FIA ACTION FOR ROAD SAFETY

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ROAD SAFETY STARTS WITH GOOD VISION

EXECUTIVE SUMMARY

VISION AND DRIVING STUDY

VISUAL HEALTH AMONG SPANISH DRIVERS AND THE IMPACT ON ROAD SAFETY

Study conducted by:

FESVIAL

VNIVERSITAT DE VALÈNCIA
FACTHUM.lab INTRAS

ESSILOR
SEEING THE WORLD BETTER

FESVIAL, Universitat de València, Fundación CNAE, RACE and CEPSA, in conjunction with Essilor and the International Automobile Federation (FIA), promote the campaign for better vision on the road.

FESVIAL

VNIVERSITAT DE VALÈNCIA
FACTHUM.lab INTRAS

Fundación CNAE

RACE
Seguridad Vial

CEPSA


80
100
120
140
160
180
1
2
3
1/min x 1000
MODE

ENTITIES

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ACKNOWLEDGEMENTS

This study could not have been completed without the generous collaboration of Essilor International, Cepsa and everyone who participated in the tests in an impartial manner.

CONTENTS

1_ INTRODUCTION

Unfortunately, road traffic accidents remain one of the main causes of death and injury in Spain today. According to figures for recent years, around 1,800 people per year die in our cities and on our roads and over 120,000 suffer serious injuries from accidents.

Among the many causes of road accidents are those related to health in general and, specifically, visual health. Any visual defect or problem can make driving difficult and can even become the direct cause of a traffic accident. The studies show that approximately 90% of decisions taken by drivers are based on information garnered from their vision.

The WHO calculates that there are around 1.3 billion people in the world with some form of visual defect, be it far or short-sightedness, and many of them are regular drivers, with all the risks that entails. In fact, in 2017, the FIA (International Automobile Federation) included vision screening as one of its golden rules, considering it a key aspect of road safety. In this context and for preventive purposes it is certainly in our

1,800

people die every year in our cities and on our roads due to accidents

120,000

people suffer serious injuries from road traffic accidents

WHO

1.3 billion people in the world suffer from some form of visual defect.

interest to ascertain the "visual health conditions" of Spanish drivers.

Essilor, the world's leading company in ophthalmic lenses has made "Improving lives, improving vision" one of its objectives and as part of this commitment has decided to join up with the International Automobile Association (FIA) to raise awareness among the public of the importance of good vision on the road through the "Road safety starts with good vision" initiative.

As a result of this partnership, in 2018 Essilor launched an awareness campaign with the collaboration of RACE (the Royal Automobile Club of Spain and a founding member of the FIA) and Cepsa.

This campaign consisted of conducting the opinion study "Vision and Driving: habits and perceptions of the relationship between vision and driving" in which 3,026 Spanish drivers participated and which was subsequently distributed at 1,500 Cepsa service stations around the country.

These tests were carried out across a broad group of people in order to establish which groups of drivers show certain visual problems and, in this case, detect the areas where these deficiencies arise.

To carry out these two studies, Essilor has realied on collaboration with FESVIAL (the Spanish Road Safety Foundation) and INTRAS (the Traffic and Road Safety Research Institute of the Universitat de València) and the space afforded in Cepsa Service Stations to be able to perform out the vision checks.

2_ OBJECTIVES

The fundamental objectives of this initiative are:

- To ascertain the habits, attitudes and beliefs of Spanish drivers in relation to vision and road safety through an opinion study.
- To carry out a diagnosis of the main parameters of the visual health of Spanish drivers, through special vision screening for driving, complementary to standard vision checks, carried out by eyecare professionals.
- To determine whether or not there are any significant correlations between the different variables evaluated in the two analyses.

2.1_ Specific objectives of the opinion study

The specific objectives of the study, in relation to the analysis of **habits, attitudes and beliefs of Spanish drivers**, are the following:

- To determine the **importance assigned to poor vision as a risk factor** in road safety. Assessment in comparison to other risk situations and beliefs regarding the possibility of causing accidents.

- To ascertain the extent to which **visual correction systems** (glasses and/or contact lenses) are used or how much time has passed since **the last vision check**.

- **Self-perception** of quality of vision among drivers.
- Frequency of **vision problems or incidents** while driving a vehicle: glare, itchy eyes or blurred vision.

