

HUMANIST Workshop

Task Forces A & F

Identification of Driver Needs Related to ITS

Cognitive Training Needs of Older Drivers

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Major Concerns Related to Older Drivers



- ❖ Increasing representation of older drivers in the population
- ❖ Road safety is a major concern everywhere, due to the actual high accident rates and their consequences, particularly for older people
- ❖ The declines of visual, cognitive and motor abilities lead older drivers to change their driving habits and often to give up driving
- ❖ Difficulties in discriminating relevant information and in the need for more time to process it lead older drivers to drive at reduced speeds and to avoid complicated traffic conditions
- ❖ The size of the useful field of view (UFOV) declines with increasing age, leading to more difficulties in detecting peripheral visual information or incoming vehicles

Major Concerns Related to Older Drivers



- ❖ UFOV could be temporarily reduced with increasing attentional demands resulting from complex traffic conditions or the performance of a secondary task
- ❖ Older people seem to be highly distractible and may easily be confused by competing sources of information
- ❖ Selective attention and attention switching declines seem to result from inefficient inhibitory mechanisms in working memory, leading to difficulties in discriminating the useful information and attending to irrelevant contextual details (Hasher & Zacks, 1988)
- ❖ A poor attention switching, more than selective attention, could lead to a high crash risk

Compensatory Strategies



The ability to compensate functional losses



Living the later life as a period of continued usefulness, recreation and productivity.

Compensation based on the task knowledge and experience is the reason why some performance decrements in laboratory tests are not replicated in daily task performance

Some strategies could reduce age differences on cognitive tasks performance

- ❖ Compensatory behaviours reduce the stress and anxiety felt by older drivers in some driving situations
- ❖ Environmental supports could minimize the use of processing resources
- ❖ Cognitive training could increase the cognitive performance in older adults

Compensatory Strategies



Although the increasing variability with aging, it seems that for the same task performance, the same type of compensations for functional losses lead to common patterns:

- ❖ driving at reduced speeds
- ❖ stopping night driving or with poor weather conditions
- ❖ avoiding freeway driving
- ❖ driving only in familiar areas
- ❖ planning routes where protected left turns can be made
- ❖ driving with a co-pilot
- ❖ and finally, stopping driving

Cognitive Plasticity on the Older Age



- ❖ Several studies have found significant improvements in performances of adults over 60 years old by means of behavioural interventions, as well as the possibility of resolving the decline of the healthy older people's cognitive performance by means of cognitive training.
- ❖ Although the fluid intelligence abilities do decline with age, there is a certain amount of cognitive energy or capacity held in reserve by elderly adults.
- ❖ With optimal training or under suitable conditions, this reserve capacity can be expressed as **plasticity** and used, increasing the cognitive performance above some observed baseline levels.



- ❖ Older adults show less cognitive reserve capacity than the young when the cognitive system is maximally stressed, that is, when the limits of a person's cognitive capacity are reached or exceeded
- ❖ Improvements in inductive reasoning and spatial orientation have been demonstrated in 2 samples of elderly subjects: those who had declined from their earlier level of ability and those who had not declined



- ❖ The concept of reserve capacity is the focus of cognitive training research in terms of how to restore the reserve capacities to elicit the desired intra-individual changes in cognitive behaviours.
- ❖ The possibility of assessing the reserve capacity and predicting who will profit from cognitive training is a main concern in cognitive training research.
- ❖ Another concern is the reversibility of age declines in cognitive functioning



Although the evidence of the intellectual abilities modifiability by training and by practice, the amount of cognitive plasticity in the older age remains unknown, as well as its assessment.

So, how to predict a person's modifiability and his or her abilities that will be increased by training?

