THE PSYCHIATRIC ASPECT OF MINERS' NYSTAGMUS.—I

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MINERS' nystagmus is the third most important cause of invaliding from the pits, coming after pneumoconiosis and the "beats" (limb injuries). But it is unlike them in having no morbid anatomy nor clinical pathology and in that the patient suffering from it presents no objective physical signs, though he is prolific in the production of protean subjective symptoms. This investigation was undertaken in order to estimate how far the disease was of emotional as opposed to physical origin.

It is not possible to assess the emotional factor in any case perfunctorily, and so statements that some patients either do or do not show psychoneurosis are valueless unless based on adequate psychiatric examination by a physician trained in psychological medicine. Indeed, such opinions by many doctors are inclined to be of less value than those of the man in the street, owing to the bias of medical training away from mental and towards physical pathology.

It is not claimed that emotional disorder was discovered in all cases in whom it existed in this series, for the psychiatric interview only lasted a half to three quarters of an hour, and further observation under residential conditions would have made the examination more complete, but it is hoped that adequate diagnosis and assessment were made in most patients.

Method of examination

It was first explained to the patient that this investigation was proceeding and we were anxious to see if his nerves were affected or could be helped in any way.

He was then seated in a comfortable chair and after his name, address, etc., had been noted, he was asked of what he complained and its duration.

All his past physical illnesses, operations, and serious accidents were then carefully noted, as were any past mental or nervous disorders.

His father's occupation, and the age and state of health or cause of death of each parent, with the patient's age at the time, together with particulars of the siblings, and the patient's position in the

family, were obtained. Particulars were also obtained as to his own children and their state of health.

He was asked whether he had been happy as a child, whether the home was happy, and his emotional relationships to each parent. Also, whether he liked school and the standard attained, with any further education.

Particulars were obtained of all his past employments and the time he spent in each post. He was asked whether he liked mining.

Enquiry was then made into the patient's relationship to his wife, and in most cases into his sexual life. He was asked if his house and home were satisfactory.

His economic circumstances, amusements, religion, sleep, dreams, alcohol and tobacco consumption, appetite, and excretion were enquired into.

An effort was made to find if he showed obsessional traits. His appearance, behaviour, cleanliness, and dress were next noted.

At this stage his ophthalmic out-patient sheet was read for the first time, and his eye movements were examined for the presence or absence of nystagmus, etc.

Enquiry was then made into any further circumstances that appeared significant, and a psychiatric diagnosis was made.

Subsequently the psychiatric case sheet was perused and summarised.

Psychiatric summaries of individual cases

(a) *Certified cases with active nystagmus*

E.B.—A dull and backward man who has developed hysteria and considers that the colliery has treated him shabbily. He now complains of giddiness and visual symptoms. Diagnosis: dull and backward person, hysteria, rotatory nystagmus.

E.W.B.—An extremely indolent man who has stopped work following an accident. His nystagmus of lateral type appeared to me to be voluntary and the result of conscious effort. He complains of giddiness and visual symptoms, but I doubt whether his disorder can be dignified by the name of hysteria—"I'd like a light job in the colliery."

When asked what his principal amusement was, he said, "Nothing much, I just sit in a chair." In looking for obsessional acts, I asked him if he ever had to go down from his bed to see if he had left the gas on, and he replied, "No. If the gas is left on I don't go down, the wife has to." This sufficiently sums up his character. Diagnosis: traumatic neurasthenia (compensation case).

T.D.—Anxiety neurosis with conversion hysteria.

J.T.D.—This man suffers from severe anxiety, which he tries to deny. His apprehension was patent to all, but he said, "No, I was not nervous waiting to see you." However, as soon as I let him go he rushed away as if very frightened. Diagnosis: anxiety neurosis, with hysterical conversion symptoms.

W.H.—This man is of the "fire-eater" type, with an Oedipus complex. He complains of quadruple or quintuple shifting vision, which has only come on since he was diagnosed as suffering from nystagmus. He complains that he cannot boss or be bossed, and is proud of having suffered numerous accidents. Although his anxiety is partly converted into hysteria, fixated on his eyes, on examination the

rotatory nystagmus in his left eye appeared quite genuine, as if he was peering or groping to see, reminding one of Milton's famous lines,

"These eyes, that rowle in vain

To find thy piercing ray, and find no dawn."

