

The eyesight of school children : being a record of the examination of over 3,000 school children / by W. B. Inglis Pollock.

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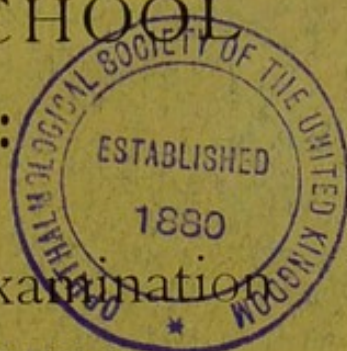


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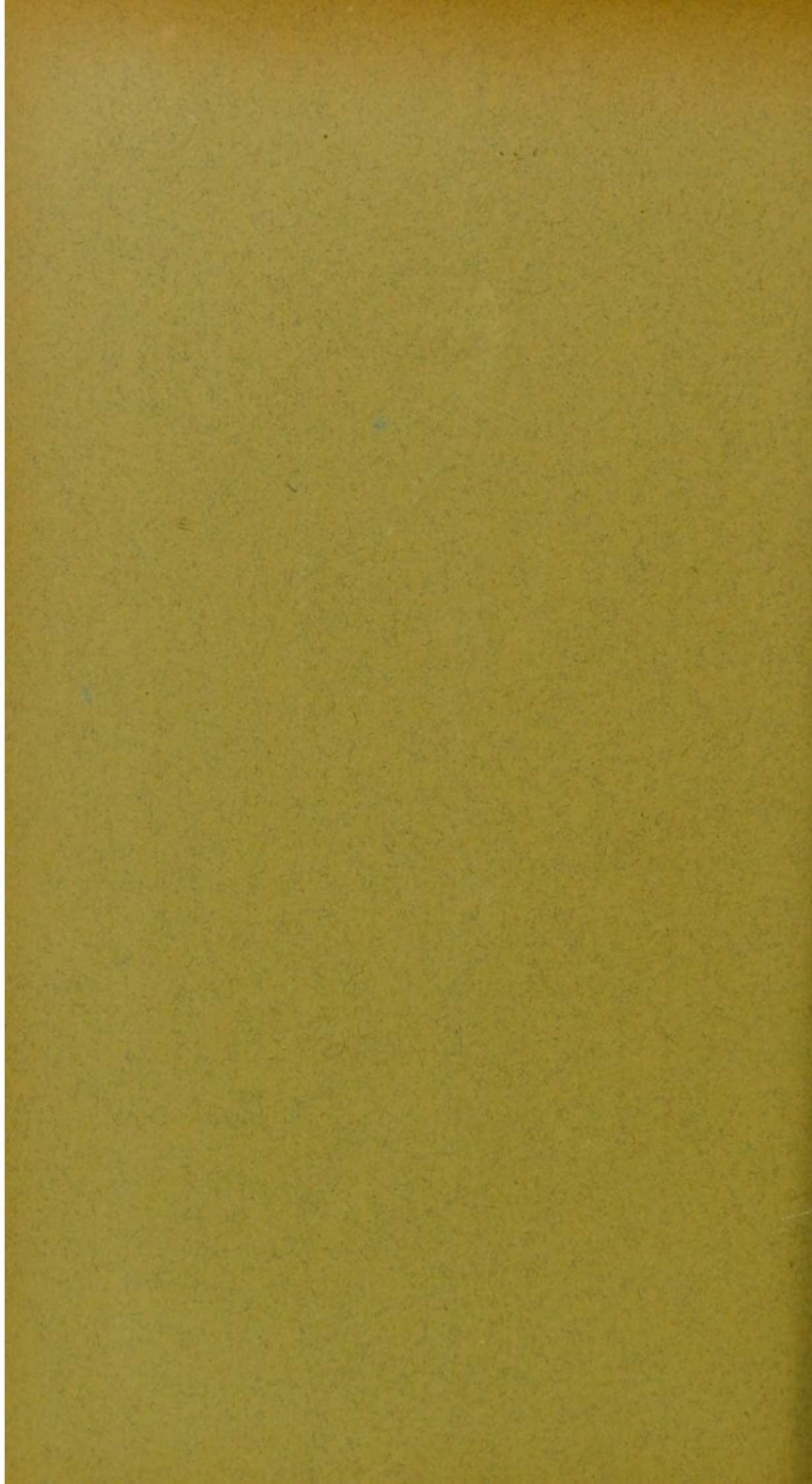


BY

W. B. INGLIS POLLOCK, M.D.

PRINTED FOR THE
ROYAL PHILOSOPHICAL SOCIETY OF GLASGOW
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The Eyesight of School Children: being a record of the examination of over 3,000 school children. By W. B. INGLIS POLLOCK, M.D.

[Read before the Society, 13th December, 1905.]

DURING the last few years there has been a very considerable increase of interest in the subject of school hygiene. We owe this in a great degree to the question of the physical degeneration of the race, which has been discussed in all manner of societies and periodicals.

The Royal Commission on Physical Education in Scotland found itself forced to discover not only the conditions which favoured, but also those which hindered physical culture, and, as a consequence, was led to recommend the medical inspection of school children.

It is unnecessary to lay stress on the importance of good eyesight in all the manifold and varied occupations of life, nor to discuss the handicap which is placed on those who are afflicted with any weakness of vision. The number of occupations is steadily increasing in which a preliminary test of the vision is necessary before the candidate proceeds to his or her training. I have examined in the course of the last eight months, by permission of the Rev. Dr. Smith and the members of the Govan School Board, the eyesight of all the pupils in three schools of the Govan School Board, viz., Elder Park, Church Street, and Hillhead High School. The two former are primary schools, while the last contains in addition a large secondary department. There are among its pupils a few French, German, Norwegian, Spanish, and Jewish scholars, but they are insufficient in numbers for a comparison with the native children.

The name, age, and standard of each child was noted. The acuteness of vision of each eye was investigated separately by means of Snellen's Test-types, and if glasses were worn it was again taken with the spectacles on. A test-type in which well-known objects replace the letters of the alphabet was used for young children. The types were illuminated by artificial light. The colour of the iris, the condition of the eyelids, the front of

the eyeball, and the fundus were then examined and noted. At the same time the refraction of each eye was taken by direct measurement with the ophthalmoscope, confirmed where necessary by retinoscopy, and checked by the results of the vision test. Colour perception was not tested, as it would have required a large amount of time to be accurately done, especially with the younger children.

VISUAL ACUTENESS.

It is not necessary for school purposes that children should have the vision of both eyes. With one eye they can read at a distance, or near at hand. The scholars have therefore been classified by their better eye. This system has anomalies, since children were returned as having perfect vision, although one eye was blind or almost so. The near reading test is not satisfactory. With it even moderate degrees of hypermetropia, or long-sight, escape detection owing to the activity of the accommodation in childhood, while it is altogether useless for the discovery of myopia, or short-sight. The vision was therefore determined by the distance test-types alone. The visual acuteness is affected by inflammation of the eyes, and such diseases are more common as a rule among the poorer classes of the population. These were fairly numerous in Church Street School, and, to some extent, accounted for the unfavourable results shown by the investigation in that school.

For statistical purposes the children have been divided into three groups according to their visual acuteness (the better eye). Table I. I have adopted the classification employed by Dr Kerr, the Chief Medical Officer of the London County Council Schools. The first group entitled good consists of all with visual acuity of $\frac{6}{6}$. The second group includes those with $\frac{6}{9}$ or $\frac{6}{12}$, and is called fair. All the others with visual acuteness of $\frac{6}{18}$ or worse are classified as defective. It will be seen that Elder Park School and Hillhead High School approximate closely, there being simply a difference of 8 or 9 per cent. between the good and the fair groups, but Church Street School is considerably worse than the other two. The reasons for this are various and will be discussed later.

