DIFFERENT BEHAVIORAL PATTERNS OF SEAT BELT USERS AND NON-USERS

H. V. Nielsen, E. Nordentoft, R. Weeth
Accident Analysis Group
Odense University Hospital, Odense, Denmark

ABSTRACT

2.295 injured front seat occupants registered at the Odense University Hospital during a 4-year period have been the subject of a closer analysis in order to define possible reasons for the lacking effect of the belt mandatory introduced in 1976. Particular attention was paid to differences of the behavioral pattern of seat belt users and non-users by means of age, hour and type of accident and errand. Several possible factors are discussed which might counteract the predicted effect of the seat belt legislation.

INTRODUCTION

In Denmark seat belt use was made mandatory for front seat occupants in cars and delivery vans as per January 1st, 1976. Several studies have been carried out to examine the effectiveness of the seat belt legislation (1, 2). Recently our group published a paper on this item, showing a vanishing effect two years after the law enactment when studied epidemiologically (3). This lack of effect is found despite the fact, that road censuses in November 1977 during daylight time estimated 83% of all front seat car occupants were using seat belt. At that time 91% of the car park had belts installed.

AIM OF PRESENT STUDY

In order to define possible reasons for the lacking, epidemiological effect of the seat belt law, we have analysed our material as to seat belt use by correlating to age, sex, time of accident, errand and type of counterpart. We have payed special attention to high risk groups, who do not follow the general trends, in order to be able to concentrate future preventive efforts on these groups.

MATERIAL AND METHODS

The material of the present study derives from the co-ordinated traffic accident registration at Odense University Hospital which covers a mixed urban and rural population of 230.000. This registration comprises all traffic casualties, and has been in permanent use since 1971. During the period 1974 - 1977, two years before and two years after the seat belt law enactment, we have analysed the EDP-registered material according to data on age, sex, time of accident, means of transportation, type of counterpart, type of lesions and their severity, use of seat belt, errand of victim and other variables concerning all front seat occupants in cars.

RESULTS

Age and sex distribution

Table I gives the material by age and sex. The ratio between males and females is 1,5, but in the younger age groups (16 - 24 years) it is 2,0. The total number of patients analysed is 2.295.

Table I

Distribution of injured front seat car occupants according to seat belt use, age and sex.
Period: 1974 - 1977

AGE	BELTED	UNBELTED	UNKNOWN SEAT BELT USE	TOTAL	RATIO Male/Female
0 - 15	3	36	4	43	1,0
16 - 24	190	571	32	793	2,0
25 - 64	388	842	73	1303	1,5
65 - 99	59	92	5	156	1,5
TOTAL	640	1541	114	2295	

Table II illustrates the age-specific casualty rate both according to seat belt use before and after legislation and according to the total material. The age group 16 - 24 years presents about a three times higher casualty rate than the average rate found in the material as a whole. This difference remains unchanged after seat belt legislation. The proportion of non-users compared to users was very high before the law enactment in both age groups, thus reflecting the low rate of belt use in general traffic confirmed by road censuses. After law enactment the proportion of non-users is reduced, but it is still smaller for the younger age group.

Table II

Casualty rates according to age and seat belt use before and after seat belt legislation.

	AGE	POPULATION PER 01.01.1975 OR PER 01.01.1977	NUMBER OF BELT USERS	NUMBER OF NON-USERS	TOTAL NUMBER OF INJURED (INCL. UN-* KNOWN BELT USE)	AGE SPECIFIC INJURY RATE PER 1000 PERSONS PER YEAR	AGE SPECIFIC INJURY RATE PER 1000 BELTED PERSONS PER YEAR	AGE SPECIFIC INJURY RATE PER 1000 UNBELTED PERSONS PER YEAR
1974 - 1975	0 -15	56.776	1	16	18	0.2	0.4	0.1
	16-24	32.063	28	339	383	6.0	0.4	5.3
	25-99	153.391	70	578	682	2.2	0.2	1.9
	TOTAL	232.230	99	933	1083	2.3	2.0	0.2
1976-1977	0 -15	56.385	2	20	25	0.2		0.2
	16-24	31.525	162	232	410	6.5	2.6	3.7
	25-99	144.955	377	356	777	2.7	1.3	1.2
	TOTAL	232.865	551	608	1212	2.6	1.2	1.3

