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## **Visual impairment, optical correction and their impact on activity limitations in the elderly.**

### **The POLA Study.**

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The loss of autonomy among older persons is a major public health issue.

In the disablement process model<sup>1</sup> chronic and acute conditions lead to psychological and physical deficiencies and ultimately to difficulty performing activities of daily life. In elderly, visual impairment is one of the major deficiencies leading to activity limitations and can be caused by either eye trauma or ocular diseases (affecting the ability to receive or process visual information), or by refractive errors (a failure of the eye to focus images sharply on the retina). Refractive errors affect about a third of the US and Western European populations.<sup>2</sup> We estimated the proportion of uncorrected refractive errors and the potential improvement in daily life functioning that could be brought about by optimal visual correction.

**Methods.** The POLA Study, described in detail previously,<sup>3</sup> aimed to identify risk factors for age-related eye diseases. The present study concerns the 1947 persons aged 63 years and over who completed the 3-year follow-up (1998 to 2000). Participants were administered standardized questionnaires and were assessed for Instrumental Activities of Daily Living (IADL) limitations<sup>4</sup> (participants unable to perform without assistance at least one of the eight activities of the Lawton scale). Eye examinations, performed by five ophthalmologists in a mobile unit equipped with ophthalmologic devices, included a measure of distance visual acuity in each eye with their usual optical correction (or no correction if they did not wear glasses/contact lenses) and then with the best achieved correction determined using objective refraction (RM-A7000, Topcon, Japan) and lenses of varying power.

Distance visual acuity was assessed with the Snellen decimal chart and analysed by extending the World Health Organization taxonomy of visual impairment. "*Low vision*" (including blindness) and "*Moderate visual impairment*" were defined as visual acuity in the better eye lower than 6/18 and 6/18 to 6/12, respectively. The "*unilateral visual loss group*" included

participants with visual acuity worse than 6/12 for one eye and normal for the other eye and the "normal group" those with 6/6 to 6/12 in each eye.

To assess the proportion of IADL-limitations that could be prevented with the use of the best achieved correction, the generalized impact fraction (GIF) of inappropriate optical correction was estimated using equations previously described<sup>5</sup> and stratified by age group (63 to 74 versus 75+). The age-stratified GIFs were combined using a case-load weighed sum method for an overall GIF.<sup>6</sup> The 95% Confidence Interval (CI) was obtained by bootstrapping.

**Results.** Of the 1947 participants 3.0% were excluded due to missing data, leaving 1887 participants (804 men and 1083 women) for this analysis. The median age was 72.3 years (interquartile range 68.1-77.0) and 10.3% (195) had IADL-limitations.

Moderate visual impairment and low vision were much more frequent in subjects with IADL-limitations (39.0% versus 23.3 % and 24.1% versus 5.6%, respectively) but not unilateral visual loss. Overall, 38.5% of participants had an inappropriate optical correction, which accounted for 64.5% and 50.4% of the cases of moderate visual impairment and low vision, respectively.

The overall GIF which represents the fractional reduction of activity limitations resulting from changing the usual visual correction to the best achieved visual correction (**Table**) was estimated to 20.5% (95% CI, 13.6-27.9). We were not able to adjust the GIF calculation for all possible confounders because of sparse data;<sup>6</sup> however age was the only obvious confounding factor when we examined the association between vision and activity limitations (adjusting for gender, living alone, smoking, alcohol, body mass index, cardiovascular and cerebrovascular disease, antidepressant use, and hospitalization).

**Comment.** Among this non-institutionalized elderly population the majority of cases of low vision and moderate visual impairment were due to uncorrected refractive errors. One fifth of

IADL-limitations could be prevented by use of the best optical correction. Our results underline the importance of including eye examinations in cohorts studying disability and integrating ophthalmic surveillance in routine evaluation of the elderly.

According to the 2009 American Academy of Ophthalmology recommendations, people aged over 65 should have eye examinations every one to two years. This is critical to not only detect eye diseases but to measure refractive errors (which vary with age) and to correct these with glasses or contact lens. Programs designed to provide optical services in this population may contribute to maintaining activities and autonomy in elderly.

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**Data access:** Cecile Delcourt and Isabelle Carrière have full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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**Table.** Number and percent of subjects having distance vision loss with usual and best achieved optical correction (N=1887).

Usual optical correction	Best achieved optical correction				Total
	Normal bilateral	Unilateral visual loss	Moderate visual impairment	Low vision	
Normal bilateral	726 (38.5)	-	-	-	726 (38.5)
Unilateral visual loss	353 (18.7)	197(10.4)	-	-	550 (29.1)
Moderate visual impairment	187 (9.9)	116 (6.1)	167 (8.9)	-	470 (24.9)
Low vision	22 (1.2)	18 (1.0)	31 (1.6)	70 (3.7)	141 (7.5)
Total	1288 (68.3)	331 (17.5)	198 (10.5)	70 (3.7)	1887 (100)