A COMPARATIVE STUDY OF COAL MINERS' NYSTAGMUS*

BY

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Introduction

RIVERS (1922), Culpin (1925, 1932), and Stern (1948) have suggested that coal miners' nystagmus is essentially psychological in origin, but on the other hand, ophthalmological opinion (Ferguson, 1939; 1943) tends to support the conclusion of the first report of the Medical Research Council's miners' nystagmus committee (1922), that the most important element in the cause of the disease is lack of light. Moreover, nowadays it is often remarked by colliery managers that the disease tends to attack some of their best workmen. There is very little social information about men with nystagmus, and in the only comparison which appears to have been made between men with and without the disease, it was found (Stern, 1948) that fifteen out of twenty-three men without the disease were apparently psychologically abnormal.

Prevention of the disease is an administrative problem, and if it is largely psychological, the administrator may well feel that it is not worth while to spend large sums on better colliery lighting. He may rather ask for guidance about selection tests to eliminate susceptible individuals.

Moreover, in order to frame a resettlement policy, it is necessary to have some idea of what a miner disabled with this disease can do, and a survey of what he *does* do when left to himself may be useful.

This enquiry, therefore, has been designed in an attempt to shed light upon the following questions:

- (1) How does the social and occupational life of a coal miner who suffers from nystagmus differ from that of one who does not?
- (2) Do coal miners with this disease differ physically from those without it?
- (3) What work are men with this disease capable of doing?

Method

Five years before the start of the survey, 225 miners in County Durham were granted certificates of disablement by nystagmus.

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A random sample of fifty of these men was taken, a meeting arranged, and a simple explanation delivered to them. A special clinic was instituted where the medical, family, and occupational histories were taken and each man was given a full physical examination. If oscillation of the eyes was not obvious, they were examined with an ophthalmoscope after stooping, or after being in a dark room for 15 minutes. Only three of these fifty men did not come for examination. One refused, one was ill, and one had moved to the South of England. The production of a true control group of normal men with whom these could be compared, presented two fundamental difficulties. First, in civilian life it is not possible to carry out a medical examination of a fit man unless he gives his consent. He is, therefore, *ipso facto* a volunteer. Secondly, there were no centralized records of the miners in the county from which a statistically random selection could be made. If, therefore, the observations were to be controlled at all, it seemed necessary to combine what was statistically desirable with what was practically possible. It was not thought valid to use men who were in hospital with other diseases, since they are by definition not normal, and moreover, their pulses and blood pressures, which were to be measured, might well have been affected by their condition. In this study a group of volunteers not suffering from nystagmus (Table I), matched in respect of age and occupation, was therefore chosen by selecting a random fifty out of the 162 miners' lodges in County Durham, and by asking each of these to nominate one man to

TABLE I
Nystagmus and Control Groups, by Age and Job.

Present Age	Employment										Total	
	Hewer		“ Putter ”		Filler		Stoneman		Rolley Weighman			
	N.	C.	N.	C.	N.	C.	N.	C.	N.	C.	N.	C.
-30	0	1	0	0	0	0	0	0	0	0	0	1
30-39	12	10	0	0	0	0	0	0	0	0	12	10
40-49	13	13	2	2	0	1	1	1	0	0	16	17
50-59	12	15	0	0	2	1	2	2	1	1	17	19
60	2	2	0	0	0	0	0	0	0	0	2	2
Total	39	41	2	2	2	2	3	3	1	1	47	49

match each of the nine age and occupation groups into which the men with nystagmus fell. This produced 450 names, from whom a final random selection of 49 was made, all of whom presented themselves for a medical and social examination comparable in every respect to that given to the men with the disease. It was important to make the selection of the controls as random as possible, but, at the same time, to avoid any wastage through men not arriving for examination, since this itself produces a selected sample.

The clinician saw each man first and took the present and past history of the disease, together with the past history of any other illnesses. His family history was noted in full, and consisted of the age, occupation, present health or cause of death, of father, mother, wife, brothers, sisters, and children. A note was then made of any accidents which had happened to the patient or which he had seen. The employment (or unemployment) history was then taken by the method advocated by Meiklejohn (1949), in which the nature of the present job is determined in detail, together with a complete employment history from the start of work up to the present time. The physical examination included height, weight, pulse rate, blood pressure, and chest expansion.