2.2_ Specific objectives of the diagnostic testing

At the same time, the diagnostic testing of the **visual health of Spanish drivers** considered the following parameters, summarised succinctly below:

- **Refractive error:** Evaluating refractive error (myopia and/or hyperopia) which prevents images from focussing correctly on the retina.
- **Visual acuity:** Visual acuity indicates the quality of the driver's vision, both photopic (in daylight conditions) and mesopic (in low illumination).
- **Visual field:** Measuring the extension of the field of vision of the eye, from 45° to 100°.
- **Glare:** Measures how many seconds it takes a person to recover central vision after looking at a light for 10 seconds.

All the parameters analysed are important for driving and, therefore, for road safety. Vision is the **principal source of information for a driver's decision making.**

As stated above, almost 90% of all the information necessary for driving safely is perceived via the eyes. Inadequate, incorrect or imprecise visual information can lead to an accident.

3_ METHODOLOGY

Both the **personal interviews** *and the* **diagnostic tests** were performed on drivers selected at random when purchasing fuel at service stations across the country.

Firstly, information was collected on the habits, attitudes and beliefs relating to vision and driving using a computerised questionnaire in order to subsequently perform **a series of diagnostic vision checks**, using an exclusive Essilor technology instrument called the **Visiosmart**, which allows for different type of vision checks to be carried out based on pre-programmed protocols. All the checks of those protocols come from models that have the recognition and approval of eyecare experts.

The final sample for the study consisted of **3,249 drivers**. This is the **largest national study** incorporating diagnostic testing of drivers on the road that we are aware of.

METHODOLOGICAL CHARACTERISTICS

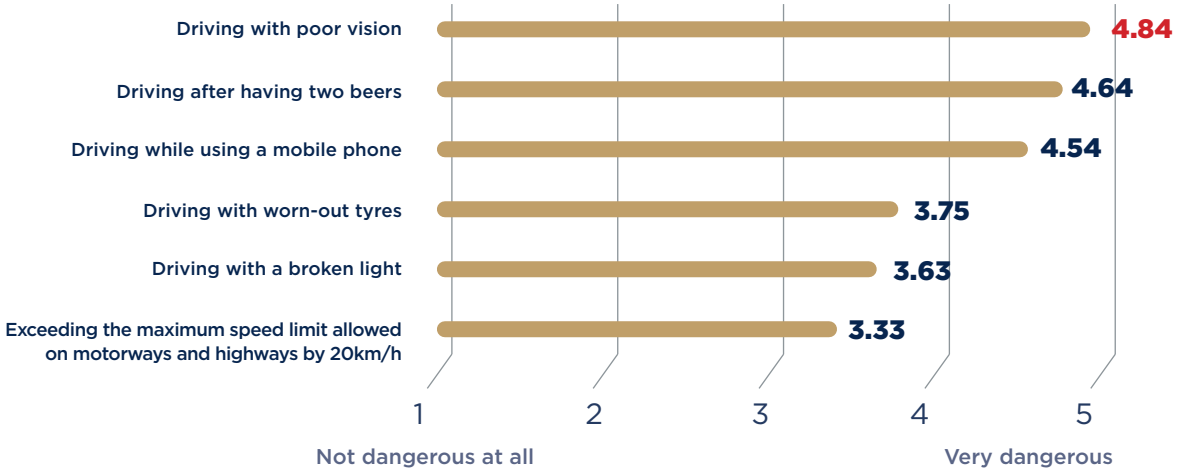
- **Universe:** Spanish driving population.
- **Scope:** National (except Ceuta and Melilla).
- **Survey/test methodology:** Face-to-face interviews using a structured questionnaire and specific diagnostic vision checks for driving.
- **Sample:** 3,249 drivers, ensuring a maximum sample error of +/-1.75%, para for a confidence level of 95.5% (where p=q=50%).
- **Stratification of the sample:** Proportional distribution by population volume of the Autonomous Communities.
- **Dates:** The fieldwork was carried out between 20 March and 30 April 2019.

