

Perseveration as a Sign of Diffuse and Focal Brain Damage*—II

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Perseveration in Patients with Focal Brain Lesions

So far the clinical significance of perseveration has been considered only in relation to conditions giving rise to general disturbances of brain function. Indeed, it is observed so often in clouding of consciousness that little attention has been paid to it as a relatively isolated expression of focal brain damage. When found in patients with focal lesions the tendency has been to treat it as a residual or early fragment of general clouding of consciousness, the effect of which is to lessen the significance of any other intellectual defects that may be present at the time. Like the farmer, who would hesitate to waste time and energy on harvesting a field of grain which had become heavily contaminated by weed, the clinician sees little advantage in probing the mental state of such patients.

Yet this attitude is not altogether justified, for in some patients recovering from a general disturbance of brain function, like anoxia or dehydration, perseveration is not seen, although the conditions necessary for its demonstration are there and it is searched for repeatedly. In the majority of these instances it is pronounced and affects all psychomotor activity, but in others there appears to be some element of selectivity at work, because it affects certain activities and not others. A third reason for studying perseveration out of its usual context, with clouding of consciousness, is that it has been described on occasion in patients with purely focal brain lesions.

Association with Frontal Lobes

Perhaps best known is its association with the *frontal lobes*. Some at least of the peculiar disorders of movement that result from damage to them are related to perseveration in their quality and may represent a motor aspect of the phenomenon which is thrown into particular prominence by lesions in this situation. These movements have been described under the titles of "tonic innervation" (Wilson and Walshe, 1914), "Zwangsgreifen und Nachgreifen" (Schuster, 1923), "forced grasping and groping" (Adie and Critchley, 1927), and the "grasp reflex" (Seyffarth and Denny-Brown, 1948). The last-named is not relevant to our discussion because, as Rushworth and Denny-Brown (1959) have shown, when the arm is immobilized it is dependent on a serial combination of cutaneous and proprioceptive stimuli to the palm of the hand. In grasping, a true perseveratory effect can be deduced only when, for example, after shaking hands with a patient on first meeting and then taking his wrist to examine the pulse, the patient again grasps the examiner's hand or catches hold of his coat. Such a result, when bilaterally obtainable, has no focal significance, although it is typical of diffuse cerebral cortical affections.

However, Denny-Brown (1951) detects in the increased resistance to passive movement observed in the monkey after frontal ablation a similarity to the clinical phenomenon of "gegenhalten," which was referred to in the previous lecture. In Fulton, Jacobsen, and Kennard's (1932) experiments it was noted that after bilateral excision of the frontal and premotor areas the behaviour became stereotyped: "once a movement, such as walking or chewing, was initiated, the animal would

continue the movement for an unlimited time to the exclusion of all other activity and in complete disregard of external stimuli which would readily divert a normal monkey." This behaviour can be likened to that of the patient described by Williamson (1896). He had a large right frontal abscess and was "constantly buttoning and unbuttoning his shirt or rearranging the bedclothes, pulling them a little higher or turning them down for a few inches."

Rylander (1939, 1943), who followed up and studied patients some time after they had been operated upon for tumours involving the frontal, temporal, parietal, and occipital lobes respectively, was careful to comment: "the frontal lobes provide better conditions for total and subtotal excisions . . . meningiomas . . . occur less often in other parts of the brain and do not necessitate removal of brain tissue as they generally do when they grow up the olfactory groove." He was asking himself whether it was the amount of cerebral tissue excised or the part of the brain removed that determined the subsequent appearance of mental symptoms. Later Bleuler (1951) was to affirm his belief that "the so-called frontal syndrome is . . . not characteristic of a frontal lesion, but occurs also in most other brain lesions if they are localized"; and Wolff and Chapman in 1957 were to show that the amount of brain removed at operation for tumours bears a logarithmic relationship to the extent of the intellectual deterioration to be expected. Nevertheless, although alive to this, Rylander summed up by saying that there was conclusive proof that the alternation in mood, disturbances in initiative, and intellectual changes that followed frontal-lobe operations were due "to the maiming" of these parts.

Reading through his admirably detailed case notes, however, one can only conclude that perseveration as we have been considering it must be a rare sequel of unilateral frontal-lobe excisions. Only one instance is recorded, and in this case (No. 5) it was the right temporal lobe that had been partly excised. This was in a schoolboy, and Rylander states: "Sometimes he [the patient] repeated the same sentence, or returned to the same train of thought, in a way typical of an epileptic person" (fits had occurred after the operation and had been very frequent since the death of the patient's mother, but two and a half years later, at the time of observation, their frequency had been reduced to about one a month). Rylander goes on to say that when given psychological tests "the patient sometimes repeated the answer to the question directly preceding the one put to him."

