

NOTES ON LEFT-HANDEDNESS.

BY WILLIAM W. IRELAND, M.D.,

Med. Superintendent Scot. Nat. Inst. for Imbecile Children, Larbert.

MY attention was directed to the subject of left-handedness by a series of articles by Mr. Charles Reade. The view advocated by this writer was that naturally the left hand is as readily used as the right, but that inveterate custom has led men to give an arbitrary preference to the right as the hand which uses the sword, while the left is condemned to bear the shield. He attributes the comparative awkwardness with which the left hand is used to the great care which women take in infancy to accustom children to use the right hand in all difficult operations which require only one arm for their use. Certain it is that infants seem at first to use both hands indiscriminately, and the one arm seems to be at first as well developed as the other, though in process of time the right arm gets more muscular than the left. It is, however, difficult to understand how all nations and tribes, without exception, have in all times of which we know anything given the preference to the right hand, unless they have got some natural reason for so doing, independently of arbitrary usage. Anatomists have pointed out a slight lateral curvature of the vertebral column in the dorsal region, the convexity of which is turned towards the right side, and some have attributed the preference given to the right arm to this bend or curve of the right side. It is, however, more likely the effect than the cause of right-handedness, a deviation caused by muscular action, as explained by Bichat. As most persons are disposed to use the right arm in preference to the left, the body is curved to the left when making efforts, as in pulling, for the purpose of giving an

additional advantage to the muscles, and enabling them to act with more power on the points to which they are attached, and the habitual use of this position gives rise to some degree of permanent curvature. In support of this explanation of the fact, Beclard has stated that he found in one or two individuals who were known to have been left-handed, the convexity of the lateral curve directed to the left side.

On making inquiry in the September of last year, which was done at the request of Dr. Crichton-Browne, who was interested in the subject, I found that there were in the Institution 78 children, 49 males and 29 females, who were using their right hands normally. There were 14 boys and 9 girls, 23 in all, who appeared to use indiscriminately either the right or the left hand; while 7 boys and 6 girls, 13 in all, were decidedly left-handed. On going over our pupils this year, it was found that we had 53 males and 31 females who were right-handed; that 11 boys and 7 girls, 18 in all, used either hand indiscriminately; while 9 boys and 7 girls, 16 in all, were decidedly left-handed. Three girls had ceased to be left-handed during the year, that is, they now use the right hand for sewing and working, where formerly they did the left.

Wishing to ascertain how many left-handed there were among ordinary children, I applied to Mr. Paterson, the teacher of the Sessional School in Larbert, who communicated to me the following observations. Amongst 54 children, whose ages ranged from 4 to 7 years, 8 children had come to school left-handed. They were not allowed to use their left hands in writing or ciphering. Great trouble had, in fact, been taken to make them desist from using their left hands. Some of them had to be kept near the teacher at their writing, but in the playground they threw stones and played at bowls with their left hands. It was thought that left-handedness seemed more prevalent with children likely to be neglected in infancy, but this could not hold good of two of the eight. These children, originally left-handed but now trained to write with the right hand, were not less expert than the rest, and two of them were extra good writers. Of 104 older children out of 52 families 6 boys and 5 girls were left-handed; that is to say, they used the left hand at play, but in the school wrote, or were made to

write, with their right hands. In the whole school, out of 70 girls, 11 girls were left-handed; and out of 88 boys, 8 were left-handed. Thus there was a percentage of 15 girls and 9 boys who were left-handed; and, putting both sexes together, 19 out of 158, that is, 12 per cent. In 1878 the proportion of left-handed amongst our idiots was 11 per cent., somewhat less than in the Sessional School; and in 1879 the proportion was of boys left-handed, 12 per cent.; of girls, 15 per cent.; of boys and girls together, 13 per cent. From this it appears that left-handedness is not more frequent with imbeciles than with normal children. But the cases amongst the imbeciles were much more decided in their left-handedness, generally using their left hands for all purposes; and in the Sessional School the children were all classified as left or right-handed; whereas in the Institution there is a class as large as the left-handed who use both hands indiscriminately. I am aware of the objection to having such an intermediate class, but it was felt impossible fairly to state these children as either right or left-handed.

Thus in the Institution at present, 15 per cent. both of the boys and the girls use their right hand or their left hands indiscriminately. So if there are no more imbecile children decidedly left-handed, there is a much smaller percentage of children who are decidedly right-handed; for while of the normal children in the Sessional School 88 per cent. were right-handed, of the imbecile children now in the Larbert Institution only 72 per cent. were decidedly right-handed.

