SIGHT OF UNDERGRADUATES* LOSS OF VISUAL ACUITY

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MEASUREMENT of individual sight among students not only enables individual diagnosis and prescription, but may determine vocational fitness, or aptitude for particular tasks. First-rate sight may be necessary for the University Air Squadron, or again, colour-vision defect may handicap a chemist whose work depends on colour indicators, and it may be better to know of any defect before the final examination takes place. Measurement of sight in a large group sets a standard of normality which may serve for comparison between university students and persons in other occupations. A knowledge of the proportion and extent of errors of refraction in each group of the population allows estimates to be made of the cost of ophthalmic services. If no young adult population is known with worse eyesight than university students, it may be because too few groups have been studied. Undergraduates' sight will be shown to be substantially worse than that of the 18-year-old men examined by National Service Boards in 1939.

The relative incidence of hypermetropia and myopia (under atropine cycloplegia) is fully discussed in most standard text-books of ophthalmology. Duke-Elder (1949) for example, shows how the incidence varies with age, race, and geographic region. It is generally known, too, that although hypermetropia is commoner than myopia in most parts of the world, more young adults wear glasses for myopia because those with hypermetropia are more often able to overcome their handicap without strain. But in seeking to compare the visual acuity of various groups in the population difficulties are soon encountered. Many authorities provide scanty information or none concerning the frequency with which defective visual acuity may be expected. This is largely because the samples studied have referred to hospital patients or to other groups equally unrepresentative of the community with regard to age, sex, or occupation. If the correction of errors of refraction under the National Health Service has recently proved unexpectedly expensive it may partly be due to greater emphasis

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having been placed in the past on the defects themselves than on how they affect the nation. Keil (1949), discussing the development of visual acuity during childhood, reported good sight (6/6 in metres, 20/20 in feet to Snellen's test type) in 16 per cent. of children aged 3 to 4 years, 56 per cent. of those aged 6, and 75 per cent. of those aged 14. He expressed the opinion, though without supporting evidence, that from 14 to 25 years of age there is probably a gradual increase in visual acuity, and that after this a general decline begins which is not attributable to disease. Evidence from the present survey suggests that visual acuity in undergraduates has already started to decline in the period from 17 to 25 years. Increasing loss of sight is a recognized concomitant of old age, but, viewed from either a physiological or geriatric standpoint, it is interesting to find decline of visual acuity already advancing in young adult life, in the same way indeed as auditory acuity may be lost or arteriosclerosis may progress.

Study may injure sight, or those with poor sight, being free from the distraction of outside activities, may find more time for study. A third unrelated or unrecognized factor may exercise selective influence. For example, more scholars may have been advised to start their university course before doing military training, or having poor sight may have been exempt from military service. On the other hand, Forces Educational Training Grants were available mainly to ex-service students, that is to those who had passed the filter of a medical board on entering the service. Such factors complicate the picture, making it more difficult to unravel the truth. On account of their small size, samples available at present do not always permit conclusive answers, but more material is in course of collection and the present position is stated below.

OCULAR DEFECTS

The ocular defects found among 474 undergraduates at the initial health examination are summarized in Table I. Five per cent. of

TABLE I
OCULAR DEFECTS. PERCENTAGE DISTRIBUTION BY SEX

Defect	Men (297)	Women (177)
Myopia	31	33
Astigmatism	10	13
Hypermetropia	8	8
Strabismus	2	4
Conjunctivitis	2	2
Other eye defect	8	3
Percentage of students affected	44	50

each sex were referred to an ophthalmic surgeon, oculist, or optician. In the year which followed the initial examination, 21 per cent. of men and 24 per cent. of women received refraction tests, but 7 and 10 per cent. respectively were not found to require new glasses. After the advent of the National Health Ophthalmic Service more use was made of it than might have been predicted from previous experience. Altogether 18 per cent. of the present sample of students obtained new glasses between 5 July, 1948, and the Easter vacation, 1949.

Neither the number of glasses provided nor the proportion of students who actually use their glasses or wear them at the time of interview is an adequate measure of the extent of ocular defects. Minor degrees of imbalance, though sufficient to cause symptoms, would escape being counted. But it is of interest to find in a report from Michigan University (1945) that the proportion of students who have at some time worn glasses has increased in successive years from 24 per cent. in 1919 to 42 per cent. in 1940. At Cambridge in 1948-49, 31 per cent. of 1,727 undergraduates wore glasses (Rook, 1950).

VISUAL ACUITY

SEX.—Snellen test type was used for testing visual acuity. No significant difference in acuity was found between the sexes (Table II).

TABLE II
VISUAL ACUITY. PERCENTAGE DISTRIBUTION BY SEX

Grade	Metres	Feet	Men (279)	Women (170)
Good	6/6 6/9	20/20 20/30	16.2 } 47.8 } 64.0	13.9 } 45.2 } 59.1
Medium	6/12 6/18 6/24	20/40 20/60 20/80	7.3 } 4.5 } 4.5 } 16.3	8.8 } 6.8 } 6.5 } 22.1
Poor	6/36 6/60 or worse	20/100 20/100 or worse	4.1 } 15.7 } 19.8	3.5 } 15.4 } 18.9

AGE.—Analysis by age groups is omitted here because of the necessity to consider those passed for military service separately from the remainder. Sub-division into three age groups produces too small samples.

