

Traffic accidents and driving problems of older road users in Marseilles

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Introduction

580 millions of people aged over 60 live in the world, 335 millions in industrialized countries. We expect in 2020 this figure to double : one billion and 700 millions in industrialized countries.

France, like the other industrialized countries, is characterized by an ageing population

	total population	Population under 20	Population over 60	% of - 20	% over 60
1980	53 731 387	16 418 623	7 541 038	30.6	14
1990	56 577 000	15 719 647	7 871 514	27.8	15
2000	58 748 743	15 014 651	9 414 103	25.6	16
2002	59 344 025	14 991 088	9 630 863	25.3	16.2

	65-69 years	70-74 years	75-79 years	80 and over	all ages
pedestrians	22%	21%	26%	39%	11%
cyclists	6%	8%	8%	3%	4%
moped drivers	4%	3%	3%	1%	6%
motorcyclists	0.3%	0.5%	0%	0%	11%
car drivers	41%	39%	41%	34%	45%
car passengers	24%	22%	20%	21%	20%

We have understood two studies on older road users in the south of France ; the first one is an emergency study on accidented subjects ; the second one is a study on the driving problems of older road users.

STUDY 1

1) Objectives of the study

The main objective of the study is to analyze the consequences of traffic accidents of older road users (over 65)

2) Methodology

2.1) Experimental population

Inclusion criterion : all subjects, aged 65 ad more, admitted in the emergency rooms of a Marseille hospital for traffic accidents between November 2000 and May 2001.

2.2) Questionnaire

A questionnaire was filled for each subject, formed of four parts :

- sociodemographic data
- accident data (road user status , localization, information on driving license and annual mileage)
- accident consequences (injury type, psychological consequences)
- medical data on the subject

3) Results

N : 138 subjects have been studied

They represent 0.75% of the total number of admissions in the hospital, and 5% of over 65 years-old admissions in the hospital

3.1) Sex :

Men : 53%

Women : 47%

3.2) Age

Mean age : 74.6 years

Women mean age : 74.6 years

Men mean age : 74.4 years

3.3) Road users status

Pedestrian	56%
Car driver	24%
Car passenger	14%
Bus passenger (fall)	4%
2-wheels	2%

3.4) Accident configuration

car-car	30%
fall in the street	27%
pedestrian-car	17%
fall in the bus	7%
pedestrian-truck	3%
pedestrian-2 wheels	2%
car-2 wheels	2%

3.5) Injury type

3.5.1) Bruises

Among the 138 patients, 105 had one or several bruises

Bruises localization

Head	35%
Arms	22%
Legs	16%
Rachis	11%
Thorax	11%
Pelvis	5%
Abdomen	2%

3.5.2) Wounds

52 patients (38%) had at least one wound. 10% had two.

Wounds localization

Head	62%
Arms	10%
Legs	28%

3.5.3) Fractures

44 patients (32%) had at least one fracture.

Fractures localization

Arms	38%
Legs	33%
Ribs	19%
Head	6%
Pelvis	2%
Rachis	2%

3.6) Orientation after the emergency room

Hospitalization : 42 (31%)

Return home : 96 (69%)

3.7) Duration of hospitalization

Mean duration : 11 days

Women : 12 days

Men : 10 days

3.8) Orientation after the hospitalization

Return home	50%
Reeducation center	31%
Death	10%
Resting house	4%
Hospital	6%

3.9) Antecedents

3.9.1) Medical and surgical antecedents

Medical antecedents	Number of patients	%
cardiovascular	67	49
no antededents	41	30
endocrinological trouble	24	17
diabetes	22	16
respiratory trouble	11	8
rhumatology	7	5
Depression	5	4
Kidney problem	3	2
Alcoholism	3	2
Neurology	2	1

Surgical antecedents	Number of patients	%
digestive	37	27
orthopedical	23	17
cardiovascular	12	9
gynecological	12	9
urological	7	5
ophtalmological	4	3
neurological	3	2
thoracic	3	2
unknown	17	12

3.9.2) Other antecedents

48 patients have visual and / or auditive correction

3 have sensorimotor deficits : two blind, one deaf and dumb

5 have Alzheimer diagnoses

3.10) Treatments

Treatments	Number of patients	%
none	23	17
hypertension	37	26
cardiovascular	26	19
diabetes	17	12
hypolipidic	16	12
anticoagulant	27	20
Depression	5	4
benzodazepines	9	7
others	22	16
unknown	27	20

4) Discussion

Limitation of the study

Population : the older road users immediately killed in the accident could not be included in the experimental sample

Data : some variables are missing, particularly the licensing and mileage data, and the accident liability for car drivers ; the psychotropes and the alzheimer treatments are underestimated.