As idiot children are much less tractable than other children, and it is much more difficult to teach them to use their limbs properly, these results would probably be considered by Mr. Reade as confirming his theory; and it is difficult to deny that custom has a certain power in inducing all those who have a weak tendency to prefer their left hand, to make use of their right one instead. Some people who have been left-handed in infancy, and who through persevering education have been made to use their right hand for acquired work still continue to use their left leg preferably to their right; for example, in kicking, or setting off down a slide.

Luys has asserted that the left side of the brain is earlier developed than the right, so that the left hemisphere in the

new-born child is a few grammes heavier than the right; and in the adult the right hemisphere has been found generally to weigh heavier. If this observation of Luys be correct, the superior weight of the left hemisphere at birth might be held to confirm as well as to account for the habitual preference given to the right limbs.¹ Moreover, if the head be carefully examined, it will be found that its contour is rarely symmetrical on both sides. There is generally a greater protuberance on the left side, a little above or behind the ear, than on the right. On the left side we have a greater curve than on the right, the right side being flatter. This would indicate a greater development of the brain on the left side, near the region where physiologists have placed the motor area of the brain.

In order that there should be less chance of error, I took the cranial outlines of the heads of our inmates with a *conformateur*. The bulging above or behind the ear in the left side was found to prevail. A very common form of the head was a bulge on the left, behind or above the ear, and a bulge on the right side in front, at the angle of the forehead. Thus the greater size of the left posterior region is made up to a certain degree, by bulging on the right anterior angle. Most of those had a bulge, or increased curvature, on the right side, above or behind the ear; but this did not hold good of all cases.

In a few instances of left-handedness there was very little

¹ Since writing this paper I have had an opportunity of examining two cases which may bear on the subject. B. N., 11 years old, epileptic imbecile, left-handed from early infancy, and subject to very frequent fits, which are occasionally on right side only, when he retains consciousness and is able to answer questions. About 8 months before death he had these partial fits, followed by temporary paralysis of right arm, which also implicated the face. Died apparently from exhaustion, following repeated general convulsions. Whole surface of cerebrum deeply injected, bright red, with patches of deeper hue. The left side of encephalon was smaller than the right. This was especially noticeable in the middle lobe, viewed from below, and the middle fossa of skull was smaller. The pons was also smaller on the left side. The right side of encephalon weighed 20½ oz.; the left side 15½ oz. H. M., paralytic imbecile, had a second shock after coming to institution, aggravating the old paralysis of the right side. Lingered on for a year in great debility, sinking into deep dementia. The cortex of cerebrum was much diseased and wasted, with adherent membranes and accumulation of fluid within the ventricles. The right side of brain weighed 16½ oz.; the left weighed 15 oz.

difference, in others there was actually a bulging on the left side. Putting aside the cranial outlines of those, the surface of whose heads were bigger on the right side, I found that 7 were decidedly left-handed, 7 belonged to the indiscriminate class, and 10 were right-handed. Of those whose outline seemed larger on the left side, 5 were decidedly left-handed, 8 indiscriminate, and 50 right-handed. One girl, who was very decidedly left-handed, was much bigger on the left side. In one boy, almost a mute, but with so much intelligence that he might be styled an aphasic imbecile, and who was left-handed, the greater size of the left side of the head was very decided. Those who are left-handed generally kick with the left foot, but not always. I have the cranial outline of a man who was left-handed in childhood, but who was trained to work at a trade with his right hand. In his case the bulging in the head is on the *left* side. On taking the cranial outline of a friend, I remarked that he ought, from the contour of his head, to be left-handed. He answered that he could use both hands almost equally well, and, as a proof of it, wrote his name upon the profile card with his left hand. He observed that his father had been left-handed, and I have met with other facts which make me think that it is worth while inquiring whether this peculiarity may not be hereditary.

It is but fair to acknowledge that I am indebted to Mr. Crochley Clapham for the idea of using the *conformateur* in this line of inquiry. This able anthropologist has stated, as the result of his extensive inquiries,¹ "that the most common form of skull met with was that having its greatest transverse diameter posterior to the median line, and being most protuberant, with reference to the long diameter, on the left side. This condition of left-handedness was present in 81·771 per cent. of the insane; but, as shown in the regional development table, was much more marked in some diseases than in others; and, as bearing upon the question of which is the 'driving side' for convulsions, it may be interesting to notice that left-handedness is not only very common in epilepsy, but is also

¹ See the paper on "The Cranial Outline of the Insane and Criminal," by Crochley Clapham, L.R.C.P., &c., and Henry Clarke, L.R.C.P., &c., in the 'West Riding Asylum Reports,' vol. vi. p. 154. — — —

more pronounced in this disease than in any other form of mental affection." Mr. Clapham also observes that the "numerical superiority of the left-headed" agrees with observations made by numerous writers on the greater relative weight of the left cerebral hemisphere. That it has an obvious, though by no means exclusive, connection with right-handedness is shown on comparing the criminal tables, where the opposite state of right-headedness was exhibited in a number of left-handed individuals." Some may hold that this one-sided development of the brain is really the consequence not the cause of right-handedness, that just as the right arm becomes stronger and more muscular than the left by constant use, the corresponding portion of the brain also takes an increased development.

