

MIRROR SYNKINESES

(CONTRALATERAL IMITATIVE ASSOCIATED MOVEMENTS)

A. M. K. OBHOLZER,
Diskobolos, Kimberley

One of the many "nice things" in life is the ability to move the extremities of the left and the right side independently. One can write with the right hand and, at the same time, guide a sandwich to the mouth with the left hand; one can also carry a suitcase with the left hand and beckon a porter with the right one. In this way, one can do many more and some very difficult things like playing the violin. In this case the left hand and the right hand perform completely different difficult movements simultaneously. While doing any of these movements no one does by any means feel like the late and hereto unbeaten king of the jugglers, Rastelli. One takes these abilities for granted, and the reader might wonder why he should be bothered with such an all too natural fact.

People who remember their physiology from good old high school or maybe from varsity days will be quick to tell you why one is able to move the limbs independently: "There are two brain halves—hemispheres—a right and a left one. They contain, amongst others, centres for movements. The left hemisphere reigns over the right side of the body and

the right one over the left side. This is due to the fact that the Pyramidal Tracts, which transfer the innervating impulses from the motor centres of the brain to the muscles of the body, cross sides in the Decussation. The two hemispheres and their Pyramidal Tracts work independently. So, why should the right hand/arm not be able to carry out a movement different from that of the left—even if these movements take place simultaneously?"

Yes, indeed, why not—if the premise to the conclusion is correct, i.e. if the right hemisphere is really only responsible for the movements of the left side of the body and vice versa.

There is, however, some reason for doubt concerning the correctness of this stated premise because:

Mirror Synkineses Associated with Pathological Conditions

There are people who are in fact unable to move the upper extremities independently from each other. This phenomenon we find not so rarely amongst spastic hemiplegias. In these cases a palsied hand/arm which is otherwise unable to move at all, may do so if the healthy hand/arm does a movement against strong resistance (Obholzer)¹. These "associated movements" might be so slight that they are not really a movement yet but only an increase in muscle tone. But even then we can regard this as an abortive copy of the movement of the contralateral side.

If the copied movement is well executed then we speak of a Mirror Synkinesis (M.S.).

There is also a special condition called Klippel-Feil syndrome which shows Mirror Synkineses (M.S.). Here, mainly the cervical vertebrae are misformed, causing neck movements to be restricted. Bauman² studied six such cases, and found M.S. in four out of the six cases. Before Bauman, papers on about 30 cases of Klippel-Feil syndrome had been published, but nothing was mentioned re: M.S. It is believed that M.S. were not noticed in these cases only because no one was on the lookout for them, the connection between Klippel-Feil syndrome and M.S. not being known at that time. M.S. can often easily be disguised and thus overlooked.

There is also a familial trend which is noticeable in M.S. An example: Smith³ reporting of a 23-year old father and his one-year old son, both showing M.S.

A case where M.S. were linked with metabolic disturbances (phenylpyruvicaciduria) has been reported by Friedman and Levinsohn⁴.

M.S. usually exists from birth, and sufferers "learn" to suppress them in later life more and more. The innate condition, however persists throughout life.

M.S. in Neurologically Normal Cases

There are also neurologically normal persons who are unable to move the upper extremities independently. There is the case of a right-handed person who when he wrote with the right hand, copied the movement with the left hand. When he tried to stop the movement of the left hand by sitting on it, he was unable to continue writing with the right hand. If, however, he took a pen in the left hand as well and started writing with the right hand, the left hand copied what the right hand wrote . . . but mirrorwise, i.e. from right to left and with inverted letters. As one can read what the left hand had written only with the help of a mirror, we call this type of writing "Mirror Writing" (Critchley⁵). This man, I can assure you was not too happy about his "gift". When he carried a bucket of water in his left hand and wanted to open a door with the right hand, he had to put the bucket down first, otherwise, he would have dropped the bucket when turning the handle.

We also know of the case of a young man with this type of M.S., reported by Burr and Crow⁶. He entered the navy but proved to be unable to climb a ladder, as every time he released a bar with one hand in order to grab the next higher one, the other hand also opened . . . and he fell down.

Burns—Continued from page 4

All dressings are done in the treatment room, both for aseptic reasons and because this is less traumatic psychologically for the other children in the ward. Large burns are soaked in a mobile bath containing a mixture of water, Cetavlon, and Ringers solution, and a thin perforated pipe circles the base of the bath through which oxygen is bubbled. This helps to loosen the dressings and cleanse the burn. Both bath and treatment room are disinfected between patients.