"Paradise Lost," III, 11/23-24.

It may be that the anxiety was secondary to the nystagmus. Diagnosis: anxiety state, with conversion and fixation hysteria.

J.H.O.—A manic-depressive now, as usual, in a melancholic phase, apprehensive of his eyes, but whose visual symptoms are subjective. He is dull and backward, childish, and dependent. Diagnosis: melancholia, dull and backward.

J.T.W.P.—A mildly schizoid personality. Diagnosis: dull and backward.

C.J.P.—A solitary type, suffering from hysteria with diplopia and other visual symptoms; he never liked mining, entered the industry reluctantly, and readily left it. Diagnosis: hysteria.

G.N.P.—This man has an obsessional character and it is probable that his anxiety is mainly a result of his nystagmus. He has numerous hysterical conversion symptoms. Diagnosis: anxiety neurosis, with conversion hysteria.

A.E.R.—Conversion hysteria in a sensitive man suffering from anxiety and severe feelings of inferiority, with masturbatory guilt. Diagnosis: anxiety neurosis, with hysterical conversion symptoms.

F.R.—Diagnosis: hysteria.

J.W.S.—This man is so dull and demented that it is difficult to make any further diagnosis, but he is probably hysterical. Diagnosis: dementia.

H.S.—Rather a dull man. Diagnosis: anxiety neurosis, with conversion hysteria.

F.F.S.—Diagnosis: mild anxiety state.

D.W.—An over-conscientious man, and an obsessional type, who has finally broken down with frank anxiety. In addition, his wife is hallucinated and on one occasion had to enter a mental hospital owing to dementia praecox.

(b) *Certified cases showing no nystagmus*

W.A.—The above is a hysteric whose symptoms are so severe that he is almost psychotic.

A.H.B.—Diagnosis: dull and backward. Mildly manic-depressive, probably hysterical.

R.W.C.B.—A dull man, who was always an unwilling pit worker, apprehensive of accidents, and developed an anxiety neurosis with hysterical conversion symptoms. He is suspicious and has some sexual guilt of which he is ashamed. Diagnosis: anxiety neurosis, with hysterical conversion symptoms, in a dull and backward subject.

S.B.—This man appears work-shy and was apprehensive in the pit—"I used to dread it and fear that the roof would fall down on me, I fear I have had enough pit work."

He is now working as a blacksmith's assistant and says of this post, "I like the work very much now, I could not have picked a better job—there are days when I don't do a tap." He is dull and backward.

The most charitable diagnosis is one of hysteria, though I cannot help doubting whether his symptoms are below the conscious level, or he is malingering.

B.D.—When I examined this man's eye movements he deliberately thrust his head back and looked upwards, and there was some slight left lateral nystagmus, which seemed to me to be voluntary. It is charitable to consider him a hysteric. Diagnosis: hysteria (or malingering).

S.D.—This man's attention was first drawn to his trouble by his doctor and then by his daughter. The few symptoms had not worried him previously. "Before that, on my pay ticket the figures were too many without my glasses on, i.e., I saw double." His case began with diplopia. He now presents no mental symptoms or signs, but has a few subjective complaints. However, he protests that he would like to be down the mine—"I would rather be there than on the bank—do you know, you simply can't be sure of the weather above ground!" Diagnosis: normal (or malingering).

R.E.—This man has had various subjective symptoms, which were possibly hysterical, but he now has no complaints. Diagnosis: normal.

E.F.—An over-conscientious, obsessional man, who shows anxiety when he thinks he fails to reach his own excessively high standards. Diagnosis: conversion hysteria resulting from an anxiety state in an obsessional man.

H.F.—An immature, emotional, unstable subject, with an anxiety neurosis and some hysterical conversion symptoms. His complaint of feeling disinclined to work on some days is probably unrelated to his eyes, but he was told by a doctor that he had "eyestagnus." He subsequently had an accident to his back, since when he has not been down the pit, but being unable to live on the money he received he took on his deceased uncle's chimney sweeping business, which he does when he feels so inclined. He is still childish and dependent and weeps when he tells how well he gets on with his Dad. Diagnosis: hysteria.