The view that the habitual preference of the right arm really arises from a greater or earlier innate power in the left hemisphere, seems strengthened by the well-known facts of aphasia, and the physiological experiments confirming and illustrating them.

It is scarcely needful to recall that on the left side of the brain in the lower part of the third frontal convolution, or in the operculum, is situated what has been called the speech-centre, where motor acts of articulation take their origin. On the destruction of these parts on the left side, the power of imitating words is lost, though the aphasic patient generally understands words. As the utterance of words requires the combined action of both right and left muscles of the vocal apparatus, it is clear we have here a fair case of one-sidedness in the hemispheres, which can only be denied by denying that in *most* cases of aphasia the lesion is on the left side, and that it is often associated with paralysis of the right arm. This left-sidedness, at any rate, is beyond the reach of mothers and teachers.

Dr. Ferrier observes, in his book on the 'Functions of the Brain':¹ "As regards the articulating centres, the rule seems to be that they are educated, and become the organic seat of volitional acquisitions on the same side as the manual centres. Hence, as most people are right-handed, the education of the centres of volitional movements takes place in the left hemi-

¹ Page 278.

sphere. This is borne out in a striking manner by the occurrence of cases of aphasia with left hemiplegia in left-handed people. Several cases of this kind have now been put on record."

An instance is given by Dr. Hughlings-Jackson,¹ who adds:—"It is admitted that these are cases of left hemiplegia with aphasia in persons who are not left-handed." In such cases we must suppose the main articulating centre to have been in the right hemisphere without inducing the motor centre of the left arm to take the lead. This seems to prove that the connection of sequence or concomitance between the education of the centres of articulation and manual execution in the same side of the brain is at least not inseparable. As a rule the left hemisphere seems functionally the most active, though the right side has also its work, and the left hand executes important actions, such as holding the reins on horseback.

Mr. Crochley Clapham has noticed that left-handedness is more marked in men than in women, which "goes to substantiate the 'crossed-action' theory, as most female employments necessitate the pretty even use of the two hands."

Dr. Wilbur, of Syracuse, New York, had a friend who professed to be able to distinguish a left-handed man from a right-handed, by attentively watching him without seeing him make any special use of the arm. He grounded his observations on the premise that the appearance of the face was also different in the left-handed. Certainly, the configuration of the face and the fulness of the facial muscles often vary a little on each side; but, as far as my observations go, I am not prepared to undertake the challenge sustained by Dr. Wilbur's friends.

Trousseau² has remarked that the right and left sides are subject to different diseases. Neuralgia is so much commoner on the left side, that for three years during which he kept notes he did not observe a single example of it on the right side of the chest, when real neuralgia was carefully distinguished from pleurodynia, pleuritic stitches, and hepatic colic.

¹ 'Brain,' October, 1879, p. 329.

² 'Clinique Médicale,' Paris, 1868, vol. ii. p. 668.

It may be asked, that where left-handedness has shown itself in a decided manner, is it proper that so much trouble should be taken to make the child break it off? By so doing it is evident that the teacher gives the child a great deal of trouble and perplexity. A left-handed child forced to write with his right hand through fear of punishment, is very much in the same condition as a right-handed one who should be forced to hold his pen in his left. There is no proof that people who remain decidedly left-handed all their lives are less skilful with their hands than others. One of the earliest mention of left-handedness is in the book of Judges, where it is recorded that amongst the 26,700 fighting men of the tribe of Benjamin, there were 700 chosen men left-handed; every one could sling stones at a hair-breadth, and not miss.

On the other hand, it may be argued that as those who are originally left-handed generally retain the use of their left hands for a number of offices, by teaching them to use their right hand we are to a certain extent making them ambidextrous. Another consideration seems much less capable of dispute; since custom has clearly so much play in determining what hand shall be used, it is a misfortune when our acquired expertness becomes the exclusive property of one hand. We ought to practise the left hand as well as the right in difficult manœuvres. There is no doubt, for example, that it is of great advantage for a surgeon to be skilful in the use of both hands, and this can be only obtained by practice commenced in early years.