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# Comparison of ophthalmological standards applicable to drivers in Poland and the United Kingdom with the European Union recommendations

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*Each country has own specific requirements with regard to the visual standards applicable to drivers. The following were summarised in the appropriate tables: 1) data contained in the Ordinance of the Minister of Health from the 30th of August 2019 regarding medical examinations of applicants for driving licences and drivers; 2) Directive 2006/126/EC of the European Parliament and the Council on driving licences updated on the 22nd of July 2018; 3) the government and nonprofit websites: Advice for Medical Professionals to Follow when Assessing Drivers with Visual Disorders updated on the 4th of March 2020. Both in Poland and the UK the required visual acuity of car and motorcycle drivers is 0.5, which is in line with the EU recommendations. The visual field of both eyes for car and motorcycle drivers with limit values horizontal ≥ 120°, range ≥ 50° right and left and ≥ 20° up and down is identical in Poland and the UK and coincides with the EU recommendations. Colour vision for drivers in the UK is not required, which is consistent with the EU recommendations, whereas in Poland, car and motorcycle drivers do not have to recognise colours, but bus and lorry drivers must correctly recognise red, green and yellow. Current minimum visual requirements for drivers in Poland are closely integrated with the EU recommendations and are similar to the criteria in the UK. They are not too strict but are sufficient to maintain safe driving and there is still a possibility of their liberalization.*

**Key words:**

automobile driving; visual acuity; binocular vision; visual fields; color vision; reference standards

**Introduction.** Wilhelm II Hohenzollern, the last German Emperor and King of Prussia, was wrong in saying the famous words: 'I think a car is a temporary phenomenon. I believe in a horse'. The car is currently a widely used commodity, not a short-lived trend. Driving is the primary means of transportation among the elderly in the United States of America [1] and is becoming increasingly important in Europe [2].

Although many medical factors contribute to safe driving, crash rates and driving-related injuries have been associated with deteriorating vision [3,4]. Therefore, one has to prove adequate health conditions to drive a car, especially when it comes to eyesight. The eternal dilemma has been acknowledging minimum requirements of the ophthalmic parameters that a driver must demonstrate to drive safely on the road.

Each country has specific requirements for drivers in this respect [5 – 10]. It is gathered in the Ordinance of the Minister of Health from the 30th of August 2019 on medical examinations of applicants for driving licences and drivers (Law Journal of 2019, item 1659) in Poland [11]. In the UK, the information is available in the Advice for Medical Professionals to Follow when Assessing Drivers with Visual Disorders (last update from the 4th of March 2020) [12]. The EU similarly has its own recommendations published in Annexe III of Directive 2006/126/EC of the European Parliament and the Council from the 20th of December 2006 on driving licences (last update as of the 22nd of July 2018) [13].

So far, there are very few comparative studies in the world literature concerning the ophthalmic standards applicable to drivers in different countries. The studies that exist are sketchy, out of date and inaccurate [7, 10].

The purpose of the study was to review ophthalmological criteria required from drivers in Poland and the UK and comparing them with the EU recommendations. The most important functions of the eye, such as visual acuity, visual field, colour vision, binocular vision, glare sensitivity, mesopic vision and contrast sensitivity, were reviewed. The choice of countries is not random. Poland is constantly adjusting its standards to UE recommendations [11, 14], while the UK as an island country has always differed from the continent (left-hand car traffic, different measurement system etc). Although the European Union countries have their individual driving licence guidelines, the EU can potentially overrule these. That is the reason why the European Union ophthalmological standards had also been reported.

### Methods

Sources included current legal acts, ordinances and directives, government and non-profit websites, as well as study reports and journal articles. The relevant legal acts in force in Poland and the UK were found on government websites (respectively www.sejm.gov.pl and www.gov.uk) while access to the European Union law was provided by the website www.uer-lex.europa.eu. This review includes

papers concerning ophthalmological criteria applicable to drivers published in 2000-2020. The papers were identified by literature search of medical and other databases (MEDLINE, Web of Science, SciELO, SCIRUS, RSCI, Google Scholar, Cochrane Library) using the terms "drivers" and "vision" or "ophthalmological norms". After the preliminary hand-search only18 papers were selected for further analysis.