E.Hu.—When I made to examine his eyes, his blepharospasm and twitching of the lids increased before I even asked him to fix his vision. At the same time he twitched the right side of his face and the corner of his mouth. His eye movements were normal, but he showed voluntary convergence from time to time as he fixated a near object, though there was no nystagmus. Diagnosis: hysteria.

E.M.—This man describes hallucinations and is fundamentally psychotic. He is also apprehensive in the pit owing to an anxiety neurosis with some conversion symptoms partly fixated on the eyes. Diagnosis: anxiety neurosis with conversion hysteria in a schizophrenic.

J.Mc.—This man is deaf. Diagnosis: hysteria.

J.M.P.—His only complaint was of the consequences of an injury to the right malar region, and he said that bending made his face swell up on that side, and so he could not again stand going down into the pit. He is a dependent type. Diagnosis: anxiety neurosis, dull and backward.

E.R.—This man has a bluff Falstaffian manner which conceals deep anxieties, and he shows hysterical conversion symptoms. He is rather exalted, as his son is a high union official, and is resentful of his treatment by the colliery, being strongly interested in his compensation. When I asked him whether he preferred candles, Davy lamps, or electric lighting, he replied, "I like candles best, you can tell when your shift is nearly up by the number of candles you've burnt." He has some anxiety and it is kindest to describe him as a "hysteric." Diagnosis: hysteria (or malingering).

J.H.R.—A man with much fear of mining. Diagnosis: conversion hysteria with some anxiety.

A.Sma.—A truculent man, who may well once have been attentive to his work, but has, not unnaturally, given it up in his old age. He is very interested in compensation. Diagnosis: hysteria.

T.G.S.—A rather dull man who has various anxieties, *e.g.*, a fear of accidents in the pit, of which he is ashamed, which he tries to hide. Diagnosis: anxiety, with conversion hysteria.

F.H.S.—Diagnosis: anxiety, with fixation and conversion hysteria.

H.Ta.—This man has a rigid, closed mind. He wears dark glasses, which seem to symbolise his wish not to see things clearly, and is sensitive and suspicious. He said, quite gratuitously, "I told the step-son that if he gets into trouble he must go to someone else for help, as he will get none from me." The patient's own anxieties may well be derived from his unsatisfactory marital life. Diagnosis: anxiety neurosis, with conversion hysteria.

R.T.—Diagnosis: hysteria.

T.T.—This man has no complaints. Diagnosis: N.A.D.

H.W.—An evasive and suspicious man, who feels he has had a poor deal from life. He is apprehensive, fearing he may lose his compensation. Diagnosis: melancholia.

A.W.—Diagnosis: hysteria.

W.B.W.—A recurrent melancholic, of poor intellect, now showing some dementia. It is possible that he previously suffered from a psychoneurosis. The first attack of melancholia occurred when his wife died $5\frac{1}{2}$ years ago. Diagnosis: melancholia, with secondary dementia.

(c) Early, no nystagmus

C.H.—Possibly there is incipient nystagmus in a high myope. Diagnosis: normal.

G.W.L.—An obsessional neurotic, who develops anxiety in certain situations and has some hysterical conversion symptoms and a well marked Oedipus complex. Diagnosis: obsessional neurosis, with anxiety and conversion symptoms.

A.R.—A mild manic-depressive, now in a melancholic phase, with some sexual guilt. Diagnosis: melancholia.

H.Tw.—An able, over-conscientious obsessional, of the type who drives himself and others, and is usually found in a position of minor authority, this man being a colliery deputy. His anxieties arise when he is unable to satisfy his compulsive demands. Diagnosis: obsessional neurosis, with some anxiety.

G.H.W.—A dull and backward man, capable of doing a simple task slowly, but showing anxiety when harassed. Diagnosis: high grade mental deficiency, with anxiety and conversion hysteria.

(d) Active nystagmus. No symptoms. Working

W.G.A.—He is now in a mild melancholic phase. Diagnosis: mild manic-depressive.

E.S.G.—A dull and backward man, with no other mental symptoms.

W.H.M.—This man showed me that he can bring on or stop a left lateral nystagmus at will. He is mildly obsessional. Diagnosis: normal.

(e) Controls, no nystagmus

F.J.J.A.—A conscientious and easily worried man. Diagnosis: mild obsessional neurosis.

R.B.—A mildly obsessional personality. Diagnosis: normal.

E.A.B.—Now a little melancholic. Diagnosis: manic-depressive.