Bricker's (1936) monograph on the man who had had his left frontal lobe "anterior to Broca's area" and part of the right frontal lobe excised, however, contains an example of perseveration. There was some naming difficulty, especially for nouns, and a tendency to paraphasia, and on one occasion, when given a series of words to define, he said "philanthropy" meant "the giving away of money." The next word was "irony," and this he stated was "not being philanthropic."

Recently Luria (1965) described the cases of two patients with frontal tumours in whom perseveration was observed, and as its character is described in detail it deserves special notice. In the first patient (massive basal tumour involving both frontal lobes and the subcortical ganglia) there was no difficulty in switching from one task to another: "Her defect became apparent only when she had to finish a movement already

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begun: it took the form of reinforced repetition of the action that had been begun—that is, efferent perseveration.” In the second case (massive tumour spreading into the posterior parts of the frontal lobes at the midline) the patient was unable to carry out any complicated programme of action. There were no compulsive movements, she could stop movements once they had begun, “but she had difficulty in carrying out even simple movements in response to visual models or verbal instructions. She could not easily switch from one action to another.”

Parietal-lobe Lesions

As Critchley (1953) notes, tactile perseveration may occur in *parietal-lobe lesions*, the patient continuing “in a perseveratory manner to feel contacts where there are none.” Reading again the account of the remarkable case of tactile hallucinations reported by Allen (1928), it seems likely that there was some perseveration, although this is not mentioned in the text. In a recent case of my own (a man of 60 years who had had a right parietal infarction) tactile perseveration could occasionally be demonstrated, but after the first three months repeated search failed to elicit it, despite the fact that there was still some residual sensory neglect of the left arm, impairment of two-point discrimination in the fingers, and dystereognosis. Earlier, however, although unable to recognize small or unusual objects by touch, he learned by practice to identify a pipe, a handkerchief, a hairbrush, and comb. Often, after giving one or two correct answers he would say that the object he was manipulating was one he had just previously identified correctly. It was notable that there was no trace of perseveration in other performances that involved seeing, hearing, or smelling, and that his general mental state was not otherwise impaired.

Parieto-occipital Lesions

As regards the posterior part of the cerebrum, Kinsbourne and Warrington (1963) have given a detailed description of two patients with *parieto-occipital lesions*—(1) infarction within the left occipital lobe due to basilar-artery ischaemia, and (2) contrecoup damage to the posterior part of the left hemisphere—in whom perseveration was readily demonstrable but confined to visual experiences. The after-imagery, although qualitatively resembling the physiological variety, differed from it quantitatively and appeared to represent “a pathological enhancement of normal physiological processes.” Whitty (1956) has also reported a case in which occasional perseveration was noted in various motor performances, the patient repeating “inappropriately the action of a previous test.” In this instance there had been a history of impaired memory and loss of interests, but she was fully orientated and was aware of her mistakes in tests. The lesion proved to be a large glioblastoma of the right *basal ganglia*. This experience of a subcortical lesion giving rise to perseveration may be compared with that of Pechtel, Masserman, Schreiner, and Levitt (1955), who found, after making bilateral thalamic lesions in the cat, that “the operated animals consumed food rapidly; however, unlike normal controls, they persisted in unsuccessful efforts to get food for as many as 100 trials in a period of 10 to 20 minutes and did not explore the apparatus for a more successful technique of procuring food.” In Kluver and Bucy’s (1938) monkey, who had been deprived of her temporal lobes, somewhat similar behaviour was noted, although modified this time by the presence of visual agnosia.

Perseveration in Aphasia

The contamination of speech in aphasics “by words which the patient has already used but cannot get rid of” (Brain, 1961) was known to Hughlings Jackson, who, according to

Head (1926), equated perseveration in aphasia with “barrel-organism,” the epithet which had been applied to it by Gairdner. Collier (1910) noted its occurrence especially in patients who were “partially agraphic” and Weisenburg and McBride (1935) in patients with sensory aphasia or receptive speech difficulties. But in the latter authors’ Case 43 the speech defects were predominantly expressive, and marked perseveration was noted in spoken responses (p. 497). Goldstein (1948) looked on perseveration, like fatigue, as being representative of the degree of difficulty a task represented, and pointed out that “the same task does not represent the same degree of difficulty for every individual, this holding particularly true for a patient.” He thought perseveration was a means “utilized by the organism to avoid catastrophe.” Eisonson (1954) subscribed to the same view that perseveration occurred especially when a patient had to exert great effort to produce a correct response and was unable “to shake off the old response and to proceed with the new.” He recognized that aphasics were usually aware of their tendency to perseveration although unable to check it.