**Results**

In Poland, an ophthalmological driving test should include:

- Visual acuity without and with compensation
- Binocular best-corrected visual acuity
- Visual field
- Colour recognition
- Binocular vision
- Glare sensitivity
- Mesopic vision
- Contrast sensitivity [15]

In accordance with the law in Poland, many vehicle categories were distinguished, which is similar to Directive 2002/24/EC of the European Parliament and the Council [16]. Details are collected in Table 1.

**Table 1.** Vehicles that can be driven in each driving licence category

| Category | Vehicle |
|---|---|
| AM | Vehicles with a maximum design speed of no more than 45 km/h, e.g. two-wheel vehicles or three-wheel ones as defined in Article 1(2)(a) of Directive 2002/24/EC of the European Parliament and of the Council from the 18th of March 2002 relating to the type-approval of two or three-wheel motor vehicles (excluding those with a maximum design speed under or equal to 25 km/h), and light quadricycles as defined in Article 1(3)(a) of Directive 2002/24/EC [15] |
| A1 | 1) motorcycles with a cylinder capacity not exceeding 125 cubic centimetres, of power not exceeding 11 kW and with a power to weight ratio not exceeding 0.1 kW/kg<br>2) motor tricycles with a power not exceeding 15 kW |
| A2 | motorcycles with power not exceeding 35 kW and with a power to weight ratio not exceeding 0.2 kW/kg and not derived from a vehicle of more than double its power |
| A | 1) motorcycles<br>2) motor tricycles with a power exceeding 15 kW |
| B1 | quadricycles as defined in Article 1(3)(b) of Directive 2002/24/EC |
| B | motor vehicles with a maximum authorised mass not exceeding 3,500 kg, designed and constructed for carrying no more than eight passengers in addition to the driver; motor vehicles in this category may be combined with a trailer having a maximum authorised mass which does not exceed 750 kg |
| BE | combination of vehicles consisting of a tractor vehicle in category B and a trailer or semi-trailer where the maximum authorised mass of the trailer or semi-trailer does not exceed 3,500 kg |
| T | tractor |
| C1 | motor vehicles other than those in categories D1 or D, the maximum authorised mass of which exceeds 3,500 kg but does not exceed 7,500 kg, and which are designed and constructed for carrying no more than eight passengers in addition to the driver; motor vehicles in this category may be combined with a trailer having a maximum authorised mass not exceeding 750 kg |
| C1E | 1) combinations of vehicles where the tractor vehicle is in category C1 and its trailer or semi-trailer has a maximum authorised mass of over 750 kg provided that the authorised mass of the combination does not exceed 12,000 kg<br>2) combinations of vehicles where the tractor vehicle is in category B and its trailer or semi-trailer has an authorised mass of over 3,500 kg, provided that the authorised mass of the combination does not exceed 12,000 kg |
| C | motor vehicles other than those in categories D1 or D, which maximum authorised mass is over 3,500 kg and which are designed and constructed for carrying no more than eight passengers in addition to the driver; motor vehicles in this category may be combined with a trailer having a maximum authorised mass which does not exceed 750 kg |
| CE | combinations of vehicles where the tractor vehicle is in category C and its trailer or semi-trailer has a maximum authorised mass of over 750 kg |
| D1 | motor vehicles designed and constructed for carrying no more than 16 passengers in addition to the driver and with a maximum length not exceeding 8 m; motor vehicles in this category may be combined with a trailer having a maximum authorised mass not exceeding 750 kg |
| D1E | combinations of vehicles where the tractor vehicle is in category D1 and its trailer has a maximum authorised mass of over 750 kg |
| D | motor vehicles designed and constructed for carrying more than eight passengers in addition to the driver; motor vehicles which may be driven with a category D licence may be combined with a trailer having a maximum authorised mass which does not exceed 750 kg |
| DE | combinations of vehicles where the tractor vehicle is in category D and its trailer has a maximum authorised mass of over 750 kg |

Annexe No 2 to the Ordinance of the Minister of Health from the 30th of August 2019 (Law Journal of 2019, item 1659) on medical examinations of applicants for driving licences and drivers precisely sets ophthalmological norms in this field. Detailed ophthalmological criteria for drivers and candidates for drivers for individual driving licence categories are presented in Table 2 [11].