4_ RESULTS

4.1_ Results of opinion studies

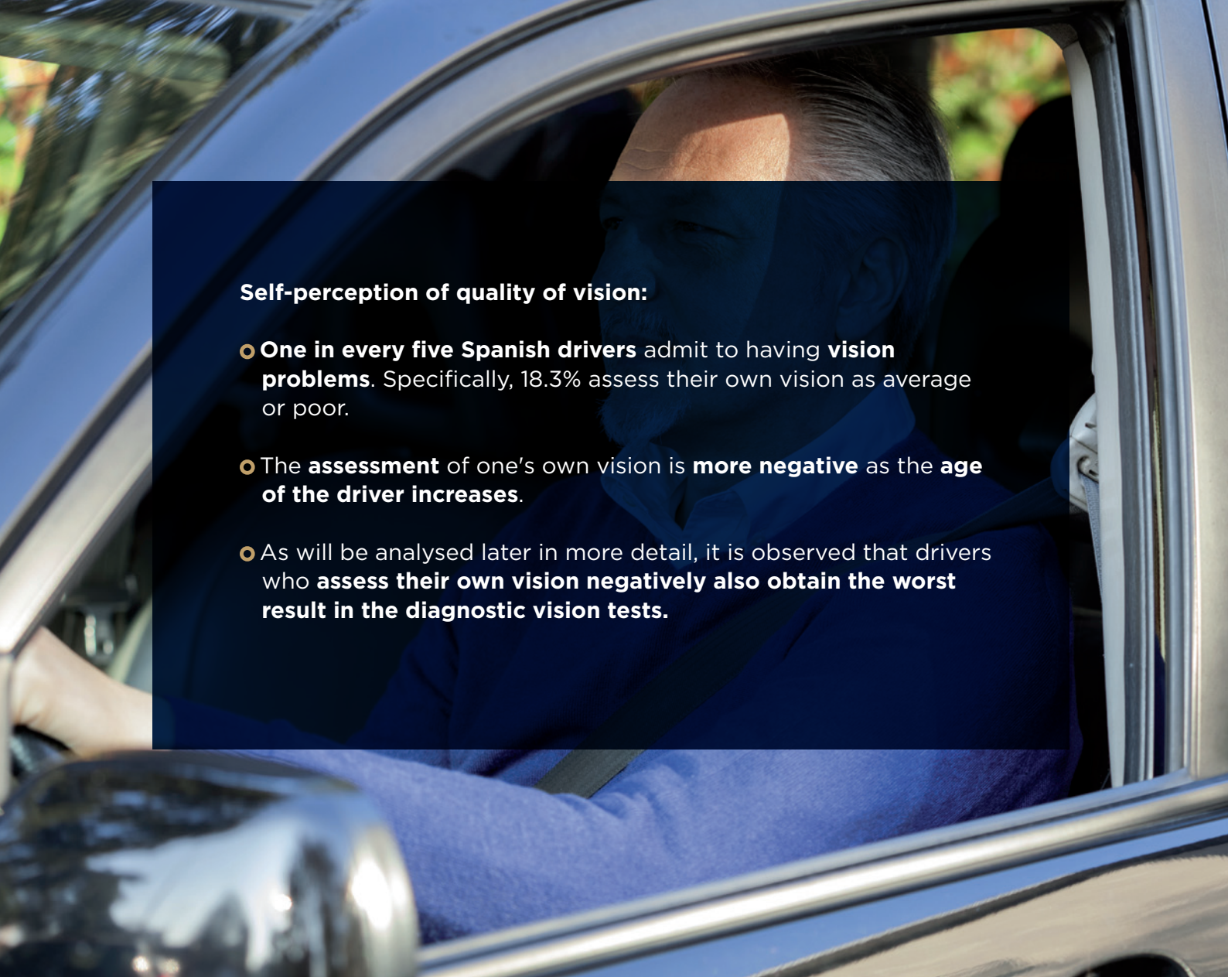
The principal results of the opinion study on habits, attitudes and beliefs regarding vision and driving were the following:

Evaluation of danger in different risk situations



Vision and perception of risk:

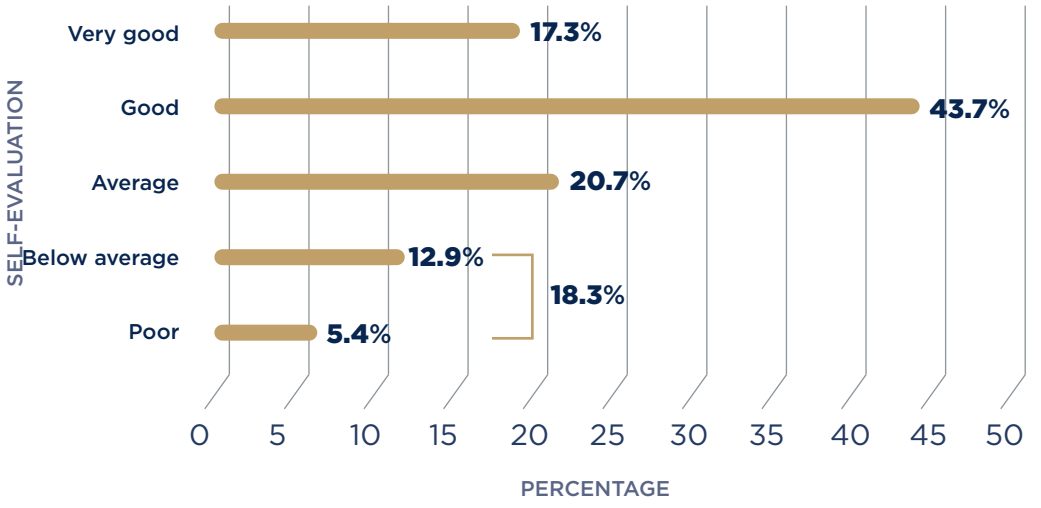
- For Spanish drivers, good **"visual health"** is fundamental for driving a vehicle and for **road safety.**
- **Poor vision** is considered the situation that **carries the highest risk to road safety**, ahead of situations like "driving after having two beers" or "driving while using a mobile phone".
- This perception of the risk of poor vision for road safety, **is even more pronounced** if that's possible, as the **driver's age increases**.
- On the same line, **eight of every ten drivers** consider that there is a **high probability** that **poor vision will cause a traffic accident.**
- This opinion is even more intense among drivers who **use visual correction systems** and is held somewhat more tenuously among drivers who **do not get their vision checked.**



Self-perception of quality of vision:

- **One in every five Spanish drivers** admit to having **vision problems**. Specifically, 18.3% assess their own vision as average or poor.
- The **assessment** of one's own vision is **more negative** as the **age of the driver increases**.
- As will be analysed later in more detail, it is observed that drivers who **assess their own vision negatively also obtain the worst result in the diagnostic vision tests.**

Self-evaluation of quality of vision:



Vision review and visual correction systems:

- Spanish drivers **appear very concerned with their visual health**, as only 15.6% admit to never having their vision checked. However, 26.1% of drivers have not had their vision checked in the last two years, when the recommendation is to do so once a year.

- Logically, the percentage of drivers who do have their vision checked increases among **older drivers.**

- Drivers who **do not attend vision checks** consider **driving with poor vision to be less dangerous,** compared to drivers who do have their vision checked.

- The data obtained indicate that **four out of every ten** drivers use a **visual correction** system (glasses, contact lenses or both).

- Among drivers who use visual correction systems the vast majority use **glasses (84.1%),** while only a small minority use **contact lenses (7.4%)** or **both systems (8.5%).**

- The use of visual correction systems is **more common among:**

  Older drivers
  Female drivers
  Non-professional drivers

Problems or incidents with vision when driving:

- **32.6%** of drivers say they suffer **glare from another vehicle** fairly or very frequently.
- **15.0%** say that they commonly suffer from glare when **exiting a tunnel.**
- It is important to highlight that **glare** leads to accidents with **high fatality rates** and they have three fundamental causes: **the state of lights of the vehicles, the illumination of the environment and the driver's vision problems.**
- **9.4%** of the drivers state that they frequently suffer **itchiness/stinging of the eyes** when driving.
- **6.7%** of Spanish drivers say they frequently drive with **blurred vision.**
- Drivers with **visual acuity deficiencies** suffer from **itching/stinging** of the eyes and **blurred vision problems.**

32.6%

is frequent glare from another vehicle

9.4%

suffer itchiness/ stinging of the eyes frequently

4.2_ Specific objectives of the diagnostics test study

To summarise, the main results of the diagnostic study of **the visual health of Spanish drivers**, were the following:

_ Refractive error

The test for refractive error measures the possible refractive error that makes it difficult for images to focus correctly on the retina. In this test, the possible results are: **Emmetropia**, where the driver does not show any refractive error, **or refractive error**, which may indicate a case of myopia or hyperopia.