Hécaen and Angelergues (1964) mention that perseveration occurs in frontal aphasia and is due to loss of the regulating function of language, in which conditions a characteristic feature is loss of monologue with retention of dialogue. Denny-Brown (1963) cites some examples of its occurrence in speech, but, like Schuell (1954), Conrad (1954), and Rochford and Williams (1963), does not refer to it specifically. The last-named authors, however, say that naming an object is dependent on “the threshold of the word, and that such thresholds are related to its frequency of usage and are raised in dysphasia, but may be lowered by a number of factors acting as clues.” Recovery from nominal aphasia they suggest is due to the lowering of thresholds in the “word pool.”

However, the impression received from a perusal of accounts of perseveration in aphasia is that its occurrence is incidental, if not fortuitous, and that in all such cases one may expect “to meet with evidence of some general mental defect over and above that which may be due to the mere lesion causing aphasia and agraphia” (Collier, 1910). The only writers who differ on this point are Klein and Mayer-Gross (1957), who averred that “perseveration is, however, not necessarily due to a general disturbance, it is also a common sign in disorders of specific function, particularly in aphasia and dysgraphia, and may be limited to the particular functions involved.”

Indeed, as the lesion responsible for an aphasia is often circumscribed and recovery of speech slow, this would seem to be a good opportunity for studying the phenomenon of perseveration in relative isolation—that is to say, against the background of residual brain damage and at repeated intervals, long after any initial clouding of consciousness has disappeared. So far as we are aware there has been no detailed study of this aspect of aphasia, and this was the reason for deciding to investigate its incidence in a series of cases. The clinical material available consisted of 49 patients with organic brain disease in whom speech and language disturbances were the chief disability and who had been seen personally over the past 15 years at the Royal Victoria and Claremont Street Hospitals, Belfast.

These were consecutive cases, but selection was necessary, as in some there were signs of diffuse brain disease and in others rapidly increasing pressure signs, which made serial observation impracticable. A number, too, had to be rejected because the case notes were incomplete. However, after pruning there remained 24 patients in whom the requirements were met and in a proportion of whom the nature and site of the lesion had been confirmed. Table I summarizes their chief features.

Perseveration was observed repeatedly in 16 of these 24 patients with dysphasia—that is, in nearly 70%. The period of observation was short in three patients who had tumours involving the left hemisphere, but in the remaining 13, although

varying in extent from day to day, provided sufficient care was taken it could be demonstrated repeatedly in the same activities for weeks, months, or even years on end (the longest period of observation was four and a half years). Two points about it

TABLE I.—Patients with Focal Lesions Causing Dysphasia and Showing Perseveration (16 out of 24)

Case No.	Age and Sex	Handedness	Clinical Summary	Lesion
46	67 F	R	Gradual onset dysphasia and R. hemiparesis	L. temporal meningioma*
70	59 F	R	Headaches, dysphasia, R. hemiparesis	L. temporo-parietal anaplastic astrocytoma*
92	62 M	R	R. hemiplegia, hemianopia, dysphasia after stroke	L. cerebral infarction
116	71 F	R	R. hemianopia, dysphasia after stroke	"
130	63 M	R	"Stuttering," R. hemiparesis, dysphasia	L. carotid occlusion*
159	59 M	R	Sudden R. hemiparesis and aphasia	L. carotid stenosis and infarction
166	58 M	R	Sudden aphasia and R. hemiplegia	L. cerebral infarction
177	54 M	R	Sudden R. hemiparesis, hemianopia, dysphasia	L. int. carotid occlusion*
178	56 M	R	Recent onset aphasia, weak R. arm	L. cerebral infarction
196	49 F	R	History of epileptic fits, hypertension, aphasia	"
205	23 M	R-L	Sudden R. hemiparesis, aphasia	" "
217	62 F	R	Recurring dysphasia, R. hemiparesis	" "
218	75 F	R	Gradual R. hemiparesis, dysphasia	" "
226	36 F	R	Following 9th confinement, epileptic fits, residual dysphasia	L. cerebral venous thrombosis
227	51 F	R	Sudden coma. C.S.F. blood-stained. Residual dysphasia	Spontaneous subarachnoid haem.*
232	73 F	R	Stroke, R. hemiparesis and aphasia	L. temporal infarction*

were noticeable: none of the 16 patients perseverated on each and all of the tests given, and in all but five perseveration was confined to activities requiring especially the use of speech and language.

In Chiefly Non-linguistic Activities

Whereas perseveration is apt to affect all activities when there is general clouding of consciousness, only 5 of our 24 aphasics displayed it in activities not directly concerned with speech.

Case 218.—During the first few weeks after a stroke the patient showed perseveration in searching tests. Thus, when three objects were hidden she kept on referring back to the place where she had found the first one.