Cognitive Training Program



A cognitive training program should address the abilities involved in the performance of target tasks, but should be based on the abilities remaining intact or having no significant declines, in such a way that lead trainees to find the adequate compensatory strategies to perform the tasks safely and efficiently

Ex: the TP should develop the ability for anticipating events in order to manage the use of the limited processing resources and avoid too much information processing simultaneously



- ❖ The **55 Alive/Mature Driving program** - the first comprehensive nationwide program designed to address the special needs of older drivers (Eby et al., 1998). This program covered physical changes related to age, traffic problems and how to overcome them, as well as automobile maintenance (Brenton, 1986). The program consists of two four-hour sessions. Like other programs offered by the American Automobile Association (AAA) and the National Safety Council (NSC), this one is a driver-refresher course



- ❖ The **Coaching Mature Drivers program**, sponsored by the National Safety Council, qualifies drivers for reductions in their automobile insurance premium. This program is promoted by the NSC as either a four-hour program or an eight-hour program (Brenton, 1986)



- ❖ The **Safe Driving for Mature Operators program**, developed by AAA in 1986, provides general driving-instruction material, as well as tests for night vision, ability to see under glare conditions, and reaction time (Brenton, 1986). This program consists of three half-day sessions, offering advice on specific techniques for improving driving performance, and providing an opportunity to practice these techniques in actual traffic during the final session (McKnight, 1988)

Training Programs in USA



- ❖ **GrandDriver**, which is a pilot program providing information about aging and driving, addresses drivers over 65 to learn more about the effects of aging on the ability to drive and to talk about these issues
- ❖ Another training program is the **Maryland model** (OECD, 2001), which is directed to older drivers who are considered to be at risk of unsafe driving. This program includes medication, evaluation by an occupational therapist, rehabilitation, cognitive training and driving school training



- ❖ ITS applications should increase mobility without compromising safety of older drivers
- ❖ If ITS are applied without taking into consideration older people's needs, safety undoubtedly will be compromised
- ❖ If ITS applications are to be useful, they must accommodate the older drivers' abilities and their safety needs. Therefore, usability testing of these systems should include samples of older drivers.



- ❖ ITS applications that seem to be useful for older drivers although they represent on their own a small and unproven fraction of available countermeasures:
 - Route guidance
 - Vision enhancement systems
 - Collision warning systems
 - Emergency vehicle location and response



If older drivers can benefit from ITS, its Impact on

- ❖ **driving task**
- ❖ **older driver's cognitive activity**

should be considered in the design of a training program aiming at:

- ❖ Teaching the use of ITS
- ❖ Using ITS as a way of developing adequate compensatory strategies in order to reduce mental workload and increase safety and mobility

Cognitive Training Program Design



The design of a training program should take into account the implications from the state of the art on cognitive training research, such as:

- ❖ Individual differences should be taken into account in order to design an adapted training program, develop the adequate training materials and define adequate learning strategies
- ❖ In order to maximise possibilities for transfer, the training program should be varied in terms of types of stimuli, as well as learning skills and materials
- ❖ Pictorial forms should be used, as they allow for easier information processing

Cognitive Training Program Design



- ❖ Training tools should be well elaborated and people should be encouraged and helped to establish links between information they are attempting to learn and pre-existing knowledge
- ❖ The cognitive training program should develop the subjects' abilities of selecting relevant information and anticipating events in order to ease decision-making
- ❖ The cognitive training program should provide the acquisition of adequate compensatory behaviours to be used in subjects' daily life
- ❖ The type of stimuli proposed to be presented during the learning period should allow the development of the cognitive potential and the strategies for the resolution of problems, in order to obtain an autonomous learning

Further Developments



- ❖ With appropriate car equipment, older drivers will feel safer and avoiding behaviours will be reduced.
- ❖ As a main conclusion, more and deeper research is required, involving longitudinal studies with representative samples in different countries.
- ❖ Other groups than healthy older people should be involved in a research program centred on the design, development and experimental applications of driver-training programs.

Further Developments



- ❖ Younger subjects suffering from cognitive impairments resulting from brain damage or older drivers having a specific pathology should be considered as well.
- ❖ A previous problem should be discussed and deeply studied: the evaluation of the driver's performance, particularly the variables to be assessed and their acceptable scores, corresponding to safe driver behaviour.
- ❖ Therefore, such a research program should start from the actual theoretical and empirical knowledge and carry out studies on the evaluation of driver performance and adapted and flexible training programs.