

# VISUAL HEALTH AND ROAD SAFETY: IT'S TIME FOR ACTION!

## THE IMPLICATION OF VISION IN TRAFFIC ACCIDENTS AND THE IMPORTANCE OF POLITICAL ACTION TO TREAT THIS RISK FACTOR



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## 1. Road safety as a global priority

**The latest Global Status Report on Road Safety, published by the World Health Organization (WHO) in December 2018,** highlights that road traffic fatalities have grown, worldwide, up to 1.35 million a year, plus 50 million road users injured as a consequence of road traffic crashes. These “accidents” (that, indeed, are not really accidental!) have turned into the leading cause of non-natural death for people aged between 5 and 29 years.

In the same way, **in February 2020, the 3<sup>rd</sup> Global Ministerial Conference on Road Safety,** held in Stockholm (Sweden), claimed for unprecedented efforts to halve road fatalities in one decade, placing the urgent need for improving road safety among the “Global Goals 2030”, through a renewed political commitment for taking effective actions and developing further measures and strategies strengthening community health and welfare.

**Endorsing this declaration, in August 2020, the United Nations General Assembly adopted the resolution A/RES/74/299,** proclaiming the period 2021-2030 as a new (second) Decade of Action for Road Safety. There is, therefore, an explicit reference to road safety into the United Nations agenda for Sustainable Development.

Finally, in the **82<sup>nd</sup> Annual Session of the Inland Transport Committee (ITC),** the widest regulatory platform of United Nations for road transport, adopted a set of recommendations for strengthening national road safety systems. These recommendations came into force April 2020, constituting a *universal* road safety blueprint that can be applied in any country, helping to identify and address key gaps through a more articulated and interconnected action. Within the most important advice, **a call to governments to adopt measures aimed to promote good vision for all road users** was included.

In brief, vision is the main source of information on the road: some studies state that up to 90% of the information acquired during driving has a visual nature. Good vision allows drivers to accurately perform driving-related tasks and to make safe decisions. However, according to **the World Report on Vision published by the (WHO 2019), at least 2.2 billion people around the world have substantial vision impairments.**

Moreover, and although there is a high consensus on the fact that vision constitutes a key factor in this field, road safety actions frequently ignore visual health among their core guidelines, and road users tend to be scarcely aware of the importance of vision for road safety. This has lead world reference organizations such as the **FIA (Fédération Internationale de l'Automobile)** to carry out specific measures to alleviate the lack of awareness on the relationship between visual health and road safety, through the



promotion of a new golden rule: “Check your vision”, alongside with other relevant mottos, such as «Buckle your seatbelt», «Obey speed limits», and «Don’t text and drive».