Case 227.—When a clock face was drawn with the hands placed at 3.30 the patient could reproduce it correctly, but when given a second drawing, this time with the hands at 11.45, she drew them pointing to 3 o'clock. Although her speech difficulty was great and perseveration rife in most linguistic activities, there was no constructional apraxia or evidence of spatial disorientation.

Case 166.—Apart from speech, perseveration was noted only in drawing. This man could copy an arrow and draw a second arrow

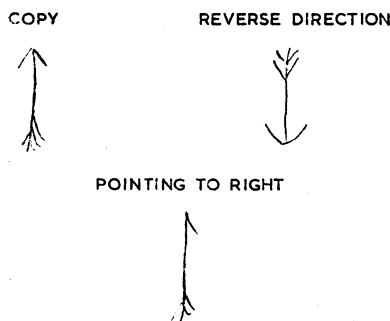


FIG. 7.—Case 166, man aged 58. Left cerebral infarction. Residual dysphasia. (No constructional apraxia, hemianopia, or spatial disorientation.)

in the reverse direction, but when told to draw one pointing to the right he repeated his first drawing, putting a barb only on the right side of the arrow (Fig. 7). There was no right-left disorientation or constructional difficulty.

Case 116.—This patient likewise showed perseveration in drawing arrows, but there was constructional difficulty.

Case 232.—Perseveration was again seen in drawing a circle and a square.

In Gesture and Pantomime

This was observed only once (Case 178). The patient made little spontaneous use of gesture to reinforce speech, and when told to wave goodbye, shake a fist, pretend to play the piano, perseverated at the second or third action. In this man there was no evidence of ideomotor or motor apraxia, but he had gross constructional difficulty. It is possible that, as his aphasia was severe, defective comprehension may have been partly responsible for the perseveration.

In Response to Simple Spoken Commands (eyes-tongue, raising arm)

This was common (Cases 46, 159, 177, 178, 218, 226, 227, and 232), and was found chiefly in the early stages of recovery after a stroke or with tumours shortly before general clouding of consciousness supervened. In the former, perseveration in these tests might persist for weeks, but usually it tended to disappear long before it did in other activities.

In Repeating and Reversing the Order of Series

This was also common (Cases 166, 178, 205, 217, 218, 226, 227, and 232). These dysphasiacs could count or give the days of the week, etc., but when they tried to reverse their order immediately began to perseverate. In Case 178, for example, when the examiner said "1, 2, 3" and indicated the patient should continue, he counted rapidly on up to 10, although he was quite unable to reverse the process, even with help. When prompted "10, 9, 8" he invariably said "9, 9, 10, 11, 12." The same tendency was seen too in repeating the days of the week or months of the year. In Case 232 the patient could say the days of the week without difficulty, but when asked to say the months, after being prompted "January, February," she went on "Wednesday . . ." (and laughed as she shook her head). There was the same difficulty with counting.

In Naming Sighted Objects

(Cases 46, 70, 92, 159, 166, 177, 218, 232, and 326.) A feature brought out by this test again was the curious blending in responses of information relating both to the foregoing and to the current stimuli. Much the same was seen with the eyes-tongue test, where a patient often responded to the second stimulus by simultaneously closing his eyes and putting out his tongue:

Case 70.—Thimble="I don't know." (Examiner: "This is a thimble") . . . "a thimble." Fountain pen="A kind of pen." Watch="A pen . . . no . . . your pen for telling the time."

When naming was a prominent difficulty perseveration could often be demonstrated with this test long after there had been a fair degree of recovery from an originally severe expressive aphasia. Thus, in Case 226, even after four and a half years, there was still some suspicion of perseveration:

- Pencil = "a pencil" (without hesitation)
- Pen = "a pen" (ditto)
- Watch = "a watch" (ditto)
- Pin = "a pen . . . pin . . . pin" (quickly correcting herself).

In Naming from Memory

In contrast to the difficulty experienced by patients in naming sighted objects, some of them—for example, Case 217—were comparatively fluent when it came to giving the names of fruits, towns, etc., showing no trace of perseveration in such exercises. This I attributed to the purely focal character of their lesions and the fact that their memory was little impaired, recalling from memory being more difficult for patients with global lesions than with focal ones.

In Writing

Neisser pointed out that in its purest form perseveration could be demonstrated in writing, and this was our experience too (Cases 92, 159, 166, 178, 197, 205, 217, 218, and 226). But it was seen only when there was an associated dysgraphia of one kind or another. Further, it was always linked to the particular disability—for example, copying letters or words, writing from dictation (which uncovered perseveration in the shaping of symbols or in the repetition of words), or letter-writing. Case 166 illustrated the first kind (copying words). The patient was asked to give the name of his old regiment (the Royal Irish Fusiliers) and wrote: TO RINI REGAINT THE REGL. Two patients (Cases 197 and 205) could print or write in script the letters of the alphabet, but when instructed to do first one and then the other perseverated on the second instruction. This difficulty in switching or changing over from one style of writing to another was very much the same as that seen in the performance with series.