H.H.B.—This man's depression may have followed his wife's death. Diagnosis: mild chronic melancholia.

J.B.B.—Diagnosis: normal.

T.C.—Intelligence poor. Possibly some hysterical conversion symptoms. Diagnosis: either dull and backward or a little demented, anxiety neurosis.

J.W.C.—Now a mild chronic melancholic. Diagnosis: chronic melancholia, with exacerbations.

J.R.D.—This man has hysterical conversion symptoms referred to his stomach. Diagnosis: anxiety neurosis.

W.J.G.—He is depressed and hypochondriacal. Diagnosis: mild manic-depressive.

J.H.—Diagnosis: normal.

E.H.—He is suffering from an exacerbation of anxiety caused by a fractured base of skull. Diagnosis: mild anxiety state.

J.W.H.—He has domestic trouble, his wife having left him. Diagnosis: normal.

H.J.—Diagnosis: normal.

C.K.J.—This patient is seriously psychotic and feels suicidal. I advise his immediate admission to an institution. Diagnosis: recurrent melancholia.

A.B.K.—A dull, anxious man, lacking confidence and drive. He has an early cataract, with fixation hysteria, giving him giddiness. Diagnosis: anxiety neurosis, with hysterical conversion symptoms, in a dull subject.

H.M.—Occupation: underground bricklayer. Superficially he at once seemed to be a different type from the miners. He is rather dull and investigation revealed his psychoneurosis. Diagnosis: obsessional neurosis.

J.M.—This man has some latent anxiety with early conversion symptoms, and it is possible that he has incipient miners' nystagmus. Diagnosis: normal.

E.T.R.—Diagnosis: anxiety neurosis, dull and backward.

W.S.—This man is mildly obsessional, but within normal limits. Diagnosis: dull and backward.

A.Smi.—Diagnosis: chronic melancholia (mild).

J.H.T.—A typical cockney—a different type from the other miners. Diagnosis: normal.

D.T.—He was not interested in the investigation and so his answers were careless and possibly inaccurate. Diagnosis: normal.

J.L.W.—A mildly obsessional personality. Diagnosis: normal.

Tabulated Summary

Groups	Normal	Malingering	Hysteria	Anxiety Neurosis	Obsessional Neurosis	Dull and Backward	Manic-Depression
(a) Certified Cases with Active Nystagmus	—	—	6	6	—	2	1
(b) Certified Cases showing no Nystagmus	2	3	9	7	—	1	2
(c) Early, no Nystagmus	1	—	1	—	2	—	1
(d) Active Nystagmus. Nosymptoms. Working.	1	—	—	—	—	1	1
(e) Controls (no nystagmus) ...	8	—	—	5	1	2	7

Classification

The cases in this investigation are given above under the classifications made by the ophthalmologists, *viz.*:

- (a) Certified cases of miners' nystagmus with oscillations.
- (b) Certified cases of miners' nystagmus showing no oscillations.
- (c) Suspected early cases, not showing oscillations.
- (d) Cases showing ocular oscillations, but working, without symptoms.
- (e) Controls.

It must be remembered that not all those classified as miners' nystagmus show, or indeed ever have shown, any rotatory or other oscillations of the eyes, and that possibly a few labelled normal or hysterical may have been malingerers. With these reservations, the nystagmus cases mostly show hysterical conversion symptoms, though in some cases, as indicated, the basic diagnosis is otherwise, *e.g.* mental defect or melancholia, the former being notoriously prone to hysteria and the latter showing nystagmus symptoms as a somatic aspect of their malady. As

would be expected, the symptoms represent a conversion of anxiety and where this is incomplete the basic diagnosis is one of anxiety neurosis rather than hysteria, but the two are complementary and not mutually exclusive. The small number of obsessionals were over-conscientious men whose failure to reach their own high standards resulted in anxiety, some of which was converted into hysterical symptoms.

There is good reason to believe that possibly the photophobia, subjective rotation of objects, giddiness, blepharospasm, and headaches, are hysterical in nature and of emotional and not organic origin.

Symptoms

Of the patients certified as suffering from miners' nystagmus, the 15 classified as showing active rotatory nystagmus and the 24 not showing this sign complained of the following leading symptoms, with the respective frequencies shown in parentheses.