In the European Union, issues related to driving licences are precisely regulated by the Directive 2006/126/EC of the European Parliament and the Council from the 20th of December 2006 on driving licences (last update as of the 22nd of July 2018). Its Annexe III precisely sets the minimum requirements for the physical and mental ability for driving motor vehicles. Detailed ophthalmic parameters for candidates and drivers recommended by the European Union are presented in Table 3 [13].

The Driver and Vehicle Licensing Agency publishes health criteria relevant for assessing driving ability in the UK. The precise parameters of the organ of vision required from drivers are contained in the Advice for Medical Pro-

**Table 2.** Ophthalmic criteria applicable in Poland to candidates for drivers and drivers with a driving licence category AM, A1, A2, A, B1, B, B + E, T, C1, C1 + E, C, C + E, D1, D1 + E, D, D + E, permission to drive a tram, privileged vehicle or transporting monetary values, as well as driving techniques instructors and making road transport or working as drivers

| | **Candidates and drivers with driving licence category AM, A1, A2, A, B1, B, B+E, T** |
|---|---|
| **Visual acuity** | Both eyes ≥ 0.5 with correction |
| **Compensation** | No limits; glasses, contact lenses, intraocular lenses; good tolerance and adaptation to correction required |
| **Colour vision** | Not required |
| **Visual field** | Both eyes horizontal ≥ 120°, range ≥ 50° right and left, as well as ≥ 20° up and down; no defect should be present within a radius of 20° from fixation (in glaucoma and retinal degeneration perimetric a test is required, in other cases confrontational test proves sufficient) |
| **Binocular vision** | If monocular, there is no contraindication for driving under the conditions:<br>a) visual acuity in the better eye ≥ 0.5<br>b) field of vision: horizontal ≥ 120°, range ≥ 50° right and left, as well as ≥ 20° up and down; no defect should be present within a radius of 20° from fixation<br>c) at least 6 months have passed from monocular or diplopia |
| **Mesopic vision** | Not required (it is performed if the examined person has implanted intraocular lenses, is after refractive surgery or for other reasons resulting from the medical examination) |
| **Glare sensitivity** | Not required (it is performed if the examined person has implanted intraocular lenses, is after refractive surgery or for other reasons resulting from the medical examination) |
| **Contrast sensitivity** | Not required (it is performed if the examined person has implanted intraocular lenses, is after refractive surgery or for other reasons resulting from the medical examination, but the lack of deviations in the twilight vision test is synonymous with the correct result of the contrast sensitivity test) |

| | **Candidates and drivers with a driving licence category C1, C1E, C, CE, D1, D1E, D, DE, permission to drive a tram, privileged vehicle or transporting monetary values as well as driving techniques instructors and making road transport or working as drivers** |
|---|---|
| **Visual acuity** | Both eyes ≥ 0.8 with correction, better eye ≥ 0.8, poorer eye ≥ 0.1 |
| **Compensation** | Glasses, contact lenses, intraocular lenses; good tolerance and adaptation to correction required**,** power not exceeding ±8.0 D |
| **Colour vision** | Correct perception of red, green, yellow |
| **Visual field** | Both eyes horizontal ≥ 160°, range ≥ 70° right and left, as well as ≥ 30° up and down, no defect should be present within a radius of 30° from fixation |
| **Binocular vision** | After the substantial and sudden loss of vision in one eye, driving is possible if at least 6 months have passed since the onset of significant loss of vision and an ophthalmologist has confirmed adaptation for monocular vision. Diplopia is a contraindication for driving |
| **Mesopic vision** | No impairment |
| **Glare sensitivity** | No impairment |
| **Contrast sensitivity** | No deviations in twilight vision means a correct result of contrast sensitivity test |

