PERSISTENT MIRROR-MOVEMENTS AS A HEREDO-FAMILIAL DISORDER

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THE following case of persistent mirror-movements is interesting from several points of view. Although the familial occurrence of this phenomenon is known, very few cases and pedigrees are actually on record, and this alone would justify the publication of a family observed by the writers, along with some observations on the few cases found in literature.

Personal Case

Summary.—Male of 49 years, admitted in a state of depression and severe retardation without any signs of an organic illness. Complains of and shows “double action,” i.e. active and passive movements of one upper extremity are accompanied by symmetrical movements of the other.

Personal History.—Little is known of his early childhood, except that it was an unhappy one, owing to his maternal grandfather's alcoholism. No definite neurotic traits are known, but he was a nervous, frightened child; nevertheless, he did well at school and was asked to take a scholarship, but did not do so because of the indecision of the family. He was good at arithmetic. He got on well with the teachers, but was shy and frightened of the boys and seldom played, although he wanted to do so. After leaving school, he worked in the Arsenal, apparently staying in the same job till he was 21 because of indecision, as it was a job which most boys left when they were 17. He became a reliable workman, but never got on because of his indecision. He served in the War, was gassed, and took a long time to recover. His work since then has been that of a warehouseman, and he has continued at it with occasional periods of unemployment up to the time of his present illness, earning £2 a week. He married in 1911, at the age of 24, gets on well with his wife, and has three children.

All his life he has lacked confidence, finding it difficult to make any decision, no matter how small the matter may be. He is slightly better when away from the environment of his own family. He has always been slow in all his actions, and this has gradually increased with age. He cannot be hurried, and is said to take ages to dress or prepare for anything. He is silent and reserved, dislikes meeting people, and is happier when out of work. He reads a great deal, mostly adventure stories and occasionally the papers. He is not religious, nor does he belong to any club. He likes the cinema and is very fond of gardening. In 1924 he had a small allotment, and could hardly believe it when he found that he had grown something. His wife found that he had not told her that some vegetables were ripe because he could not believe it.

Present Illness.—In April, 1935, he knocked his leg, and although it got well he worried about it unnecessarily. In August, 1935, he was in St. Nicholas' Hospital for

10 weeks with a carbuncle on his neck. About this time he began to behave strangely, he would stand about doing nothing, saying nothing, and would not even go to bed until his wife made him. He could not make up his mind to do anything, and complained that he seemed to be two people. He managed to carry on with work for another 11 months. In 1936 he was in hospital with pleurisy, and during that time never spoke spontaneously, read, nor answered any letters. He went back to work, but could not get on with it; he was seen to stand for two hours with a sack on his shoulder and his hand on his head trying to make up his mind what he was to do. He was eventually discharged. He developed a series of stock phrases, such as "Good morning, doctor," which he would repeat over and over again. He said that he was very unhappy, that his legs felt like rubber, that there was no hope for him, and talked about drowning himself. Attended the outpatient department and was admitted. The "double action" was only referred to by chance as something from which he had suffered for a long time, which was a family affliction, and which was not considered to have anything to do with his present depression.

Mental Status.—He appeared depressed and sat very still with his hand to his head and a gloomy expression on his face. He showed motor and psychic retardation, but was co-operative and friendly. His voice was monotonous and slow, with a pause before answering questions, and there were no spontaneous utterances. His mood was one of depression and pessimism about the future. He said, "I don't seem to get better; I don't think anything can be done for me." Complained of hot flushes in the face and head and a feeling of being muddled and unable to make up his mind. There were no delusions, hallucinations, or compulsive phenomena. He was correctly orientated, and was able to give an account of his illness, though it took a long time to get it from him. He was able to do the usual tests slowly. He explained this by saying: "I'm not muddled over things like that; I'm only muddled over how I am now. I seem to get worse. Things keep repeating in my mind. I'm all wrong; everything everybody says to me I mean to say no to."