Visual symptoms which could be referred to an organic lesion in the eyes :—

(0, 1).

Visual symptoms which could not be so referred :—

Blindness (1, 2).

Difficulty in seeing or inability to focus (2, 0).

Dazzle (2, 3).

Double or multiple vision (2, 0).

Subjective rotation or movements of objects (2, 8).

Shakiness of the eyes (1, 0).

They also complained of the following, which are ordinary psychoneurotic symptoms not usually related to disease of the eyes :—

Stiff neck (1, 0).

General shakiness (1, 0).

Giddiness or drunken feelings (8, 11).

Headaches (2, 10).

Insomnia and dreams (0, 2).

Noises in the head (1, 0).

Nervousness and anxiety (1, 2).

Depression (1, 0).

Loss of interest in reading and writing (0, 1).

Disinclination to work (0, 1).

In addition, 3 of the second group complained of pain in the eyes, and 2 stated that they now had no symptoms at all.

The 23 controls complained of 19 leading symptoms such as

would be expected from their physical condition (two being of diplopia) and also of dazzle (3), subjective rotation or movements of objects (1), giddiness (2), headache (1), fear of blindness (1).

The difference between the first two of these groups and the third is striking, and strongly suggests that the former have little objective eye disease but are suffering from psychoneurosis, in contradistinction from the latter, who were a series of ordinary ophthalmic miner out-patients. This is confirmed by calculation which shows the correlation between psychoneurotic symptoms and the first two groups to be positive and statistically significant (Q =coefficient of correlation = +0.8).

The three cases with asymptomatic rotatory nystagmus made no complaint not referable to organic disease of the eyes, for two had corneal ulcers and one had presbyopia. The five cases or suspected early miners' nystagmus complained of no symptoms which could be referred to organic eye conditions, but of apparent oscillation of objects (1), giddiness (1), headache (3). But these last two groups are too small for any firm conclusion to be drawn from them.

Predisposition to mental illness and miners' nystagmus

Of the 15 patients certified as suffering from active miners' nystagmus and showing active rotatory movements, and the 24 certified cases without this sign, 4 (27 per cent.) and 9 (38 per cent.) respectively gave a history of unsatisfactory emotional conditions in infancy, while 5 (22 per cent.) of the 23 controls did so. The differences between those affected and the controls do not appear significant, and so it is improbable that this is a major aetiological factor in the disease. It leads one to suspect that breakdown in the first two groups did not readily occur, but only after unusually severe or prolonged emotional stress in the mines.

A history of previous mental instability was given by 1 (7 per cent.) and 7 (28 per cent.) respectively of the first two groups, against 6 (26 per cent.) of the controls, and the same arguments apply.

It was found below that miners' nystagmus only occurred after many years' work in the mines, which accords with the above.

It was found that the certified cases did not give a history of a significantly greater number of minor ailments or accidents than the controls, suggesting that up to the onset of symptoms their service had been satisfactory as regards absence for health reasons. It must, however, be admitted that only a perusal of their work records can confirm this.

The above facts indicate that it is unlikely that future cases of

miners' nystagmus could be eliminated by any method of selection on entering the industry, and that even if this were possible, it would be unwise to exclude from the mines a body of men who would give many years of satisfactory service before breakdown.

Statistical considerations

The social and similar data were carefully compared in the three major groups. The findings in the two smaller groups were also considered but their numbers were insufficient for analysis.

At the onset of symptoms the ages of the certified cases of active rotatory nystagmus showed a range from 29—71 years, with a median of 43 and a probable error of 4.0. The corresponding ages of the certified cases not showing this sign showed a range of 29—71 years with a median of 45 years and a p.e. of 3.5. The differences between the means in the first two groups (43 and 45.7) were found not to be statistically significant, and since the curves were of similar form they have been combined in a histogram in Fig. 1. The controls had a corresponding age range of 0 (the next figure being 24)—61 years. The graph shows that we

FIG. 1. *Ages shown in quinquennial periods, at onset of symptoms*

FIG. 2. Years, shown in quinquennial periods, spent in the mines before the onset of symptoms

are not here dealing with a curve of normal frequency but more probably with an average sample of the mining population, which contains a slightly younger (mean 41.5) body of men. This means that the controls are not truly comparable with the affected cases, but it also demonstrates that they form a group distinct from the first two, each of which gives a similar type of curve. Eight of the 15 in the first group and 13 of the 24 in the second, but only 7 of the 23 controls fell within the age group 40—49 years.