After the clinical examination, an almoner saw each man privately, noted his financial situation, and enquired about his early life and the reasons for entering coal mining. She also made a subjective assessment of intelligence, arranged a visit to his home, where she met the patient's wife and assessed the home accommodation. The men's intelligence, the "personalities" of their wives, their household standards, and physical accommodation, were graded on a single three-point scale, together with any domestic strain encountered.

Limitations of the Method.—The main limitation in the historical data was memory, so that the reliability of the research cannot be considered to be greater than that of the usual type of clinical history. But, at the same time, it is no less. In the past symptoms have been grouped merely under the main systems, as set out in the international statistical classification (1948) and no special diagnosis, other than that of peptic ulcer, has been attempted. In regard to the occupational histories, periods of unemployment are well remembered because of the financial hardship involved, and so are times in the armed forces. Coal miners climb their professional ladder in fairly regular steps, and usually say quite confidently at what age they started certain work. The age when a man starts coal-face work and the age when he gives it up are nearly always accurately remembered, because of the financial implications.

The limitations of the social worker's subjective assessments are perhaps rather greater, and more weight can be placed upon them when they confirm tendencies already apparent, than when they do not. Subjective assessments were made by the same person throughout, and were recorded before any analysis of the data was made. In theory, it would have been better if the social worker had not known which men had nystagmus and which had not, but in practice this is not possible, as it can be deduced from their conversation.

A further limitation of this work is in the volunteer composition of the normal group, but there was no wastage, and its bias was towards a better than average group, so that in the event it turned out that the comparison was made more and not less severe, and that the bias was against and not in favour of the men with nystagmus.

TABLE II

Number of Cases showing Various Symptoms at Three Points of Time.

Symptom	Presenting		At Certification		Five Years after Certification	
	No. of Cases	%	No. of Cases	%	No. of Cases	%
Unsteadiness	12	25	46	96	18	38
Photophobia	2	4	45	94	2	4
Headache	13	27	41	85	21	44
Moving objects	19	40	42	87	1	2
Night blindness	—	—	38	79	—	—
Anxiety	—	—	16	33	5	10
Depression	—	—	13	27	3	6
Insomnia	1	2	32	67	—	—
Irritability	—	—	31	65	—	—
Fear at work	1	2	7	15	3	6
Nausea and vomiting	—	—	6	12	1	2
Faintness	—	—	6	12	—	—
Fatigue	—	—	6	12	3	6
None	—	—	—	—	16	33

Results

(a) **Symptoms and Signs.**—Forty-seven of the men had had one attack of the disease and one man had had two. The commonest presenting symptom in this series of cases was a complaint that objects—usually the lights in the pit—appeared to be moving (Table II). Unsteadiness, more marked in the dark and especially on meeting a bright light or on stooping, was second in order of frequency. This is often described as dizziness or giddiness, and sometimes by doctors as vertigo, but careful enquiry shows that the patient usually means that he becomes unsteady on his legs, a symptom which causes some anxiety to men working in the dark, surrounded by machinery. In no case was there anxiety or depression in the early stages of the illness. The length of time between the first symptom and certification is very variable

TABLE III
Relation between Number of Attacks of Nystagmus and Time between First Symptom and Certification.

Time (months)	Attacks				Time (years)
	No.	%	No.	%	
0— 6	15	31	0	0	5—
7—12	7	15	1	2	6—
13—18	5	10	0	0	7—
19—24	9	19	0	0	8—
25—30	0	0	3	6	9—
31—35	2	4	1	2	10—
36—42	1	2	—	—	—
43—48	2	4	—	—	—
49	2	4	—	—	—

(Table III). In slightly less than one-third of the attacks it is less than six months, but more than half the men put up with the disease for more than a year before becoming certified. At this point there is an expansion of the symptomatology. There is an increase in the symptoms which were common on presentation, such as unsteadiness, headache (which may have a very varied distribution), and the apparent movement of objects. There is also a widening of the range of complaints and the appearance of new symptoms. For example (Table II), anxiety and depression are found in about one-third of attacks, and insomnia and

irritability in about two-thirds. Five years later—and most of the patients had been out of the pit for this length of time—the symptomatic pattern has again changed. One-third of the patients have no complaints, but unsteadiness and headache are still common. Anxiety and depression are still present, but less commonly than five years before. On the whole, the frequency of the symptoms is less and their range has contracted.

The general physical findings in both the nystagmus and control groups are summarized in Table IV. The mean ages differed by slightly more than two months, the heights by less than half an inch, and the weights by little more than a pound. The average pulse rate of the men with nystagmus is only two beats per minute more than that of the normal group. The two groups have identical systolic blood pressures, but the average diastolic pressure of the men with the disease is 8 mm. Hg higher than that of the controls. The chest expansions of the two groups are not significantly different.