Table II. gives the results for the total boys and the total girls arranged in the same groups. 1,574 boys and 1,609 girls were examined. The girls are worse than the

TABLE I.—VISUAL ACUTENESS.

ELDER PARK SCHOOL.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	2	63	131	134	118	112	130	134	107	88	20	1	—	—	—	1040	78.07
Fair, -	2	1	17	20	22	21	19	27	12	27	1	—	—	—	—	169	12.68
Defective, -	—	7	10	13	20	19	20	13	12	9	—	—	—	—	—	123	9.23
Total,	4	71	158	167	160	152	169	174	131	124	21	1	—	—	—	1332	—

CHURCH STREET SCHOOL.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	3	23	43	30	33	47	42	43	36	22	1	—	—	—	—	323	47.22
Fair, -	—	7	11	20	27	35	27	33	31	18	—	—	—	—	—	209	30.55
Defective, -	—	8	25	21	14	24	21	18	13	7	1	—	—	—	—	152	22.22
Total,	3	38	79	71	74	106	90	94	80	47	2	—	—	—	—	684	—

HILLHEAD HIGH SCHOOL.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	1	31	60	60	47	83	88	79	92	86	94	42	29	12	5	818	70.09
Fair, -	—	2	10	18	27	34	39	29	37	16	21	11	7	1	1	253	21.67
Defective, -	1	2	3	6	8	11	9	8	9	10	9	7	5	6	2	96	8.22
Total,	2	35	73	93	82	128	136	116	138	112	124	60	41	19	8	1167	—

TABLE II.—VISUAL ACUTENESS.

TOTAL BOYS.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	3	51	127	125	105	140	151	124	113	98	52	19	5	—	—	1113	70·71
Fair, -	2	5	16	32	33	43	37	43	38	34	8	4	3	—	—	298	18·93
Defective, -	—	9	17	20	18	18	24	19	15	11	5	2	3	2	—	163	10·35
Total,	5	65	160	177	156	201	212	186	166	143	65	25	11	2	—	1574	—

TOTAL GIRLS.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	3	66	107	108	93	102	109	132	122	98	63	24	24	12	5	1058	66·37
Fair, -	—	5	22	26	43	47	48	46	42	27	14	7	4	1	1	333	20·70
Defective, -	1	8	21	20	24	36	26	20	19	15	5	5	2	4	2	208	12·92
Total	4	79	150	154	160	185	183	198	183	140	82	36	30	17	8	1609	—

TABLE III.—VISUAL ACUTENESS.

GRAND TOTAL.

Ages, -	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Good, -	6	117	234	233	198	242	260	256	235	196	115	43	29	12	5	2181	68.52
Fair, -	2	10	38	58	76	90	85	89	80	61	22	11	7	1	1	631	19.82
Defective, -	1	17	38	40	42	54	50	39	34	26	10	7	5	6	2	371	11.65
Total,	9	144	310	331	316	386	395	384	349	283	147	61	41	19	8	3183	—

PERCENTAGES.

Ages, -	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Average.
Good, -	81.25	75.48	70.39	62.66	62.59	65.82	66.66	67.34	69.26	78.23	70.48	70.73	63.15	62.50	68.52
Fair, -	6.94	12.26	17.52	24.05	23.32	21.52	23.17	22.92	21.55	14.96	18.03	17.07	5.26	12.50	19.82
Defective, -	11.81	12.26	12.08	13.29	13.98	12.65	10.15	9.74	9.18	6.80	11.48	12.19	31.58	25.00	11.65

boys by 1·8 per cent. in the fair group, and 2·5 per cent. in the defective group, so that the boys have the advantage by 4·3 per cent. in the good group. The actual percentages of the defective group are 10·35 in the case of the boys, and 12·92 for the girls. Table III. contains the grand total of 3,183 school children of both sexes. The numbers are placed above, and the percentages for each age group below. Over all there are 68·52 per cent. with good vision, 19·82 per cent. with fair, and 11·65 per cent. with defective vision.

During the first four years of school life the good vision group exhibits a fall from 81·2 per cent. to 62·6 per cent., corresponding with a rise in the fair group from 6·9 per cent. to 24 per cent., while the defective group merely rises from 11·8 per cent. to 13·3 per cent. Although the picture test-type employed for the infant classes did not discriminate accurately between the good and the fair group, yet there is little doubt that these changes in the percentages prove that a very large strain has been thrown upon the eyes of the infants during their first years of school life. Thereafter there is a gradual improvement in the good group from 62·6 per cent. to 78·2 per cent. at fourteen years of age. During the same period both the fair and the defective groups decline, the former supplying about two-thirds of the improvement by falling from 24 per cent. to 14·9 per cent., and the latter, the other third, passing from 13·3 per cent. to 6·8 per cent. The eye-sight of the pupils has therefore recovered to a great extent from the strain of the earlier years. I cannot agree, however, with those observers who state that the number of children with normal vision increases with every year of school age. On the contrary, even with 78·2 per cent. at fourteen years of age the good group are not so high as the 81·2 per cent. of five years of age. It does not stand to reason that the vision of a child should improve as he grows older (I mean from five to fourteen years of age). If it is found that he is worse at five, a doubt arises as to whether the test was suited to his knowledge and understanding. My opinion is supported by the figures showing the results of the examination of 2,782 children in the infants' schools in London.¹ The percentages for the fair and the defective groups are given in the report, and from these the percentages for the good group are easily obtained. The tests were

¹ Report of the Medical Officer of the School Board of London, 1903.

very carefully carried out by three oculists, every effort being made to induce the children to take an interest in the proceedings. The good group began at 81·7 per cent. for 458 children of 6 to 6½ years of age, and fell steadily for each set of children arranged into age-periods of six months till it was 74·2 per cent. for 958 children of 8 to 8½ years. These figures are both convincing and instructive.

At fourteen years of age another change commences, which will be better understood later. Here it may be noted that the group with good vision falls from 78·2 per cent. to 63·3 per cent., while the defective group increases from 6·8 per cent. to 25 per cent. for eighteen years of age. Taking the defective group as a whole it will be seen that the variations are small during the first fifteen years of age. There were few children with very bad vision in the earlier classes. It is also true that the group may include a number of pupils of slow mental grasp or even timidity. Such factors would tend to show that the percentage of defective vision is too high for these earlier years, and if allowance were made for them the group might exhibit a greater increase than it does during school life.

Dr. Kerr¹ showed, two years ago, that there is an association between defective visual acuity and retarded position in school by dividing the children into two groups of those who were older and those who were younger than the average age of their standard. The former group exhibited a much larger percentage with defective vision than the younger pupils.

The same report also shows that defective visual acuity is greatest among children drawn from poorer neighbourhoods. Among the schools in which the pupils were mostly Jewish 36·2 per cent. had defective vision. The percentage was 30·2 in the schools in crowded neighbourhoods with no wide thoroughfares to which children were likely to resort. In schools from similar neighbourhoods, but with wide thoroughfares, the number was 27·0 per cent., a fourth group of schools in more or less residential neighbourhoods had only 19·2 per cent.

The same rule applies to the schools examined here. Elder Park School—See Table I.—occupies an especially favourable situation. It is quite close to the Elder Park of Govan, through which a certain number of the children pass on their way

¹ Dr. Kerr *loc. cit.*

to and from school. On its other side, a single row of houses separates it from the open country, while at a distance of quarter of a mile is the river Clyde. The neighbouring streets are broad and clean, bounded in some cases by terraces of small two-storied houses, each with its own front door. The children belong to a class in which tradesmen, steady working mechanics, and foremen predominate. Church Street School stands in a crowded district. It is some little distance from any of the city parks. A number of the surrounding streets are narrow and bounded by high tenements. The children probably belong to much the same class as those seen in Elder Park School. Hillhead High School is in one of the better residential districts of the city, and the children are drawn from a very wide circle, some even from the country. None of the schools are in the worst districts of the city. I purposely avoided such in order to exclude certain factors which might have been blamed for the results which were discovered.