At the onset of symptoms, the 13 certified cases of active rotatory nystagmus from whom such data were obtained, had worked a range of 11—59 years in the mines, with a median of 30 years and a p.e. of 5.0; the 24 certified cases without this sign had worked a range of 11—47 years in the mines, with a median of 27 years and a p.e. of 3.0. The difference of the mean (29.1 and 28.7) in the two groups were found not to be statistically significant and so, as the curves were of similar shapes, they have been combined in the histogram of Figure 2. The 23 controls had worked a range of 0—46 years in the mines, with a median of

24 years and a p.e. of 10.5 (mean 23). Once again the controls do not show a curve of normal frequency and the same considerations apply as in the last paragraph. Six of the 13 in the first group had worked 25—34 years in the mines at the onset of symptoms, as had 15 of the 24 in the second group, against 6 of the 23 controls. This corresponds with the findings as regards age, since most of the men enter mining when 14 or 15 years old—See also Graph V, First Report (1922, p. 51).

Social findings

The 15 certified cases with active rotatory nystagmus and the 24 certified without this sign have an average of 9.3 and 8.2 siblings respectively, of whom 1.5 and 2.1 have died, so that 7.8 and 6.1 survive, the corresponding figures for the 23 controls being 5.8 born, 1.1 dead, and 4.7 surviving. This suggests that the latter had known less privation and a healthier family life in childhood. (The corresponding figures for numbers of children in the three groups are: 3.3, 3.2, 2.6 born, with 0.2, 0.5, and 0.3 dying, leaving 3.1, 2.7, and 2.3 surviving, the numbers in the control series being the smallest, possibly because of the lower ages of the fathers. This matter, though not germane to our present investigation, must give rise to apprehension about the future labour force in a largely hereditary industry.) The father of the patient was a miner in 13 out of the 15 and 17 out of the 24 of the first two groups, against 14 out of the 23 controls; so that such parentage is not a favourable one as regards liability to this disease ($Q = +0.3$).

The number of collieries in which the miners in each group worked was not significant, but the first two groups of 15 and 24 miners had on 4 and 12 occasions respectively to leave the mine presumably at the usual fortnight's notice owing to its closing, but in the 23 controls this had only happened twice. Even having regard to the total average number of years spent in the mines, 32 in each of the first two groups against 26 in the controls, these numbers seem significant ($Q = +0.6$ and $+0.9$ respectively) and suggest that insecurity of employment is an aetiological factor in miners' nystagmus.

Mechanism of rotatory nystagmus

The oscillations of the eyes are generally striking, unique, rapid, and circular or elliptical.

Lateral nystagmus is sometimes seen in hysterics and a few subjects can produce it voluntarily by strong convergent fixation.

When a person enters the dark he converges strongly and it may well be that lateral nystagmus can be thus produced. In this connection it is interesting that it has been reported that, during the war, night fliers, who were subject to considerable emotional strain, sometimes complained of subjective lateral oscillations of the tail light of the aeroplane in front as an early symptom in mental breakdown. Besides working in the dark, the miner is often in an awkward and stooping attitude when walking and when having to hew coal above his line of vision, so that he is obliged to look upwards, the relative positions of his eyes and body being contrary to the static reflexes of Magnus and de Kleijn. An upward gaze is always difficult to maintain, and so we should expect that, owing to rapid fatigue, the eyes would continually tend to turn downwards and repeatedly have to be brought back upwards—with the production of a vertical nystagmus.

Now the directions of the horizontal and vertical excursions are at right angles. Each nystagmus is a periodic movement and so can be resolved into one or more simple harmonic motions and should be regarded as consisting of these components. We have then the case of s.h.m.'s at right angles, if they are of the same frequency their sum will be a circular or elliptical movement, unless one component is negligible when it will be lateral or vertical, and except in the rare instance where they are in the same phase, when it will be diagonal, as has been noted (First Report, 1922, p. 20). Thus it appears that the rotatory oscillations of miners' nystagmus are the summation of a vertical and a horizontal nystagmus resulting from darkness and prolonged upward gazing.