**Table 3.** Ophthalmic criteria recommended by the European Union to candidates for drivers and drivers with a driving licence category AM, A1, A2, A, B1, B, BE, C1, C1E, C, CE, D1, D1E, D, DE

| | **Candidates and drivers with a driving licence category AM, A1, A2, A, B1, B, BE** |
|---|---|
| **Visual acuity** | At least 0.5 when using both eyes together |
| **Compensation** | No limits: glasses, contact lenses, intraocular lenses. When progressive eye disease is detected or declared, driving licences may be issued or renewed subject to the applicant undergoing regular examination by a competent medical authority |
| **Colour vision** | Not required |
| **Visual field** | Moreover, the horizontal visual field should be at least 120°, the extension should be at least 50° left and right and 20° up and down. No defects should be present within a radius of the central 20° |
| **Binocular vision** | Applicants for a driving licence, or for the renewal of such a licence, who have a total functional loss of vision in one eye or who use only one eye (e.g. in the case of diplopia) must have a visual acuity of at least 0.5, with corrective lenses if necessary. The competent medical authority must certify that this condition of monocular vision has existed for a sufficiently long time to allow adaptation (for example six months) and that the field of vision in this eye meets the above requirement |
| **Mesopic vision** | Not required (may be considered in 'exceptional cases', where the visual field standard or visual acuity standard cannot be met; in such cases, the driver should undergo examination by a competent medical authority to demonstrate that there is no other impairment of visual function) |
| **Glare sensitivity** | Not required (may be considered in 'exceptional cases' where the visual field standard or visual acuity standard cannot be met; in such cases, the driver should undergo examination by a competent medical authority to demonstrate that there is no other impairment of visual function) |
| **Contrast sensitivity** | Not required (may be considered in 'exceptional cases' where the visual field standard or visual acuity standard cannot be met; in such cases, the driver should undergo examination by a competent medical authority to demonstrate that there is no other impairment of visual function) |
| **Visual acuity** | Better eye ≥ 0.8 with correction, poorer eye ≥ 0.1 with correction |
| **Compensation** | Glasses with power not exceeding + 8.0 D, or with the aid of contact lenses, which must be well-tolerated |
| **Colour vision** | Not required |

| | **Candidates and drivers with a driving licence category C1, C1E, C, CE, D1, D1E, D, DE** |
|---|---|
| **Visual acuity** | Better eye ≥ 0.8 with correction, poorer eye ≥ 0.1 with correction |
| **Compensation** | Glasses with power not exceeding + 8.0 D, or with the aid of contact lenses, which must be well-tolerated |
| **Colour vision** | Not required |
| **Visual field** | Moreover, the horizontal visual field with both eyes should be at least 160°, the extension should be at least 70° left and right and 30° up and down. No defects should be present within a radius of the central 30° |
| **Binocular vision** | After a substantial loss of vision in one eye, there should be an appropriate adaptation period (for example six months) during which the subject is not allowed to drive. After this period, driving is only allowed after a favourable opinion from vision and driving experts<br>Diplopia is a contraindication for driving |
| **Mesopic vision** | May be considered in 'exceptional cases' |
| **Glare sensitivity** | May be considered in 'exceptional cases' |
| **Contrast sensitivity** | No impairment |

**Table 4.** Ophthalmic criteria applicable in the United Kingdom to car and motorcycle as well as bus and lorry candidates for drivers and drivers

