INVESTIGATING DRIVER ATTITUDES AND BEHAVIOUR ON HIGHWAYS

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INTRODUCTION

Risk perception is believed to be one of the main causes of highway accidents [U. Trankle, C. Gelau, T. Metker 1990; A. Zervas 1995]. Therefore, investigating and understanding the opinion of drivers regarding risk perception of roadway geometry and driving conditions is necessary. The investigation will help in satisfying user needs during the highway design phase and improving the driving conditions.

The scope of the present paper is to examine the opinions of Cypriot drivers regarding various driving conditions on highways and to compare them with those of Greek drivers. A questionnaire study was conducted to examine drivers’ behaviour and attitudes. Thirty people drove along both directions of a highway section in Cyprus and rated its geometric elements. Their driving behaviour was represented by their speed, the overtaking of other vehicles and the position of their vehicle on the road. In addition, 139 drivers were asked to express their opinion on the difficulty of certain driving conditions. Ninety two (92) of them were from 19 to 25 years old (young drivers) and 47 were over 60 years old (senior drivers). This survey took place in Cyprus in the period from April to July of 1999. The results of the survey on driving attitudes were compared with the results of a similar survey conducted in Greece. The answers of the young and the senior drivers were compared in order to find out whether the two groups have the same risk perception and face the same or different difficulties under the same driving conditions.

QUESTIONNAIRE, FIELD INVESTIGATION AND OPINION SURVEY

The questionnaire used for the field investigation consisted of four parts: i. questions on risk perception for a selected curve for both directions, the risk perception of its curvature, the width of the shoulder on the curve, the superelevation, the grade, the visibility and the median barriers on the curve segment; ii. questions of risk perception on the interchange where they drove (drivers rated the overall risk and the risk on the various parts of it, such as the lengths of the acceleration and deceleration lanes, the visibility, the traffic flow and the signs); iii. questions on risk perception of the road segment in general and specifically of the design and maintenance of the road and the traffic equipment; iv. questions on various demographic characteristics (sex, age and driving experience). For the first three parts of the questionnaire the subjects were to choose a number ranging from 1 to 5, where 1 implied ‘very safe’ and 5 implied ‘very dangerous’.

The questionnaires used in the opinion survey were divided in five parts, consisting of questions on: i. the experience of the drivers measured in years of driving, in distance driven...
and in the numbers of trips on highways during the past year; ii. issues related to speed limits (drivers were asked to express their opinion about it); iii. some factors that contribute to the decision of the speed they select to drive (such as the existence of a speed limit, the condition of the pavement, the grade on the road, the curvature, the visibility, the traffic on the road crossings, the truck traffic and driving behaviour of other drivers. Each factor was rated from 1 (not affected) to 5 (very affected). In the same part, drivers rated the difficulty of some manoeuvres like entering and exiting the highway, overtaking other vehicles and trucks and driving in construction zones. Finally, they evaluated themselves upon the capacity and safety of their driving compared to an average driver; iv. whether the drivers experience difficulties in driving under conditions such as darkness, bad weather or during a traffic jam; and, v. demographic characteristics such as sex, age and educational level.

The sample of the drivers that took part in the survey and the field trial consisted of two age groups. The first group included people over 60 years of age and the second group included people between 19 and 25 years of age. These two age groups were selected since the literature clearly suggests that they are the most “dangerous” drivers on the road. [Y. Mori, M. Mizohata 1995; FHWA 1997, 1998; B. Schlag 1993; L. E. Hakamies – Blamqvist 1993; D. Levy 1990].

The field investigation took place in a road segment of 8 km on the highway from Limassol to Nicosia (from the interchange of Pyrgos to the interchange of Governor’s Beach). The drivers who volunteered to take part in the experiment were 12 senior drivers (all men) and 18 young drivers (4 women and 14 men). The investigator asked the drivers to rate the risk of the road elements while driving. At the same time, the investigator completed an additional form with the speed of the drivers on selected sites of the road, the location of their vehicle on the pavement and the number overtakings. The completion of the second form was not known to the drivers.

As for the opinion survey, 47 senior drivers and 92 young drivers took part as mentioned previously. Approximately 4% of the senior drivers and 47 percent of the young drivers were women. The young drivers completed the questionnaires themselves while the senior drivers had difficulties in understanding basic concepts of the questionnaire so they were assisted in completing it.
RESULTS OF THE FIELD TRIAL

Characteristics of the drivers

The age of the senior drivers ranged from 63 to 76. Their experience in years of driving ranged from 20 to 40 for 50% of them, while their majority (58,3%) stated that they drive often on the specific road segment. As for the education level of senior drivers, 83,3% had had at least joined the senior year of elementary school (Fig. 1). The age of young drivers ranged from 19 to 24 years. The percentage of women among them was 22%. Their driving experience was between 3 and 5 years and most of them have been driving often on the road segment examined. Unlike the senior drivers, almost all of the young drivers had joined high school (Fig. 2).