If these mechanisms are taking place in the higher centres of the brain, the precise muscles involved are immaterial, since these centres deal with integrated movements only and not with individual muscles. These nystagmoid movements will only develop in the conditions named, *viz.*, darkness and sustained upward gazing in the normal subject, but in the hysteric, once they have been learned, there is the possibility of their occurrence in the light and when looking in a normal direction, though they will still be particularly easily elicited by darkness, strong convergence, or upward gazing, which is what is found in miners' nystagmus.

Discussion

Amongst the various suggested causes of miners' nystagmus are focal sepsis, in the days when such a belief was popular (O'Sullivan, 1932), increase of blood pressure on entering the pits (Idem, 1936), failure of dark adaptation owing to lack of Vitamin A (Campbell, 1941), and even spontaneous combustion (Sack,

1925). But these have failed to pass the tests of experience or investigation. The work of Roche (1932), Zeiss (1932), and the First and Third Reports (1922 and 1932), indicate darkness as an aetiological factor. This darkness is more profound in "safety light," and therefore dangerous, pits, where a greater stress due to fear is present. It was early believed that awkward posture was an important cause (First Report, 1922), and as long ago as 1725, the Manchester Justices fixed a rate of 1s. 3d. a ton for Lancashire colliers getting coal in a high delf, and only 1s. a ton in a low delf (Rogers, 1891). Elworthy (1925) showed that the incidence of miners' nystagmus varies inversely with regular work and high wages, and Collis (1925) attributes it to economic anxiety. Dickson (1933) pointed out its similarity to shell-shock. Brock (1938) considers it psychoneurotic, Butler (1939) calls it "miners' neurosis."

In their investigation of telegraphists' cramp, Smith, Culpin, and Farmer (1927) state: "It is pertinent to enquire why telegraphy should have a specific 'cramp,' when other occupations of an allied nature have not . . . the exacting nature of the work, the inevitable rigidity of the conditions, the isolation of this one symptom, with its disabling effects, have all operated to concentrate attention into this channel. . . . In England telegraphy is a permanent occupation . . . in America there is more mobility of labour and the disease is hardly recognised . . . Should such general conditions become characteristic of any other allied occupation, we should expect a similar result, *viz.*, some form of disability affecting that part of the body which is most used or essential for the particular process, and the people likely to be affected to be . . . the psychoneurotic. Expressed more generally, a person emotionally unstable working in an environment either actually, or conceived by him as, inflexible will have just that interaction of conditions necessary for 'cramp' or some similarly determined disorder." In the Third Report (1932, p. 16) Culpin showed miners' nystagmus to be a psychoneurosis.

From the above and the investigations in this paper, it is evident that miners' nystagmus is a disease of emotional origin, commonly called hysterical, hysteria (Medical Research Council, 1941) being "a condition in which mental and physical symptoms not of organic origin are produced and, maintained by motives never fully conscious, directed at some real or fancied gain to be derived from such symptoms," or a psychosomatic affection (Halliday, 1945), with eye symptoms, and is related to prolonged work under emotional stress in an awkward posture in the dark.

Now, in general, the characteristic of hysteria is that the

symptom can be imitated by a normal person. In miners' nystagmus this is not so, and the explanation is that the mechanism of the movements, as shown above, is so complex that it can only be learned, albeit unconsciously, by prolonged periods and emotional stress in an awkward posture in the darkness. It is thus a typical "occupational neurosis." In a case where the physical mechanism is so complex it is to be expected that the mental mechanism will also be complex, and so will not easily yield to treatment.

That some miners show the ocular oscillations without complaining of any symptoms, is not inconsistent with a diagnosis of hysteria. For which of us, when keeping an unwelcome appointment, or carrying out a distasteful task, has not heroically done his duty in spite of a headache, stiff neck, nausea, coryza, or even a "bone in the leg," which we bore with ascetic fortitude but without complaint; though this does not mean that if the emotional strain continued we should not eventually be disabled by our malady.