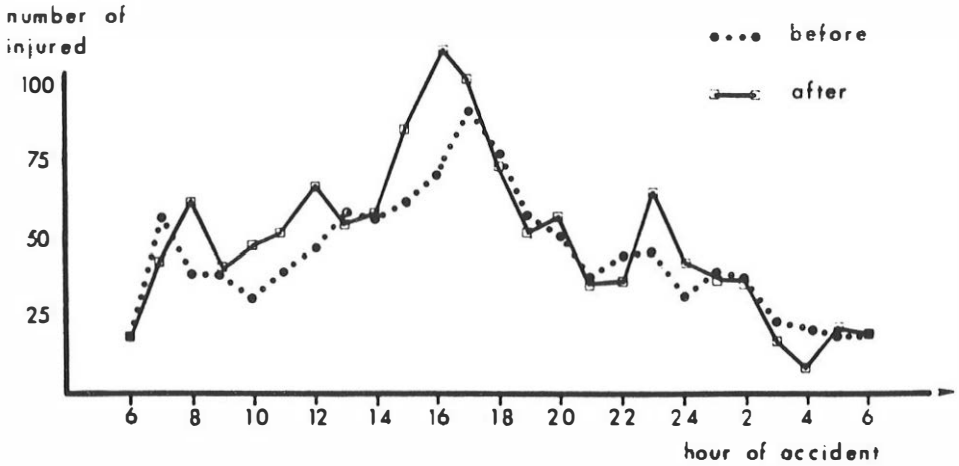
* 5.0% of victims with unknown seat belt use

TIME OF ACCIDENT

The frequency of injured persons according to time of accident before and after the legislation shows the well known distribution with well defined peaks during morning and afternoon rush hours as seen in figure 1.

FIG. 1

DISTRIBUTION OF INJURED FRONTSEAT OCCUPANTS ACCORDING TO HOUR OF ACCIDENT BEFORE AND AFTER BELT LEGISLATION PERIOD 1974-75 AND 1976-77



A different pattern of accidents correlated to hour of day is found both according to age and to the use of belt. Among non-users in the youngest age group (16 - 24), 40% of all accidents occur during night time (defined as from 22 p.m. to 05 a.m.). In the older age group (25 - 99) only 18% of all accidents occur during night hours. This time distribution is unchanged after the seat belt legislation as shown in table III. In contrast belt users have a smaller proportion of their accidents during night time. After the law enactment 24% of the young age group and 13% of the older age group had been involved in night accidents.

Table III

Distribution of injured front seat occupants according to seat belt use, age and time of accident before and after seat belt legislation.

		BELTED		NON-BELTED		PERCENT OF BELTED VICTIMS AT NIGHT	PERCENT OF NON-BELTED VICTIMS AT NIGHT
	AGE	NIGHT	TOTAL	NIGHT	TOTAL		
1974-1975	16-24	7	28	130	339	25	38
	25-99	7	70	101	578	10	18
1976-1977	16-24	38	162	94	232	24	41
	25-99	48	377	64	356	13	18

PURPOSE OF RIDE

Figure 2 demonstrates seat belt use according to purpose of ride. The high proportion (78%) of leisure driving is seen both in the belted and in the unbelted group. In spite of the pronounced increase in accident frequency during morning and afternoon rush hours, only 15% of all victims were involved in accidents on their way to and from or during work. That is, even rush hour accidents most often occur at leisure driving and not while commuting.

In figure 3 the same material is divided into age groups. The proportion of leisure driving in opposition to other errands is slightly higher in the younger age group.

