

Effects of ISA-like I S T - applications on the communication behaviour of young car drivers in urban areas

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Introduction

As some of you know, "speed adaptation via in-car devices has been studied for over 15 years. Estimates of safety effects of a fully implemented automatic speed management system in Sweden and the UK vary from a 10 percent reduction in injury accidents with an advisory system to a reduction in the range of 20-40 percent with a system that enforces current speed limits and automatically limits the speed in critical conditions (slippery road, poor visibility; Várhelyi 1996; Carsten and Comte 1997, Carsten and Fowkes 2000). Earlier field trials (Persson et al. 1993; Almqvist and Nygård 1997) and simulator experiments (Comte 1996; Comte 1998a; Comte 1998b) have demonstrated positive effects of the " Intelligent Speed Adaptation " (ISA), with one focus on the "adaptive accelerator pedal" AAP (Várhelyi et al. 2002).

In studies about ISA it is very often pointed out that speed reduction of vehicles affects communication between road users. Car drivers for instance yielded more often for pedestrians, and pedestrians were less often forced to stop when vehicle speeds were lower (Várhelyi 1996). The question of communication seems generally of high importance against the background of the fact that around 75 % of all accidents take place between two or more road users, as can be seen in most of the European accident statistics. It can be assumed that those 75% represent a breakdown of communication. According to what has been said above, ISA has shown to improve communication due to better adapted speed of the drivers.

Young Drivers

It is without controversy, that young drivers are the group with the highest accident risk. In Austria 2003 9.684 15 to 19 year old have been in an accident; 88 died. For this age group the risk to get involved in an accident is three times as high as for the whole population (KfV, 2004). In Germany the situation is quite similar. More than a fifth of the 18 to 25 year old have been in an accident in 2004 and again more than a fifth of these died. The main causes of accidents are unadapted speed (27%), followed by mistakes in giving right of way (12%), mistakes in distance keeping (12%) and problems with turning (11%; (Statistisches Bundesamt, 2005) What could be the reason for this?

According to literature one has to differentiate between the “risk because of being a novice driver” (“Anfängerrisiko”) and the “risk because of youth” (“Jugendlichkeitsrisiko”) (Mienert in ZVS Nr. 4, 2002). Mienert describes the difference as follows: the main discrepancy is the degree of becoming involved in risky situations or taking risk consciously.

Because of absence of experience, there are many reasons why young drivers get involved in accidents. They may end up in unexpected situations where they do not know what to do or they may be busy with handling the car, so that they cannot react adequately at the same time. There also exists evidence that not only age but primarily driving experience influence accident risk. Especially in the first three years of driving age seems to have only a minimal bearing on the accident liability as the table below shows.

Table 1: The effects of age and experience on accident liability for young and inexperienced drivers (Bast, 2001)

Percentage reduction in accident liability				
Experience Alone		Age Alone		Age and Experience
During year 1	30%	Between 17 and 18	6%	34%
2	17%	18 and 19	6%	22%
3	11%	19 and 20	5%	15%
4	7%	20 and 21	4%	12%
5	5%	21 and 22	4%	9%
6	4%	22 and 23	4%	8%
7	3%	23 and 24	4%	7%
8	3%	24 and 25	3%	6%

The results derive from a british study from Maycock et al.,1991 (Bast,

On the other hand some studies exist that document that the “risk because of youth” is the main reason of high accident rates (ZVS, Nr.3, 2002). The “risk because of youth” seems to be much more complex than the factor driving experience; it seems to be logical that people with less experience make many mistakes. To handle this topic one has to go far back. Adolescence is a period of life where many processes happen while a person becomes a grown-up. Mienert, 2003 notes that society's demands on the adolescents to become grown-up but do not show them, when they have achieved this status. And youth on the other hand is looking for a new identity, for autonomy and acceptance (ZVS, Nr.3, 2003). Lamszus (ZVS, Nr.3, 2002) specifies this behaviour with terms like showy behaviour, force or autonomy. This leads to a different view on the vehicle; it is no longer only a means of transport but an instrument for profiling, a possibility to experience strong feelings, or just a sign of freedom. The car is used to demonstrate power and advantage or to provide adventure and thrill through dangerous driving maneuver (Lamszus, Nr.3, 2002). Not every adolescent shows the same risky behaviour in traffic. For instance female adolescents still are less involved in traffic accidents than boys are.

We have to bear in mind, additionally, how important the driving license is for young people. Not only 18 years old but already 16 years old teenagers share this opinion. The driving license is the key to autonomy and mobility (Mienert in ZVS Nr. 4, 2002). In this study it is pointed out, that there exists a discrepancy between the group of the potential risky drivers and the normal drivers regarding social acceptability.

Mienert (2002) also mentioned that risky drivers are more strongly against restrictions concerning their driving license than "normal" adolescent are. They do not want to have an alkoloc in their car, nor an ISA like application that does not allow them to drive faster than 80 km/h. This specific group is also against a label that shows that they are still novice drivers. However, there are hardly any differences between the groups regarding tachographs, longitudinal and lateral control systems.

Additionally to their age and their lack of experience, adolescents do also show a specific exposure, like driving by night frequently.