## 2. Vision as a high-impact factor for road safety: what does science say?

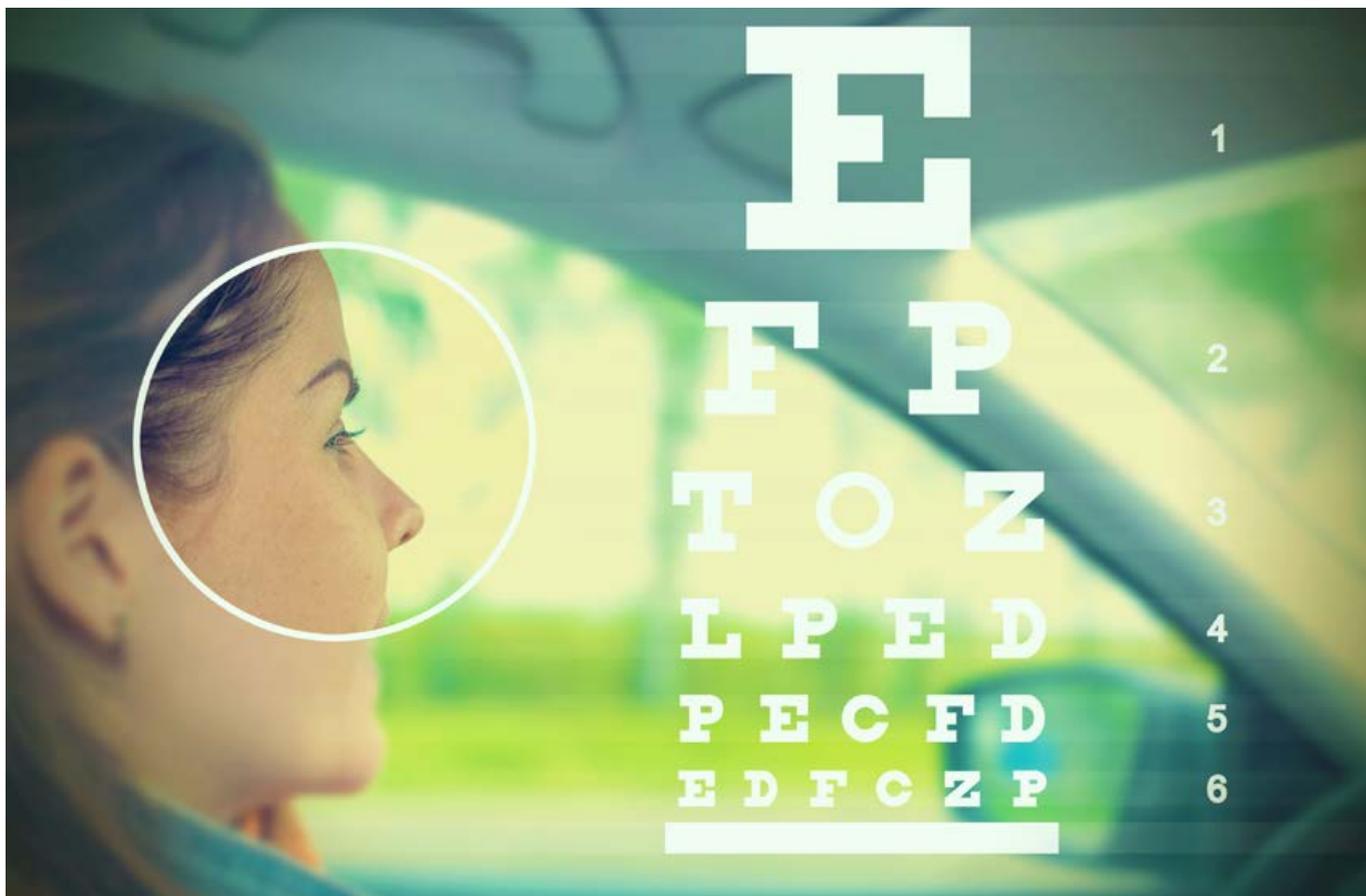
The evidence accumulated over the last 40 years depicts the significant impact that vision problems have on road crashes. Although the number of studies in this field is still limited, their results tend to be clear and coherent, overall reinforcing the importance of retrieving more (and better) empirical knowledge, useful for developing more effective policies adapted to each country as a manner to meet United Nations’ goals for road safety.

For instance, most of the studies developed in this regard agree on the fact that between **5% and 20% of traffic crashes** (depending on contextual issues), whether directly or indirectly, are caused/enhanced by road users’ visual problems that are majorly preventable through good policymaking and healthcare-related actions. Below, we present some key facts provided by empirical studies on vision and road safety:

- There is a clear correlation between poor vision and the number of crashes reported by drivers (DfT, 2002). In other words, individuals with better visual health tend to have, overall, significantly lesser crash rates than those with vision problems (Owsley & McGwin, 2010).
- A retrospective study analysing more than 4,400 accidents suffered by drivers, concluded that the most relevant risk medical conditions affecting them were: diabetes, cardiovascular issues, fatigue and vision

problems – specifically myopia and other correctable refractive errors, which under specific conditions may increase crash risk between 22%-26% (Sagberg, 2006).

- In the United States, it has been found that up to 50% of traffic crashes involving older drivers are related to vision defects (Research Council, 1993).
- According to the French Association for the Improvement of Vision (ASNAV, 2018), it can be estimated that approximately 12% of road accidents are associated with visual impairments of drivers.
- An in-depth analysis of a sample of 403 drivers (94% men aged between 16 and 74) found that approximately 8% of the drivers who suffered traffic accidents over the period of one year had been diagnosed with visual issues prior to suffering such a crash. Additionally, only 16% of them used prescription glasses to drive (Behboudi, Moghadam, Tiefeh & Karkan, 2017).
- Even the most minor or *common* visual impairments (e.g., dry eyes, itching, acute eye strain, etc.) may substantially affect the ability to drive safely (Fundación MAPFRE, 2019; Deschamps et al., 2013).
- There is a mistaken belief about the incidence of “mild” or “common” visual problems - such as refractive errors (e.g., myopia, hyperopia and astigmatism) - on the crash risk (Wood et al., 2012; Schallhorn et al., 2010). Overall, and given their high prevalence in the population, it is often assumed that these problems do not represent an important risk for road safety. However, different experimental studies have shown how, in situations of low light or visibility - such as night driving- key tasks such as the recognition of pedestrians, signals or specific stimuli are significantly impaired among those drivers who have a “mild” visual



problem, compared to those having a healthy vision status (Wood et al., 2012; Balk, Tyrrell, Brooks & Carpenter, 2008; Cohen et al., 2007).

