

THE COST-EFFECTIVENESS OF VISION TESTS FOR MOTORISTS

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Eye-tests for road users, more particularly for applicants for a driver licence, are considered primarily as a way to improve road safety. One seems to adhere to the following "logic", usually only implicitly:

- (a) driving a car is predominantly a visual task
- (b) blind persons cannot drive
- (c) people with good eye-sight can drive good
- (d) there is a gradual increase from "impossible" to "good" both as regards driving and vision
- (e) driving poorly is identical to driving dangerously
- (f) critical, visual aspects of driving are (nearly) constant in time.

If this "logic" would make any sense, the number of accidents should decrease if those persons with inadequate eye-sight were prohibited to drive.

A more detailed inspection of this "logic" reveals, however, its weakness:

Ad (a). True, but that does not mean that the visual aspects are the most critical as regards road safety. In the contrary, it seems that accidents usually can be connected with faulty decisions.

Ad (b). Correct.

Ad (c). This assumption seems plausible; it is, however, in many cases nothing but a circular argument, as usually in this way "good" (i.e. adequate) eye-sight is defined.

Ad (d). A difficult point, which cannot be substantiated as regards the visual aspects. It seems, however, that, as in many visual aspects, a better description is a sudden transition (threshold) between inadequate and adequate vision.

Ad (e). This assumption is incorrect, as follows from extensive research.

Ad (f). This statement is only partly true. The pathologies of the eye that are to be found in Western Europe are either (nearly) stationary, or do not impair vision. In fact, the long-term effects

are nearly completely restricted to refractionary aberrations, which are usually innate.

The "logic" so it seems, does not hold, and therefore should not be followed. However, one has to do with a very complicated matter; it is conceivable therefore that the chain of cause-and-effect is not that simple. So another approach should be considered: if in reality people with poor eye-sight present a traffic hazard, they must be over-represented in traffic accidents. It might seem to be a simple matter to check this; however, it turns out that - primarily as a result of the way accident data are collected - it is difficult to arrive at a conclusive statement. The research can be summarised as follows: at the one hand it is difficult to prove a relationship between the accident history of drivers and their visual performance (Hills & Burg, 1977), at the other hand it is quite clear that better sight (or better optometric correction) helps to reduce accidents (Hofstetter, 1975).

With this in mind, a prohibition to drive on the basis of an obligatory eye-test should be taken into consideration only if

1. the (absolute) number of accidents that will be avoided, is large;
2. the number of individuals correctly prohibited to drive, is small;
3. the number of individuals prohibited incorrectly to drive, is very small.

On the basis of a numerical example it will be investigated whether an eye-test can fulfill these requirements. For the sake of the argument, it will be assumed that the eye-test itself is absolutely certain, i.e. the relevant criteria are known, and they can be tested with 100% accuracy. This is an optimistic, probably even an unrealistic viewpoint, so that the results will in reality be less favourable for the eye-test.

The following example is based on recent overall data of The Netherlands, part from statistics, part from estimates.

The number of drivers is about 5,000,000. The number of traffic fatalities is about 2,500 per year, thus per driver per year $5 \cdot 10^{-4}$. The number of new applicants for a driver licence is about 250,000 per year. An eye-test is considered to cost about Hfl 40,-. The total economic loss as a result of road accidents is about 3.5 billion guilders, thus well over one million guilders per fatality. Here, the number of fatalities is used as a basis for the comparison. This is a valid method, as the ratio between fatalities, injuries and damage-only-accidents is near constant. Finally, a driver will drive for about 40 years.

Now assume that 1% of drivers had very bad eye-sight (whatever may be the criterion for this) resulting in a double risk. Thus 50,000 drivers account for 50 instead of 25 fatalities per year. The maximum effect of the test resulting in eliminating these drivers would be 25 fatalities per year. For the average "life" of 40 years of a driver this is 1,000 fatalities. Thus, in order to arrive at this effect, 49,000 drivers are prohibited unjustified - for their life - to drive. It follows therefore, that the three requirements 1, 2 and 3 are not met.

Furthermore, 250,000 tests per year cost 10 million guilders. Thus, a considerable part of the - monetary - benefit of the measure is lost on the costs of the tests alone!

And finally, the 1% with double risk seems unlikely to be true; if such large effects would exist, one should expect that this would be shown in the accident repeater studies.

The foregoing considerations lead therefore to the conclusion that the prohibition to drive, based on a eye-test cannot be justified on grounds of accident reduction. Considerations of this sort have prompted the Government of The Netherlands to make an eye-test (in casu a simple measurement of the visual acuity) obligatory as a screening test only for applicants for a driver licence. If negative, the applicant has to consult an ophthalmologist, who may give a negative advice as regards the acquisition of a driver licence. This screening test has the additional benefit that insuf-

ficient eye-sight is often a sign of pathologies, that otherwise might stay unnoted.

References

Hills, B.L. & Burg, A. (1977). A reanalysis of California Driver Vision Data: General Findings. Report No. 768. Transport and Road Research Laboratory, Crowthorne, 1977.

Hofstetter, H.W. (1975). Vision traits in relation to driver licensing requirements. Proc. 1st International Congress on Vision and Road Safety, Paris, 1975, pp. 461-471.