

IN-DEPTH STUDIES OF DRIVERS WITH EXPERIENCE OF AN OBLIGATORY SPEED LIMITER IN THEIR CAR

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INTRODUCTION

The Department of Technology and Society at the University of Lund has carried out research connected to a dynamic speed-limiter since the late eighties. The research work from the beginning consisted of literature studies (Almqvist & Hydèn 1987), theoretical discussions from an interdisciplinary point of view and the development of hypotheses concerning implementation (Almqvist et al. 1991), self-observation studies (Almqvist et al. 1993) and four field studies: Observation of drivers without previous experience in Lund, combined with interviews (Persson et al. 1995 = "the Lund study"), Observation of drivers with 2 months experience in Eslöv, combined with interviews (Almqvist & Nygaard 1997 = "the Eslöv study"), the EU-project MASTER (Varhelyi 1998), and the preparation and exploratory testing of a GPS-based system (Almqvist & Nygaard 1998). This presentation is mostly referring to the Lund study and to the Eslöv study.

GOAL

The reason to do the study presented here - which is a follow up especially of the Eslöv study (Almqvist & Nygaard 1997) – is manifold. The central issue is that among others the following questions have to be discussed, or answered, before going on with further research concerning the effects of the speed limiter:

1. How would a legal implementation of a speed limiter system (e.g., all new cars have to have a built-in speed limiter from the factory, old cars have to be equipped within a certain transition period) influence attitudes; would there be acceptance problems?
2. How will behaviour be influenced in those areas where the speed limiter does not work: e.g., if one thinks of an obligatory system in urban areas; or of situations where a speed below the legal limit should be chosen
3. What attitudes towards the speed limiter do critical groups take in (e.g., youngsters, professional drivers, elderly people)
4. How does driving with the speed limiter influence attitudes towards it? Will negative attitudes become positive or will they get worse? Will positive attitudes even improve? Etc.
5. What are the pros and cons connected to the speed limiter and, as a next step, to an obligatory speed limiting system?
6. Others

The discussion of these questions should allow to develop ideas about accompanying measures that become necessary in case of implementation (acceptance!). These ideas should be further developed in the frame of large-scale studies to follow. Moreover, the in-depth analyses presented here should help us to decide what aspects have to be analysed further and in a larger scale than has been done so far.

On the whole, it should be seen to it that acceptance of the dynamic speed limiter, if it can be proved that it helps improve traffic safety, is optimised. This should be possible due to that fact that one has attitudes and their development in the course of time, or before and after having used the dynamic speed limiter, etc., under control. Acceptance of the speed limiter should not be disturbed or distorted just because important aspects on the users' side have not been considered.

PLANNED PROCEDURE/WORKING STEPS

Work consisted of three main steps: The first one („*state of the art*“) was a screening of the know-how so far developed by the Department of Technology and Society in own projects and in the frame of work carried out in co-operation with other institutes. Especially what we until then had learned about technical, behavioural and acceptance aspects should be elaborated on.

The second step consisted of the development and implementation of interview instruments (see next chapter). The verbal material for these instruments should be prepared on the basis of the literature screening mentioned above and of expert discussions ("Round-table discussion"). This step was called „*communication with the users*“ (i.e., with those people who had used the dynamic speed limiter in their car for two months in Eslöv; Almqvist & Nygaard 1997).

The third step was to *develop more thorough hypotheses* than before concerning the effects of the implementation of a dynamic speed limiter, and what position road users would take in this respect. This is considered an important basis for deciding HOW a dynamic speed limiter should be implemented (what steps should be taken, what accompanying information should be given, should implementation be combined with other measures or not, what goals should be reached and what achievements should be evaluated).

MAIN METHOD

When looking at points 1 to 5 above, one can easily see that they cannot be tackled in a fully standardised, or quantitative, manner. Of course, the questions to be asked will be standardised. I.e., everybody who is asked will be asked the same questions. But the possibilities to answer have to be open: There has to be the possibility to have answers explained, and the interviewees have to have the chance to introduce explanations that have not been foreseen by the developers of the instrument. Thus an interview form was developed the main part of which reflects these thoughts.

At the same time some statements were presented of which it was known already that they are relevant in connection with the topic. They were presented in a way that allowed quantitative answers, mostly by scaling the statements somewhere between the answer "I do not at all agree" and "I fully agree". In this way, one has the possibility to combine some of the qualitative answers to quantitative results, which gives a more complete picture of the interviewees view on certain issues. Moreover, quantitatively dealt with key-questions are more easy to use in a before-after frame, viz. at repeated occasions.

Work on the interview instrument should start with *Round table discussions* among experts. The set-up of the discussions we did was very similar to the one of focus-group interviews. The difference was that the topics were presented in a more general and more open way than is usually done in focus-group interviews, and that the participants were rather free in the way they dealt with the topic. What was going on in practice was not so much an interview but rather a discussion. This is why the label "Round-table discussion" is better than "Focus-group interview".