So what can be done? We know, that young people do have problems at the beginning of their driving career because of a lack of experience but also because of their age-specific behaviour which in many cases is risky. Sometimes it becomes risky because they do not know better and sometimes their youthfulness gets the upper hand.

In-Vehicle Information System/Advanced Driver Assistance Systems and adolescent road users

The next chapter deals with one possible solution for some of the problems that have been mentioned above. ISA is a system which helps the driver to control the car in the longitudinal direction. It warns if the car becomes too fast, or it automatically limits speed to the allowed limit, although the driver still can ignore the system by kicking-down function.

We already now from studies which derived in Sweden, that an active accelerator pedal (AAP) can improve the communication of drivers with other road users. They (e.g. Hjalmdahl, 2004) showed that they for instance yielded more often (gave pedestrians the right of way at zebra crossings) but also that the headways to the vehicle in front increased slightly. What we do not know out of this is how the behaviour especially of young drivers is affected.

Maybe for some of the young drivers this can reduce the accident risk. But still one group of them will stay at a high level of risk. And maybe also those, who show a more or less well-adapted behaviour may "change their mind" and behave more risky while using an ITS system because of the enhanced feeling of being safe. Out of this many side effects may arise. The safety gains might be compensated by more **risky behaviour**.

Another aspect that has to be stressed is that there exists a dialectic relationship between risk as it actually exists ("**objective risk**"), and risk experienced by people, in different situations ("**subjective risk**"). According to the model of Klebelsberg, many safety problems result from a discrepancy between these two aspects. An increase in objective safety, for example on icy winter roads when using spikes, can lead to a disproportionate increase in a person's feeling of safety. This phenomenon may lead to overcompensation for the possible safety gains and a reduction of safety, thus.

As it is very difficult for people to understand and follow complex dynamical processes and assess their outcome, a part of the road users rely on technical systems to take difficult decisions. And a logical consequence is that trust in a "perfectly" functioning system is quite easily achieved. This can lead to nonchalance about one's own behaviour - "the system is taking care of that". For example, in connection with ISA, that could mean that "If keeping the speed is solved by an ISA system, I do not have to be so careful in that part of my driving". The problems which may arise have already been mentioned. This phenomenon is called "**delegation of responsibility**".

The next aspect to be discussed is **interpersonal communication**. It has already been shown, that ISA can improve the communication between road users. This seems particularly very important, as 70 % of all accidents happen between two or more road users.

In this thesis, it is mentioned, that young drivers are even more affected by this phenomena than average drivers are. Out of this comes the necessity for a training for young drivers that makes them aware of difficulties on the road, mainly if using ITS systems. As speed is one of the main factors contributing to young drivers' accidents, this point also has to be studied in this master thesis. And since some problems in lane keeping or when using a Route guidance system may be reduced if the user shows better adapted speed, additionally to the training, the ISA system appears to be a good choice for changing young drivers' behaviour.

Hypotheses

Hypotheses 1: The use of an ISA system will improve the communication between the driver and other road users.

Hypotheses 2: Training that address a wide range of people can change a negative attitude towards ISA and speed behaviour in general.

Hypotheses 3: The short-term use of ISA is not enough to get a long term effect on the drivers' behaviour.

Hypotheses 4: Training has the potential to improve drivers' behaviour for a long period of time.

Work plan

As the master thesis took place in the frame of the NoE HUMANIST also the cooperation with one of the partners of the network is wanted. Therefore the communication between equipped car drivers and other car drivers viz. other (groups of) road users in connection with use of ISA-like applications will be investigated in Austria but also Czech Republic. Where CDV is our partner institute.

It already has been mentioned, that ISA systems do have a positive influence on the communication at least for some persons. Therefore it seems to be important to find out, who these people are. According to research results, it can be taken for granted that persons with a positive attitude towards ISA-type applications are those people who show a better communication with other road users (supported by previous studies: Hjalmdahl 2004; Várhelyi and Mäkinen 2001).

A questionnaire will be used to identify these people. An in-car-observation instrument based on the principle of registration of critical incidents, is used in order to identify certain communication characteristics.

Additionally, it is important to apply another method – interactive group training – in order to understand motives for erroneous speed behaviour, and at the same time achieve some understanding for the necessity of changes in speed behaviour. Therefore, group sessions are planned (duration of four hours, each with 10 persons), including settings with only mixed groups (drivers with a positive attitude and drivers with a negative attitude). The hypothesis is, that persons with a positive attitude will have a positive influence on the others, which will be tested with the help of attitude measurements after the group sessions. Table 1 (Experimental design).

Table 2: Experimental design

	ISA		NO ISA	
	Training	No Training	Training	No Training
Austria	10	10	10	10
Czech Republik	10	10	10	10

Presently it is considered to include only novice drivers in the study. People belonging to this group can be easily recruited with the help of driving schools, and novice drivers are an important target group for the application of speed-control measures. Especially communication with other road users is something that develops slowly and is difficult to learn, and especially for young novice drivers it will be of importance to both understand the importance of communication and to become aware of ways to improve communication and of possible interferences.

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