Conclusions of the study

Pedestrians are the more exposed type of road users : 56% of cases, but with a high rate of falls (27%). Falls in public transport are also frequent.

Similar results had be obtained in another emergency room study in Paris in 1986

Concerning the medical antecedents of the patients, cardiovascular troubles are by far the most frequent (48%), and drugs for hypertension or cardiovascular troubles are the more frequent treatment.

Diabetes could also be associated to accident frequency.

Traffic accidents of older road users is a severe health problem : hospitalization rate after the accident is important (31%) ; the majority of hospitalizations are in surgery (60%) and orthopedical surgery. Hospitalization is more frequent among men (35%) than among women (24%) because their accidents are more severe.

Head injuries are frequent, with short and long-term consequences on the health status of the patients.

So, consequences of traffic accidents are more severe for older road users than for young people, and the hospitalization in itself may have destabilization effects on the psychological level.

STUDY 2

1) Objectives of the study

The main objective of the study is to analyze the driving problems of older road users (over 65)

2) Methodology

2.1) Experimental population

Inclusion criterion : all subjects, aged 65 and more, consulting for a health check-up in a social security center. Participation in the study is totally voluntary.

2.2) Questionnaires and tests

Data collected was :

- socio demographic data
- licensing and mileage
- vehicle type, age and use
- accident data (frequency and type)
- Manchester Driving Behaviour questionnaire
- Neuropsychological tests :

The tests chosen are those which are used by the clinicians in geriatric work, their passations are simple and they have a long time validation

- 1) the Mini Mental State : evaluation of the global cognitive functioning, of cognitive deterioration and of Alzheimer.
 - 2) the TMT A and the TMT B : tests of divided attention, the B form adds a time component and evaluate also the mental flexibility
 - 3) the SPAN direct and the SPAN inverse : tests of immediate memory, the indirect form being more precise relatively to the results
 - 4) the STROOP : evaluation of the ability to ignore non pertinent information, of the inhibition of information perceptions (characteristics of Alzheimer)
 - 5) the BREF : evaluations of the frontal cortex pathologies (tumours, strokes)
 - 6) the YESAVAGE and BRINKS : global evaluation of the psychic state and of depression
 - 7) the GOLBERG : evaluation of anxiety
- Medical data
 - Questionnaire on irritability

3) Results

Number of subjects	300	
Mean Age	69,1 years	
Sex	Men	66,3 %
	Women	33,7 %
Licensing age	Mean	23,9 years
Weekly mileage	Mean	194,5 kms
Annual mileage	Mean	11309 kms
Frequency of driving	everyday	50,0 %
	several days per week	41,0 %
	once a week	3,7 %
	once a month	4,0 %
	less than once a month	0,7 %
	never	0,7 %
Place of driving	city	11,3 %
	highways	28,7 %
	main roads	26,7 %
	suburbs	4,3 %
	countryside	16,3 %
	no answer	12,7 %
Car ownership	me or spouse	97,3 %
	family member	0,3 %
	other	0,7 %
	no answer	1,7 %
Car age	Mean	5,4 years
Car power	Mean	6,7 CV
Cm3 number	Mean	1713,5 c

Number of accidents in the last three years		0	1	2	3	NR
active		80,0 %	7,7 %	0,7 %	0,0 %	11,7 %
passive		70,7 %	16,0 %	1,3 %	0,0 %	12,0 %
material		63,0 %	21,3 %	2,7 %	0,3 %	12,7 %
light injuries		85,0 %	2,7 %	0,0 %	0,0 %	12,3 %
severe injuries		87,3 %	0,3 %	0,0 %	0,0 %	12,3 %