![Figure 1: Older driver characteristics](image1)

![Figure 2: Younger driver characteristics](image2)

In the first part of the questionnaire, the senior drivers stated various opinions regarding the road segment separately for each direction. The main finding was that the shoulder width is sufficient.

The young drivers rated the curves’ features to be worse on one direction than on the other. It is interesting to notice that the rates they assigned to the curve’s overall risk are the same with the rates they gave to its curvature. That implies that the radius of the curve had a primary role to the rating of the curve’s overall risk.
Young drivers tend to drive on the right lane more often, much in agreement with their general more offensive driving attitude. On the contrary, the young drivers appear to drive on the left lane for the senior drivers. This indicates a defensive way of driving for the senior drivers. The mean number of overtakings for young drivers was 4 for both directions (Fig. 4). Finally, the position of the vehicle in the lane. The mean speed of the senior drivers was 92 km/h and 110 km/h (Fig. 3). The overtakings for the senior drivers were only 1 per driver for both directions but the vehicles that overtook them were 18. The mean number of overtakings for young drivers were 4 for both directions (Fig. 4).}

In the second part of the questionnaire, which was related to the risk assessment of the interchange, the following results were observed: The acceleration lane was rated in different ways since each driver was affected by special conditions he/she faced when driving in the area. Although the pavement was not marked, the senior drivers rated in various ways the provided guidance. As for young drivers they rated the acceleration lane to be very safe and the deceleration lane to be very dangerous. They generally stated that the visibility on the overpass was too dangerous; their answers on the risk caused by the traffic flow was related to the other traffic conditions they encountered. Regarding pavement markings, their answers varied much. Considering the fact that road signalling is totally absent in the examined segment, it may be assumed that the drivers misunderstood the question.

The third part of the questionnaire dealt with questions about the risk assessment of the road segment in general. From the answers of the senior drivers it can be concluded that the curves consumed much of the drivers’ attention and played a primary role in their ratings (the pavement was in poor condition according to the investigator’s opinion). Consequently, there was a great variation to the answers of the drivers.

The drivers’ behaviour was represented by the speed on selected locations, the overtakings and the position of the vehicle in the lane. The mean speed of the senior drivers was 92 km/h and the maximum speed was 115 km/h. The respective numbers for the young drivers was 110 km/h and 140 km/h (Fig. 3). The overtakings for the senior drivers were only 1 per driver for both directions but the vehicles that overtook them were 18. The mean number of overtakings for young drivers were 4 for both directions (Fig. 4). Finally, the position of the senior drivers’ vehicle was mainly the middle of the left lane. This indicates a defensive way of driving for the senior drivers. On the contrary, the young drivers appear to drive on the right lane more often, much in agreement with their general more offensive driving attitude.
Comparison of senior and young drivers

In order to compare senior and young drivers, based on their driving behaviour, the use of the non-parametric Mann-Whitney test was selected. [SPSS Inc. 1997]

The results seem to indicate that senior drivers differ from the young ones regarding their opinions on the risk assessment of the curve. The young drivers believed the curve to be safe, but the senior drivers rated the risk on the curve on average, higher than the young drivers. The same applies to the overall risk of the road segment. The senior drivers stated that they found the markings on the intersection area helpful. Finally, it was also concluded that the young drivers’ behaviour is much more offensive than that of the senior drivers. This is based upon the higher driving speeds and the overtakings they did while driving (Fig. 5).

![Figure 5: Differences between older and young drivers on the questions of the field trial](image)

RESULTS FROM THE OPINION SURVEY

Drivers’ characteristics

As mentioned previously, the total number of drivers taking part in the survey was 139. 47 of them were senior drivers and 92 were young drivers. Females were only 4% of senior drivers. Young women drivers were almost equal in number with men of the same age group. As for the educational level, it is noted that all young drivers had graduated from high school and many of them had a university degree. Senior drivers had variable educational backgrounds.