- According to several studies, drivers whose visual acuity is less than 0.7 have a 15% greater crash rate, compared to drivers whose visual acuity is equal to or greater than 0.7 (Elvik & Vaa, 2004).
- Increased sensitivity to glare and reduced night vision can increase in about 60% the rate of road crashes occurring in driving situations of low illumination (i.e., driving at night; Elvik & Vaa, 2004).
- In an important study carried out in Florida (USA; McGwin et al., 2008), it has been shown that increasing visual checks (and corrections) among older drivers is one of the most effective strategies that can be used to reduce their crash likelihood. Similar conclusions and practical implications can be inferred from other investigations (Levi et al, 1995; Shipp, 1998, 1998).
- Drivers are not the only type of road user on which vision status influences safety. According to a previous study carried out to address the case of pedestrians (Roberts & Norton, 1995), the probability that a child with visual impairment will be run over is much higher than, for instance, the estimate for elderly people with visual problems.

### 3. Stating our position

In a few words, our vision is that visual health represents a key issue for road safety, and immediate actions from both public agencies and further stakeholders are needed to reduce the prevalence of unaddressed visual issues

among road users, particularly drivers. To achieve this goal, we propose to work on these three complementary areas:

1. To upgrade all the pertinent National/European/International **laws and policies**, promoting **the need of improving visual assessments for drivers** (broader and more systematic), for the case of both firstly obtaining the driving license and its renewal process.
2. To develop major awareness on the relevance of visual health, making drivers accountable for the **importance of regularly checking their vision**, and thus promoting the performance of **corrective procedures** (as indicated by a specialist) **and protective habits** (e.g., wearing glasses, avoiding hazardous situations like day/night glare), **always in consideration of the specific road scenarios in which they use to drive and their particular risks**.
3. To increase the number, quality and scientific rigor and deepness of **empirical studies addressing the prevalence of visual problems among road users (principally driving populations), and their relationship to traffic crashes**, especially in high-risk driving scenarios such as night driving and professional driving.

Besides these concrete steps themselves, it should be mentioned that this set of actions might also contribute to strengthening the road safety culture, if well-designed, implemented and divulgated among road users.

### 4. Our action and commitments

During the last decade, the Spanish Foundation for Road Safety (FESVIAL) and the University of Valencia have rolled-out an extensive list of actions aimed at promoting an



unprecedented positive change in Spain, in terms of vision and driving. To the date, some of the most outstanding actions taken have been:

**a) Development of a pioneer (empirical and nationwide) study on the visual health of Spanish drivers**

- Although it is planned to be replicated across Europe and the Americas, this study (conducted in Spain) firstly provided a country-scale analysis of driver's visual health with an empirical basis.
- More than 3.200 Spanish drivers from the 17 regions of Spain partook, having been visually checked through a specialized drivers' eye test protocol\* focusing on three key variables: visual acuity, visual field campimetry, and glare recovery.
- This large-scale study has shown how an estimated 29.5% of Spanish drivers present substantial visual impairments that need to be attended to, since they represent a latent risk for their road safety.
- Among these issues, 15% of Spanish drivers have poor photopic vision, while up to 38% of them may have inadequate mesopic vision under very low light conditions. Further, 23% of drivers have deficiencies in peripheral visual field campimetry, and 44% of Spanish drivers need more than 20 seconds to fully recover from a 10 seconds glare.
- The results of the study have been publicized through different means: an article in the scientific journal (*International Journal of Environmental Research and Public Health*; Q1 in *Journal Citation Reports – JCR*); a national-coverage mass-media press conference offered to both general and specialized public, especially road safety and optometry practitioners; and