Routine Physical Examination.—No abnormalities were found in any of the systems. The eye movements were normal; there was no nystagmus, he could close each eye by itself. The pupils reacted normally. Movements of lips and tongue were normal, deep reflexes equal, brisk, and did not spread to the other side. Abdominal reflexes present, plantar reflexes flexor. There was no paresis, ataxia, choreiform, athetoid, or similar hyperkinesis, no sensory loss, no stereognosis or apraxia. His facial expression was one of depression; expressive movements were scanty, he showed little spontaneity, and was slow in all actions. All active movements of his right hand were accompanied by symmetrical movements of his left, and vice versa. The associated movements were generally smaller in extent and often seen only as a faint symmetrical jerk. He could control these movements to such an extent that often they could not be seen at all, though he stated that he could feel the stiffness of the muscles. He said that the "double action" was most marked with forceful movements, and, indeed, movements carried out against resistance or requiring special effort showed the associated movements very clearly, but they could also be seen accompanying ordinary movements, so long as he did not concentrate on suppressing them. The associated movements of the left hand with active movements of the right were, *ceteris paribus*, stronger than vice versa. The associated movements always occurred in strictly symmetrical muscles, and did not spread beyond the normal synergisms, either on the leading or on the secondary side.

Passive movements of either upper extremity were also accompanied by mirror-like associated movements of the symmetrical limb. The more the patient's attention was distracted from the test, the more clearly this effect could be seen. The associated movements were smaller in excursions than those seen with active movements, but similar in that they were more marked from right to left than from left to right. They could be easily demonstrated in pronation and supination movements of hand and forearm, in flexion of the arm, or in flexion and extension of the hand. Movements of

the fingers and movements other than those mentioned which would need a somewhat unnatural starting position did not produce the associated movements. Occasionally, instead of the symmetrical movement a parallel one could be observed, i.e. if the patient's right hand was suddenly supinated, the left did not supinate but pronated.

Electrical stimulation of the muscles of either upper extremity also produced associated reactions in the symmetrical ones, but mirror-like and parallel associated movements were seen in approximately equal proportions. Reactions only appeared when the current used was sufficiently strong to produce a marked "spastic contraction." It seems that the parallel associated movements only occur if the patient innervates his antagonists as a response to the painful contraction of the stimulated muscle. This observation may also cast light on the origin of the atypical effects of passive movements. The analysis of slow-motion pictures showed that in pronation-supination movements a visible associated movement started later than the original movements.

When requested to write or to do simple drawings, the mirror movements appeared, though he tried to control them by closing his hand tightly or pressing it on his knee. His mirror writing with his left hand was very good and similar to his right-hand writing, though there was hardly the difference in size which usually distinguishes the writing of both hands. The direction of writing and drawing of the left hand when tested with both hands corresponded to what is the rule in all normal persons, as soon as visual control is necessary the movements became parallel instead of mirror-like (compare the same observation in Lange case).

He was able to distinguish left from right. When shown drawings of extremities he started imitating positions, but named them afterwards without a single mistake. He recognized and named the geometrical patterns in Ableson's test. He did the Porteus mazes for years 12 and 14 slowly and correctly, without help. He recognized the colours of all wood samples, naming them correctly in all shades. He constructed with mosaics up to 7 in all different colours without difficulty (allowing for the retardation). He was able to do one of the complicated geometrical puzzles well. He put together words up to 7 letters (from wooden letters), and numbers up to 5 digits.

Diagnosis : Endogenous depression. Persistent mirror movements. No organic illness.

FAMILY HISTORY (*see p. 18*)

Cases of persistent mirror movements in neurologically and mentally normal persons have been published by several writers (Fragstein, Burr and Crow, Stief and Dancz, Avery). As far as synkinesis when writing is concerned, the literature can be found in Critchley's monograph. But only in a very small number of cases is the disturbance familial in occurrence. The following family tree shows the relationship of the members affected to the patient (Pt).

I. The paternal and maternal grandparents are known to have been normal, except that the maternal grandfather, I.1. was a very heavy drinker.

II.1. Mother. Aged 83, still alive. Is a nervous, fussy woman, indecisive and unable to tackle difficulties. She is very hypochondriacal.

II.2. Paternal uncle. Is known to have had marked associated movements, though little else is known about him.

II.3-9. Little known, except that they did not have associated movements.

II.10. Father. Died aged 76. Showed "double action" very markedly. Whenever he did something with one hand, the other would do the same. He was a heavy drinker, pessimistic in his outlook, easily confused by any trouble, and unable to concentrate. As he grew older he became progressively slower in speech and action. His wife states that there was something about mental illness on his death certificate.

III.1. Sister. Aged 58. Has not got "double action." She has always suffered from heart trouble, asthma, and psoriasis. She is nervous, oversensitive, easily

offended, and said to be slow in her actions. She is married and has two healthy children.