Driving experience was divided into three different categories. The drivers were asked how many years they had been driving, how many kilometres and how many trips they had driven on highways in the past year. 60% of the senior drivers answered that they had been driving for 20 to 40 years. For the past year, 31% of the senior drivers drove between 10.000 and 20.000 km. They had also travelled from 10 to 30 times on the highway (Fig. 6). On the other hand, half of the young drivers stated that they had been driving for 3 to 5 years. 24% of them drove from 10.000 to 20.000 km in the past year and also 24% of them stated that they drove 1.000 to 5.000 km in the same period. Half of the young drivers stated that the trips on highways were less than 10 (Fig. 7).
Regarding speed limits, both age groups believe that speed limits must exist. However, this was not the case for young drivers (Fig. 6, 7). Observations indicated that senior drivers tended to rate themselves above or equal to the mean driver, while 41% of the young drivers had the same opinion. It was generally observed that senior drivers tended to rate themselves above or equal to the mean driver, but this was not the case for young drivers (Fig. 6, 7).

Regarding speed limits, both age groups believe that speed limits must exist. However, only the senior drivers stated in majority that they conform with them. Young drivers perform more often overtakings while driving on highways than the senior drivers do (Fig. 6, 7). So, it is apparent that young drivers drive more offensively and in higher speeds.
As for the factors affecting speed selection, both age groups considered visibility as the most important one. In addition, senior drivers stated that the vehicles entering and exiting the highway and the bad condition of the pavement are factors of serious concern.

There are conditions under which driving becomes too difficult and sometimes is avoided. Those conditions were examined in the questionnaire and the following were observed: Bad weather and traffic congestion are two of the factors that make driving difficult for both age groups. But, specifically driving at nights is considered very cumbersome for senior drivers. Regarding difficulties in driving, both senior and young drivers stated that they find driving through construction zones a difficult task, but the most difficult situation is dealing with the potential rude and dangerous attitude of other drivers.

**Comparison of the opinions and behaviour of senior and young drivers**

In order to compare the opinions of senior and young drivers, the non-parametric Mann-Whitney test was used. [SPSS Inc. 1997]

- Before describing the results of the comparison between young and senior drivers, it is worth mentioning that senior drivers were divided into two age groups: one group from 60 to 63 and another group from 63 to 76. The differences obtained from the comparison between those age groups were related to the difficulties in manoeuvring, the influence from the traffic flow in selecting the speed and the confusion of signals (Fig. 8).

![Figure 8: Comparison of drivers' opinions of the age below and over 63-years-old.](image)

- Regarding the differences between the senior and young drivers, the two groups do not share the same opinions on the compliance with the speed limits and the frequency of overtaking. It should be mentioned that half of the young drivers stated that they usually obey the speed limits. Most of the senior drivers (75%) though, stated that they always conform with the speed limits. Likewise, half of the senior drivers stated that they overtake other vehicles often, while the corresponding percentage for young drivers was 85%.

- The differences in factors that affect drivers in selecting their speed were (Fig. 9): the radius of the horizontal curves, the visibility and truck traffic. The first two factors affect more the young drivers whereas the third affects the elderly.
There is also a difference in the self-evaluation on safety of driving for the two age groups. 40% of young drivers evaluated themselves to be better than the average driver while the corresponding percentage for senior drivers was 65%.

The senior drivers avoid driving at nights (40%) more often the young drivers (10%).

Considering the difficulties in driving on highways in general, the factors that make driving more difficult for the senior drivers are: high speeds, rude and dangerous attitude of other drivers, and the rapid change of different situations on highways (Fig. 10).

**Figure 9:** Comparison between young and older drivers concerning the selection of driving speed.

**Figure 10:** Comparison between older and young drivers concerning difficulties in driving.
COMPARISON OF GREEK AND CYPRIOT DRIVERS’ OPINIONS

The answers from Cypriot drivers were compared with the answers that drivers gave to a similar survey conducted in Greece [Matsouris, Papamitropoulos 1999]. A non parametric test, Mann-Whitney was used for the purpose of this comparison and the results are as follow:

- Regardless of their age, Greek drivers do not drive on highways as often as the Cypriot drivers do. This is mainly related to the transportation system and living habits in Cyprus. The distances between cities are rather short, so using a highway is sometimes a single choice for Cypriot drivers. Further, the alternative routes contain roads that have bad maintenance or are much longer.

- Young drivers in Greece do not overtake other vehicles as often as young Cypriot drivers do. The main reason for this is that Cypriot drivers are used to driving on highways. Besides, driving on highways in Greece means driving on rural roads most of the times which is an indication of long distance travelling.

- Factors that affect drivers in making a selection of their speed, were rated and it was observed that senior drivers in Greece are affected by the visibility more than Cypriots, and also that young Greek drivers are more affected by the condition of the pavement. This leads to the conclusion that some characteristics of highways in Greece, such as the median barriers, are inconvenient to the drivers. Nevertheless, young Cypriot drivers conform better than Greek drivers with the speed limits.