Main results of the study:

- **29.5% of Spanish drivers present deficiencies in refractive error (myopia or hyperopia)**
- **Drivers who consider that they don't have good vision in the one-to-one interviews are those who objectively suffer most frequently from refractive error in the checks for same.**
- **The cases of refractive error show a sharp rise among drivers who recognise they suffer from blurred vision when driving.**

Refractive E r

29.5%
of Spanish drivers have poor vision.

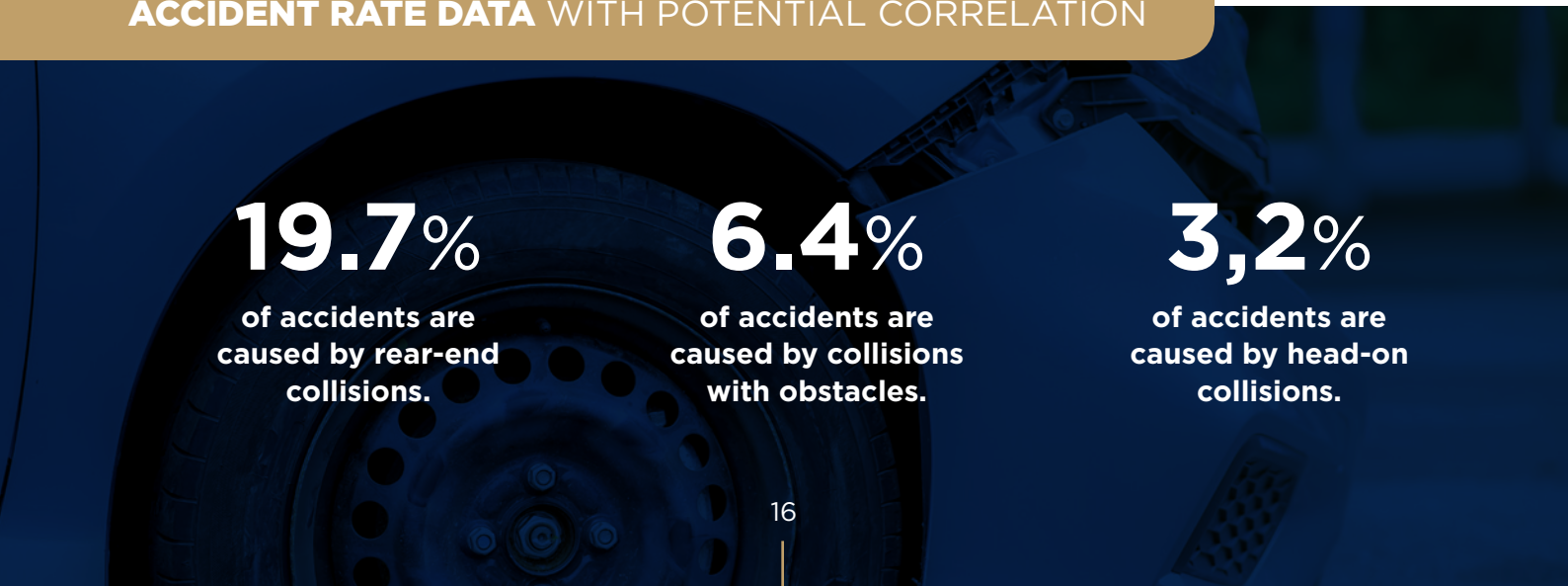
Consequences for Road Safety

- Difficulties seeing signposting, road markings, obstacles, pedestrians, other vehicles, etc. clearly.
- Poor interpretation of indications or signs made by other road users (drivers, pedestrians, traffic wardens, etc.).
- Poor estimation of safe distances, speed of other vehicles and, consequently, reaction times.
- Greater effort required to interpret road signage resulting in increased physical and mental tension and increased fatigue and stress when driving.

Special attention to:

- Older drivers.
- Driving in heavy or busy traffic and access to urban areas.
- Driving on highways or motorways (errors reading signage, errors calculating distances and paths, etc.).
- Overtaking (errors calculating distances and speeds).
- Handling of curves, access to roundabouts, winding sections, etc. (errors calculating distances and paths).
- Secondary roads with poorer maintenance of signage.

ACCIDENT RATE DATA WITH POTENTIAL CORRELATION



19.7%
of accidents are caused by rear-end collisions.

6.4%
of accidents are caused by collisions with obstacles.

3,2%
of accidents are caused by head-on collisions.