III.2. Sister, aged 56. No "double action." Said to be the most healthy and stable of all. Married and has five children.

III.3. Brother, aged 54. (Personally interviewed.) A cheerful-looking man, but inclined to worry easily—for example, he gets upset and unsure of his ability if put on to a different job. On examination he appeared anxious, a little flushed, a little too jocular, and sweated slightly. He was slow in producing matches to light a cigarette, being impeded by a difficulty in controlling the right hand. He was able to give a good account of himself. He is right-handed, the left hand follows the right; the converse occurs, but less markedly. The legs are not involved. He has found difficulty in his work as a moulder, e.g. in using a hammer and chisel the left hand has to be controlled. He cannot play the piano, of which he is very fond, because as his right hand goes up the keys his left must go down. He therefore has to knock out a tune right-handed. He is handicapped in sport, of which he is very fond. He has to take up things like weight-lifting or swimming, but cannot swim side-stroke, because it is not symmetrical. Cricket is all right because in batting both arms swing together. His fencing can never be classical because his left hand "jiggles about." Homely acts like shaving or taking off his hat are impeded by the other hand wanting to join in, and he has on more than one occasion found himself raising his hat with both hands. He is very self-conscious about his disability, because he feels that one half of him is "daft." Has always been afraid to tell any doctor about it, talks of it as the family affliction, and thinks his brother's mental trouble is related to it. Is married and has three children.

III.4. Sister, aged 51. (Personally interviewed.) She never noticed that she suffered from "double action" until it was pointed out to her when she was a girl. She has always been easily tired, always wanted to "flop" when extra work was necessary, always got flustered easily, especially at times of stress, never could do arithmetic properly. When pouring out tea with right hand the other hand wants to do the same, and she has been known to empty a sugar bowl on the floor in this way. She can feel the muscles move in the left hand, and has to control them consciously. If she takes her time, e.g. in doing her housework, she can control the movements better, but this effort makes her feel depressed and she worries because she cannot do as others do. The difficulty is worse at times of stress, monthly periods, etc. Never notices it in legs, only in the arms. She is married and has four children, one of whom has "double action."

She was cheerful, but talked with marked self-consciousness and almost with fright about her disability. She has never mentioned it to a doctor, and was loath to discuss it or to implicate her son. She said that she had to be continually on her guard against giving herself away.

III.5. Brother, aged 47. Has no "double action," but is slow in talking and gets easily confused. Is married and has three healthy children.

III.6. Patient. (See elsewhere.)

IV.1 and 2. Both well. One is seamstress and the other able to play the piano.

IV.3-7. All healthy and normal. One plays the guitar for a living.

IV.8-10. All healthy and normal. All able to play the piano.

IV.11. Nephew, aged 25. (Personally interviewed.) Has "double action" very markedly. He has always had "bad nerves," and has twice left home because he was upset. He gets depressed and grumbles about his disability; has never put his mind to a proper job because of it, and has thrown up many. Has caused considerable trouble to his mother and family. He is especially annoyed because he cannot play the piano, of which he is fond. Says: "I wish this wasn't so; I could play as well as anybody." On examination he has associated movements with both active and passive movements, but not with relaxation. His writing with his left hand is indistinguishable from that with his right, although he has never practised it.

IV.12. Nephew, aged 22. No "double action," but he is described as having formerly been moody and slow in actions.

IV.13 and 14. Twins, aged 15. Healthy.

IV.15-17. Healthy and normal. They are described as smart, capable young men.

IV.18. Daughter, aged 24. (Personally interviewed.) No "double action." She used to be nervous, but has improved. Now works as a housemaid, is able to play piano.

IV.19. Son, aged 23. (Personally interviewed.) Never noticed anything wrong, is a tool-maker, can play piano and ukelele.

IV.20. Son, aged 19. (Personally interviewed.) Nothing has been noticed by others, but he himself thinks he has some degree of "double action"; says: "When I am doing something with one hand, and the other has nothing to do, there are slight movements in it. For example, when cleaning a shoe, I can feel a tendency to move the other hand." He says that the left hand is more inclined to follow the right, but, on examination, associated movements could be seen more clearly from left hand to right; although he has never practised it, he can write well with the left hand.

Discussion

As mentioned at the beginning of this paper, only a few cases of this kind have been reported in literature, and the family trees, as far as they can be construed from the case records, are far from being complete. Only Levy and Drinkwater examined the relations of their cases, whereas in the other observations only the patient's description is available.