| | **Car and motorcycle candidates for drivers and drivers** |
|---|---|
| **Visual acuity** | In good daylight, able to read the registration mark fixed to a vehicle registered under current standards at a distance of 20 metres with letters and numbers 79 mm high by 50 mm wide on a car registered since 1 September 2001 or<br>at a distance of 20.5 metres with letters and numbers 79 mm high by 57 mm wide on a car registered before 1 September 2001 and<br>The visual acuity must be at least 6/12 with both eyes open or in the only eye if monocular<br>Any driver unable to meet these standards must not drive and must notify the Driver and Vehicle Licensing Agency, which will refuse or revoke a licence |
| **Compensation** | Glasses or contact lenses: good tolerance and adaptation to correction required<br>Bioptic telescope devices are not accepted |
| **Colour vision** | Not required |
| **Visual field** | At least 120° on the horizontal measured using a target equivalent to the white Goldmann III4e settings (a cluster up to 3 adjoining missed points, unattached to any other area of defect, lying on or across the horizontal meridian and a vertical defect of only single-point width but any length, unattached to any other area of defect, which touches or cuts through the horizontal meridian are disregarded when assessing the width of the field)<br>The extension should be at least 50° left and right. In addition, there should be no significant defect in the binocular field that encroaches within 20° of the fixation above or below the horizontal meridian (scattered single missed points and a single cluster of up to 3 adjoining points are generally regarded as an acceptable central loss)<br>Homonymous or bitemporal defects that come close to fixation, whether hemianopic or quadrantanopic, are not usually acceptable for driving |
| Binocular vision | For complete loss of vision in one eye (cases where there is any light perception in the affected eye are not considered monocular), the driver: must meet the same visual acuity and visual field standards as binocular drivers and may drive only after clinical advice of successful adaptation to the condition. Only those monocular people who fail to meet these requirements are required to notify DVLA.<br>Driving may resume after the DVLA has received confirmation that the diplopia is controlled, for example by glasses or a patch for which there is an undertaking to use it while driving (but note the requirements for monocular vision above). Exceptionally, stable uncorrected diplopia endured for 6 months or more may be licensable with the support of a consultant specialist's report of satisfactory functional adaptation. |
| **Mesopic vision** | Usually not required but in the case of nyctalopia driving may be licensed after individual consideration, provided the standards for visual acuity and field of vision |
| **Glare sensitivity** | Usually not required but in the case of cataract glare may counter an ability to pass the number plate test of the minimum requirements, even when cataract allows apparently appropriate visual acuity |
| **Contrast sensitivity** | Usually not required but in the case of cataract glare may counter an ability to pass the number plate test of the minimum requirements, even when cataract allows apparently appropriate visual acuity |

fessionals to Follow when Assessing Drivers with Visual Disorders (last update as of the 4th of March 2020). The most important data from this document are shown in Table 4 [12].

**Discussion**

It is worth noting that both in Poland and the UK the required visual acuity of car and motorcycle drivers is 0.5, which is in line with the EU recommendations [11–13]. There is an additional condition of ability to read the registration mark fixed to a vehicle at a distance of 20 meters in the UK [6, 12, 17].

The visual field for car and motorcycle drivers with limit values of 120°, 50° and 20° is identical in Poland and the UK and coincides with the EU recommendations [11-13].

Similar ophthalmological criteria for obtaining a driving licence are binding for monoculars both in Poland and the UK and match the EU recommendations (VA = 0.5 and adaptation to monocularity required; 6 months from the start of monocularity) [11–13]. Poland only complied with these guidelines by the Ordinance of the Minister of Health from the 23rd of December 2015 [14]. By 2015, to obtain a category A driving licence in Poland, a correct

**Table 4.** Ophthalmic criteria applicable in the United Kingdom to car and motorcycle as well as bus and lorry candidates for drivers and drivers *(continuation)*

| | **Bus and lorry candidates for drivers and drivers** |
|---|---|
| **Visual acuity** | 6/7.5 (0.8 decimal) in the better eye with correction and 6/60 (0.1 decimal) in the poorer eye with correction |
| **Compensation** | Glasses (corrective power not exceeding +8.0 D in any meridian of either lens) or contact lenses; good tolerance and adaptation to correction required<br>Bioptic telescope devices are not accepted |
| **Colour vision** | Not required |
| **Visual field** | An uninterrupted measurement of at least 160° on the horizontal plane<br>Extensions of at least 70° left and at least 70° right<br>Extensions of at least 30° above and at least 30° below the horizontal plane<br>No significant defect within 70° right and 70° left between 30° up and 30° down (it would be acceptable to have a total of up to 3 missed points, which may or may not be contiguous)<br>No defect is present within a radius of the central 30° |
| **Binocular vision** | The law bars licensing if in one eye there is a complete loss of vision or corrected acuity falls below Snellen 3/60 (Snellen decimal 0.05).<br>Monocular drivers must meet the same visual acuity and visual field standards as binocular drivers and may drive only after clinical advice of successful adaptation to the condition.<br>Licensing will be refused or revoked permanently in cases of insuperable diplopia. Patching is not acceptable for licensing. |
| **Mesopic vision** | No impairment |
| **Glare sensitivity** | No impairment |
| **Contrast sensitivity** | No impairment |

binocular vision had been required, although one could apply for a category B driving licence [18].