EMMETROPIA.

Emmetropia, so-called normal sight, is not so common as is generally believed. Before going further I must state that all subsequent calculations and tables are based on the number of eyes and not on the number of children examined. This method avoids the difficulty of classifying the cases in which the eyes are different. A slight difference is common, but a considerable difference is not infrequent, and occasionally the two eyes have the opposite errors of refraction.

Table IV. contains the number of emmetropic eyes in the three schools at the different ages. Elder Park has a total of 45·72 per cent., Church Street 34·62 per cent., and Hillhead High School 45·58 per cent. The first and the last are again very close together. Table V. gives the total number and the percentage of emmetropia over the three schools at the various ages. The percentages of Table V. have been accurately mapped out and are reproduced graphically in Illustration I. It will then be seen that the line E shows an almost continuous rise from the age of entrance to fourteen years of age, viz., from 38·5 per cent. to 51·7 per cent. This increase is in association with the growth of the eyeball, so that it approximates more closely to the adult form. After fourteen years of age a decline occurs in the curve, which is similar to the fall of the good

TABLE IV.—ERRORS OF REFRACTION.

ELDER PARK SCHOOL.

Ages,	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
Emmetropia,	4	56	150	146	132	115	161	165	133	131	25	—	—	—	—	1218	45.72
Hypermetropia,	4	75	137	159	150	155	139	156	110	82	13	2	—	—	—	1182	44.36
*M. Astigmatism,	—	10	20	16	22	18	13	12	8	11	2	—	—	—	—	132	4.95
Myopia,	—	1	9	13	16	16	25	15	11	24	2	—	—	—	—	132	4.95
Total,	8	142	316	334	320	304	338	348	262	248	42	2	—	—	—	2664	—

CHURCH STREET SCHOOL.

Emmetropia,	—	23	39	31	54	88	51	77	72	38	—	—	—	—	—	473	34.62
Hypermetropia,	6	47	102	92	62	87	104	87	65	52	3	—	—	—	—	707	51.76
*M. Astigmatism,	—	4	14	9	14	16	13	12	8	—	1	—	—	—	—	91	6.66
Myopia,	—	2	3	9	18	21	12	12	14	4	—	—	—	—	—	95	6.95
Total,	6	76	158	141	148	212	180	188	159	94	4	—	—	—	—	1366	—

HILLHEAD HIGH SCHOOL.

Emmetropia,	2	32	65	88	58	105	110	105	130	117	127	62	38	18	7	1064	45.58
Hypermetropia,	—	36	72	85	90	120	131	98	110	84	93	32	28	8	5	992	42.50
*M. Astigmatism,	1	—	3	8	9	15	12	10	10	3	8	2	1	2	—	84	3.59
Myopia,	1	2	6	5	7	16	19	19	26	20	20	24	15	10	4	194	8.31
Total,	4	70	146	186	164	256	272	232	276	224	248	120	82	38	16	2334	—

* Mixed Astigmatism.

vision group in Table III. It amounts to 8 per cent. *i.e.*, from 51.7 per cent. to 43.7 per cent. at eighteen years. Over all the three schools there is 43.29 per cent of emmetropia.

HYPERMETROPIA OR LONG-SIGHT.

The hypermetropic eyeball is relatively too short, *i.e.*, the images of distant objects, when the eye is at rest, are in focus behind the retina. The great majority of infants at birth are hypermetropic, but as they grow older the eyeball lengthens so that it gradually assumes the emmetropic or normal form. All eyes of less than one dioptré of hypermetropia are excluded from this group. At five years of age (Table V. and Illustration I.), this group is 54.9 per cent., but thereafter falls steadily until, at fourteen years of age, the number is 37 per cent., and then rather irregularly to 31.2 per cent. at eighteen years of age. The numbers for the three schools are given in Table IV. Elder Park School, 44.36 per cent.; Church Street, 51.76 per cent.; and Hillhead High School, 42.50 per cent. Of 6364 eyes examined there was

Hypermetropia (long-sight)	. 2105 = 33.1 per cent.
Hypermetropic Astigmatism	. 775 = 12.1 per cent.
Total,	. 2881 = 45.2 per cent.

MYOPIA OR SHORT-SIGHT.

This is a subject which claims our most serious attention. Some one has said that it is the accompaniment of intellectual progress, since not only is it almost never present among savage races, and varies among civilised nations more or less according to the state of their intellectual advance, but even in the same country it is most prevalent among the learned and the teaching professions. I hope to prove that, although this combination occurs, it is not necessary, and already there is evidence of a diminution of short-sight where regulated efforts have been carried out for its prevention.

The number of myopic eyes is given in Table IV., for each school at the different ages. From Table V. and Illustration I., line My., it is seen that Myopia exhibits a steady and progressive increase at each school-age period. This rise is most marked during the higher ages, but although more gradual in the earlier period it is, nevertheless, just as ominous. At five years of age there is only 1.7 per cent. of near-sight, but at fourteen it has risen to 7.5 per cent., while

TABLE V.—ERRORS OF REFRACTION.

GRAND TOTAL.

Ages,	-	-	-	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
Emmetropia,	-	-	-	111	254	265	244	308	322	347	335	286	152	62	38	18	7	2755
Hypermetropia	-	-	-	158	311	336	302	362	374	341	285	218	109	34	28	8	5	2881
Mixed Astigmatism,	-	-	-	14	37	33	45	49	38	34	26	14	11	2	1	2	—	307
Myopia,	-	-	-	5	18	27	41	53	56	46	51	48	22	24	15	10	4	421
Total,	-	-	-	288	620	661	632	772	790	768	697	566	294	122	82	38	16	6364

PERCENTAGES.

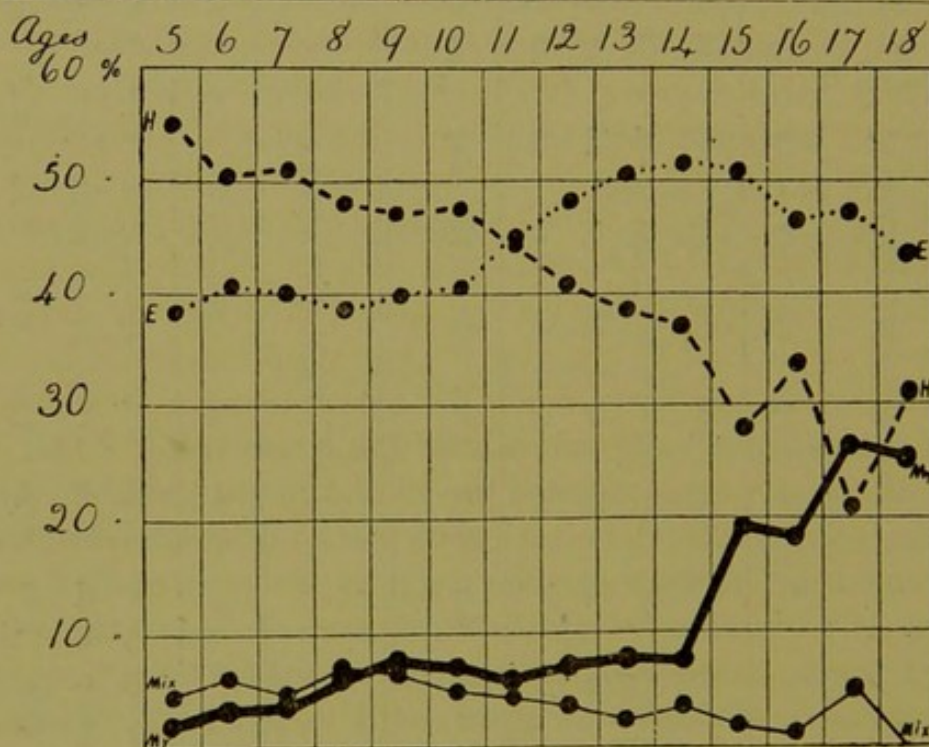
Ages,	-	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Average.
Emmetropia,	-	38.53	40.97	40.09	38.60	39.90	40.76	45.18	48.06	50.53	51.70	50.82	46.34	47.36	43.75	43.29
Hypermetropia	-	54.86	50.16	50.83	47.78	46.89	47.34	44.40	40.89	38.52	37.07	27.87	34.15	21.05	31.25	45.27
M. Astigmatism,	-	4.86	5.97	4.99	7.12	6.34	4.81	4.42	3.73	2.47	3.74	1.63	1.21	5.27	—	4.82
Myopia,	-	1.73	2.90	4.08	6.48	6.86	7.08	5.98	7.31	8.48	7.48	19.67	18.29	26.31	25.00	6.61