As can be seen easily in the family trees, the disturbance is directly transmitted in all but the case of Drinkwater. He was interested in the mode of inheritance, and thought that the disturbance was transmitted as a single dominant, not sex-linked gene, and he assumed that his *propositus*' mother (who transmitted the disturbance from her mother to her children) might have made a complete recovery. He was led to this assumption, because another member of the family mentioned a decrease of the disturbance with advancing age. This, however, is the only case where this happens; in all other instances the disturbance is described as absolutely stationary. In any case, the assumption of the disappearance seems hardly necessary, since incomplete dominance is so common, i.e. the probability of manifestation is rarely 100 per cent. In our family there is also a direct transmission; the number of descendants is much too small for any statistics on the proportions of affected members, but the findings are well in keeping with the assumption of a single dominant gene.

So far, the mirror-movements have been regarded as an entity. On closer analysis, however, there is much that is very problematical.

The discussion of synkinesias or associated movements has been greatly impeded by the confusing nomenclature. Kinnier Wilson rightly says: "Among the tangled mass of movements described by different observers as . . . associated movements, reflex synergias, movement synergias, and associated reactions the student may well be excused if he loses his way."

Foerster in his monograph on *Mitbewegungen bei Gesunden, Nerven- und Geisteskranken* divides the phenomena in question into (1) synkinesias under

CHART 1
PERSONAL CASE

CHART 2
FAMILY DRINKWATER

CHART 3
FAMILY LANGE

FAMILY HELDMANN

CHART 4
FAMILY LEVY

FAMILY DAMSCH I

physiological conditions, and (2) synkinesias under *pathological* conditions (e.g. peripheral and pyramidal lesions, tabes, chorea, etc.). The former are divided into (a) normal purposeful and (b) normal purposeless synkinesias. Purposeful synkinesias occur with all intended movements, in fact, all normal movements may be regarded as consisting of two components, the chief movement and the associated movements. As examples of this type of normal purposeful synkinesias, Foerster writes : " If the hand is closed, not only are the fingers bent, but the hand is extended also ; if the eyes are closed, the shutting of the eyelids is the chief movement, upward turning of the eyeball and narrowing of the pupil being synkinesias ; when looking upwards not only the bulbi are turned up, but in addition the upper lid is lifted and the forehead wrinkled." Foerster feels justified in analysing the normal purposive movement like this for two reasons : (1) the synkinesias are not original components of the movements ; they are absent in infancy and are only acquired later in life ; (2) they can be lost in disease. Kinnier Wilson has various objections to Foerster's concept of *Mitbewegungen*. He distinguishes, for example, two phenomena within Foerster's normal purposeful synkinesias. According to him they ought to be described partly as normal components of movement, partly as movements of co-operation. The interplay of agonists, synergists, fixers, and antagonists should not be called " movement synergia," since there may be a " co-operation of antagonism " ; here we are dealing with normal components of voluntary movements ; on the other hand, one ought to speak of movements of co-operation, if one means " movements that are auxiliary to other also voluntary movements, preceding or accompanying them, such as putting the feet back before rising from a sitting position, etc." This is certainly a very useful distinction which points to the profound difference between movement and action. We shall try to omit this psychological problem as far as possible.

The term *associated movement* is used by Kinnier Wilson to denote " those involuntary movements of one limb which may be seen to accompany forceful voluntary movements of its fellow on the other side." This nomenclature is certainly clearer than that of Foerster, who includes under the same term (*Mitbewegungen*) normal muscular components, spread of movements in hemiplegic cases from one group to another in the same limb, and also the mass movements of tetraplegia and spastic paraplegia. Although Kinnier Wilson appears to object to this procedure, he himself in a preceding paragraph writes about the " associated movements " in his sense as " readily elicitable, *more particularly in cases of hemiplegia and diplegia.*" These movements which occur in pathological cases do not fit into his definition, since " they are often spread on the second side in a way not to be seen in the first " ; in other words, they are not " movements of one limb accompanying movements of its fellow on the other side " any more. As is so often the case, this difficulty of definition points to a problem in the facts : it is doubtful if the " associated movements " in Wilson's sense are identical with the phenomena, roughly of the same kind, to be observed in hemiplegia, paraplegia, and other pathological conditions, and connected with the tonic reflexes (Simons, Walshe). The mirror-move-

ments in our patient (and his relations) may be regarded as a classical example of "associated movement" in Kinnier Wilson's sense.