One goal that should be reached in the discussions was clearly defined, though: It should become clear what aspects/areas were to be tackled by the interviews to be carried out in the study presented here.

RESULTS

In the following, the main results of the literature screening, also reflected in the round table discussions of experts, are shortly displayed under the title "Recommended interview contents". After that, the outcomes of the interview study are discussed somewhat more extensively:

Recommended interview contents

As a result of the round table discussions and the literature screening, it was established that the interview forms should deal with the following areas:

Attitudes towards the dynamic speed limiter

One central point seemed to be that attitudes towards the dynamic speed limiter always became better after having it used, both when it was used without having had experience with it before (Persson et al.) and with two months of experience (Almqvist & Nygaard 1997). The interesting question was, whether this change of attitude would be a longer lasting one – i.e., if it still was there one year after the use of the dynamic speed limiter (present study).

The impression that the speed limiter would be considered more attractive than other speed limiting measures, that we already had got after the first round of observations, was supported in connection with the field study in Eslöv (Almqvist & Nygaard). The interesting thing even in this respect was to find out whether this attitude still was unchanged after one year (present study).

Functionality

Both in the Lund and in the Eslöv study there were many complaints that the dynamic speed limiter in its present form did not always function very well technically speaking. In the present study it should be discussed more extensively to which degree such problems influenced the attitudes towards the speed limiter. I.e., the assumption is that these attitudes could be even better if there had not been any technical problems.

Advantages and disadvantages in connection with traffic processes

A lot of critical comments – e.g., that overtaking will be impossible with the speed limiter – lost in importance, though the issue in practice still seems to be relevant. This has to be analysed in a larger scale, both as far as the attitudes are concerned, but of course especially as far the real-time processes of overtaking are concerned. Behaviour observations so far indicated no increase in critical overtaking manoeuvres, but this conclusion is drawn on basis of rather small observation samples.

On the other hand, keeping the correct speed worked well and comfortably with the speed limiter, according to the Lund *and* to the Eslöv study. The interesting point now was, how the perspective on this advantage was after one year.

Motives and interests affected by the use of the dynamic speed limiter

The fear to disturb others (by being a barrier) and to have problems with time organisations was mentioned in the beginning of work with the dynamic speed limiter (Almqvist et al 1991 and 1993). Neither in the Lund nor in the Eslöv study did this turn out to be relevant according to the test subjects' responses.

Support of law-abiding speed behaviour

It was already said above that the dynamic speed limiter was experienced to support law-abiding behaviour and it was also stated that this was to some degree also valid for areas and for times where/ when the speed limiter did not work. Was this stated positive effect still there after one years driving without having the speed limiter in the car?

Should a dynamic speed limiter be obligatory or not

Subjects displayed a somewhat inconsistent attitude when asked about the pros and cons of introducing an obligatory speed-limiting system in traffic (= all cars have to be equipped with a speed limiter). On the one hand the majority of the subjects suppose that traffic would become more homogeneous. On the other hand, the opinion was expressed that "many people" (e.g., young drivers, professional drivers, impatient drivers) would have problems, were they forced to drive with a speed limiter. However, no one believed that safety would become worse in such a system. Rather, the contrary was expressed. What would the subjects think one year later?

Influence on traffic safety

As has just been said, a speed limited traffic system is generally considered rather safe. Additionally, drivers of equipped vehicles in our studies, especially in the Eslöv study, expressed that the speed limiter supported feelings of safety and security. Of course, this leads us to the discussion of risk-compensation aspects (see "Behaviour adaptation" below). Could feeling safe have a more nonchalant behaviour as a consequence? This was another issue that was to be discussed now, one year after people had taken part in the Eslöv study.

Who should be responsible for the implementation of a dynamic speed limiter

This was a question that had not been asked in earlier studies. However, it was considered interesting to learn what subjects thought about this question. So this issue was taken up in the present study and also the question who, according to the subjects' opinion, was responsible for the respecting of the speed limits – whether it were the car drivers themselves, or society and its institutions.

Behaviour adaptation aspects

Early hypothesis were that there would be mainly three types of behaviour adaptation connected to the speed limiter: 1) Driving with pressed-down gas-pedal all the time ("pedal to the metal"), 2) intimately connected to this, problems in the interaction between equipped drivers and vulnerable road users (mainly at intersectiones), and 3) increased infringements of speed regulation where the speed limiter does not work (e.g., outside urban areas). The "pedal to the metal" phenomenon was marginally there in the Lund study where drivers still had no experience with the dynamic speed limiter, but vanished in the Eslöv study. Problems with pedestrians and cyclists were also discovered in the Lund study. And even they vanished in the Eslöv study. In no

case could an increase in speed be registered at places where the speed limiter did not work.