FIG. 2

DISTRIBUTION OF INJURED FRONTSEAT OCCUPANTS ACCORDING TO SEAT BELT USEAGE AND ERRAND. PERIOD: 1974-1977

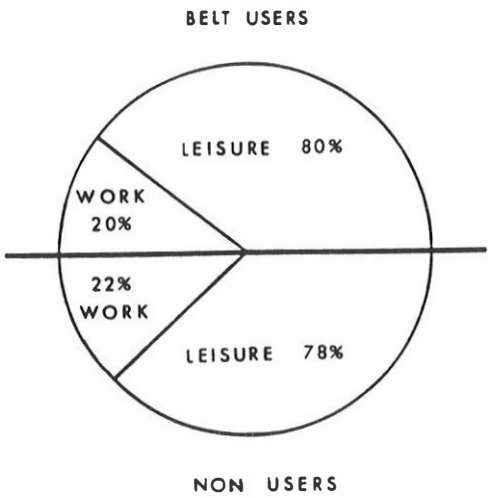
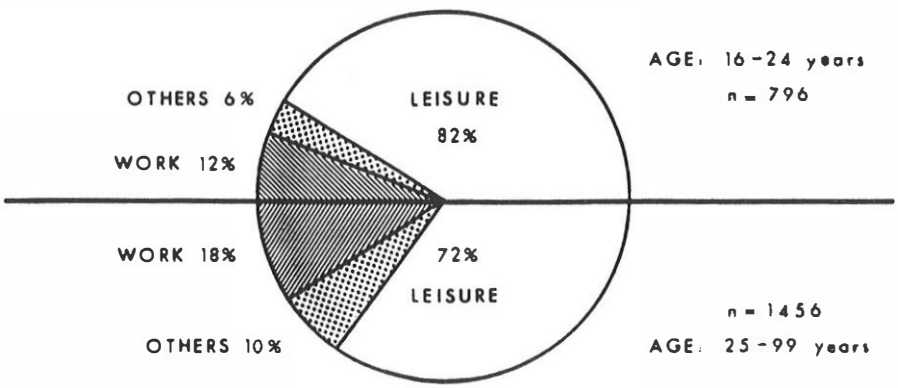


FIG. 3

DISTRIBUTION OF INJURED FRONTSEAT OCCUPANTS ACCORDING TO ERRAND AND AGE

Total number = 2295 (n = 43 victims < 16 years of age)



TYPE OF ACCIDENT WITH SPECIAL REGARD TO SINGLE ACCIDENTS

Drivers involved in single accidents are often assumed to be composed of a special risk-taking group (with particular high occurrence of alcohol intoxication, little driving experience etc.)

Table IV shows the distribution of the whole material according to counterpart and age. The young age group (16 - 24) is involved in 50% of the single accidents, but only in 28% of all other collision situations.

Table IV

Distribution of injured front seat occupants according to type of accident and age.
Period: 1974 - 1977

Type of counterpart	0 - 14	16 - 24	25 - 99	TOTAL
Single	9	373	373	755
		(49.4%)	(49.4%)	(100%)
Others	34	420	1086	1540
		(27.3%)	(70.5%)	(100%)
TOTAL	43	793	1459	2295

There are several indications pointing towards the younger age groups as high risk groups in traffic accidents. The younger age group is therefore analysed with special regard to the drivers behavior according to seat belt use, driving habits and accident proneness. When involved in single accidents the age group reveals a high proportion of non-users (80%) compared to 74% in the older ages as it appears in table V.

Table V

Distribution of drivers involved in single accidents according to seat belt use and age. Period: 1974 - 1977.

BELT USE	A G E 16-24	25-99	TOTAL
Single accident Belt used	71	91	162
Single accident Belt not used	282	262	544
TOTAL	353	353	706
Percent of non-users	79,8	74,2	

In the younger group 80% were leisure driving when involved in single accidents, against 68% in the older age group as it appears in table VI.

Table VI

Drivers involved in single accidents according to age and errand.

AGE	LEISURE	WORK	SCHOOL	UNKNOWN and OTHER	T O T A L	PERCENT "LEISURE" DRIVING IN AGE GROUP	PERCENT "WORK" DRIVING IN AGE GROUP
16 - 24	202	27	2	21	252	80	11
25 - 99	202	59	-	34	295	68	20
TOTAL	404	86	2	55	547		
Percent	74	16	-	10	100		

In regard to seat belt use in the category of leisure driving according to age, an equal distribution of non-users in the two age groups is found. 4/5 of both elderly and younger drivers did not wear seat belts when involved in single accidents during leisure time driving as shown in table VII.

Table VII

Drivers involved in single accidents according to age, errand and seat belt use.