ANNUAL RE-TESTING.—Fortunately another method is available, which is better in that the rate of deterioration is determined in a

TABLE III
VISUAL ACUITY (UNAIDED)
DETERIORATION IN ONE YEAR IN A PARTICULAR SAMPLE

Visual Acuity			Men (150)			Women (107)			Both Sexes
			Year I	Year II	Diff.	Year I	Year II	Diff.	Difference
Good ...	...	6/6	34	32	—2	27	24	—3	—5
		6/9	139	133	—6	105	102	—3	—9
Medium	...	6/12	23	23	0	19	22	+3	+3
		6/18	13	14	+1	14	12	—2	—1
		6/24	17	15	—2	11	12	+1	—1
Poor ...	...	6/36	13	16	+3	7	9	+2	+5
		6/60 or worse	61	67	+6	31	33	+2	+8

particular sample re-examined after 12 months. In this way possible errors resulting from the employment of varying samples are minimized.

In Table III are reported 514 observations of visual acuity, and the difference in that particular sample after one year. During this interval fourteen eyes left the group with good visual acuity and thirteen entered the group with poor visual acuity.

Test Conditions.—The test was carried out using the same test type in the same surroundings, and the rule throughout was that the complete line had to be read correctly. A second chance was given if one mistake was made. Although this should not be relevant it might be considered unfair to omit mentioning that the recorder changed before the second observations were complete.

The rate of deterioration would be subject to criticism on the grounds that because the change is small it is not easy to estimate correctly on a sample of only 257 persons. Lastly, because I could find no published account of annual re-testing in Great Britain, no comparison with results at other British universities was possible.

RATE OF DETERIORATION.—These limitations being borne in mind, it seems that 2 to 3 per cent. may be expected to leave the group with good sight each year and that about the same proportion will be added to that with bad visual acuity. A similar but slightly slower rate of deterioration of visual acuity was reported by Boynton (1936). Of 1,000 students, 18.2 per cent. had a visual acuity of 20/50 or less at enrolment, but this proportion had risen to 23.9 per cent. at the end of 4 years, an annual increase of 1.4 per cent. This author also noted that the students with lowest visual acuity on entry had the most marked decrease in vision at the end of 4 years, and that the better students (judged by a college ability test) tended to have poorer sight.

COMPARISON WITH OTHER GROUPS

A difference in visual acuity between university students and young men of 18 in the general population is demonstrated in Table IV.

TABLE IV
VISUAL ACUITY
UNDERGRADUATES COMPARED WITH OTHER YOUNG MEN

Number Examined		279 at Oxford	90,913 at Medical Boards
Visual Acuity Percentages	6/6 or better in both eyes	8.3	65.9
	6/6 or better in one, the other worse	14.7	13.3
	6/9—6/12 in both	41.6	7.6
	6/9—6/12 in one, the other worse ...	8.3	3.8
	6/18—6/36 in both	5.0	4.6
	6/18—6/36 in one, the other worse	5.4	2.2
	6/60 or less in both	16.8	2.6
		64.5	86.8
		13.3	8.4
		22.2	4.8

The figures for young men of 18 throughout England and Wales are taken from an analysis of the tests carried out by National Service Boards in 1939 (Martin, 1949). It seems that good sight is less common at Oxford, and poor sight is four or more times more common among undergraduates than in the general community. It is interesting to note that when similar tests were carried out on Oxford undergraduates by Schuster (1911) he reported 18 per cent. as having distinctly bad eyesight. The total number of errors of refraction is not, of course, revealed by Snellen's test. Short sight and moderately severe astigmatism are detected, though not distinguished from one another, but long sight and minor degrees of astigmatism may pass unnoticed.

Having shown this contrast between university students and others in the matter of visual acuity, the question may be asked whether the rate of deterioration of sight found among students could itself account for the difference between students and others. If from two to three per cent. leave the group with good sight annually, in the seven years from the age of 14 to 21 an approximate total of 14 to 21 per cent. of students would appear in the group with less than good sight. This calculation is only an approximation based on the questionable assumption that the eyesight would deteriorate at a uniform rate. A rate of deterioration of this order would, however, supposing it to be caused mainly by excessive reading, be capable of bringing about the difference observed between students and others. Furthermore, injury to sight among the studious may

overtake natural improvement in visual acuity before the age of 14. The available evidence supports, or at least does not disprove, the contention that the poor sight of undergraduates results from excessive reading.

SUMMARY

(1) Existing ophthalmological literature lacks references to the prevalence of defective visual acuity in certain groups of the population.

(2) The prevalence of common ocular defects among undergraduates, nearly a third of whom wear glasses, is recorded.

(3) The sight of undergraduates is four times worse than that of 18-year-old men in the general population; the general population was assessed by the findings of national service medical boards.

(4) Deterioration of visual acuity occurs while at the university.

(5) An attempt to estimate the rate of deterioration of visual acuity (excluding transient disturbance) suggests that the rate is slow. It may, nevertheless, be sufficient to account for the substantial difference between students and the general population of 18-year-old men.

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