INTERVIEW RESULTS

As an introduction to the results chapter one could say that, according to their answers, the subjects in Eslöv appear as an average group. Many say that they sometimes like to drive fast, half of them have already been fined for exceeding the speed limits or for similar infringements. Their partners and their children are not especially critical as far as their driving style is concerned. One third of them say that they have some problems with respecting the speed limits, and especially so outside inhabited areas. One Person (5% of 20) has been taken away the drivers' licence once.

Attitudes towards the dynamic speed limiter

The majority of the subjects had a positive attitude towards the dynamic speed limiter already before our study, and this attitude became even more positive after having driven with an equipped car. And even one year later, in the in-depth study presented here, a very positive attitude prevailed. Today almost 70% of the population dealt with in Eslöv are prepared to pay up to 5000 SKR for a speed limiter in their car.

All interviewed subjects without a single exception believe that speed limiting measures are necessary. All except one believe that the speed limiter is actually necessary, at least in certain cases or under certain circumstances, and that it is good for traffic safety. The interviewed persons underline that driving with the speed limiter has positively influenced their attitudes towards speed regulations. They say to have become more law abiding and more aware of traffic safety issues.

Almost all are of the opinion that it is good to spend money for research around a dynamic speed limiter, and almost 80% believe that an obligatory automatic speed limiter would be good in built-up areas.

When looking upon the answers in detail, one detects, however, a number of critical comments:

According to the interviewees, the speed limiter also has the potential to cause problems at intersections, in connection with overtaking, by disturbing other car drivers who want to get on without "obstacles", or when it does not work well. (As will also be said later on there have been a number of technical problems).

One can expect the feeling that one disturbs other car drivers to vanish, though, if all car drivers were equipped. Overtaking habits will change. And problems at intersections, e.g., when accelerating ("much too slowly") after having stopped, can be solved by modifying the speed limiter technically.

Functionality

Functionality is a problem, however (which of course refers to the speed limiter 1997). Even if attitudes have become more positive after the use of the speed limiter, the in-depth interviews showed that problems with the functionality have quite a potential to influence attitudes negatively:

Only 27% found that the speed limiter works well at all occasions, whereas 73% mentioned noticeable technical disturbances: Sometimes the speed limiter was out of function where it should have worked, it was easily possible to accelerate past 50 km/h, it allowed 90 in some cases where it only should have allowed 70, it sometimes missed to change the speed limit where it should have done

so, sometimes it broke. Another negative comment (falsely addressed as "bad functioning") was that it influenced interaction with other road users and that one sometimes was forced to switch it off (mainly, of course, when one was "too slow").

In connection with the large scale study planned in Lund that was discussed in the interviews, as well, 14% said that it was very important to see to it that the speed limiter worked well.

It also showed that the subjects were not really satisfied with the gas pedal, and the reason was the same as above: it did not work "100% perfect":

73% found that the pedal worked well "except for some little problems" (23%). 27% said that there were some considerable problems: One comment was, again, that one could come up to far more than 50 before the pedal started to react. Moreover it did not work at the start and after braking (slow acceleration), etc.. At the same time it was considered as stressing not to be able to accelerate in critical situations.

Advantages and disadvantages in connection with traffic processes

Even if there were problems with the functionality the majority said that they relied on the speed limiter, strangely enough. The only explanation is that in reality the speed limiter, when applied, does not cause any serious problems, even if the functionality is not perfect. The usual question concerning *system safety* of a new equipment and the *consequences of system failure* has, thus, in some respect been answered in a positive way.

Almost one third of the interviewed persons said that the speed limiter had caused problems for themselves (in contrast to the *general problems* that could be identified):

One was limited where one should have been able to accelerate. One had to anticipate more in order to avoid critical situations. It was often difficult to adapt one's speed to the other car drivers/to the traffic flow. Acceleration from the start was too slow. The layout of the box one had to have in the car was not nice, it should be designed better ("maybe with a little digital thing in the dash board"). There were problems with overtaking manoeuvres.

Thus, overtaking problems and problems with acceleration are returning topics. In case the concept of an obligatory automatic speed limiter had to be sold, communication policy should, among others, focus on these topics.

On the other hand, there were definitively no problems with timely organisation, according to the interviewees. One had to organise a little more, they said, and the driving style on the whole became a little bit more relaxed. At the same time, driving with the speed limiter felt safe and secure, and to some degree it also was fun. Only at a few occasions did it cause disturbances and stress, which became less relevant after having become used to the speed limiter. In any case, the speed limiter was considered a sensible and good driving aid. The question whether it was difficult to use was answered partly positively and partly negatively. The reason why it was considered difficult by some was that one had to learn new behaviour strategies.