The best examples of perseveration in writing, however, were seen when patients attempted to compose a letter (see Fig. 4).

In Reading

As with naming from memory, perseveration was observed much less often in reading than in speaking or writing—probably because of the infrequency of pure dyslexia. However, it could be demonstrated when there was a specific reading difficulty, as shown in Case 116. This was a woman with a marked literal dyslexia, some nominal defects, constructional apraxia, and a contralateral half-field defect. Encouraging her to trace the shape of letters with her finger helped her to read, and she made good progress towards recovery. But even when she reached the stage that she could recognize a number of letters she continued to perseverate when a second or third letter was presented to her.

In Spontaneous "Small Talk," in Answering Simple Questions, or Making Short Factual Statements

Perseveration in casual talk was pronounced in most patients. Thus a man who had served in the first world war (Case 130) could tell that it had begun in 1914 and ended on 11 November 1918, but when asked what was the present year (1955) he replied "1915." Some time later, when asked to say how many halfpennies there were in a penny he answered at once "two." But when invited to give the names of some vegetables he said: "half . . . half . . . a quarter . . . an eighth," until he finally broke away and rattled off: "carrots, celery, turnips, peas, barley," showing clearly that he recognized his mistake, and, also, how selective was his perseveration. The same man, it should be noted, had pronounced naming difficulties with sighted objects and in propositional speech.

Other Features Associated with Perseveration in Dysphasiacs

An undercurrent of emotional tension was apparent in many of our patients, especially when their ability to comprehend

was less impaired than their capacity to express themselves. In trying to comply with spoken or written instructions they often became anxious, tense, or exasperated. Goldstein (1948) postulated that perseveration, which was the result of fatigue, represented a means whereby the organism sought to avert catastrophe. But not all aphasiacs react emotionally in this way. Some display actual "push of talk" and an air of assurance, as if indifferent to or unaware of their defects, although their speech is generously interlarded with periphrasis and paraphasia and under stress often reverts to jargon. Others, by contrast, preserve a dignified silence, withdrawing themselves from activities to which their attitude implies they know they are unequal. A few who keep silent, however, make skilful and free use of gesture and pantomime, with which they can express their immediate wants or convey to the examiner that they understand what is said. Indeed, although it is hard to forecast how any given individual will react to the disaster of aphasia, it is reasonable to suppose that this might depend to some extent on his education, basic intelligence, handedness, personality, and temperament. More important still is the extent of actual brain damage. When this is relatively small and circumscribed one would anticipate that a patient should have greater insight into his disability than if damage were more widespread.

To test how these theoretical considerations matched the incidence of perseveration the case notes were reviewed with regard to:

1. The frequency with which catastrophic reactions were associated with perseveration.
2. Casual talk: did perseverators engage much in spontaneous talk? The assumption was made that the absence of any spontaneous effort at talking denoted either an especially crippling lesion—for example, a tongue-facial-oral apraxia—or that the patient, although not rendered speechless, had sufficient insight not to expose his disability unnecessarily.
3. Use of periphrasis or circumlocution. In considering a possible association here it was assumed that use of this stratagem by a patient indicated that he had not only considerable naming difficulty but relatively good retention of insight—that is, he was able to make use of other capacities, so that his deficiency was at least partly overcome by a change of method (Welford, 1958).
4. Gesture and pantomime: would the free use of these aids to spoken speech reduce the tendency to perseveration?
5. Other non-linguistic defects—for example, constructional apraxia, right-left disorientation, finger agnosia, dyscalculia—did they affect it?

The results of this inquiry are summarized in Table II. As expected catastrophic reactions were common, being observed in 10 out of the 16 patients who were perseverating. The conditions responsible for releasing them were invariably related to some aspect of speech. They were brought to the fore especially when a patient had sufficient insight, comprehension, and expressive ability to stimulate him to try to express himself, the emotional reaction following only upon later recognition of his inability to do so adequately. However, as the same catastrophic reactions were observed in about one-third of the aphasic patients who were *not* perseverating, it seemed unlikely that the perseveration was attributable to emotional influences alone, although these were contributing factors. More striking was the relationship between perseveration and the absence of spontaneous talk, an association observed in 13 out of 16

TABLE II

Clinical Feature	Patients Displaying Perseveration (16)	Patients with no Trace of Perseveration (8)
Emotional stress in activities related to speech	10	3
Little or no spontaneous talk	13	3
Plus use of periphrasis to compensate for naming difficulties	8	5
Plus use of gesture and pantomime	12	6
Other intellectual defects present	6	3

patients. Whatever may be the reason—the severity of speech loss or a compensatory desire to conceal it—there would appear to be a link between perseveration and either imperfectly comprehending a stimulus or imperfectly responding to it. This view is supported by the observation that when some avenue of escape, like circumlocution or periphrasis, was available, the incidence of perseveration at once fell, whereas it remained high in patients whose only means or supplementing their defective speech was through the less adequate media of gesture and pantomime. The presence of other intellectual defects made little difference to its occurrence.