- As for the difficulties of manoeuvring, drivers in Greece characterised the overtaking of cars and trucks and the lane changing as very difficult. Especially senior drivers in Greece stated that they have much difficulty in entering the highways (Fig. 11).

- Driving under congested conditions was considered a situation to be avoided by the

![Figure 11: Comparison of older drivers in Greece and Cyprus.](image)

Greek drivers. This did not appear to apply to the Cypriots. Moreover, the senior drivers in Greece do not drive on highways in bad weather while young Greek drivers feel uncomfortable when driving at night.

- The elements that seem to make driving more difficult in Greece than in Cyprus, are confusing and unobservable signs, and high truck traffic.
Figure 12: Comparison of young drivers in Greece and Cyprus.

CONCLUSIONS

Field Investigation

The senior drivers who took part in the field trial were aged from 63 to 76. The young drivers were aged from 19 to 24. The average educational level of the two age groups was different. The experience for both age groups in driving on the specific road segment varied. Ratings on the risk assessment of the road elements showed that all drivers considered the road shoulder to be very safe. However, especially young drivers rated the deceleration lanes as very dangerous because of their short lengths.

The drivers’ behaviour which was represented by the mean and highest speed, the number of overtakings and the vehicle’s position on the roadway leads to the following conclusions: Senior drivers appeared to drive slower than young ones. Their speeds were on average 20 km/h slower than young drivers. They overtook only one vehicle per experiment session, but they were overtaken by 18 vehicles on average on both directions. In addition, their position on the pavement reflects their driving behaviour. They used to drive in the middle of the left lane for most of the time (it has to be reminded that Cyprus follows the British system of driving opposite than the rest of Europe).

Evidently, senior drivers drive more defensively than young drivers and rated road and traffic features with higher scores. They stated that signs and markings are very helpful to them, so they find more difficulties when marking is inadequate. They are also being more affected by the existence of other vehicles when rating the risk of the acceleration and deceleration lanes and the way of moving in the intersection area. On the other hand, young drivers were more unaffected by those features and they did not seem to receive much information from the road environment. This is supported by the low ratings they gave to the same elements as the senior drivers. Thus, it can be stated that young drivers have lower risk perception than senior drivers.
Opinion Survey

Drivers who took place in the opinion survey were 139 in number, 47 of whom were senior drivers and the rest were young drivers. Their driving experience expressed in distance and trips on highways, showed that both age groups had driven about 10,000 to 20,000 kilometres during the past year, but senior drivers had more trips on highways than their young counterparts. This indicates that young drivers do not drive very often on highways although they do drive more.

The opinions of the senior drivers (collected from the opinion survey) do not differ much from the opinions taken from the field investigation. Senior drivers, especially those over 63 years of age, are calm and defensive while driving. They stated that they always conform with speed limits on highways (100 km/h in Cyprus). It is worth mentioning that senior drivers are affected by truck traffic when choosing their driving speed and that they encounter difficulties with high speeds in general.

Comparison of drivers in Greece and Cyprus

Investigating the possible differences in driving attitudes in the two countries, it was decided to examine the answers of the opinion survey which were more applicable than the ones of the field trial.

It has to be noted that highways in Cyprus are used for transportation even in urban areas which is something quite rare in Greece. Thus, Cypriot drivers appear to have more experience in driving on such roads and consequently gave lower rates to the risk perception and the difficulty of using them. Drivers in Greece are more affected by the radius of the curve, the visibility, other drivers’ behaviour, the condition of the pavement and the traffic flow for choosing their driving speed. As for manoeuvring, Greek drivers find more difficulties in overtaking and in entering the highways. Finally, Greek senior drivers believe that inadequate signalling, truck traffic and high speeds is very bothersome to them.

Concluding Remarks

Summarising the findings of the present study, Cypriot young drivers appear to have less requirements than senior drivers to the road and traffic conditions. Factors that make driving difficult for the senior drivers in Cyprus are related to road design (radius of curve, entrances and exits of highways) as well as traffic conditions (truck presence, overtakings, drivers’ attitude, traffic congestion).

Finally, it is advisable to conduct a thorough examination of issues concerning human factors in road design in Greece and Cyprus. An in-depth analysis of the interaction between human factors the road and the vehicle would be an additional and necessary approach. A final recommendation would be a wider investigation of driving behaviour and attitudes of more age groups in more road categories internationally.
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