Car dependency

How many times, these two last years, did you use these transport modes for your trips ?						
	Car	Bus	Taxi	Train	Bicycle	Walking
more than once a week	61 %	13 %	0,4 %	2 %	4 %	68 %
once a week	9 %	13 %	0,4 %	1 %	4 %	11 %
once a month	4 %	11 %	2 %	1 %	4 %	6 %
several times per year	20 %	18 %	15 %	29 %	8 %	10 %
once per year	2 %	13 %	29 %	35 %	6 %	2 %
never	2 %	31 %	52 %	33%	74 %	3 %

For the following activities, during the last year, did you use the car ?				
	never	sometimes	often	always
« big » shopping in supermarkets	5 %	11 %	11 %	72 %
« short » shopping	28 %	32 %	15 %	25 %
city center shopping	56 %	23 %	8 %	12 %
outskirts of town shopping	28 %	17 %	13 %	42 %
Visiting friends or family	1 %	12 %	27 %	59 %

Influences of the environment				
Does somebody influences your driving ?				
yes	no			
13%	87%			
If yes, who ? (multiples answers)				
physician	spouse	children	friends	others
3%	82%	9%	3%	3%

Do you think that you are :		
1 =a good driver		
2 =an average driver		
3 =a bad driver		
1	2	3
80 %	19 %	1 %
Do you think that your accident risk is		
weak	average	important
87%	13%	0%

Médical check-up	
Vision deficiency (corrected)	10 %
Hearing deficiency (not corrected)	19 %
Cardiovascular diseases	3 %
Cardiac rythm troubles	8 %
Respiratory diseases	
Sleep apneas	4 %
Lungs	2 %
Diabetes	6 %
Neurological troubles	
Alzheimer disease	0 %
Parkinson	0,7%
Stroke	1 %
Neuropathy	1 %
Epilepsy	0,7%
Rhumathology	7 %
Chronic drinking	3 %

Hearing the vision deficiencies are the more frequent, our experimental population being relatively « young », the neurological pathologies are not present yet.

<u>Neuropsychological tests</u>		
		Deficit
MMS		2,3%
TMT A		8,0%
TMT B		14,0%
SPAN Direct		5,3%
SPAN Inverse		9,3%
STROOP		1,3%
BREF		4,3%
YESAVAGE/BRINK		8,7%
GOLDBERG		24,0%

Anxiety is the more common problem, followed by divided attention, and particularly problems of mental flexibility. Then, we may notice the immediate memory problems and the depressive states.

Accident types :

I slowed down and was hit in the back

N=13 4.3%

I hit an object (not a vehicle) which was on the road

N=10 3.3%

I hit the back of a vehicle which had started to go in a crossroads but which stopped

N=9 3%

I was hit by a vehicle whose driver had lost momentarily the vehicle control

N=8 2.7%

I hit a vehicle while I was backing

N=8 2.7%

I was hit by a vehicle coming from a side road

N=7 2.3%

Another vehicle moved to another lane and hit me

N=6 2%

I hit the back of a vehicle which was not moving since a few seconds

N=6 2%

I was starting from a parking place and was hit by a vehicle

N=5 2%

I hit the back of a vehicle which had slowed down

N=5	2%	I was hit by a vehicle while I was backing
N=4	1.3%	I was hit by a vehicle which was turning to the left
N=4	1.3%	I hit a pet on the road
N=4	1.3%	I hit a vehicle which was starting from a side road or from parking
N=3	1%	I was turning to the right when I hit another vehicle
N=3	1%	I hit a vehicle which had « burnt » a light
N=2	0.7%	Driving on a roundabout, I hit a vehicle which was on this roundabout
N=2	0.7%	I lost momentarily the vehicle control and I hit a vehicle
N=2	0.7%	I was coming from a side road and hit a vehicle
N=2	0.7%	Driving on a roundabout, I hit a vehicle which was coming into it
N=1	0.3%	I hit a vehicle which was turning to the left
N=1	0.3%	I was starting to go in a crossroad but stopped and was hit in the back
N=1	0.3%	I hit a child who was on the road
N=1	0.3%	I moved to another lane and had been hit by another vehicle
N=1	0.3%	I « burnt » a light and hit another vehicle
N=0	0%	I hit an adult who was on the road
N=0	0%	