Nature and Site of Lesion and Perseveration

Of our 24 patients aphasia had been precipitated by an acute cerebral vascular lesion in 15 (of whom 13 showed perseveration) and by a tumour involving the speech area in the dominant hemisphere in the remaining nine (of whom three showed perseveration). These figures are not significant. It is generally recognized that aphasia is most often due to cerebral vascular disease. But that perseveration occurs more often after this than in patients with tumour has three possible explanations: (1) because it is often not specifically looked for; indeed, we had to discard about half of our available clinical material on this account; (2) by the time perseveration is recognized it is usually associated with other symptoms of clouding of consciousness; and (3) perseveration may be observed for years after an acute cerebral vascular episode, whereas when a tumour is operable it disappears soon afterwards.

In four patients with perseveration the vascular lesion responsible was shown by angiography to be in the common or internal carotid arteries, but the site and extent of the resulting brain lesion was firmly established in one instance only by necropsy. This case (No. 232), however, was of considerable interest, for though the patient's original hemiparesis and

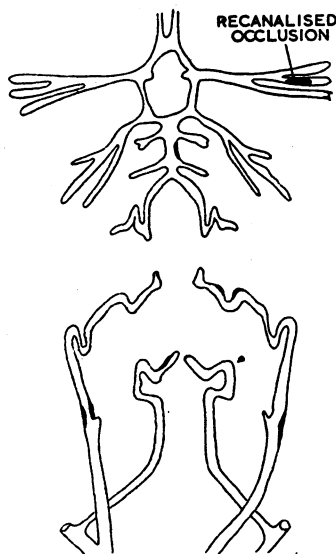


FIG. 8.—Case 232. Carotico-vertebral arteries and circle of Willis. (By courtesy of Dr. Balmer, Institute of Pathology, Queen's University, Belfast.)

clouding of consciousness finally resolved and she was left only with a residual dysphasia, perseveration was noted repeatedly in relation to speech activities for one and a half years. Catastrophic reactions were never seen. Indeed, the carefree way in which she reacted to the marked perseveration that accompanied attempts to express herself verbally raised the suspicion that there must be extensive brain damage. Yet at post-mortem examination the cranial vessels in the neck were all patent, and when the circle of Willis and intracerebral vessels were dissected out after fixation little evidence was found of atherosclerotic changes. With the use of the criteria adopted by

Corsellis (1962) there was also no appreciable cerebral cortical atrophy or shrinkage of white matter, and the only abnormal finding was an old infarct measuring 1 by 1 in. (2.5 by 2.5 cm.), its walls well organized, deep in the middle part of the left temporal lobe and involving the island of Reil (Figs. 8, 9, and 10). Goldstein (1948, p. 240) mentions that "there is only

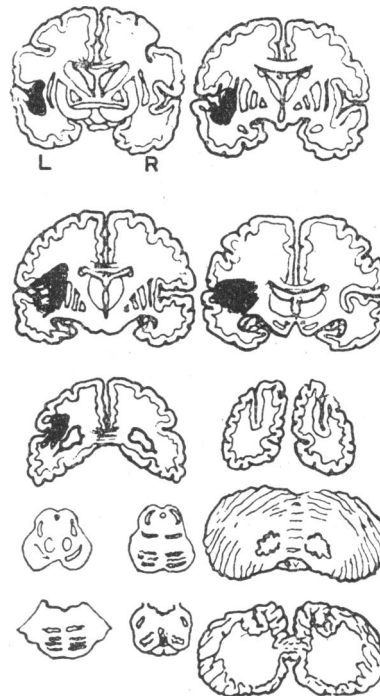


FIG. 9.—Case 232. Diagram showing site of solitary lesion in brain. (By courtesy of Dr. Balmer.)

one case known where the lesion was restricted to the insula alone, the case of Voisin" (Goldstein, 1912). Here all speech function was affected, particularly repetition, but the patient died within a few days.