TABLE IV
Physical Findings.

Particulars	Nystagmus	Controls	Difference	Standard Error
Age (years)	47·7	47·5	0·2	1·86
Height (inches)	67·0	67·5	0·46	1·60
Weight (lbs)	150·1	151·4	1·31	4·29
Pulse (beats/min.) ...	70·2	67·7	2·51	1·05
Blood Pressure (mm.Hg)	145	145	0·00	4·42
	91·4	83·4	8·00	2·88
Chest Expansion (inches)	1·9	1·8	0·1	0·14

Table V compares the past illnesses of the two groups. More men with nystagmus than controls had had no illnesses; the controls seemed to suffer more with their chests. There is no evidence in this study that men who have nystagmus fall sick more often than usual. The past medical history of this group is well summed up in the words of one of them, "I've only been off four shifts in my life—all for funerals".

(b) **Occupational Histories.**—A numerical comparison of the occupational histories of the men with nystagmus, before certification, and the normal men is made in Table VI. "Surface work" includes work in the screens, in the timber yard, labouring, and "at bank" in the local phraseology. "Haulage work" includes

the jobs of haulage hand and trapper-boy (a boy who opens and shuts a door in an air lock for the pony and tubs to go through), pony-driving, and "datal work" (*i.e.*, odd jobs underground paid at a daily rate). "Putting" is a corruption for pushing tubs, which is done either by hand or with the help of a pony.

TABLE V
Past Illnesses Classified.

Type of Disease	Nystagmus	Controls
Infectious	11	4
Nervous	0	2
Respiratory	11	21
Circulatory	0	1
Digestive	12	8
Genito-urinary	2	0
Skin	2	3
Bones and Movements	3	1
Accidental Poisoning	1	0
Peptic Ulcer... ..	5	4
<i>Total Disease</i>	47	44
<i>No Disease</i>	19	16

TABLE VI
Occupational Histories of Men with Nystagmus before Certification and of Control Group.

(Percentage of man-years in each age group spent in each occupation.)

Occupation	Age Groups											
	15—24		25—34		35—44		45—54		55—65		All Ages	
	Nys.	Cont.	Nys.	Cont.	Nys.	Cont.	Nys.	Cont.	Nys.	Cont.	Nys.	Cont.
Unemployed ...	—	1	1	3	—	—	2	—	—	—	1	1
Outside mining	2	6	1	5	—	—	2	2	—	—	1	4
Forces ...	4	4	2	1	—	—	—	—	—	—	2	2
Surface ...	1	6	1	1	1	—	—	—	—	—	1	3
Haulage ...	37	28	3	—	3	3	—	7	—	—	15	11
Putting ...	32	38	7	10	1	—	—	—	—	—	13	17
Face work ...	24	17	85	80	95	96	96	91	100	100	67	62
Deputy ...	—	—	—	—	—	1	—	—	—	—	—	—
<i>Total Percentage</i>	100	100	100	100	100	100	100	100	100	100	100	100
<i>Total Man-Years</i>	478	423	445	397	299	258	106	106	18	5	1346	1189

"Face work" includes filling tubs or shovelling coal on to a conveyor belt, hewing by hand or pneumatic pick, coal-cutting, and working in stone above or below the coal seam. A "deputy" is a type of underground foreman. For all ages, both nystagmus and control groups spent an equal time unemployed. A smaller proportion of time is spent by the men who eventually get the disease outside mining and on the surface. Time in the armed forces is the same for both groups, and it will be noticed that the men who get nystagmus spend a slightly greater proportion (67 per cent.) of their time at the coal face than do the normals (62 per cent.). In the 15- to 24-year age group, and to a lesser extent also in the 25- to 34-year group, the men with the disease graduate to the coal face a little more quickly than the normals. In short, therefore, the working histories of the men who eventually get nystagmus, so far from being worse than normal, are, if anything, rather better.

TABLE VII

Number of Patients by Length of Unemployment after Certification.

Months	0-6		7-12		13-18		19-24		25-30		31-36		37-42		43-48		49-		Un- known	
Men with Nystagmus	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
	22	46	8	17	5	10	3	6	3	6	1	2	1	2	3	6	1	2	1	

TABLE VIII

Number of Patients by Each Period of Unemployment up to Twelve Months.

