as many accidents as one could think they would, based on the declines observed in research laboratories. In this respect, the conditions and limitations of self-regulation practices should be further examined (Molnar and Eby, 2008). What role does the awareness of age-related changes in their abilities and self-evaluation biases have upon the enactment of optimization strategies? How do psychological and socio-cultural variables, in particular those related to gender, impact upon the development of awareness and the confidence in one's own driving abilities? Answering these questions is crucial since road safety improvements are also dependent on the improvement in car drivers' performance and behaviour (Lee, 2008). In addition, the impact of socio-cognitive and affective factors has been demonstrated on the attitudes adopted and car driving behaviours (Delhomme, 2008 ; Hakamies-Blomqvist and Wahlström, 1998). The extent to which they specifically intervene in the elderly and in other fields than driving, *i.e.* use of public transport, should be further investigated.

A third field in which further research is needed is that of the different measures aimed at supporting mobility. These are related, in particular, to infrastructure, vehicles, embedded technologies and available services. In these different areas, even if some improvements support all public transport users, the elderly's needs are not necessarily the same as those of the other categories of the population. Regarding technologies, for instance, a lot can be expected in terms of enhancement of visual perception, reduction of physical effort, assistance to navigation or prevention of collisions (a special issue of *Le Travail Humain* was devoted to car driving assistance for safety three years ago; see Hoc, 2006). It should however be ascertained that the elderly fully benefit from such assistance without generating new attention-related risks; this applies to in-vehicle systems, for instance. In terms of new services, which benefits are to be expected for the elderly from more regular driver training during adult life and from remediation experiments in this field? A number of such experiments have been initiated but very few have been evaluated.

This special issue consists of four original articles dealing with a few aspects relating to the different issues mentioned above and results from reflections and collaborations initiated within the framework of the "GDR 3169- GDR Psycho-Ergo". The first article, by *J. Rogé, J. Ferreti and G. Devreux,* evaluates the influence of colour contrast between powered two-wheelers and other vehicles on the young and older driver's ability to detect in the rear-view mirror powered two-wheelers while they ride back up the outside lane (filtering manoeuvres). Findings show that although they detect approaching powered two-wheelers later than their younger counterparts, the elderly do not benefit from the improvement of conspicuity meant to enhance colour contrast. Speed and traffic composition variables (light or heavy goods vehicles) as well as drivers' ocular strategies seem to be major variables both for the interpretation of these findings and for the design of new experiments.

In the second article, *C. Gabaude, J.-C. Marquié and F. Claudel* investigate the psychometric properties of the French version of the Driving

Behaviour Questionnaire (Reason *et al.*, 1990) which allows evaluating inappropriate driving behaviours amongst a sample of adult and elderly car drivers. The authors further explore the links that a shorter version of this evaluation test (32 items) has with one type of self-regulation strategies *i.e.* avoidance of difficult driving situations. Findings show that the Driving Behaviour Questionnaire is not as good a predictor of the self-regulation behaviours under study as self-evaluation using a few items of the cognitive abilities involved in driving such as processing speed and attention.

In the third article, *M. Pereira, M.-P. Bruyas and A. Simoes* seek to evaluate the impact on the elderly, by comparison with younger drivers, of the simultaneous use of several in-vehicle systems during driving. One of these systems is directly related to driving (navigation system) while the other is not (mobile phone). Although one would expect greater disorganization of driving performance amongst the elderly using simultaneously both systems, the results show that fairly similar effects are observed in both younger and older drivers. This may be justified by the fact that the study has been carried out in real conditions and that, in such situations, the safety issues at stake bring in subtle compensations which are not visible to the observer. Still, precisely beyond the performance-related findings, one contribution of this study is that it looks into methodological approaches for the evaluation of driving performance as closely as possible to routine situations, which should allow drawing valuable conclusions for a more ecologically valid approach of finalized behaviours.

Lastly, the fourth article deals with driving-related injuries occurring in France and evaluates the age-related risk. The authors (*S. Lafont, C. Gabaude, L. Paire-Ficout, and C. Fabrigoule)* use a method that highlights, from a different perspective, the question of the risk that elderly drivers represent for other road users, taking into account the fact that older drivers gradually reduce the mileage actually driven. This article shows that if, beyond a certain age, the relative risk increases, *i.e.* per mile driven, the absolute risk is smaller and the number of lost-life years due to the elderly is lower than that attributable to younger drivers. Another finding of this study shows that this remains true even in complex driving situations in which the risk of accident is greater for older drivers.

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