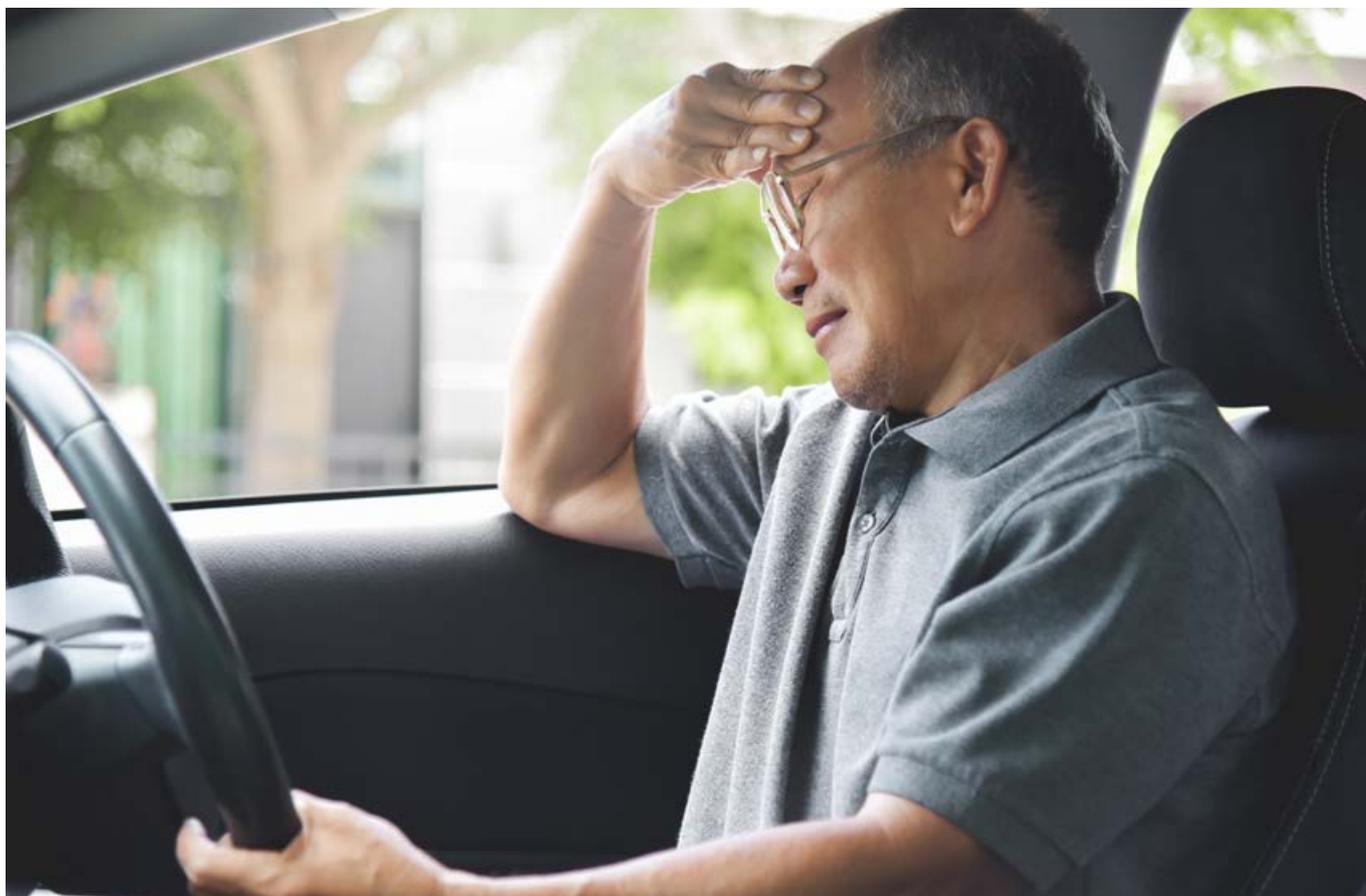
an official meeting held with the Spanish Government and its agencies (such as the General-Directorate of Traffic) of Spain, oriented to explore joint actions aimed at reducing traffic crashes caused by visual impairments.

**b) Development of a visual-testing protocol for drivers**

- Based on the study findings, a specific protocol was developed for carrying out specialized visual inspections for drivers.
- The protocol was free-of-charge offered to more than 1,500 opticians throughout the Spanish territory, to be applied to their customers (licensed as drivers) on a voluntary basis.
- The tests also made it possible to obtain very useful information on the state of the vision of drivers, providing useful feedback to raise their awareness on the vision-related risks they currently face.