The site of new growth was determined in all eight patients with tumours, and is shown diagrammatically in Fig. 11. In only two was perseveration observed, but in both cases the tumour involved the left temporal lobe, in one instance spreading to the parietal area. Of the six other patients, none of whom showed perseveration, the tumour was confined to the left temporal lobe in two (Cases 133 and 167), to the temporo-parietal region in two (Cases 45 and 300), to the fronto-

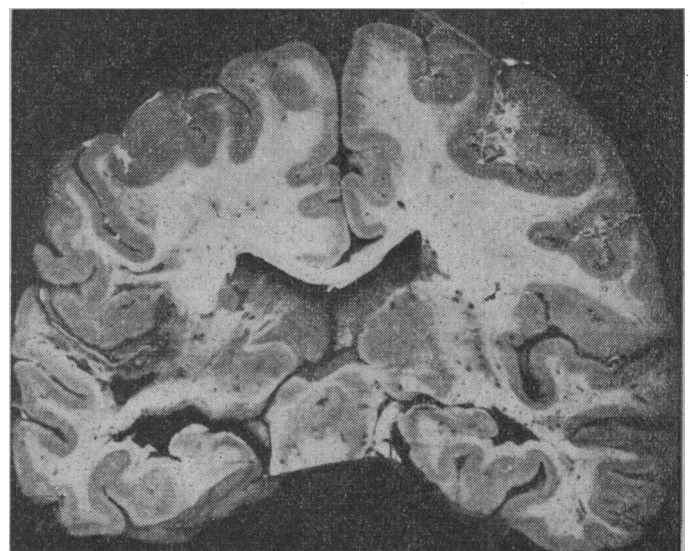


FIG. 10.—Case 232. Photograph of lesion (old infarct involving island of Reil). (By courtesy of Professor J. H. Biggart, Institute of Pathology, Queen's University, Belfast.)

temporal region in one (Case 174), and to the left frontal lobe in one (Case 87). In view of what has been said of perseveration occurring especially when there is frontal-lobe damage this case is of interest. The patient was a man of 33, of good intelligence, with expressive defects which, although obvious in his speech, were not sufficient to interfere to any great extent with communication. Comprehension was good. He was seen at a relatively early stage in his fatal illness, and was observed daily thereafter for a number of weeks and at a time when there was as yet no question of general clouding of consciousness. He was tested repeatedly for perseveration, but it could never be demonstrated. At necropsy there was an infiltrating malignant tumour (glioblastoma multiforme) which had invaded the greater part of the left frontal lobe, causing it to become enlarged and the brain to herniate through the falx cerebri. But although serial sections were studied, by courtesy of Professor Blackwood and Dr. Mair, the growth was confined to the left frontal lobe and did not extend posteriorly beyond the level of the corpus Luysii.

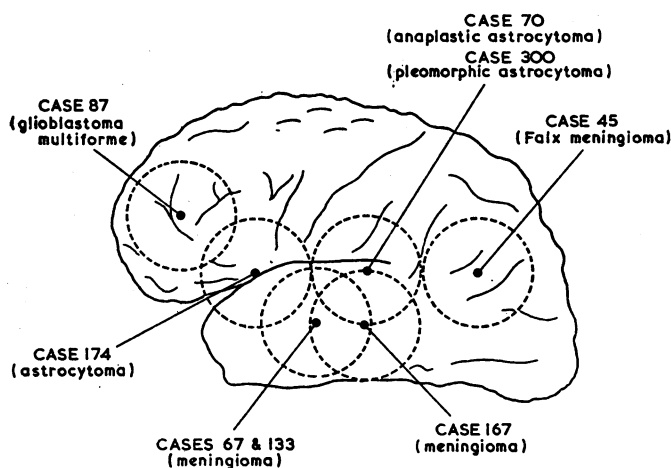


FIG. 11

Comments

Perseveration occurs both in health and in disease. In health it is more common in children and old people than in adults, but at all ages, although transient, it can often be evoked by appropriate tests. In disease, although qualitatively similar, perseveration is quantitatively different, being much more pronounced and more or less consistently present from day to day. It is a reliable indicator of disturbance of physiological brain function. Clinically it is most often found in association with the other symptoms of clouding of consciousness: impairment of recent memory; inability to learn; disorientation in time and place; altered mood. In the slow reintegration of intellect after severe closed head injury and anoxia it may be one of the last of these symptoms to disappear. Conversely, it is often one of the first to herald deterioration in the level of consciousness, especially when this is stealthy or insidious, as can occur in hypoglycaemia, disturbances of the water-and-electrolyte balance, hepatic insufficiency, concealed haemorrhage, and in stages of drug intoxication. It is suggested that when such patients are being examined for signs of impaired consciousness more routine use should be made of simple objective tests for perseveration and that in the nursing of patients whose conscious level is *sub judice* the part played by perseveration in determining abnormal behaviour should be given more publicity.