AGE x ACCIDENT

65-69	70-74	75-80
47	22	8
25%	28%	24%

SEX x ACCIDENT

MEN	WOMEN
56 (28%)	21 (21%)

HEALTH STATUS x ACCIDENT

		Vision deficit	
		yes	no
ACCIDENT	yes	33 %	25 %
	no	67 %	75 %
		audition loss	
		yes	no
ACCIDENT	yes	39 %	23 %
	no	61 %	77 %
		Cardiovascular diseases	
		yes	no
ACCIDENT	yes	10 %	26 %
	no	90 %	74 %
		Cardiac rythms troubles	
		yes	no
ACCIDENT	yes	9 %	27 %
	no	91 %	73 %
		Sleep apnea	
		yes	no
ACCIDENT	yes	27 %	26 %
	no	73 %	74 %
		Diabetes	
		yes	no
ACCIDENT	yes	42 %	25 %
	no	58 %	75 %
		Stroke	
		yes	no
ACCIDENT	yes	33 %	26 %
	no	67 %	74 %
		Alcoholism	
		yes	no
ACCIDENT	yes	62 %	25 %
	no	38 %	75 %

NEUROPSYCHOLOGICAL TESTS x ACCIDENT

		MMS deficit	
		yes	no
ACCIDENT	yes	29 %	25 %
	no	71 %	75 %
		TMT A deficit	
		yes	no
ACCIDENT	yes	46 %	23 %
	no	54 %	77 %
		TMT B deficit	
		yes	no
ACCIDENT	yes	33 %	25 %
	no	67 %	75 %
		SPAN Direct deficit	
		yes	no
ACCIDENT	yes	33 %	26 %
	no	67 %	74 %
		SPAN Inverse deficit	
		yes	no
ACCIDENT	yes	30 %	26 %
	no	70 %	74 %
		STROOP deficit	
		yes	no
ACCIDENT	yes	25 %	26 %
	no	75 %	74 %
		BREF deficit	
		yes	no
ACCIDENT	yes	42 %	25 %
	no	58 %	75 %
		Yesavage et Brink deficit	
		yes	no
ACCIDENT	yes	25 %	26 %
	no	75 %	74 %
		GOLDBERG deficit	
		yes	no
ACCIDENT	yes	31 %	24 %
	no	69 %	75 %

Manchester Driving Behaviour Questionnaire

LAPSES						
to choose a wrong lane, approaching a crossroad						
never	exceptionally	occasionally	rather often	frequently	always	NR
39 %	41 %	14 %	1 %	0 %	0 %	5 %
Misread the signs and get out of the crossroad by a wrong road						
never	exceptionally	occasionally	rather often	frequently	always	NR
49 %	31 %	13 %	1 %	0 %	0 %	5 %
Forget where you've parked your car in the parking						
never	exceptionally	occasionally	rather often	frequently	always	NR
37 %	33 %	22 %	5 %	0,3 %	0 %	3 %
To hit something not seen while backing						
never	exceptionally	occasionally	rather often	frequently	always	NR
26 %	56 %	13 %	3 %	0 %	0 %	2 %
To try to start with the third gear						
never	exceptionally	occasionally	rather often	frequently	always	NR
92 %	3 %	2 %	0 %	0 %	0 %	3 %
To action something (lights) while wanting to action something else (wipers)						
never	exceptionally	occasionally	rather often	frequently	always	NR
53 %	36 %	7 %	1 %	0 %	0 %	3 %
Intending to go to A, you find yourself going to B maybe because B is a more usual destination						
never	exceptionally	occasionally	rather often	frequently	always	NR
42 %	35 %	17 %	2 %	1 %	0 %	4 %
To reckon that you have no precise souvenirs of the trip you've just done						
never	exceptionally	occasionally	rather often	frequently	always	NR
67 %	19 %	8 %	3 %	0,3 %	0 %	3 %