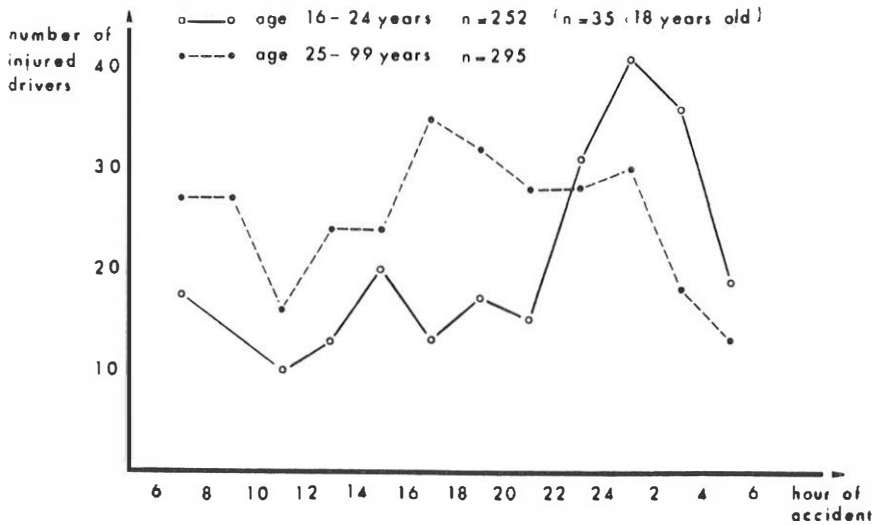
	L E I S U R E			W O R K		
	16-24	25-99	TOTAL	16-24	25-99	TOTAL
Seat belt used	41	47	89	17	17	34
Seat belt not used	150	150	300	15	39	54
TOTAL	191	197	389	32	56	88

37 victims are recorded, where seat belt use is unknown.

Figure 4 shows the hour of single accident for drivers in the age groups 16 - 24 and 25 - 99 years during the entire period 1974 - 1977. A pronounced peak of accident frequencies at night (22 p.m. - 04 a.m.) is demonstrated for the younger group, whereas the older group shows a more even time distribution. The material after the belt legislation is still too small to analyse whether this behavioral pattern has changed.

FIG. 4

DISTRIBUTION OF INJURED DRIVERS INVOLVED IN SINGLE ACCIDENTS ACCORDING TO AGE AND HOUR OF ACCIDENT PERIOD 1974 - 1977



DISCUSSION

The biomechanical effect of the seat belt in laboratory conditions is well established. However, it has not been possible for us to show the expected effect of the seat belt mandatory through epidemiological investigations in spite of the rising belt wearing rate according to daylight censuses. This indicates, that there are factors counteracting the predicted effects.

The following factors might be suggested:

a) Changes in catchment area or lowering of uptake criterias (increased liability to seek medical attendance at hospital).

b) Overestimation of belt use.

c) Rise in traffic work.

a) We know from previous investigations, that our casualty department is treating more than 95% of all casualties in the area. The uptake area of the hospital has not changed in the past few years. Our registration procedures have not been altered, but we may have been more liable to keep belt users under observation as in-patients due to the special attention we payed to the possibility of belt induced lesions after the seat belt legislation. However, there were few such cases.

b) It is our impression, that some victims when asked, are not honest as to their informations regarding seat belt use at the time of accident.
It is very unlikely, that roadside censuses of seat belt use in daylight reflect beltwearing habits in actual collision situations especially in single accidents. In our material the rate of belt use by drivers who had been involved in single accidents is only about 50% in both the younger and older age groups as opposed to 80% found in roadside censuses.

c) Unfortunately we lack information about the work in real traffic, and we know nothing about the various age groups represented in real traffic. Without this kind of information we are not able to estimate the activity risk of the various groups.
Data on fuel consumption, traffic censuses and registration of new cars do not indicate any notable increase, which might explain the lacking effect of the law.
The young age group does have three times higher casualty rate than the older group, and this holds true both before and after seat belt legislation. In the younger age group a high proportion of non-belted victims is found compared to the older age group, but there is no difference in the rate of seat belt use between the two age groups when involved in single accidents during leisure time.

The frequency of single accidents compared to all other types of counterparts show a small decline after the seat belt legislation, and equal proportions of younger and older people are involved in this type of accident. So, a higher proportion of this type of risk takers is not found after the law enactment.

Other indicators, usually used to estimate the traffic work, such as speed measurements (4), material damage only accidents and the number of new licenses issued do not indicate any increase which might explain the lacking effect of the law.

CONCLUSION

The three-point seat belt is known to give good protection under laboratory conditions in frontal and roll over collision situations. However, the initial effect of the seat belt legislation by means of decreasing number of casualties and days of inability in our area, was lost during the second year. This might be due to a higher proportion of injuries caused by cabin intrusion than assumed. Also it could be due to non-optimal function of the belt systems as used in real traffic. Another possible reason could be an increasing proportion of risk takers among those, who are not obedient to the law, or an increase in traffic. The lacking effect however, could in this analysis not be explained neither by differences of the behavioral patterns of seat belt users and non-users, nor by alterations in traffic. The lacking effect might be due to the interaction of different counteracting factors in real traffic, which cannot be identified separately.

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