Visual acuity

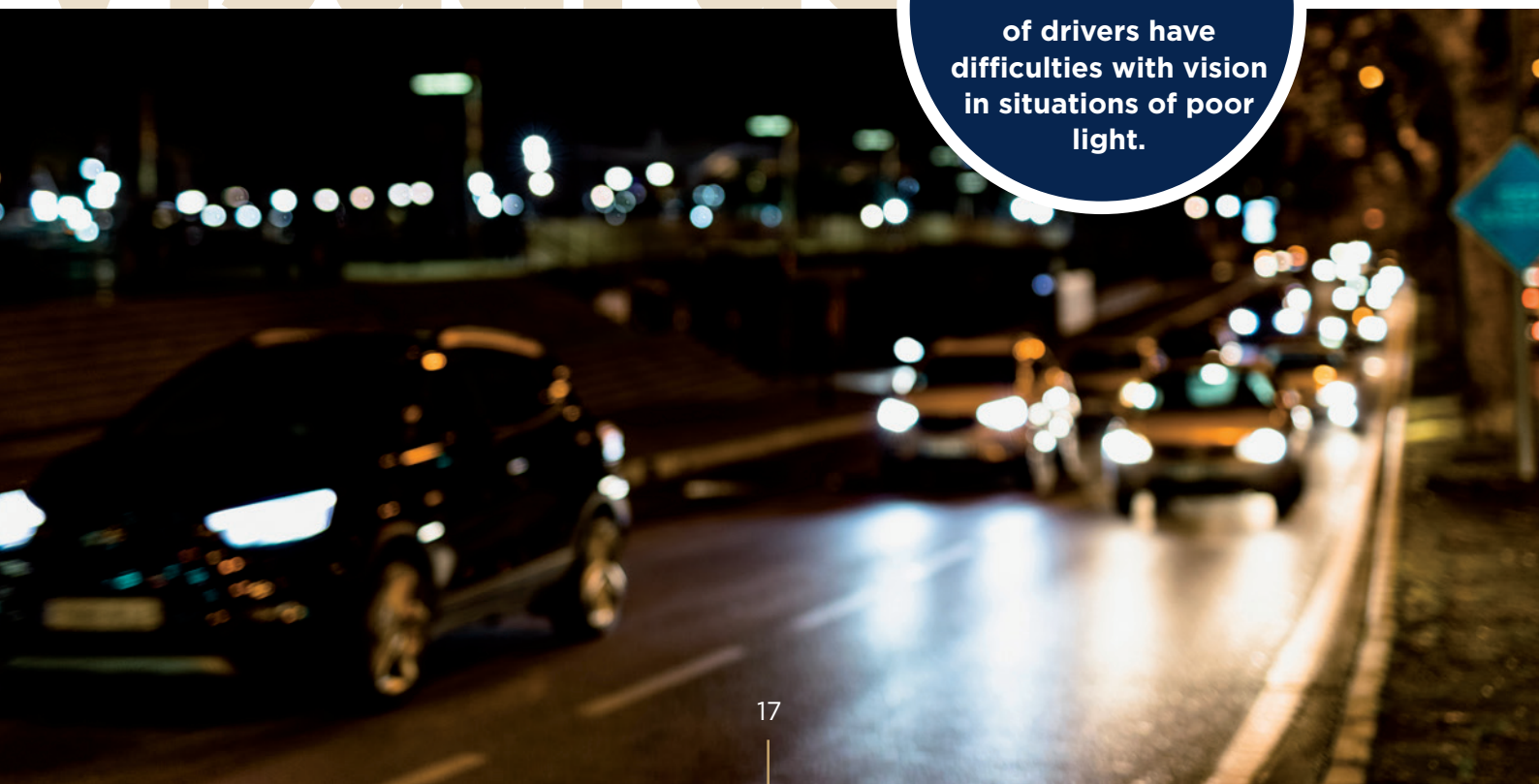
Photopic visual acuity indicates the visual acuity of the user in daylight conditions, and mesopic visual acuity indicates the quality of vision in low illumination conditions, for example at night time or in fog or rain conditions.

Main results of the study:

- **14.1% of drivers have difficulties with vision even in conditions of optimal light (deficiency in photopic visual acuity).**
- **37.8% of drivers have difficulties with vision in situations of poor light (deficiency in mesopic visual acuity).**
- **Drivers with "good" results in visual acuity are younger than those who obtain "poor" results.**
- **Professional drivers obtain better results in visual acuity tests than other drivers.**
- **Drivers who believe they don't have good vision more frequently show deficiencies in visual acuity, both photopic and mesopic.**

14.1%
of drivers show deficiencies is visual acuity

37.8%
of drivers have difficulties with vision in situations of poor light.