at eighteen it reaches 25 per cent. The first period corresponds to the progress of a child through the primary school, or as it used to be called, the standards, and for the most part the second age-period covers the secondary school.¹ The reason for the abrupt change in the curve at fourteen years of age is to be sought in the withdrawal from school at that age of almost all the non-studious children. Those who remain, in Board schools at anyrate, are more or less intent upon intellectual progress, and the majority of those examined were preparing for the University or Training Colleges.

ILLUSTRATION I.—ERRORS OF REFRACTION.

Total Emmetropia, Hypermetropia, Mixed Astigmatism and Myopia in percentages.

E H — — — M_{ix} — M_y —



We are thus met with the fact that *the number of short-sighted children increases at each age-period of school life*. Slight variations in the curves may be caused by the accident of the day upon which the examination was carried out. A child one day is eleven, but two days later might have to be classed as twelve, his birthday having occurred upon the intervening day. In the

¹ Some of the pupils of the secondary department in Hillhead High School are twelve, thirteen, or fourteen years of age, but the great majority of children at these ages are in the primary schools.

continental statistics the children are arranged according to classes, but again a disturbing factor is caused by scholars having sometimes to spend two years in one class. The best classification would be one based upon the number of years a child has been at school. This information, however, is not easily obtained, because of the transfer of pupils from one school to another, and the statements of the children are not to be trusted.

Table VI. contains the percentage of myopic eyes in the three schools separately, while the total percentages are repeated in the last column from Table IV., and the average line for the three schools together at the foot, from Table V. They all exhibit a progressive increase. It will be noticed that Church Street School has relatively high percentages for the ages of seven, eight, and nine. This is to be ascribed to the fact that the pupils had left a defective building shortly before my investigation. The old school had badly-lit and ill-ventilated rooms. The building was very old and surrounded by high tenements. These conditions are sufficient to account for the high percentage of defective vision and myopia. The rooms in the new building are well lit, and in almost all cases the light comes from the left side of the children, in a few rooms it is from the right. The plenum system of ventilation is in use throughout the building. The new school stands in the centre of large playgrounds, and the high buildings immediately adjoining the old school have all been taken down, while on the opposite side of the street several high tenements have given place to the two-storied out-patient department of the Western Infirmary. Altogether the surroundings are now exceptionally favourable. One might expect the older pupils of Church Street to have also had a higher percentage of myopia than they actually exhibit, but the change of residence and consequently of school, which is so frequent among the working classes, had probably diminished the effect before my investigation.

Elder Park School again occupies the most favourable position for almost all ages. The building is of recent construction and has been erected according to all modern hygienic requirements. The playgrounds are large while the nearest buildings are only two stories in height. The ventilation is on the plenum system.

The high total percentage for Hillhead High School, viz. 8·31 per cent. is accounted for by the presence of the large secondary department. The number of near-sighted eyes is only 6·56 per cent. for the primary school which compares with the 4·95 per

TABLE VI.—MYOPIA.
THE PERCENTAGES FOR EACH SCHOOL.

Ages, . . .	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Average for the whole school.
Elder Park School,	0.70	2.82	3.89	5.00	5.26	7.39	4.31	4.19	9.68	4.76	—	—	—	—	4.95
Church Street School,	2.63	1.89	6.38	12.16	9.90	6.66	6.38	8.80	4.26	—	—	—	—	—	6.95
Hillhead High School*	2.85	4.11	2.69	4.26	6.25	6.98	8.19	9.42	8.93	8.06	19.67	18.29	26.31	25.00	8.31
Average for the three schools,†	1.73	2.90	4.08	6.48	6.86	7.08	5.98	7.31	8.48	7.48	19.67	18.29	26.31	25.00	6.61

* The total percentage of myopia in the primary and infant departments of Hillhead High School was only 6.56.

† This line is repeated from the lowest line of Table V.

cent. of Elder Park, and 6.95 per cent. of Church Street School, and stands between them. The investigation was mainly carried out in the Hillhead School just before the examinations, and after a long winter's work, and probably the results are a little more unfavourable than would otherwise have been the case. The rooms are well-lit, and the windows are placed on the left side of the pupils. The school stands high, but is more crowded by surrounding buildings than either of the other two. The ventilation is on the exhaust principle.

SEX.

Table VII. contains respectively the number of eyes and of myopic eyes among the total boys and the total girls of the three schools, arranged again in ages, and gives the relative percentages. It will be seen that the two percentages run closely together, and both agree with the previous tables in proving that myopia increases as the children grow older. The girls have the higher percentage for all but four of the age-periods, viz., ten, eleven, fourteen, and sixteen to eighteen. The greatest difference between the two sexes is at the beginning and at the end of the school period. The former is the more important, because at the latter the number of boys available was rather small for comparison. The ages of five and six require special attention, since at each there are three times the number of girls with myopia as the boys. For the boys, of 3137 eyes there are 201 myopic, or 6.40 per cent., while the girls with 3209 eyes have 219 myopic or 6.82 per cent., contrasting with a percentage for the total boys and girls of 6.61. Sewing has been generally blamed for the larger number of myopes in the female sex, and I see no reason to doubt it.

MIXED ASTIGMATISM.

Between the conditions of long-sight and near sight there is a state of refraction named mixed astigmatism. This is a stage in the series of changes by which the hypermetropic eyeball becomes myopic, and indicates that the eye is already partially myopic. In Table IV., will be found the number of mixed astigmatic eyes. Church Street School is again worst, while Hillhead High School has the best result, but of course over the two departments, primary and secondary. As will be seen from Table V., and Illustration I., line Mix., mixed astigmatism is most frequent

TABLE VII.—MYOPIA.—THE TOTAL BOYS.

Ages,	5	6	7	8	9	10	11	12	13	14	15	16	17	18	16-18	Total.
Total Eyes,	130	320	353	312	402	424	372	332	286	130	50	22	4	—	26	3137
Myopic Eyes,	1	5	14	20	26	32	24	23	24	13	9	7	3	—	10	201
Percentages,	0.8	1.5	3.9	6.2	6.4	7.5	6.5	6.9	8.4	10.0	18.0	31.8	75.0	—	38.4	6.40

THE TOTAL GIRLS.

Ages,	5	6	7	8	9	10	11	12	13	14	15	16	17	18	16-18	Total.
Total Eyes,	158	300	308	320	370	366	396	365	280	164	72	60	34	16	110	3209
Myopic Eyes,	4	13	13	21	27	24	22	28	24	9	15	8	7	4	19	219
Percentages,	2.5	4.3	4.2	6.5	7.3	6.5	5.5	7.7	8.6	5.5	20.8	13.3	20.6	25.0	17.3	6.82

TABLE VIII.—MYOPIA.

TOTAL NUMBER OF MYOPIC AND MIXED ASTIGMATIC EYES, ARRANGED IN THE DEGREE OF SHORT-SIGHT.

Ages,	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.	Percentage.
0-1 D.	2	15	44	44	70	87	69	56	36	42	22	13	5	5	—	510	70.05
1-4 D.	—	4	11	14	12	13	23	24	34	18	9	13	8	5	—	188	25.83
4-10 D.	—	—	—	2	4	2	2	—	7	2	2	—	3	2	4	30	4.12
Total,	2	19	55	60	86	102	94	80	77	62	33	26	16	12	4	728	—

in the earlier years of school life, and from the age of eight it exhibits a progressive decrease. The true relation of these figures to the causation of myopia will be discussed later.

THE DEGREE OF MYOPIA.

Although it is generally known that those who are near-sighted tend to become more near-sighted, yet individuals who are myopic, do not often admit that their myopia has increased. It is therefore of interest to find what light is thrown upon this aspect of the subject by my investigations. We have already discovered that the number of myopic children is constantly increasing as the children become older. The question is, do such children remain of the low degree of near-sight in which the myopia originated, or does the amount of myopia increase? To answer this question, the myopic eyes and the mixed astigmatic eyes have been arranged in three groups according to the degree of myopia. The first includes all of less than one degree of near-sight (one dioptré); the second those between one and four degrees (one to four dioptrés); and the third all over four degrees, reaching, in fact, ten degrees in one case (four to ten dioptrés). Table VIII. gives the result arranged according to ages.

In the case of myopic astigmatism the average was taken, and entered in the corresponding group.

Illustration II. exhibits the percentages for the different ages, of each group to the total myopic eyes for the respective age. The curve of the first group exhibits a distinct and progressive decrease. Commencing at 100 per cent. by the age of eighteen it has fallen to 0 per cent. The second group, on the other hand, increases in a somewhat irregular fashion during the first two-thirds of school life, and then maintains its position, except for the age of eighteen when it likewise falls to 0 per cent. The third group, consisting of eyes with a fairly high degree of myopia, presents an almost continuous rise in numbers. It does not appear until seven years of age, which means that two years or even three years of school life have been sufficient to produce this rapid development of myopia. At sixteen years of age almost 20 per cent. of the myopic eyes are included in this group while at eighteen the entire number belongs to it (100 per cent.). In other words 25 per cent. of the scholars at eighteen years of age are myopic, and each has over four degrees of near-sight.

There is thus very distinct evidence that *the number of eyes*

with the higher degrees of myopia or near-sight, increases at each age-period of school life. But, since the number of myopic eyes is constantly increasing and since the myopia commences in each individual gradually from nothing, being at first less than one degree, it is clear that *the majority of children who have become myopic in school, exhibit a continual increase in the degree of their near sight.*

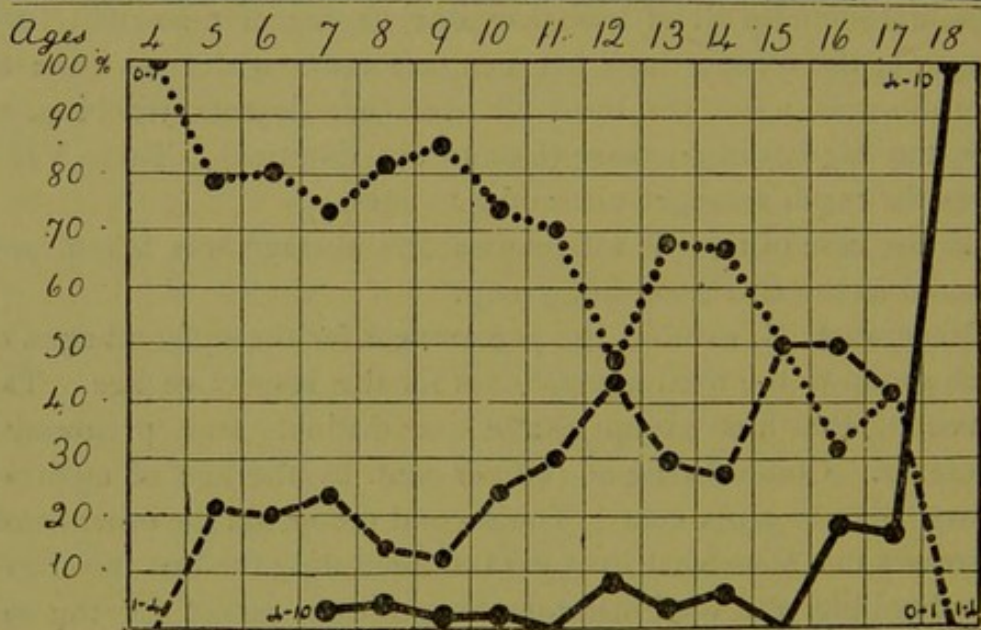
CAUSATION OF MYOPIA.

Myopia may be defined as that refractive condition of the eye in which images of distant objects are in front of the retina, *i.e.*, the

ILLUSTRATION II.—MYOPIA.

Grade of Myopia of pupils of all three schools in percentage to total Myopia at each age.

D. 0-1 ... D. 1-4 --- D. 4-10 —



eyeball is relatively too long. Although such a condition may originate otherwise, we have here to deal entirely with an elongation of the globe. The normal eye closely resembles a sphere, but the myopic eye is longer from before backwards than in any other diameter. The coats of the eye are so elastic that the ball may be dimpled by pressure, but immediately the pressure is removed, it resumes its normal shape. During childhood and youth the eyeball may undergo a change of form by long continued pressure from within or without, but after adult life is reached it is rare for such a process to originate in the healthy eye. In near

work the eyeball is compressed from all sides by muscles except in front and behind. If the pressure be maintained long enough while the coats of the eye are not firm, the eyeball gradually assumes an elongated form. It is, therefore, in childhood and youth, when the whole body is growing, that the strain of near work develops myopia. This has been confirmed by observations from all over the world, that myopia occurs almost exclusively among those who are constantly studying or performing fine work, like tailors, compositors, or needle women, etc. In proof of this statement we have statistics on the eyesight of school children from almost every country, and mine support them. They show that the more years the near work continues, the greater is the number of short-sighted eyes, and the higher the degree which the myopia reaches. Cohn's¹ statistics, drawn from the examination of over 10,000 school children, are widely known and it is unnecessary to repeat them in this paper.

A number of observers have shown that a higher percentage of myopia occurs among purely classical scholars than among pupils of technical schools, while mixed schools occupy an intermediate position. This has been blamed on the constant bookwork, and the frequent reference to dictionaries, especially as those usually found in the scholars' bags are badly printed and have very compressed type. Laboratory work on the other hand does not strain the eyes to the same extent, nor so continuously. Myopia is rare among country children. A life spent mainly in the open air leads to a strong physique and consequently greater powers of resistance in all the organs of the body. The town child is more confined to the house, and even when outside his prospect is too often limited by the other side of the street.

With regard to the prevalence of myopia among the different classes of the community, Tscherning's statistics are of interest. He examined 7,523 persons liable for military service in France, and found that 2 per cent. of country workers had myopia; 5 per cent. of town labourers; 12 per cent. of artizans; 16 per cent. of printers; and 32 per cent. of students. Cohn found that 59 per cent. of the students of the University of Breslau were myopic; while Priestly Smith reported that it occurred in 20 per cent. of the students of the Birmingham Teachers' Training College.

¹ "The Hygiene of the Eye in Schools." By H. Cohn, M.D., Breslau. Translated by W. P. Turnbull. Simpkin, Marshall & Co., 1886.

There is therefore no doubt that the causation of myopia lies in continuous near-work if commenced in early life. Those who say that myopia is an adaptation to the exigences of modern life, must prove that near-sight is beneficial to the individual. It is, however, quite the other way. Myopia is frequently accompanied by painful symptoms. It is very often progressive, more especially in youth and early adult life. The progressive cases are nearly always followed by changes in the retina and the choroid, due to the stretching of the eyeball, changes which cause the deterioration of vision. Professor Widmark, of Stockholm, has recently reported the result of the treatment of myopia in his private practice. In the last 500 myopic eyes he found that as the myopia increased in degree, the best vision, by the aid of glasses, progressively decreased. In high degrees of short-sight the vision may become extremely poor.

The fact that only a certain number, although a high one, of those who are subject to the strain of near-work become myopic, has lead to the discovery of factors which favour the production of myopia in any given case.

I.—NEAR-WORK.

All circumstances which compel the eyes to be brought too near to the work are especially dangerous. These are of two classes, viz., those which affect the individual, and those which are external. The former include all the causes of the diminution of vision. When the sight is weak, the book or the sewing is taken closer, because the nearer to the eyes the larger is the image formed upon the retina, and consequently the more distinct the object becomes. The farther away the book is taken, the smaller does the print appear. The defective visual acuity may be the result of opacities on the front of the eyes. One should therefore take great care of all inflammations of the eyes. On the other hand, the defective vision may be due to hypermetropia (long-sight). This is particularly the case when it is complicated by astigmatism. If we revert to the curves in Illustration I. it will be noticed that the myopic curve is almost the hypermetropic curve inverted. That is a most important fact. In other words, the increase of short-sight in school children is drawn from the long-sighted and not from the emmetropic (normal-sighted) except to a very limited extent. It may be of interest to describe the changes by which this result is attained. The hypermetropic eye

with astigmatism first becomes less hypermetropic, then it passes into the condition of mixed astigmatism. As the process advances the hypermetropic element decreases, while the myopic element increases, until the former also becomes myopic. Ultimately the condition of myopia with astigmatism is reached, with a tendency to increase later. The change is not through emmetropia. Mixed astigmatism is therefore an index of the number of long-sighted eyes which have commenced to elongate unduly, and are in course of developing myopia. It has already been mentioned that this process is most active in the earlier years at school. Nevertheless, it may commence at any school age, as shown by the rise in this curve at the age of seventeen. (Table V. and Illustration I.)

The external factors which necessitate the eyes being brought too close to the work are various, and they will be considered in detail later. Insufficient light, especially with fine work, is one of the most important. If one is reading by the window as dusk is drawing near, it will be observed that the print must be brought nearer and nearer the eyes as the daylight diminishes. Others are too fine work, badly printed books, and ill-fitting desks, etc.

2.—HEREDITY.

Heredity has been popularly believed to be the origin of short-sight. A number of observers in carrying out investigations upon the eyesight of school children, have made special enquiries upon this point. Some merely asked the children if their parents were near-sighted, or if they wore glasses; but such questions are useless, as the information gained from them is wholly unreliable. The popular beliefs of what is long-sight, or short-sight are frequently quite at variance with the actual facts of the case. Others went a step further by sending printed questions to the parents of the children; but even then the information, although more reliable, is still open to the same objection. The most accurate results have been obtained from the private records of oculists in Germany and elsewhere. To be valuable such records must be upon a large scale, and this is only possible to the surgeon of long standing practice, who has had the opportunity of examining both the parents and the children. From *a priori* considerations we may say that myopia is not directly hereditary, because it is very rare for an infant to be born myopic, indeed the great majority of myopes turn near-sighted during school life. On the other hand, if myopia were hereditary we

should expect a very much greater increase in prevalence than actually occurs. It is frequently found where one parent is, and occasionally where both parents are myopic, that the children are hypermetropic or emmetropic, and none are myopic; while the reverse is equally common. It is, therefore, difficult to formulate a definite rule upon this question, but it is probably true that where the parents are myopic, the chances are double for their children, as compared with others, becoming myopic under suitable conditions. We must, therefore, recognise that such children having a tendency to myopia, require all the greater protection against its incidence.

3.—ANTHROPOMETRY.

Certain investigators have found that the orbital index is lower in myopia than in emmetropia or hypermetropia. They point out that if this is true the occurrence of a shallow orbit predisposes to the elongation of the eyeball during growth, instead of allowing the eye to increase equally in all directions, like a sphere. These results, however, have not been confirmed by all observers, and even if true they do not minimise the evil effects of bad school hygiene. Factors such as the low orbital index may explain the greater prevalence of myopia in some countries than in others. The broad, low face of the Germans, the Russians, the Chinese, and the Japanese, may, therefore, account for the frequency of myopia among the learned of these countries. The narrow and rather longer type of face found in France and Great Britain would thus be in association with the lower preponderance of near-sight among us.

PREVENTION OF MYOPIA.

The prevention of myopia is a very important branch of school hygiene, the study of which originated from the publication of Cohn's work in 1866. The first, however, who directed attention to the relationship of myopia and school work was James Ware,¹ who found that in the military school of Chelsea only 3 pupils out of 1,300 had short-sight, while of 127 students at Oxford there were 32. Since Cohn's work appeared, a vast improvement has taken place not only in buildings and benches,

¹ James Ware, Observations relative to the near and distant sight of different persons. *Philos. Transact.* London, 1813. Vol. I., p. 31.

but also with regard to all that concerns the scholars. It may be of interest to indicate the general lines along which progress has been made, and at the same time to point out certain improvements as well as the importance of a regular inspection of all school children by an oculist.

BUILDINGS AND LIGHTING.

Formerly almost any old building was thought good enough for a school, but fortunately a great advance has taken place in this direction, particularly among our public schools, although it is doubtful if the same can be said for the smaller private schools. A school should stand clear of all surrounding buildings not only for fresh air, but also to let every scholar's bench obtain, if possible, a certain amount of direct light from the sky. This is usually managed by placing the school in the centre of the playground and near vacant spaces, although in the centre of towns the high value of land militates against these proposals. The windows are best on the pupils' left, *i.e.*, on the teacher's right hand. This prevents a glare shining into the eyes of either scholars or teacher. If the illumination should be insufficient, light may also be obtained by extra windows on the right hand, but cross-lights are best avoided. Trees ought not to be allowed near the school, as the foliage darkens the rooms too much. Drawing and sewing rooms should be on the uppermost floor and be lit from the roof. In certain continental schools photometers are employed to find the amount of light at each desk. Seats below a minimum of 10 candle power on dark days are excluded from use. For the dull days of winter artificial illumination is necessary. Electric light is the most convenient for school work as it does not vitiate the atmosphere. There should be sufficient lights for all the benches. A good standard for telling when to turn to artificial illumination is a set of test-types. When it is too dark for a normal sighted person to read them at the proper distance, daylight has become insufficient.

DESKS AND POSTURE.

School desks have to be suited to the height of the children so far as possible, because a wrong seat conduces to a bad posture. Pupils while at work should sit upright. Too low a desk leads to sitting with a curvature of the spinal column, because as the child becomes tired he falls forward on the desk, and his head comes too

near his work. When the desk is too high the child cannot raise his head far enough off the paper. From these requirements the following dimensions have been deduced. The height of the seat should correspond to the length of the leg below the knee, while the height of the desk should be such that the elbows just touch it when the arms are hanging by the sides. All seats must have backs because fatigue very soon brings on bad posture. There must be an arrangement for holding reading books at an inclination of 40° , and the teacher should see that it is used. Most modern desks are made according to these regulations, but our school authorities still supply one size to each class-room. There is frequently a difference of eight or twelve inches between the height of the tallest and the shortest children in a class, and even the best desk cannot be expected to suit such variations. The ideal system is to have single adjustable desks for each pupil and this is done in certain American schools. Some English schools on the other hand keep four standard sizes in each class room, and that appears to be the more economical system.

READING AND WRITING.

All school books should be easily legible at a distance of 16 or 18 inches from the eyes. This allows the children to sit upright and yet to rest the books on the desks. Such a distance tends greatly to relieve eye-strain. It is probable that the print should be distinct at a slightly longer distance, so that upon dull days it may be legible at the sixteen inches. The school books of the present day are generally well printed, especially for the younger classes. The size of the type, the width between the lines, and the distance between the letters, are points to which attention has been paid. Some of the books for the highest classes are not quite so good. Mathematical, German, and Greek text-books should be particularly good, as they are more read by figures and letters and not syllables as in English books. Javal, an eminent Paris surgeon, pointed out that in reading our eyes follow a horizontal line just immediately under the tops of the letters. This can be confirmed by covering first the upper half of a line of print and then the lower half, and comparing the legibility, when it will be found that the print is more easily read in the latter case. I am sorry to say that the majority of parents allow their children to use bibles printed in small type. There is no reason why this should be the case, for well-printed bibles may be

obtained at a very moderate cost. It is also important that good paper should be used for school books since it helps to show up the print ; whilst bad paper tends to render the type indistinct.

Writing occupies a great part of school and university life. In the higher classes of the school as well as of the university too many teachers insist upon the pupils and students taking notes to dictation. That system cannot be too strongly condemned for many reasons. The penmanship suffers, since the necessity of writing rapidly leads to the most slovenly scribbling in the majority of cases. Too often such notes are illegible, when, of course, they are worthless, and the entire lecture has been lost ; or at the best, their reading is a weariness of the flesh. Most students fail to retain any mental recollection of the subject of the lecture because the whole attention must be given to the writing. In the course of rapid note-taking bad habits of posture develop, so that the eyes and the spinal column suffer, whilst the sight is again strained in deciphering the notes. In these days of cheap printing, when we can select from so many text books on every subject, it is possible to obtain more accurate and more detailed information than is given in lectures. The lecturer is free to devote attention and explanation to the more difficult matters when he knows that his students can obtain everything else from text books. When he wishes to give his own views, he ought to supply printed sheets. There has been considerable discussion as to what style of writing is best for good posture and eyesight. Excessive sloping or angular writing is undoubtedly harmful, but I believe that a slight slope is not prejudicial, while it is easier than an exact vertical.

The posture during writing is of the greatest importance. When young children are left to their own devices, half of them are observed to bend down over their writing so that their eyes may be as near the paper as six inches or less. The current belief is that these children have weak sight and require to approach their work to see distinctly. Such an idea is absolutely wrong. My examination has shown that 85% to 90% of young children have almost perfect vision. There are only 10% with defective sight. To allow the remainder to take their books close to their eyes is giving them the greatest possible chance of injuring their eyesight and leaving damage which will never disappear. The nearer the eyes are taken to the work the greater is the strain upon them, and the greater the liability to the development of myopia. Once the coats of the eyeball have yielded to pressure, it is impossible

to say when they will cease to yield. A twelve-inch working distance is the minimum for children.

STRAIGHT HOLDERS.

With any tendency to short-sight a child instinctively draws his reading book or his writing copy nearer. Imperfect vision also urges the same approximation so that a larger retinal image may be obtained. With many children as well as adults it is simply a habit, which can be broken off with a little perseverance. For all such cases various forms of straight holders or face rests have been devised. Kallmann's Face Rest is simply an iron loop covered with india rubber at the end of a vertical rod, resembling the frame of tennis racquet. It is attached to the front of the desk and fixed at such a height and angle that the face looks through it but cannot approach nearer to the desk than a definite distance. Complete freedom is given to the arms. Durr's Horizontal Reading Support is much better and simpler. It is a horizontal rod covered with indiarubber held up by a support at each side of the desk so that it can be fixed at such a height as to catch the forehead and prevent the head reaching closer to the desk. It is upon exactly the same principle as the bar across the carriage window in a corridor train. I would strongly urge school authorities to introduce one or even two to each classroom below the second Standard. The worst sitters might be placed behind them and they would act as a deterrent to the others. Such a contrivance cannot injure the little ones, and will be of a great assistance to the teachers, while its cost need not exceed one or two shillings. Dr. Kerr has also recommended them in the London County Council schools.

SEWING.

I have been informed that a large amount of the sewing taught in school is of no practical utility, in fact a great deal is merely for exhibition purposes. We are living now in the age of sewing machines, as one will be found in almost every house, even to the one room and kitchen dwelling in the poorest districts of the city. Great attention is paid to "back-stitching" and to "over-casting," and when these are done with fine stitches they are dangerous to the sight. The sewing machine may be made to overtake the great bulk of the work carried out in school and also by repeating to do "back-stitching." One is glad for æsthetic as

well as for medical reasons that the making of wall decorations and texts in worsted on a canvas background is gradually being given up, although they are still seen in the country. The children should be taught to use the sewing machine, to darn all kinds of garments, and more attention should be given to the designing of clothing, and the "making-down" of garments for smaller children than to actual sewing. I have been consulted by a considerable number of young ladies with eye troubles which have arisen from the strain of "drawn-thread work." It is to be hoped that this kind of work may ultimately be undertaken by the machine.

The following points are of importance:—Children under seven years of age should not be allowed to sew. Sewing classes should have the best lit rooms in the school, and they are best held as near mid-day as possible, at any rate in winter time. Attention may again be drawn at this point to the discrepancy between the boys and the girls of five and six years of age in Table X., because it is just at these ages that the girls are taught to thread needles, an operation which always throws a great strain upon the eyesight.

THE HOURS OF STUDY AND RECREATION.

The hours of study should be arranged so that desk work alternates with distance work. Five or ten minute intervals are useful at the end of each hour of work in order to let the eyes as well as the brains have periodic rests. Some of these breaks may be occupied with class exercises. I wish you could see the children performing this classroom drill. No time is taken to get into position as half of the children stand at the end of each desk. Three minutes exercise and the class are again at work. These exercises should be repeated thrice daily in the infants' classes.

Kindergarten teaching, with fine work abolished, and black board drawing are partly recreation, and as such are valuable adjuncts in the infants' time table. The dust caused by the chalk is troublesome, no doubt, but perhaps a substitute for it may yet be devised. Drawing exercises in which all fine lines are absent, are also useful and do not strain the eyes. In Church Street School young ones of five and six had in this manner made very presentable coloured drawings of apples, fishes, etc.

SPECTACLES.

When the vision is so poor that a child cannot read ordinary print at fourteen inches, or large type at eighteen inches, and if such a defect is remediable by glasses, the child ought to have spectacles. Hypermetropia, and especially hypermetropic astigmatism are the commonest causes of pain and headaches and eye-strain; and if uncorrected are frequently converted by continuous near-work into myopia with deterioration of the vision. The correct spectacles will protect during school life. It is by no means necessary for them to be always worn, and much less necessary for their use after the children have left school and are at work. When myopia has commenced the best protection against further increase is in the wearing of the correct glasses.

It has been found in the London County Council Schools that the children who have been certified by the oculists as defective may not be taken to a doctor or an eye hospital, or if taken to one or the other that the parents do not purchase spectacles where these are necessary, and have been prescribed. The County Council (December, 1905) took the opinion of counsel as to whether spectacles might be supplied at the cost of the rate-payers. The counsel's opinion was negative, and, in consequence, a very influential association has been formed to supply spectacles at wholesale prices to the parents of school children, on the prescription of a doctor, as they find that the difference between the wholesale and the retail price is "very considerable." In cases of real poverty the price will be reduced. In the Glasgow Eye Infirmary the optician is under contract to supply spectacles at as low a price as one shilling. The Glasgow School Board have already supplied spectacles to the very poor. Needless to say it is essential that the glasses should be correct. It occurs at times that children are found wearing the wrong glasses, and I have also seen children wearing spectacles when they were quite unnecessary.

HOME WORK.

All these matters apply with greater force to the home work, since it has to be performed by artificial light. The children are often mentally and physically tired. We have to remember that the nervous mechanism of the eyes is especially liable to fatigue, and, in consequence, impressions are not taken on so well, and they may not be carried to the brain. The more tired the child

is, the closer the book goes to his eyes. The parent or guardian must see that the child sits upright and in a suitable relation to the light when doing lessons. Music books require to be well lit, as new music is learned note by note. Miniature editions are not for children. It is almost unnecessary to say that reading by firelight is very prejudicial, and that reading in bed is rarely carried out under favourable circumstances. One or other hygienic single desk, or some suitable arrangement, I recommend to parents of children who are already myopic.

CONCLUSIONS.

We have seen that there is a progressive increase throughout school life not only in the number affected with myopia, and also in most individual cases in the degree of the myopia. These results have been obtained in schools in which the children come from the middle class and the steady working classes. It cannot therefore be said to be due to defective home influences or poverty of parents. It has been shown that myopia is only subordinately associated with heredity, and that it is due to the school work. School hygiene has already done much to mitigate many of the worst evils associated with school life, but so far it has only led to a slight decrease in myopia. Even recently 60 per cent. of the students in certain German universities were myopic; while, although not so bad as a rule in this country, the same was true of at least one-half of the advanced medical students in last year's large class in Dr Fergus' clinique at the Eye Infirmary. It is therefore necessary that something more should be done. There is a very general consensus of opinion that there ought to be a medical inspection of school children. I do not wish to enter upon the larger question, but to emphasise its importance for the eyesight.

The results from Sweden, where a complete system of inspection of school children by ophthalmic surgeons has been in operation since 1895, are conclusive proof of the value of regulated efforts against myopia. Table X. is a synopsis of the official yearly reports, and shows a steady and regular fall in the total percentage of myopia both for the whole school and for the secondary departments taken separately. The number of children in the schools varies between 14,000 and 16,000 yearly. There has also been a decrease in the number of children with the higher degrees of myopia. Such a result is extremely satisfactory, and augurs well for the future.

TABLE X.—THE PERCENTAGE OF MYOPIA AMONG THE PUPILS OF ALL THE FIVE CLASSICAL AND HIGHER SCHOOLS IN SWEDEN. 1895-1901.¹

Class.	1895.	1896.	1897.	1898.	1899.	1900.	1901.
1	5.2	5.9	4.0	4.7	4.3	4.7	4.2
2	5.8	6.5	5.5	4.8	5.6	5.3	5.0
3	7.8	5.8	6.8	6.2	6.4	6.1	5.2
4	9.1	8.7	7.1	7.9	7.6	7.3	8.1
5	11.8	10.8	9.9	9.1	9.8	9.2	8.7
6	15.8	15.0	11.9	13.2	11.6	12.6	11.5
7	19.7	18.7	16.5	15.9	15.3	16.1	14.2
8	22.6	20.9	21.4	19.8	17.7	17.0	18.5
9	24.6	22.1	22.6	22.8	22.1	10.6	19.5
Tl. Sch'rs,	10.9	10.4	9.5	9.4	9.2	9.1	8.8

Number of Scholars—1895, 14,310; 1901, 16,745.

The recent report of the Inter-departmental Committee appointed in March, 1905, by the President of the Board of Education in London, declared with regard to medical inspection already undertaken that

“4. To nothing probably has more attention been paid than to the eyesight, and in no direction have beneficial results more certainly been obtained. Defects have been discovered which would have otherwise past unnoticed, and spectacles have been provided. Overstraining of the eyes has often been stopped, with consequent disappearance of many headaches and much apparent stupidity.

“6. Teachers have been led to take a more intelligent and more sympathetic interest in the physical welfare of the children placed under their care. Ventilation is better attended to as its importance becomes more fully realised. The school medical officer gives teachers valuable support in any effort they may make to arouse the better feelings of the apathetic or negligent parent.

“7. Generally we feel no doubt that the medical inspection has done much towards bringing to view defects, the treatment of which secures the child from unnecessary suffering, and may save him from serious trouble in later life. Finally, we desire to point out how small is the expenditure which inspection involves; in no urban area does it require more than 1-10d. rate, generally not so much.”

¹ From Widmark Johan, Ueber das Vorkommen der Kurzsichtigkeit in der höheren Djarsholmer Schule. *Mitteilungen aus der Augenlinik des Carolinischen Medico-Chirurgischen Instituts zu Stockholm.* Heft 6. 1904.

Medical Inspection is already instituted in London where there are six oculists working under Dr Kerr, the medical officer to the London Council schools. Five of these give three half days per week to this work. It has also been carried out in many towns in England, and in the following countries—Germany, Switzerland, France, Sweden (where it is compulsory), and America. Of course, our public schools as well as the industrial and reformatory schools have been under medical inspection for a very long time. With respect to the eyesight a considerable amount of work may be performed by the teachers, viz., by providing them with test-types, when they are able to eliminate all who fail to come up to a certain standard. Where teachers have been doing this it has been found that they incline to make out a larger percentage with defective vision than the true one, but that is an error on the safe side. The Glasgow School Board has pursued this course during the last year, and as a result very large numbers of children with defective vision have come to the Eye Infirmary, where the consequent, and at times unwarranted, embarrassment of work has occasionally almost led to a breakdown. The tests which the teachers can perform are not sufficient to detect many of the cases of eye-strain. The discovery of diseases of the eye not only requires one trained in medical ophthalmology, but also in the bacteriology of the diseases of the eye. The prevention of the spread of infectious troubles of the eye is just as important as the prevention of diphtheria or scarlet fever. Some have suggested that the inspector of school children should be the medical officer of health for the district in which the school is situated. This course may be advantageous for such branches of the duties as are identical with the public health service, but for eye-work a specially trained assistant is necessary, whether he should devote his whole time or part of his time to the school duties is related to the amount of work, and to the salary provided. The London County Council obtained the oculists from among the younger specialists by demanding from each three half days per week. It would be difficult to get a competent man to give his whole time to the work, because the subject is so special that there would be no promotion.

The eyes of all children should be examined upon entering school and provision made for notifying the teaching staff of any modification necessary in their training. The examination should be repeated four years later, and again the year before

leaving school, in addition to the vision tests carried out by the teachers yearly. By these means the development of myopia would be detected at its commencement, and efforts could be made to prevent extension, if not to lead to a cure before permanent damage had been done. At the last examination the doctor might warn parents or guardians if the eyes did not appear capable of standing certain occupations or trades, or if the early use of glasses appeared necessary, when such necessity might cause a man to be thrown out of his trade in his prime. Surely, if we can do something to save the eyesight not only of our professional but of all our workers for their daily bread, it behoves us to do it. The disease, for myopia is a disease in the true sense, commences in the school-room, and it must be stamped out in the school-room.

Objection may be raised against the inspection of the eyesight of our school children, on the score that if performed for the eyes it ought to be carried out for the ears, the teeth, etc. But there is one very decided difference between these organs. It has never been shown that the ears or the teeth have been made worse by school work, but I have proved that the vision deteriorates in consequence of bad books, or defective school hygiene, and that a complete inspection of the eyesight will lead to decided improvements. Others may object that this is the thin end of the wedge of socialism. To them I would reply that the question is urgent, and the expense is slight. I should also point out that when you compel children to go to school you must see to it that their bodily organs are not injured in consequence of school life.

I began with the question of physical degeneration, and I wish to end by reference to it. The eye is but one of the organs of the body, and attention ought to be directed to the welfare of the whole, because when we improve the general *physique* we improve all the individual organs of the body. There is also no doubt that a healthy condition of our frame is antagonistic to the working of almost all morbid processes, and it will certainly improve the resisting power of the eyeball to the various influences, which have been described. Out-door games and recreations, with gymnastics indoors, are means to improve the *tone* of the system, and as such they ought to be included as an integral part of the education of childhood and youth. They do not require any great amount of time—too much may be as disastrous as none—but regularity and precision are essential.