Only a few writers have given any attention to the fact that synkinesias of some kind may also be present in extra-pyramidal lesions, and little use has been made of such cases in forming theories about the pathology of these symptoms. Wilson has studied "associated movements" in cases of hemi-parkinsonism and found that "in the performance of individual movements with the affected arm, hand, or fingers, an identical mirror movement is executed on the sound side."

All the motor phenomena discussed can be observed accompanying (or immediately preceding or following) voluntary, active movements. There are, however, some observations on record where passive movements of one limb produced similar reactions. Alexander has recently studied this phenomenon which he calls "Mitbewegtwerden." The two cases which he investigated both had pathological conditions, one being infantile hemiplegia, the other post-encephalitic parkinsonism in a patient who had suffered from epilepsy before the encephalitis. Their synkinesias also accompanied movements produced by electrical stimulation of the muscles. In the hemiplegic case they could be elicited only in the paralysed arm (by moving the healthy one). In the post-encephalitic case they worked both ways. Alexander found this passive variant of synkinesias only in one other instance, although he examined a large number of organic cases as controls (unfortunately there was apparently only one case among his 53 controls that had associated movements with active movements without special effort). Other writers on synkinesias hardly mention this passive variant, but when they do they emphasize how rarely passive movements are accompanied by associated movements. Walshe, for example, who made a very thorough investigation of associated movements in hemiplegia says: "Passive movements of the limbs have not been found effective in producing associated reactions."

Unfortunately the examination of the cases of familial mirror-movements which we collected from literature is not complete in this respect. The data found are given in the following table.

NAME OF AUTHOR	ASSOCIATED ACTION PRESENT IN :			TYPE OF MOVEMENT :			ADDITIONAL CASES IN FAMILY
	FACE	UP. EXTR.	LR. EXTR.	PASS.	ELECT.	RFL.	
Damsch	0	++	+	nn	+	nn	1
Levy	+	++	0	nn	?	0	2
Drinkwater	2	++	?	++	nn	nn	7
Heldmann	+	++	?	nn	+	nn	2
Lange	0	++	+	nn	nn	nn	2
Own case	0	++	0	+	+	0	6

0=absent. nn=no note.

Practically all writers agree that the mirror movements as shown by our patient are closely related to the associated movements found in children and adolescents. Movements such as used for testing adiadochokinesis (also alternate opening and closing of the fist, touching of the thumb with the other fingers singly) tend to be accompanied by the same movements of the corresponding hand ; this phenomenon is present normally, though to a variable extent, up to approximately the age of puberty, and then it decreases with age (Curschmann). Forceful or complicated innervations elicit mirror movements more readily than ordinary ones. They are generally less marked if the dominant hand leads than vice versa ; in other words right-handed children show less associated movements in the left hand than in the right. With the progress of motor development these synkinesias decrease in intensity and finally disappear, although the tendency for symmetrical innervations can be demonstrated in normal adults if they have to learn to carry out new and complicated patterns of movements. In children and adolescents with retarded motor development, they may exist longer and appear more obviously than they do in subjects with well-developed motor systems.

Neither our patient nor any other member of the family was able to describe a definite onset of the disturbance, and this may be used as an argument that it really is the persistence of the early stage of the motility. Subjects like our patient would appear to have a partial infantilism, a developmental error in a particular motor function which may or may not have a structural basis. The possible existence, site, and type of the anatomical anomaly, if any, are irrelevant for this conception.

There are, however, two clinical differences between our patient's and the infantile mirror-movements : first, the converse variation of intensity with regard to the dominant hand, and secondly, the absence of the associated movements with passive movements in children. Although the conditions are not to be paralleled, the first difference recalls that between extra-pyramidal and pyramidal hemiplegics. In the former the movements of the paretic, in the latter those of the healthy hand cause associated movements more readily. In children the preference corresponds to that in extra-pyramidal states. We do not think that the phenomena observed by Wilson in hemi-parkinsonian states differ in essence from the associated movements of normals : the increased effort necessary to overcome the extra-pyramidal disturbance produces the overflow into symmetrical parts ; this is a normal mechanism. There is no reason to assume any pyramidal involvement in our patient or in his family to explain the " hemiplegic " accentuation in their associated movements. There is also nothing to suggest a parietal lesion. The difference in accentuation of the synkinesias, as compared with that in children, seems to be accounted for by the patient's attitude towards the phenomenon : he permanently struggles against it and tries to control it ; he does so by means of active innervations, and this highly complicated motor activity is more easily and more successfully carried out with his (dominant) right hand. Therefore the synkinesias are better seen in the left hand. In Lange's left-handed patient, who was apparently less self-conscious of his movements than our patient, the mirror-movements