Consequences for Road Safety

- Difficulties adapting adequately to conditions of poor light (evening, dawn, night, rain, fog, etc.)
- Late detection of obstacles, drivers, other vehicles, signage, etc.
- Greater effort to interpret situations of heavy traffic, increasing physical and mental tension and dangerously increasing fatigue.
- Difficulties estimating distances, speed of other vehicles and, consequently, reaction times.
- Problems capturing information from the vehicle dashboard.
- It is important to highlight that the night-time driving with poor vision is a clear risk: visual acuity falls some 70% and capturing depth can be 7 times lower.

Special attention to:

- Older drivers.
- Driving at night time
- Driving near schools and children's play areas
- Situations of poor light for pedestrians.
- Situations of excessive signage and/or complex signage.
- Driving in adverse weather conditions.
- Night-time driving on poorly lit roads

ACCIDENT RATE DATA WITH POTENTIAL CORRELATION

27.5%

occur in conditions with insufficient light.

13.2%

of accidents with reduced visibility are collisions with pedestrians and are the most serious accidents involving cyclists.

Night-time traffic accidents are the most lethal.

Visual field

Visual field measures the extension of the field of vision of the eye, from 45° to 100°.

Main results of the study:

- **23.5% of Spanish drivers show deficiencies in visual field.**
- **Drivers with good results for visual field are younger than those who obtain poor results.**
- **Among those drivers who believe they don't have good vision, the percentage of cases of defective visual field increases.**

Visual field

Foundation for Road Safety:

- Difficulties for managing traffic situations in: intersections, lane changes or overtaking.
- Reduction of field of vision at high speed, together with the naturally produced tunnel effect: at 65km/h the field of vision is 70°; at 100 km/h it is 42°; and at 130 km/h it falls to 30°.
- Sensory distortion of speed, especially for the poor capture of lateral stimuli.
- Difficulty of vision in rear-view mirrors or larger blind sport.
- Distorted reading or inability to read signalling
- Problems detecting signals and lateral stimuli.

Special attention to:

- Older drivers.
- Driving on urban streets and especially intersections.
- Shared environments with PMVs (bicycles, scooters, etc.).
- Driving on high speed roads or driving at high speed.
- Roads shared with motorcycles.
- Driving near schools and children's play areas.

ACCIDENT RATE DATA WITH POTENTIAL CORRELATION

13.2%

of accidents are collisions with pedestrians (the majority due to lateral encroachment).

of lateral collisions are usually more serious due to the poorer passive security of this part of vehicles.

8.8%

of accidents are caused by lateral collisions.

Older drivers have more lateral collisions due to the reduction of their field of vision.

_ Glare

The glare test measures how many seconds it takes a person to recover central vision after looking at a light for 10 seconds.

Main results of the study:

- **El 44.2% of drivers take 20 seconds to fully recover central vision after glare and 9.4% have serious problems recovering full vision.**
- **From 45 years old on, the recovery time increases significantly and with the advancing age of the driver this is more evident.**
- **Women show a longer average recovery time than men.**
- **Professional drivers show a shorter recovery time than non-professional drivers.**
- **The average recovery time is shorter among drivers who drive on six or seven days a week compared to those who drive for fewer days.**

Glare

Consequences for Road Safety:

- Serious loss of vision when driving. For example, at 50km/h a recovery time of just 5 seconds means driving 70 meters with inadequate vision. At 120km/h, a recovery time of 5 seconds means driving 170 meters with inadequate vision.
- Major difficulties in managing safe driving in the following situations:

  · Low sun (early in the morning or in the evening).
  · Driving at night, especially on two way roads.
  · When entering and exiting tunnels, changing from lit roads to unlit roads.
  · Situations where there is a sudden change of illumination: underground carparks, etc.

Special attention to:

- Older drivers.
- Driving at certain times of day (early in the morning or in the evening).
- Driving at certain critical points (entering and exiting tunnels).
- Night-time driving, especially in heavy traffic.