In the organic mental states perseveration has an unhappy reputation for impeding observation of the true extent of intellectual impairment. But this is perhaps not wholly deserved, and it may depend to some extent on the belief that the symp-

tom represents solely one of the less soluble ingredients of the concept of clouding of consciousness. Yet in such states perseveration may be more prominent in some activities than in others, and it has been described with focal brain lesions, where no question of general clouding has arisen and where it has exhibited particular qualities affecting only motor or sensory performance or visual experiences, depending on the site and extent of the lesions responsible. For example, although unilateral frontal lobe damage may not disclose it in motor performance, it is usually evident with bilateral lesions.

Aphasia is another example. Our experience is that it can be demonstrated in a high proportion of all dysphasics, and in these its distinctive qualities may be summarized as follows:

1. In no case could it be elicited in all the tests used. Invariably some tests would precipitate it, others not. It occurred chiefly in tasks which tested those aspects of speech which were especially affected by the presence of the lesion. It was not found on testing other and unaffected aspects, and this linkage with the actual disability or disabilities present appeared to be consistent.

2. In the early stages, after an acute vascular lesion, it was induced by simple verbal commands to perform one familiar act and then another, the patient repeating the first act inappropriately. It was also seen when a patient tried to switch over from one form of some familiar activity to another—for example, printing and then writing letters of the alphabet in script, counting from 1 to 20 and then from 20 to 1. To some extent such responses are automatic, but in the most automatic activities, even after the "sticking" effect of previous stimuli had disappeared, it could still be demonstrated in more reflective types of response—for example, naming unusual objects, writing from dictation, reading, composition.

3. A summation effect was often noticeable, items of information relevant to previous stimuli being included in the perseveratory response. Other writers have observed this same effect, which lends support to the belief that at the time perseveration occurs comprehension and recent memory are not materially affected.

4. The presence of emotional tension and anxiety facilitated perseveration, but the symptom could be demonstrated in patients whose mood was equable, and in some patients who were affectively disturbed it did not occur. Brain damage increased fatigability, but when perseveration occurred in our patients the sticking effect was usually more pronounced at the beginning of an examination than towards the end of it, when indeed it might be less noticeable. The too-rapid presentation of stimuli could not have unduly favoured its occurrence, for even when intervals of one to five minutes were allowed to elapse between stimuli it could still be elicited.

5. Absence of spontaneous talk was a frequent accompaniment of perseveration in dysphasics but in those who could make use of periphrasis or circumlocution its incidence was less, this being a compensation not afforded to others who, instead, had to make do with the use of gesture and pantomime.

Luria's division of perseveration into "efferent," "switching," or "programming" types is preferable, I think, to purely psychological classifications, although the difference between the old and the new is probably less a matter of semantics than it is of the shift in emphasis regarding the importance of psychological and physiological factors in its causation. In favour of a physiological basis is the observation that in the early stages of recovery after aphasia it affects both automatic and reflective types of psychomotility, whereas in the later stages it lingers on chiefly to affect those requiring preliminary reflection. So far back as 1933, Cameron commented on the apparent similarity between the phenomenon and the conditioned inhibition of brain function observed by Pavlov, and we have asked ourselves how the distinctive qualities of perseveration in dysphasia could be explained by a lesion of the speech cortex alone.

The necessity of there being such a lesion to link the perseveration with the actual defects present can scarcely be doubted, but the first responses of our patients were invariably correct and the symptom declared itself only in inability to arrest these responses or to switch over to a second and different response. This raises the possibility of disturbance of the speech mechanism at a subcortical level, or of its being due to inter-

ference with the passage of impulses to and from the cortex and the upper brain stem or through the ramifications of the limbic system. In the few cases where it was possible to obtain post-mortem confirmation of the site of the lesion this seemed to be a possibility. Equally striking was the aphasiac whose lesion was confined to the left frontal lobe and who showed not the slightest trace of perseveration. Indeed, some of the qualities observed of perseveration in dysphasia—for example, the ability to reach the same goal by one means, and not by another—have points of similarity with a pathologically acquired conditioned response. There is, too, the striking effect of immediate past experience in leading to summation of responses, which brings to mind the difficulties that used sometimes to be experienced in the old telephone exchange system in getting oneself disconnected from a first call in order to make a second one.

Summary

Perseveration is a well-recognized symptom of clouding of consciousness. It is also seen in aphasia due to circumscribed lesions, and as such may be demonstrated long after any initial clouding has disappeared. Tests used are described and attention is drawn to the linking of perseveration not only with speech and language but with the actual disabilities found, and to that extent it is thought to have focal significance.

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