Motives and interests affected by the use of the dynamic speed limiter

No other speed limiting measure was considered equally good as the speed limiter. The interviewees liked the speed limiter considerably more than police enforcement, a feed-back system on speed excess, humps, video cameras.

Many interviewees said that they miss the speed limiter in some respects: The main explanation given for this was that it was comfortable not to have to think of the speed limits in built up areas. One third does not know whether their own speed-meter does show speeds correctly - for them the speed limiter means a solution to this problem.

Should a dynamic speed limiter be obligatory or not

Our subjects believe that the speed limiter should be voluntary in some cases and obligatory in some other cases (70% believe the latter). "Speed freaks" and persons who constantly get in conflict with the traffic regulations should have an obligatory speed limiter in their car. Moreover, it is definitely possible to imagine an obligatory speed-limiting system for built-up areas. But also a traffic system that is completely speed-limited is thinkable, according to 1/3 of the interviewees.

Influence on traffic safety

It has been said already that a large majority of the subjects believes that the speed limiter is good for traffic safety (66%), and more than half of them say that "the speed limiter is the only possible measure", while the others think that "one has to do something in addition". Accidents would go down considerably if everybody had a speed limiter, and the situation for pedestrians and cyclists would become much better. On the other hand, many assume that overtaking would become more dangerous with a dynamic speed limiter.

Who should be responsible for the implementation of a dynamic speed limiter

According to a majority of the subjects Road administration, Car industry and the Government are responsible for the *implementation of a speed-limiting system*. Often, Road administration and Industry, and Road administration and the Government, are mentioned in combination. However, most of the interviewees think that the responsibility for appropriate *speed adaptation* lies on the subjects' side.

Support of law-abiding speed behaviour

According to 41% of the subjects the behaviour in built-up areas has been influenced positively (more cautious, more relaxed, more understanding for speed limits in built-up areas). 36% say that their speed behaviour has changed ("calmed down") generally. Only 23% state that there has been no change in behaviour. But what is most important: *Nobody says that behaviour has deteriorated due to the speed limiter*. According to 70% of the interviewees one's general driving speed was reduced due to the dynamic speed limiter. The amount of speed infringements has been reduced, even on rural roads (!).

In principle it is also said, more generally, that one has become a better car driver due to the use of the dynamic speed limiter: 50% state that they had started driving in a more reliable and more relaxed way, especially in built-up areas, while 45% say that there had not been any change. However, nobody says to have become worse due to the speed limiter:

Speeds have generally gone down according to the interviewees. Speeds at right- and left turns at intersections have hardly changed while there was an accentuated reduction in 30 km/h areas, they believe. As far as consideration of traffic signs is concerned, some improvement is postulated; distances to the car in front were said to have become longer immediately after the use of the speed limiter (Eslöv study), while this difference compared to the before phase has vanished now. Interaction with pedestrians and cyclists has improved.

According to most of the interviewees the changes in wished-for behaviour that came around in connection with the use of the speed limiter are still there, especially the fact that one today is more aware of one's speed behaviour.

Behaviour adaptation aspects

More than 70% thought that there were no unexpected/unwanted behaviour changes, while 18% found that some wilful behaviour adaptation and planning was necessary. However, when asked more directly, only 45% assume that there is no "pedal-to the metal" risk¹, while 27% believe that there could be such a risk and another 27% believe that this risk is indeed high. But this is obviously a more theoretical way of looking at things, as almost 2/3 do not really believe that there are any "new" risks combined to the use of the speed limiter, at least not if it works well. Some potential problems could be the following:

There is some risk that one is hit from behind ("disturbing the others"), it is more difficult to overtake (again), and one cannot accelerate in critical situations ("you do not have the gas"). One person also reports that she missed the speed-limit signs and went too fast at one occasion when the speed limiter, unexpectedly, did not work.

All persons except for one find that not to be able to "make up for lost time" is no problem: Part of them say that one simply has to adapt to the new situation and to organise one's time better (which is not considered a real difficulty). Some others believe that it is impossible in any case to make up for lost time in built-up areas, so all attempts to do so would be quite senseless.

It looks as if driving outside built-up areas, where the speed limiter does not work, has become better in many cases, as well: 59% state that they drove as before, there. 14% said that they drove in a more relaxed way, and 18% stated that they had put on the speed limiter even there.

One has become more attentive with respect to speed regulations and one obeys them better than before, especially in built-up areas, "and this is still the case today". One is better aware of speed limits even in areas where the speed limiter does not work, even if this change is not as accentuated as in built-up areas that are covered by the speed limiter. Finally, one is also more aware of what generally happens on the road, and at its side.

¹ The hypothesis that refers to this concept assumes that speed limited person feel a pressure to follow traffic flow and not to lose too much time, which would lead to a lesser reduction of speed in low-speed situations (turning left/ turning right, interaction with pedestrians and cyclists, etc.), viz. to keeping full speed even in these situations.

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