were also more marked when the left hand led. The second difference seems much more important. By the kindness of Dr. Creak (Physician in Charge of the Children's Department) it was possible to test a large number of children who exhibited symmetrical associated movements. Most of the children had no neurological symptoms, a few were cases of slight infantile hemiplegia or mild choreoathetotic conditions. In only one was there found the slightest tendency for synkinesias with passive movements, the only exception being a very shy and tense girl of twelve who showed marked synkinesias of the ordinary type, with active movements. If the examiner moved her hands, slight mirror movements were sometimes seen. But, by simulating the beginning of the test movement and not carrying it out, it could be shown that the movements were due to her own active efforts, and once her attention was successfully diverted the synkinesias disappeared. It has been found in many examinations that mechanisms of this kind were not present in our patient and the other members of the family.

The few authors who have discussed passive associated movements agree that their physiology must differ fundamentally from that of the active movements. Fragstein, who was mainly interested in the mirror reactions after electrical stimulation, thought that a direct transmission of the stimulus (by means of antidrome conduction on the primary side) is responsible for the occurrence. Otherwise it is generally assumed that this type of synkinesia is a reflex, the stimulus of which is the primary movement, the centripetal path the sensory fibres from joints or muscles participating in the primary movement. Alexander, who studied the *Mitbewegungen* so carefully, distinguishes this phenomenon clearly from the crossed reactions described by Sherrington, which consist of mass movements and lack the strict symmetry in parts of limbs, even muscles. Clinical and anatomical considerations make Alexander assume the centre for the passive mirror-movements in the region of the substantia nigra. Experimental proof of the reflex nature of the passive synkinesias is missing, and it does not seem very satisfactory to assume a different origin for the "active" and "passive" movements when they are so closely related and so similar in appearance. It is worth considering the possibility that the "active" synkinesias are also of reflex origin, or alternately that the "passive" synkinesias may be due to the same central connection as are the active ones. It is hoped to discuss these points in a further communication.

The following classification of associated movements is suggested :

- A. Normal : (1) Components of movements.
 (2) Movements of co-operation.
 (3) Mirror-movements, transient, in children, and in adults when acquiring new patterns of movements.
- B. Abnormal : (1) Symmetrical without spreading (parkinsonian type).
 (2) Symmetrical with spreading.
 (3) Mirror-movements, persistent.

In each group associations accompanying active or passive movements have to be distinguished.

In conclusion, the psychological aspect of our case may be mentioned, i.e. the patient's attitude to his disturbance. He appears to have always regarded his motor anomaly as a kind of foreign body ; he has tried to hide it and has developed a system of economy of movements which to some extent helps to prevent its manifestation. This attitude is familial, like the disturbance itself ; differences in the personalities concerned may account for the fact that some members minimize it, whilst others study it and develop methods to overcome it. But it is known and feared throughout the family, and there is a vague idea it might be a sign of imminent madness. The more striking is it that it plays no part in the symptomatology of the depressive illness which our patient developed. He complains of all sorts of physical malaise, but the "double action" is never spontaneously mentioned. If he is questioned about it, he generally says that this does not concern him now, but his head is dull and his feet feel like rubber, etc. It is a most striking example of the endogenous character of even the symptomatology of the endogenous melancholia.

Summary

A case of persistent symmetrical associate mirror movements is described in which the associated movements accompany both active and passive movements, and in which the disturbance is familial in occurrence. The observations found in the literature and the present case point to a single dominant, not sex-linked factor as responsible for the syndrome.

The various types of normal and abnormal associated movements are discussed and a classification of the various types proposed. The difference between associated movements with active and with passive movements is emphasized. It cannot yet be stated how far the physiology of the two types differs.

In children mirror-movements with active movements are physiological, but they never occur with passive movements. This difference from the case recorded must cause some reserve in regarding the familial disturbance as an inherited developmental delay.

The patient's depression is independent of his neurological anomaly. Though the latter is an important factor in the make-up of his pre-psychotic personality, it plays no part in the symptomatology of his present mental illness.

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