Colour vision for drivers in the UK is not required, which is consistent with the EU recommendations [6, 12, 13]. In Poland, this issue is diverse; car and motorcycle drivers do not have to distinguish between colours, but bus and lorry drivers must correctly recognise red, green and yellow [11]. This is in accordance with the Annexe III of Directive 2006/126/EC of the European Parliament and the Council from the 20th of December 2006 on driving licences. The above also mentions that the standards set by the Member States for the issue or any subsequent renewal of a driving licence may be stricter than those set out in this Annexe [13].

Mesopic vision, glare and contrast sensitivity are not required but may be ordered as an auxiliary examination for a person who is considered for a driving licence despite not meeting the visual acuity criteria according to the EU recommendations [13]. In Poland, they are required for bus and lorry drivers. However, for motorbike and car drivers they are not obligatory but are performed if the examined person has implanted intraocular lenses, is after refractive surgery, or for other reasons resulting from medical examination [11]. In the UK glare and contrast sensitivity or mesopic vision are not required. However, the plate test can be a substitute of glare or contrast sensitivity test especially in the case of cataract [19–21].

Required ophthalmological specifications are enough to drive. The analysis of road crashes in 2014 and 2018 shows that the number of collisions has been decreasing both in the entire EU, in particular Poland and the UK [22, 23]. Detailed results are collected in Table 5.

While throughout that time the EU recommendations and ophthalmological guidelines applicable to drivers in the UK have not changed, in Poland they have become much more liberal after 2015. The 10% decrease in the number of road crashes in Poland is therefore not related to the relaxation of ophthalmic parameters for drivers but rather results from speed limit, road safety observatory, better road infrastructure, safer cars and greater road culture of drivers [24, 25, 26, 27]. In the period considered, the effect of road crashes i.e. the number of fatalities and injuries, also significantly decreased in Poland.

**Conclusions**

Current minimum vision requirements for drivers in Poland resulting from the Ordinance of the Minister of Health from the 30th of August 2019 (medical examination of applicants for driving licence and drivers) are closely integrated with the European Union recommendations expressed in the latest update to the Directive 2006/126/EC of the European Parliament and of the Council on driving licence and are similar to the criteria in the United Kingdom. Similarities with minor nuances relate especially to visual acuity, visual field and binocular vision and differences occur in the approach to colour vision.

A detailed analysis of road crashes in Poland, the United Kingdom and the European Union has shown that the visual requirements for drivers in these places are not too strict but sufficient to maintain safe driving. Moreover, the

**Table 5.** Statistic of road crashes in 2014 and 2018 in Poland, the UK and the EU

| | Poland | | The United Kingdom | | The European Union | |
|---|---|---|---|---|---|---|
| | 2014 | 2018 | 2014 | 2018 | 2014 | 2018 |
| Road crashes | 34,970 | 31,674 | 152,407 | 128,384 | 1,034,148 | 1,026,641 |
| Fatalities | 3,202 | 2,862 | 1,854 | 1,839 | 23,355 | 23,899 |
| Injuries | 42,545 | 37,359 | 202,011 | 167,478 | 1,358,170 | 1,318,607 |
| Fatalities/100 crashes | 9.2 | 9.0 | 1.2 | 1.4 | 2.3 | 2.3 |
| Injuries/100 crashes | 121.7 | 117.9 | 132.5 | 130.5 | 131.3 | 128.4 |

example of Poland shows that the liberalization of ophthalmic norms applicable to drivers does not lead to an increase in the number of road crashes. Thus, it is possible to further relax the ophthalmic standards for drivers.

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