SCHOOL HYGIENE IN RELATION TO VISION.

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Among the multifarious duties of a medical officer in charge of troops in quarters, perhaps not the least important is the weekly inspection of the schools for soldiers' children, in the barracks or sanitary district under his charge. The chief object of this inspection is, no doubt, the early detection of infectious disease, in order that first cases may be isolated, arrangements for disinfection immediately undertaken, and the infection, as it were, nipped in the bud. This periodical inspection also often leads to the detection of scabies, tuberculosis, chorea, adenoids, granular ophthalmia, errors of refraction, &c. In this respect the military community is in advance of the civil, in this country at least, where periodical medical inspection of schools has not yet been adopted, although in America, Germany, and some other countries, the system has been tried and found to work with the most beneficial results.

There is no doubt but that in the spread of infectious diseases, such as scarlet fever, measles, diphtheria and contagious ophthalmia, the personal contact of children in schools is a most important factor, and the infection of scarlet fever, for instance, may be spread to an enormous extent by the contact of children in the close, ill-ventilated atmosphere which is found in many of our elementary schools; the cubic space ranging from 90 cubic feet per head in the elementary schools to 130 cubic feet per head in the Board Schools. Under the system at present in vogue in this country we are dependent for our knowledge of the occurrence of infectious disease in schools on two sources, namely, the compulsory information given under the Infectious Diseases Notification Act of 1889, and the voluntary information supplied by teachers and others. When a medical officer of health becomes aware that a child attending a certain school is attacked with an infectious disease it is his duty to warn the school authorities, in order that the child may be prevented from resuming school attendance too soon after his recovery, and also in order that children living in the same house may be debarred from attending school before the expiration of the maximum incubation period. But, as pointed out by Kenwood, the danger is not so much from infected children resuming school attendance too soon, as from mild cases attending school before
they are diagnosed. Hence the need for the compulsory medical inspection of all schools, civil as well as military, for the early detection of infectious disease, and for what is almost of as great importance, the early recognition of defects of vision among the children, and the correction of errors of refraction.

While making an investigation into the vision of the children attending the different military schools in Dublin I was struck by two facts, first, the great extent to which errors of refraction prevailed among the children, and secondly, by the frequent occurrence of anisometropia, or difference in the refractive condition in the two eyes in the same child, one eye being perhaps normal (\( \frac{2}{5} \)), and the other slightly ametropic (\( \frac{3}{5} \) or \( \frac{4}{5} \)), or one eye being more myopic, hypermetropic, or astigmatic than its fellow; this condition, in my opinion, being often the result of inadequate lighting arrangements and faulty illumination of the children's books.

It is stated by Cohn that all children are born hypermetropic, that 3 to 5 per cent. of school children suffer from myopia, while by the time the university age is reached the myopia has attained the alarming proportion of 20 to 40 per cent. Now this disease, myopia, is largely the result of faulty school hygiene, and therefore to a great extent preventable. Leaving aside the questions of ventilation, which is notoriously deficient in most of our public elementary schools; of warming arrangements, by means of which, with ill-constructed cast-iron stoves, and absence of proper air inlet for the stoves, carbon monoxide, that most poisonous of gases, is frequently circulated in the school-room; or drainage, and of other important bearings on the health of the children, I shall only deal with the conditions which affect the eyesight and predispose to that grave affection, progressive myopia. The health of the child is quite as important as its intellectual or mental development, and it is essential that the best possible hygienic conditions should be provided for both pupils and teachers.

The first point to be considered in this connection is the lighting of the school-room; but before describing the ideal lighting arrangements, it may perhaps be better to state what they ought not to be, as illustrated by a large school-room which I visited in Dublin. The room was of rectangular shape, 60 feet long by 40 feet broad, and 17 feet high; the air space was 40,800 cubic feet; the number of children attending the school was 160, working out to about 250 cubic feet per head. The area of window-glass was
334 square feet, and the floor space 2,400 square feet, the ratio of glass to floor space being as 1 to 7.185. This ratio should never be less than 1 to 5, and the nearer the area of the glass approaches the floor area the nearer will the ideal standard be reached. The arrangements for lighting the room consisted of eight windows with small diamond-shaped panes of glass, situated four at each side of the room, the doors being at the ends. The ventilation was provided for by ten Hopper ventilators in the windows, six air-bricks in the wall, and twenty-four feet of ridge tiling raised to give 1\(\frac{1}{2}\) inches of air space at the top of the roof. Warming was arranged for by a single large cast-iron stove, situated in the centre of the room, with a flue passing through the ceiling. It may here be mentioned that the Board of Education rule states that an "iron stove with a pipe through the wall or roof can under no circumstances be allowed," owing to the danger of carbon monoxide gas being generated. The desks were arranged in four parallel rows at the long sides of the room, and placed with their backs to the windows and the light, the result being that the light fell, not on the pupils' books but on the pupils' backs, so that to get more light on their books they are obliged to "screw" round, and consequently the strain in reading falls on one eye only. In this way the occurrence of the anisometropia alluded to above may be explained. The desks were all of one size, although the children varied in height from 3 feet 6\(\frac{1}{2}\) inches to 5 feet 4\(\frac{1}{4}\) inches; the height of the seat was 17\(\frac{1}{4}\) inches, the desks themselves being 30 inches from the floor, and a foot-rest was provided for the smaller children.

It will thus be seen that the arrangements of this school, which may be taken as a type of the rest, were faulty in regard to lighting, warming, position of the desks, and construction of the seats and desks.

The defective eyesight of school children is due to two causes: (1) Imperfect illumination; (2) too great distance between the desk and seat; the books or writing should not be distant from the eyes less than 14 inches. The windows should be so placed, or what comes to the same thing, the desks should be so arranged, that the light comes from the left side, or from the left and rear, and so falls on the books over the children's left shoulders. Next to this plan comes that with windows at both sides of the room, so that both sides of the book are more or less equally illuminated; this system answers well if the light from the left side is the stronger; but on no account should the windows be directly in front of, or directly
behind, the desks. Unequal illumination of the printed matter or writing results in unequal strain on the eyes, and in one eye being used more than the other, or in the eyes being brought nearer the work than the child's near point; all of which conditions tend to the production of myopia. The windows should be five or six feet from the ground, the horizontal rays coming from lower than this being too bright and dazzling; they should be carried up as near the ceiling as is possible, as the best light comes from the highest parts. Sky-lighting is probably the best of all the methods of lighting a school-room, but it is open to the objections that in summer the heat may be too great, while in winter the difficulty of warming the room is much increased. The best colours for the walls of schools are the more delicate and lighter shades of yellow-green, or light grey.

Home lessons play an important part in the production of myopia in children; they are undertaken when the body, the mind, and the eyes are fatigued. The children, after spending seven or eight hours in school, are obliged to pore over the home lessons for two or three hours, and at a time when there is no teacher or other responsible person present to regulate the manner in which the light should fall on the books; too often the illumination is from an oil lamp in the centre of the table, while the children sit around. Again, what is commoner than to see a small child sitting near a fire, or stretched on the hearthrug, reading a book with the aid of the flickering firelight only?

The desks in schools should be so arranged that the child will find it more comfortable to sit upright than in any other position. For the attainment of this object the seats and the tops of the desks must be of a height from the ground suitable to the requirements of each child. The seat must allow the soles of the feet to rest on the floor, and its height should be equal to the distance from the sole of the foot to the angle formed by the leg and thigh, when the latter are flexed at a right angle. The seat should be as wide as the length of the thigh, sloping neither backwards nor forwards, and slightly concave, to prevent the child from slipping. The front edge of the seat should be placed one to two and a half inches from the inner edge of the desk (Norris and Oliver). If the desk is too high the arms cannot rest on it without forcing the shoulders upwards; while if the seat is too high the child must stoop over his work, the upright position is rendered impossible, and curvature of the spine may be induced. The top of the desk must incline towards the pupil at an angle of 30 degrees for writing, and 45 degrees for
reading, and it must be low enough to permit the forearms to rest lightly on it without raising the shoulders while writing; the lower part of the back and the pelvis should be supported by a rest which can be easily felt when the pupil is sitting upright (Norris and Oliver). Children of the same age vary considerably in height, and children of the same height vary in the measurements of different parts of the body; it is obvious, therefore, that the same type of desk will not suit all pupils. The desks should be constructed to suit individual children; they should be single and each readily adjustable, that is, the desk and seat should be capable of being raised and lowered to suit the requirements of each case. A separate desk for each child would be the ideal arrangement, but failing this, the desks and seats should be of three or four sizes, and the children should be allotted to them according to their measurements.

The books used by the pupils should be printed on good paper and in bold type, and it should be borne in mind by the teachers that the strain on the eyes is much less at the far point than at the near, and that instruction given by means of blackboards and maps is less fatiguing than that with paper and pen; while with young children oral instruction is much better than work at the near point.