**c) Raising awareness from driving schools**

- Further awareness campaigns were also developed in collaboration with the National Confederation of Driving Schools (CNAE). The trainee drivers of Spanish driving schools were covered for several months. The awareness-raising action consisted of promoting three simple rules:
  1. To carry out regular and periodic vision checks.
  2. To use the appropriate visual equipment (e.g., prescription glasses and lens, sunglasses) while driving.
  3. To well-manage risky driving scenarios, such as night driving and prolonged glares.



This information was included in the training manuals of the driving schools that were also diversified across 5,000 nationwide centres composing the CNAE network. Together, this action was well-valued and appreciated by its beneficiaries. Its subsequent evaluation indicated that it is an effective strategy to increase awareness of the role of vision as a determining factor for road safety among novel drivers.

#### **d) Targeting high-risk groups**

Apart from novel drivers, elderly drivers were determined as a highly vulnerable group in terms of vision and driving. At this time, our proposal is to include them as a “key” group in which comprehensive and periodic vision screenings should be performed, in order to prevent traffic crashes by detecting and intervening the main visual problems that usually appear with age, in consideration of some key facts:

- Aging is a factor clearly increasing the risk of suffering from visual problems that may compromise road safety (Gruber, Mosimann & Nef, 2013; Kaleem et al., 2012).
- The visual health of older adults is not only negatively affected by conventional aging patterns, which involve, for example, a lower visual field acuity and width (Brinig et al., 2007). It is also impaired by the high comorbidity with physical diseases such as diabetes and cognitive deficits, which are more common in older population segments and increase (i) the probability, and (ii) the severity of visual problems.
- The oldest age groups (in the case of both sexes) have significantly lower rates of maintained visual

attention, and a slower processing of visual information.

- Older drivers who have a substantial reduction in the useful field of vision, are at least 20 times more likely to be involved in a serious accident than drivers who are visually healthy, or presenting mild visual perimetry problems (Owsley, McGwin & Ball, 1998).
- According to the Association of Medical Recognition Centers (ECAM, 2015), almost 70% of the Spanish population over 65 years requires corrective glasses to drive.

#### **e) Awards and Recognitions**

- All these actions (i.e., pioneer empirical study, driver’s assessment protocol and actions carried out in driving schools) partake in the campaign “Road safety begins with a good vision”, which was awarded in the national “Ponle Freno 2020” awards as the best action in road safety.
- This award was promoted by the Atresmedia communication group (present in different communication means such as TV, radio and web), with the aim of highlighting initiatives that may strengthen road safety at all levels.
- The award was presented by the President of the Spanish Senate.

### **5. Short-term recommendations: improving road safety step-by-step.**

Considering all the aforementioned, FESVIAL and the University of Valencia propose the following

recommendations, in order to promote visual health as a manner of strengthening road safety:

1. **To enhance the role of the vision within the training contents for driving licensure**, increasing the information given to driving trainees, with the aim of enhancing their awareness on the topic, as well as their risk perception and decision-making for safe driving.
2. **To promote three simple (but useful) visual care-related rules** (periodical visual checks, use of appropriate visual equipment, and well-management of road-risk scenarios like day/night glare) both inside and outside the driving school. The importance of vision for road safety could start being emphasized from the educational system
3. **To improve visual examination-related practices, laws and protocols**, positioning visual health as a main criterion for driver's assessment. Visual health must be, undisputedly, one of the universal aptitudes needed to obtain and renew the driving license. Secondly, the periodicity of visual checks for drivers (especially for those presenting visual impairments) should be revised and improved.
4. **To pay special attention to vulnerable groups**, i.e., those population segments needing more attention and intensive efforts aimed at guaranteeing their safety at the roads.
5. **To promote the road safety culture** through both our own actions on vision and driving, but also increasing the articulation with other stakeholders (private and public agencies, research groups, mass-media groups, etc.) working on different spheres of road safety.

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#### KEY TAKEAWAYS:

- Considering all the available evidence, strengthening visual health among drivers is a key need for road safety worldwide. It might also contribute to increasing community health in many other spheres, and to reduce the great burden that traffic crashes represent.
- Although the vital role of visual health for traffic safety could be assumed as “self-evident”, it is often assumed that visual impairments do not represent an important risk for road safety, given their high prevalence in the population and other popular misconceptions.
- Apart from being addressed in driving licensing processes, visual health (along with its related practices) is a matter that should get expanded to other relevant scenarios for road safety, including the educational system.
- Further research is important, since it might add even more insights on the ways in which visual problems affect accidents. Therefore, it can be expected that future studies can help improve visual health-related practices aimed at preventing both visual problems and road crashes.

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