VIOLATIONS						
To drive very close to the car in the front, in order to indicate to the driver to accelerate or to change of lane						
never	exceptionally	occasionally	rather often	frequently	always	NR
71 %	14 %	10 %	2 %	0 %	0 %	3 %
To pass at the red light						
never	exceptionally	occasionally	rather often	frequently	always	NR
49 %	36 %	12 %	1 %	0,3 %	0 %	2 %
not respecting the legal speed limits during the night						
never	exceptionally	occasionally	rather often	frequently	always	NR
46 %	26 %	19 %	5 %	1,7 %	0,3 %	3 %
To feel an hostility toward a particular category of road user, ad to show it by any means						
never	exceptionally	occasionally	rather often	frequently	always	NR
64 %	20 %	9 %	3 %	0,7 %	0 %	4 %
To become impatient toward a slow driver on the left lane and to overtake by the right						
never	exceptionally	occasionally	rather often	frequently	always	NR
58 %	28 %	9 %	2 %	0,7 %	0 %	2 %
To drive with a B.A.C. over the limit						
never	exceptionally	occasionally	rather often	frequently	always	NR
75 %	18 %	4 %	0 %	0 %	0 %	3 %
To be involved in a run						
never	exceptionally	occasionally	rather often	frequently	always	NR
92 %	3 %	0,3 %	0,3 %	0 %	0 %	4 %

<u>ERRORS</u>						
To try to overtake somebody , not seeing that he was turning to the left						
never	exceptionally	occasionally	rather often	frequently	always	NR
76 %	17 %	1 %	0 %	0 %	0 %	5 %
Not detecting a stop or a priority sign, to have a near accident with an oncoming vehicle						
never	exceptionally	occasionally	rather often	frequently	always	NR
67 %	27 %	2 %	0 %	0 %	0 %	4 %
Not detecting pedestrians crossing while turning to the right, coming from a main road and going into a secondary road						
never	exceptionally	occasionally	rather often	frequently	always	NR
74 %	18 %	3 %	0 %	0 %	0 %	4 %
In a file, in order to turn to the right into a main road, to be so attentive to this main traffic that you hit the car in front						
never	exceptionally	occasionally	rather often	frequently	always	NR
89 %	7 %	0 %	0 %	0 %	0 %	4 %
Turning to the right, to just miss a cyclist on your right						
never	exceptionally	occasionally	rather often	frequently	always	NR
87 %	9 %	0,7 %	0 %	0 %	0 %	3 %
To forget to check the rear mirror while starting or changing lane						
never	exceptionally	occasionally	rather often	frequently	always	NR
71 %	21 %	5 %	0,3 %	0 %	0 %	2 %
To underestimate the speed of an approaching vehicle, while overtaking						
never	exceptionally	occasionally	rather often	frequently	always	NR
59 %	31 %	4 %	0,3 %	0 %	0 %	5 %

DISCUSSION

The « healthy » older driver is driving more than was usually considered, old women driving less than old men.

Older road users still need the car for their autonomy, and driving may still be experienced as a pleasure.

Older drivers are still confident in their abilities (maybe overconfident) but find some traffic situations stressful and difficult to cope with, especially the interactions with the other drivers.

Risk compensation exists in front of these driving difficulties : reduction of speed, increase of inter-vehicular gaps, choices on the strategic level of Michon or Van der Molen hierarchical level of risk (avoidance of certain traffic situations).

STRATEGICAL

TACTICAL

OPERATIONNAL

Secondary effects of drugs are and will be a main issue for traffic safety research on older road users

Different types of road users are sharing the same space, the road, but, in fact, they don't share it sufficiently enough, without a sufficient knowledge of the man-machine-environment interactions and constraints.

Accidents of older drivers occur mainly in intersections ; if the older driver is often considered as « responsible » of the accident, the behavior of the other driver, particularly the young driver, is also a problem : if young drivers were driving more slowly, that would give more time to the older driver to react. The older drivers are « pushed » to the fault.

Concerning the impact of medical conditions : vision, audition, alcoholism and diabetes seem to be associated to accident frequency, and cardiovascular diseases do not seem to be.

Concerning the neuropsychological tests, divided attention, anxiety (and particularly, considering the low level of benzodiazepines use ¹, non treated anxiety), frontal cortex pathologies, cognitive deterioration seem to be associated to accident frequency ; immediate memory and informations inhibition seem to be less associated.

¹ if one considers benzodiazepines as the only anxiety treatment ...