POST OPERATIVE OR FINAL HEALING STAGE

After the dressings have been removed and the graft has taken exercises are started again, progressing from gentle to more vigorous movements. Later the children are able to go to the Physiotherapy Department where ball games, pedal toys and other apparatus can be used to gain mobility and confidence.

The grafted area is massaged gently with lanolin, which is mixed with olive oil to a very soft consistency as the skin is both delicate and of a reduced sensitivity at this stage. The grafted skin will tend to contract for anything up to three months after the operation, particularly over the flexor aspects and the palm of the hand, and it requires great supervision on the part of the physiotherapist to prevent deformities developing which may require further surgery. Keloid scarring may occur, particularly in African patients and this has to be excised when it has ceased being active. Night splinting, and "lively" hand splinting for day time use is of great value, and light plaster of Paris splints can be made which may be easily applied by the parents when the child goes home.

Unless the patient lives far away, he attends the hospital as an out-patient, both for physiotherapy treatment and check-up at the Burns Follow-Up Clinic at regular intervals. Many of these children, after sustaining a severe burn, require a series of cosmetic plastic surgery operations which may have to be spread over a period of several years.

In conclusion, it can be seen that the physiotherapist has a most important part to play in the general team work of rehabilitating the burnt child, and her work is complementary to that of the surgeon in restoring the patient to a normal life.

M.S. are, fortunately, as a rule, limited to the upper extremities. Just imagine what would happen to the locomotion if the left and the right legs could only make identical movements.

What the reason for M.S. is, remains unknown up to date, as no report on an obduction of such a case has been published yet.

All these types of M.S. discussed above, carry, somehow, the stamp of "pathological". But, what has the really "normal" human being got to do with it?

M.S. with Every One

Here it can be stated that even the "really normal" human being shows M.S.—to a lesser or greater extent—under certain circumstances. This occurs especially under stress, e.g. heavy resistance to a movement (Oberholzer)⁷ (Abercrombie *et al*⁸).

As a matter of fact, the two halves of the body tend to act in unison and the "ability to split" (Levin⁹), i.e. to move left and right independently and at the same time, in other words: to attend to two or more matters simultaneously, is regarded as a "measure of growth and maturity". This remark applies to the physical as well as to the mental development.

The Original Representation of Movement in the Brain is a Bilateral One

There is good reason to believe that the original representation of movement in the brain is a bilateral one. The movements for the left as well as for the right side are represented in *each* hemisphere. The normal child has the inclination to move the *left and right sides simultaneously*. Later, this tendency subsides, when co-ordination and muscle power has been acquired (De Jong¹⁰). In the course of this process side dominance is established.

Side Dominance

The establishment of side dominance is of great importance for the development of skill, speech, intelligence, reading, writing, and behaviour.

The bid of some physical educators to make the children "ambidextrous" is incompatible with the development of a well established side dominance.

Some parts of the body, especially the facial muscles, show bilateral associated movements for a much longer time than the extremities. If, in the extremities, M.S. are persistent in later life to any marked degree, they are according to Critchley¹¹, regarded as pathological:

That M.S.—in the latent form—are present in normal adults, can be demonstrated by the following experiment: Take a piece of chalk in your right hand (if you are right-handed) and one piece in your left hand. Then write on a blackboard—simultaneously with left and right—e.g. abcd with the right hand, and concentrate on the writing of this hand. You will then find—the majority of cases react thus—that the left hand mirror copied what the right hand had written, thus writing from right to left and inverting the letters. Critchley¹¹ states that—genuine—Mirror Writing is seen in all classes of individuals ranging from the mentally defective to intellectuals of the highest order. The outstanding example for the latter class is Leonardo da Vinci, who at least since his 20th year, wrote all his notes mirrorwise.

I understand that some piano teachers make use of M.S. by asking their pupils to practise music scales with the right and the left hand simultaneously—but in opposite directions, i.e. the right playing from left to right and the left from right to left—both hands moving centrifugally, thereafter in the opposite direction. This is supposed to be much easier for the left hand than independent practice.

According to Erlenmeyer¹² M.S. are "the most natural movements for the hands". He thinks that the outward, abductive or centrifugal movements are the easiest, the

best co-ordinated and best controlled movements. Therefore "Mirror Writing is the most natural mode for the left arm".

(Our way of writing from left to right is a writing for the right hand—centrifugally. Left-handers should, correspondingly, also write centrifugally, i.e. from right to left—in the semitic way.)

Once your attention has been drawn to M.S. you will observe this phenomenon in activities of daily living under various circumstances . . . on yourself, on your friends and on your patients.

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