The true nature of the malady being established, it is evident that the presence or absence of the typical oscillations is relatively unimportant, merely representing a further stage in hysterical conversion of symptoms, and this is confirmed by the statistical similarity of the groups of miners' nystagmus with and without symptoms. Hence the alteration of the definition of 1906, "Miners' nystagmus is an occupational disease of the nervous system which is confined to workers in coal mines, and in ironstone mines where on account of the presence of thin coal seams safety lamps are used. The chief symptom and physical sign is a rotatory oscillation of the eye balls," to that of July 30, 1913, "The disease known as Miners' Nystagmus, whether occurring in miners or others, and whether the symptom of oscillation of the eyeballs is present or not"—would have been wise if only the malady had been recognised as of emotional origin and not in any way organic, and had been frankly called "Miners' Psychoneurosis."

If once the fact that the malady is psychological and not organic becomes generally recognised it is probable that the gross hysterical symptoms will become rarer and be substituted by frank anxiety, which is more amenable to treatment.

Mining is a dangerous occupation which subjects the collier to prolonged emotional stress, and so it is to be expected that the incidence of mental disorder of a mild type would be common in many such workers. This has been shown to be so in the series here investigated, not only in those certified as suffering from miners' nystagmus, but also in the 23 controls, and in accordance with the above we find (Table, p.214) that little behind the biggest group of eight normal men come the seven mild manic-depressives,

or cyclothymes, this being the adult reaction to prolonged and severe mental stress (Stern, 1944), whilst anxiety state is the next most common reaction. Conditions should be improved to lessen the emotional strain on the collier.

Miners have always tended to be a peculiar people. In Devon and Cornwall the tin miners had their own Courts of the Stannaries in the Middle Ages, the privileges of which were confirmed by Edward I as early as 1305, and were only abolished on the 1st January, 1897. The miner, too, is singular in that his occupation involves the spoiling, despoiling, disfiguring, and laying waste of his environment (Myres, 1946), his whole village lives on the destructive exploitation of the surrounding district, and when its mineral wealth is exhausted the community comes to an end; an end often sudden, unexpected, and catastrophic. His position is thus difficult and precarious. Miners are often vaguely conscious of these facts, and regard themselves, sometimes with reason, as a neglected and rejected people, their relation to the community being analogous to that of the neglected child to the parent, so that their behaviour often seems correspondingly irrational and irritating to their fellows.

Among themselves, however, miners form a closely-knit community, and this is especially so within the depths of the pits, for here is team work *par excellence*, and one weak, incompetent, or otherwise unsatisfactory member is a source of irritation, frustration, inefficiency, and lowered output, or even of positive danger to his fellows. It follows that if a miner has once had a severe emotional breakdown it must be doubted if he will again be readily acceptable to his workmates, for the true nature of such breakdown is often intuitively realised by them. This is yet another factor which may partly explain the common failure of nystagmus cases to remain for long in the pits when once they have been certified as suffering from this malady.

Summary

1. Miners' nystagmus is a psychosomatic affection.
2. It arises from emotional stress, but for the full development of the oscillations a prolonged period of work in the dark with an upward gaze is also necessary.
3. The central mechanism of the oscillations is elucidated.
4. The emotional stress gives rise to anxiety and there is a varying degree of conversion of this into hysterical symptoms, which include the typical rotatory nystagmus, the presence or absence of which is relatively unimportant.
5. It does not usually develop until the miner has been underground for over ten years, more commonly for 25—34 years, and

although related to the stress and danger of the occupation it is unlikely that any psychological selection procedure could be devised to eliminate those likely to break down with nystagmus, before they enter the mines.

Recommendations

1. The term "miners' nystagmus" should no longer be used, but all patients complaining of symptoms which would formerly have been considered under that heading should be referred to a psychiatrist as early as possible, for appropriate diagnosis and treatment, and should be certified as suffering from the actual psychoneurosis or psychosis found.

2. All such cases should be found work above ground and in the light, instead of being put on compensation. This work should be found as soon as possible, though a short period of rehabilitation may be necessary for psychiatric reasons.

3. They should be under psychiatric supervision.

4. Lighting in the mines should be improved.

5. Efforts should be made to ease the posture of the miner at work.

6. Special attention should be paid to safety measures in the mines.

7. The miner should be given economic security at his work.

8. Optimum hours of work in the mines should be worked out scientifically, and this matter should be removed from the sphere of politics.

I thank my friend, Dr. Dorothy Campbell for her kindness in inviting me to join in this investigation, for providing me with the necessary facilities, and for her constant encouragement and help, without which its completion would not have been possible, though it must be realised that the responsibility for the opinions expressed in this paper is mine alone.

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