ACCIDENT RATE DATA WITH POTENTIAL CORRELATION

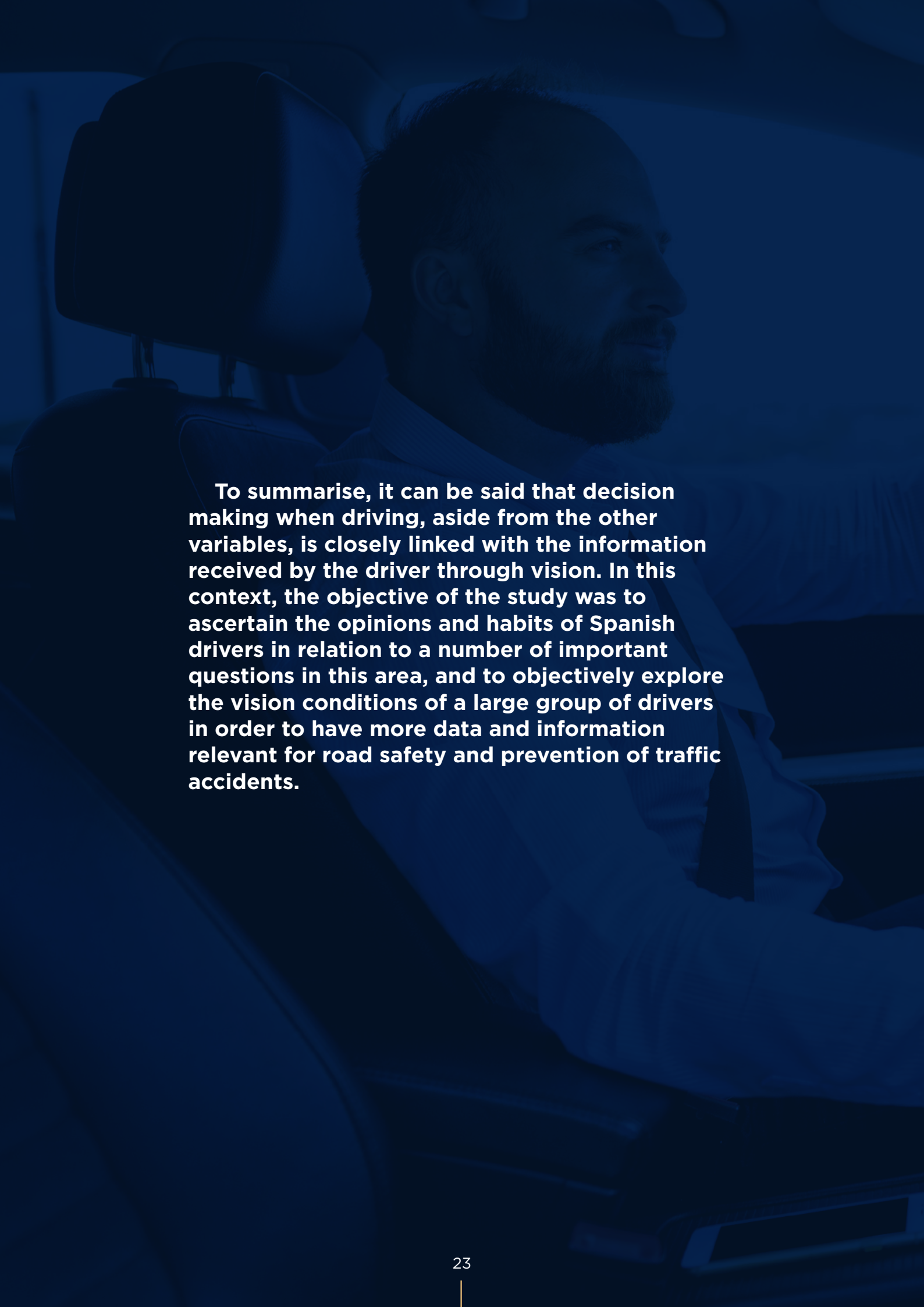
5-15%

of night-time accidents have glare as a factor

40%

of fatalities are caused by night-time accidents

Accidents caused by glare have high fatality rates.



To summarise, it can be said that decision making when driving, aside from the other variables, is closely linked with the information received by the driver through vision. In this context, the objective of the study was to ascertain the opinions and habits of Spanish drivers in relation to a number of important questions in this area, and to objectively explore the vision conditions of a large group of drivers in order to have more data and information relevant for road safety and prevention of traffic accidents.

Study completed by: