

To The Very Rev. Can. F. Fullinwider D.
with Dr. Manché's compliments

23

SCHOOL HYGIENE.

FOUR LETTERS

TO THE

EDITOR OF "PUBLIC OPINION"

FROM

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SCHOOL HYGIENE.

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I.

Valletta, 28th Oct. 1878.

SIR,

At such times as the present, when the Home Government shews such marked interest in the question of the Education of our rising generation, as to specially commission Mr. P. J. KEENAN, C.B. to report upon the state of our Public Schools, I shall feel extremely obliged by your publishing, through the medium of your valuable paper, some special remarks on the great necessity of such improvements in the hygienic arrangements relative to the same, which, though apparently of little consequence and but little calculated to engage public attention, have nevertheless proved to be as essential and indispensable to the health of growing children, as those more General Sanitary conditions of buildings, which modern civilization has recognized of paramount necessity and which in our Island are confided to the care and supervision of the Police Physicians, under the direction of a Sanitary Board. With regard to the latter, I do not deem it necessary to discuss any details, as I am sure every possible care will be bestowed in improving the drainage, ventilation, water supply, warming, cleanliness, &c. of the Public Schools.

It being granted, however, that the premises are kept in perfect sanitary condition, I will ask: What are the preventive measures adopted to check the spreading of contagious diseases amongst the pupils? Are there any rules as to the number of children that may occupy each room, so that there shall be no overcrowding? Is the proper ventilation attended to, by keeping the windows open as much as required, in order to change the air vitiated by the respiration and cutaneous exhalations of unclean children? Again: Who is to regulate the intellectual work thrown on the undeveloped mind of young boys? Who is to distribute the hours of exercise, and see that they are duly intermixed with those of application,

so as to alleviate the mind and strengthen the body of the little creatures? These and similar questions, though of great importance, I content myself with merely in mentioning, as it is not probable that an enlightened Commissioner who has devoted so much of his time to the improvement of schools and education should not pay the required attention to the most important part of the subject,—the maintenance of health amongst the pupils, so that after their curriculum they shall be in possession of the *mens sana in corpore sano*.

Considering, however, that even at present, in many English and German schools, there are arrangements in the benches and desks, as well as in the quantity and distribution of light in school-rooms, which prove injurious to the pupils by altering the figure of their body, particularly of the spine, and impairing their sight, I am led to suspect that the same bad arrangements do exist in our schools perhaps to a more aggravating extent, and they require to be remedied.

The two above mentioned causes act simultaneously; for it "is a fact that shortsightedness increases curvature of the spine and that this latter tends to produce or to increase shortsightedness, and also that bad posture is a cause common to these two different diseases."

Let us see, therefore, the defective posture which the pupils are allowed or better are obliged to take, on account of the bad accommodations in the school.

In the first place, if the seats have no backs the child cannot keep its body straight, the muscles of the back cannot maintain for a long time the spine in an upright position, therefore, this is bent forwards and it presses on the viscera. If the distance between the bench and the desk is not proportionate to the age and size of the child, it sits on the edge of the bench, the body stoops forward, the head becomes too heavy and has to be sustained by one or the two fore-arms, the elbow being placed on the desk and the hand to the forehead or the chin. In this manner the shoulders support the

body, instead of being supported by it. Further, in writing, the bad effects of the unsuitable height of benches and desks are more apparent on the figure. Nay more, the different posture affected in writing brings on different deviations in the curvatures of the spine and in the height of the shoulders, so that, by physically examining the body, one may state which is the habitual posture of the boy in school. In fact, when the left elbow rests completely on the table and the right fore-arm to a very limited degree, so that the right elbow is kept close to the ribs, then the weight of the body is supported by the left shoulder which becomes higher than the right, the lower part of the spine becomes more curved forwards and the body is twisted on its axis. When the other position is preferred, viz.: the right elbow on the table and the left one hanging down with the left hand on the edge of the desk, then the right shoulder is found higher and more projecting than the left, and the middle part of the spine increased in curvature. Lastly, if both elbows are on the table, the weight of the

body is supported by both shoulders and there is no difference in height, but the head is strongly bent forward and therefore the natural curvatures of the spine become more marked and the inferior angle of the shoulders-blade stands off from the ribs. These bad postures continued for hours and repeated daily, induce at last deviations in the skeleton, which become permanent and explain why after a few years of school life, 20 per cent of the boys and 40 per cent of the girls, who on account of their sex do not enjoy out-door exercise, have one shoulder higher than the other; and also why, (as the well known orthopedic surgeon Eulenburg states), "90 per cent of curvatures of the spine, which do not arise from a special disease, are developed during school life."

Having already trespassed on your space and on the patience of your readers, I shall leave for another occasion the subject of the bad distribution of light in school rooms, as well as the means by which, both the distortion of the body and the impairment of vision may be prevented.

II.

Valletta, 6th November, 1878.

SIR,

In thanking you for publishing my letter of the 28th ult., I have to ask you again the favour of allowing me space in your paper for considering the above-mentioned subject, with reference to the injurious effect of insufficient or ill-arranged light in school-rooms.

In order to be clear in my statements, I think it is necessary to premise a few concise notions about the different qualities of sight with regard to the state of refraction of the eyes.

The eye may be: 1st *Emmetropic* (normal) that is to say, of such a length that parallel rays from distant objects, after converging, meet on the retina (the sensitive part at the back of the eye-ball) to form a clear image of the objects looked at; 2dly. *Myopic* (long) or such as the parallel rays in it unite together to form a clear image *before* reaching the retina. It can see distinctly only near objects from which divergent rays are given out, and, therefore, this quality of sight is called short-sightedness; 3dly. *Hypermetropic* (short) in which parallel rays meet the retina before converging together to form the clear image of the objects, as if they were intercepted in their course by a screen, upon which undefined images are formed. This is the long-sighted eye which can see objects clearly, only by an effort of accommodation (the act of rendering more convex the surfaces of the crystalline lense of the eye) or by the help of convex spectacles; lastly *Astigmatic* (badly-shaped) in which different diameters or the parts of the same dia-

meter have not the same strength in refracting the rays of light which enter into the eye.

Light is indispensable for vision and as much as it is useful when in the proper quantity, so much it is hurtful when too strong or too weak. Leaving out of the question the bad action of bright light on the eye, let us consider the ill effect of an insufficient quantity of it. In a badly illuminated place, to see an object distinctly, we have to approach it to the eyes. The smaller it is, the nearer it must be brought; and the nearer it is to the eyes, the more divergent are the rays coming out of it. It is, therefore, with an effort of accommodation that the object may be seen plainly. Further, the nearer the object is kept to the eyes, the more convergent must be the eyes to fix it. These efforts of *accommodation* and *convergence* have an inevitable result: the elongation of the eye ball. Thus the emmetropic eye, after such prolonged straining, becomes myopic; the myopic has an increase of short-sightedness and the development of atrophic changes at its hind part; and the hypermetropic becomes unable to keep up the convergence, so that one of the eyes is put out of fixation (convergent squint) and this, the squinting eye, far want of use, loses sensibility for vision.

Apart these organic changes and others which it is not the place to mention here, the muscles, by means of which the convergence and accommodation are accomplished, cannot endure the strain for a long time and, therefore, arises that sensation of fatigue and tension on the fore-head (asthenopia) which obliges the sufferer to leave off application for a time and "which" has destroyed many a career, prevented the

"development of many a fine intellect, and "deprived many of the fruit of their laborious "exertions and persevering industry." (Liebreich) This fatiguing sensation, unless remedied, is always on the increase, as the more the convergence of the eyes becomes necessary, the less is it possible owing to the configuration of the bony cavity in which the eye moves.

Statistical reports made by Dr. Cohn at Breslau and Dr. Erismann at St. Petersburg prove to demonstration that myopia prevails much more among school-boys than among country boys of the same age. Also that the predisposition to such a condition of the eyes is hereditary, but that those amongst the members of the same family who make use of their eyes on small objects and in badly illuminated places have the highest degree of short-sightedness. Dr. Erismann examined 4,358 pupils and found that among those who worked 2 hours daily, there were only 17.7 per cent. affected with myopia; in those who worked 4 hours daily, the percentage reached 29; and of those who worked more than 6 hours daily, 40.8 per cent. were myopic. His experiments show also that the sight was impaired in proportion to the hours of application and to the bad illumination; so that he concludes as to the above mentioned conditions that: "C'est le travail seul avec toutes ses circonstances secondaires qui produit cet état."

So far with regard to the defective quantity of light in school-rooms; let us consider now its distribution. From which side of the child's head, must the light come?

The Committee of Council on Education of Great Britain, in framing regulations for lighting class-rooms, gives the following rule:—"The "windows should be so placed that a full light "should fall upon the faces both of the teacher—"and of the children." If by this is meant that there should be windows at the back of both the teacher and the pupils, the only way by which the faces of all can be equally illuminated, the arrangement cannot be worse. In fact, the glare, besides injuring the sensibility of the retina, prevents the teacher and children from seeing each other. Also, to avoid the glare, in reading and writing, they must either turn their head to one side, or bend it so much as to shade their eyes by the projection of the forehead.

The light coming from the right side or from the back is insufficient and to be avoided, because of the shadow which the right arm and the head throw on the book or the paper. It is quite clear, therefore, that "it must be sufficiently strong, and fall on the desk from the left-hand side, and, as far as possible, from above." (Liebreich).

The practical conclusions and the regulations to be enforced in our Public schools will form the subject of another letter.

III.

10th November 1878.

SIR,

Being convinced that it is useful to render accessible to the majority of the people that which can be known to the learned on referring to scientific books, I shall endeavour to point out the artificial light that ought to be used in evening classes, as well as in all places where writing or reading is going on.

Light emitted from the sun or from any luminous body is composed of seven different kinds which constitute the *spectrum*. Different substances in burning give particular *spectra*, and as our eye has by the Creator been adapted to solar light, it is clear that those substances the light from which is most similar to the solar, are the least fatiguing to the eye. Dr. Heymann of Dresden has shewn experimentally that olive-oil-light gives a spectrum almost identical to that of the sun, while gas, paraffine oil and other substances used for illumination contain relatively too much of the dazzling part of the spectrum and also spread too many calorific rays. It is true that electric light would be also recommendable, its spectrum being similar to the solar, but until its many disadvantages are remedied, as lately promised by the American Dr. Edison, it cannot be used

for illumination, without great detriment to the sight.

I venture to state, therefore, that olive oil would be the best material for lighting school-rooms and other places for study, but for the three following disadvantages, viz: 1st the small quantity of light emitted from an oil lamp; 2nd the necessity of having many lamps and, therefore, the contamination of the air in the room from carbonic acid gas and other emanations; and 3rd the bad smell which such lamps give, as well as their uncleanness.

I think that the Carcel lamp recommended by all the ancient oculists and the Silber burner lately patronized by Dr. B. Carter, because it gives a larger quantity of blue rays than any other lamp, should be used by the rich, whose private accommodation may counterbalance the above stated disadvantages; while, for public establishments, gas or paraffine oil is to be adopted. In order, however, to lessen the bad effects of gas-jets and petroleum lamps, I shall try and give a few suggestions with regard to the same.

As to gas-jets, they are certainly very objectionable, unless provided with glass tubes to render their light steady. There is, in fact, nothing more fatiguing and injurious to the eyes than an unsteady light, from whatever source it may derive. As to checking the brightness and dazzling effects

of both gas and petroleum lamps, the means to be adopted are *blue tainted* glass-tubes which are highly spoken of by Dr. Calderini, because they are capable of intercepting the passage of the bright and green rays; as well as by Dr. Reymond, because they relieve the efforts of accommodation, being more refrangible. It is true that these blue glass tubes, as Dr. B. Carter states, "greatly diminish the total amount of light and should not be had recourse to unless this were originally abundant," but in the case of gas and petroleum, the light is abundant and therefore it may be diminished to a small extent. On this principle is constructed the "Patent parallel-rays reading-lamp" which may be used either with paraffine oil or with gas, and can be had in Malta at Mr. Vella's establishment in strada S. Giovanni.

Shades to reflect the light on the object looked at might, I think, be advantageously used in schools, as they prevent other rays from reaching the eye, which by their irregular reflections on it

would render the images undefined. But ground-glass tubes or globes which, in some places, are employed, with the object of softening the strong glare from a bright flame, are to be rejected. In fact "they are useful for the ordinary lighting up of a room, as they diffuse the light more equally throughout all parts; but, for that very reason, they give an indistinct light for work, and if they are opposite the eye are dazzling and injurious." (Liebreich).

I should also like to consider the size and neatness of types in school books, the colour of the writing paper, the models for copying in drawing classes, and such other things as are strictly connected with school Hygiene; but I see that I have been deviating from my path and trespassing on your indulgence. Whilst thanking you for your kindness, I am afraid I shall have to trouble you once more, in order to bring to a conclusion the subject to which, without laying any claim to originality, I ventured to call public attention.

IV.

Valletta, 18th Nov., 1878.

SIR,

Believing it to be useless for any one to point out defects, unless he is able to suggest the means to remedy them, I shall now proceed to give a few practical hints as to the improvements required in our schools, in order to obviate the injurious effects mentioned in my previous letters.

For reasons already stated, the desks should be placed parallel to the short side, if it be a rectangular room, and this is to be lighted by means of windows of proportionate dimensions, from the left-hand side of the pupils. The horse-shoe disposition of desks is to be avoided as it does not attain the object it aims at, viz: to have the children "under the eye of the master." The latter is to face the former and to be on a higher level than that of the desks.

The desks and seats should be proportionate to the stature of the body and each pupil ought to have its own seat; but in order that my recommendations may not be considered utopian, I shall make a sacrifice of some necessities and try to improve our school-furniture, without entailing any great expense and trouble.

Leaving, therefore, for boarding and private-schools the scientific model, with screws and pulleys, of a desk and chair for each pupil, I shall transcribe the rules which my learned teacher Dr. Liebreich printed in 1872:

"One and the same model of desk should be used for children and grown-up persons of both sexes."

"The adaptation to the height of each child should be effected by varying the height of the seat and foot board."

"The edge of the desk is always to be perpendicular to that of the seat."

"No seat is to be without back and the top of this is always to be one inch lower than the edge of the desk for boys, and one inch higher than the same for girls."

"The back-board ought to be straight and to consist of a piece of wood only three inches broad."

"The seat ought to be wide enough to support almost the whole length of the thigh." Or as Zvez more precisely states, it must be equal in breadth to half the distance between the back part of the body and the fore part of the knee, when in the sitting position.

"The height of the seat is to be such as to allow the sole of the foot, in its natural position, to rest on a foot-board."

"The height of the seat is to be regulated as follows:—On putting a ruler on the desk and continuing its sloping outline, it should meet the elbow of the child sitting in the right posture and without displacing its shoulders."

"The desk should have an inclination of about 40 degrees with the horizon for reading: whilst for writing, on account of mechanical reasons preventing the adoption of the same inclination, we must satisfy ourselves with an angle of about 20 degrees."

At this point it is natural to ask: How can these principles be applied to the furniture of our school-rooms?

The already existing desks, might, I think, be made serviceable by adding a movable flap to the fore part of their inclined plane which is almost of the required slope for writing. The flap, when lowered, will prolong the

inclined plane of the desk so as to bring its edge perpendicular to that of the bench and, when turned up, will make an angle of 40 degrees with the horizon: which is just the inclination required for reading. Other advantages of this flap would be the possibility for the children to stand up, and to change place as well as to have the book at the required distance from the eyes.

A foot-board which can be raised or lowered according to the stature of the child is indispensable to support and keep the feet warm, which, in the case of our country children, are generally bare and, therefore, get easily benumbed when in contact with the stone pavement. It is scarcely necessary to state that both the application of the mind and the coldness of the feet are the principal factors for the congestion of the head and eyes so injurious in early life.

As to the proper height of the forms, according to the rules already given, I think, it ought to be taken into full consideration, as it is the source of most serious evils, and, in my opinion, three different sizes of forms are quite sufficient to provide accommodation for the children frequenting our schools.

These arrangements might be objected to, because they render very difficult the change

of place of one pupil without troubling his neighbours. It is necessary, therefore, that both the flap in the desks and the back in the seats should be for two children only and a little space be left unoccupied between each couple. By such a disposition, already adopted by the London School Board, the above-mentioned inconvenient is done away with and each child can leave its place without any trouble to the others.

What I have stated is, I trust, sufficient to direct the attention of Government to the necessity of improving the hygienic condition of our schools, and, should my words have the desired effect, I shall be quite happy to have spent time and trouble in collecting these precepts, whilst the result of my self-imposed task may prove an incentive to me to continue my researches in a matter which is by no means of little importance.

Apologizing for taking such an advantage of your kindness.

I remain,

Sir,

Your Obedt. Servant,

L. MANCHÉ, M.D.

Surgeon R.M.F.A.