Months	0	1	2	3	4	5	6	7	8	9	10	11	12
Men with Nystagmus	1	2	1	5	1	4	8	1	2	2	0	0	3

The length of unemployment after certification is important from two aspects. It represents a wastage of face workers and is an index of the degree of mental depression. Table VII shows that thirty (63 per cent.) of the men were back at work within a year. The greatest number of these returned to work at the sixth month after certification (Table VIII). 1942, the year of certification, was a time of full employment in the coal industry. When a man was certified as fully disabled he was entitled to draw a basic rate of 35s. per week for six months. At the end of this time

he was re-examined, and, if declared fit (often on the unsound criterion of whether his eyes were oscillating or not), applied to his colliery manager or to the local employment exchange for work. If thought to be unfit, he would be certified again for a further six months. If the patient was not satisfied about the decision, he might appeal to a medical referee. The times of unemployment shown in Tables VII and VIII must, therefore, be related to a number of complicating factors :

- (a) The natural history of the disease.
- (b) The labour shortage in the coal field.
- (c) The low compensation rate in comparison with what could be earned.
- (d) The certification machinery.

It is reasonable to suppose that during the first six months men were spontaneously recovering and returning to work. At the sixth month eight men (Table VIII) were "signed off" and returned to work, and during the next few months those who felt themselves to be fit gradually drifted back.

TABLE IX

Work to which Men returned after Certification.

Underground			Surface		
			At Colliery		Outside Colliery
Deputy	1	Labourer ...	11	General labourer ...	4
Hewer	3	Timber yard ...	5	Road work	2
Coal cutter ...	1	Screens	3	Platelayer	1
Stoneman	1	Granary	2	Bricklayer's labourer	1
Timberer	1	Lamp cabin ...	2	Factory hand	2
Pump-man	1	Girder straightener	1	Pitch and tar work	1
Tub loading at shaft		Saw mill	1	Public-house	
bottom	1	Banksman	1	manager	1
		"Creeper"	1		
Total	9	Total	27	Total	12

The work to which they returned is shown in Table IX. Nine went back to work underground, six were offered work by their own colliery, but three (two hewers and the deputy) obtained work at another pit, and these are also the only underground workers who did not relapse. This suggests, therefore, that about two out of 47 (4 per cent.) of cases of nystagmus may return to, and remain at, the coal face for 5 years in a time of full employment, having had no treatment other than initial removal from the original working environment. Twenty-seven men were offered work by their own colliery, and nearly all undertook either a type of labouring or a light job on the screens, in the lamp cabin, or

controlling the tub elevator or "creeper" motor. Those for whom there was no work at their own pits obtained much the same range of jobs elsewhere. Since only sixteen of these men were symptom free (Table II), it appears that it is quite possible to do useful work—albeit of a labouring type—although recovery from the disease may not be complete. The outlook for return to the coal face without treatment does not seem good, since only small numbers did so, and only a still smaller number of these maintained their working capacity for a period of five years.

Twenty men with nystagmus and 23 controls had avoided any accidents to themselves. All the rest had been involved in at least one accident, with damage ranging from a crushed finger to serious multiple injuries. There was no apparent difference between the two groups in the number or severity of accidents. Twelve men with nystagmus and sixteen controls had witnessed fatal accidents, and a few non-fatal mutilating accidents had been seen in both groups. One man with nystagmus developed symptoms soon after a "bat on the eye", and two others had been involved in accidents a short time before their breakdown. One man had seen an extremely revolting fatal accident three months before certification.

TABLE X
Size of Own Family compared to Size of Father's Family.

Group	Number of Families																											
	No. of Siblings														No. of Children													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7				
Nystagmus	...	2	1	3	13	6	5	5	4	3	4	0	0	1	0	0	0	7	5	1	4	3	1	2				
Controls	...	0	0	2	5	8	9	8	4	5	2	2	1	0	0	0	1	1	6	5	3	3	1	5	0			

(c) **Social Investigation.**

Family Structure.—The number of children in the families of the nystagmus and normal groups, compared with the number of brothers and sisters which their parents had, is shown in Table X. Only the children of families where the mother was 45 or over are considered, the assumption being that by this age no more will be born. The men with nystagmus had an average number of 3.1 children and the control group three. On the

other hand, the men with the disease came from families of an average size of 4.8, whereas the size of the normals' families was greater at 5.8, the odds against this being a chance finding being 100 to 1 ($t=2.74$, $p=0.01$). Table X also shows the usual decrease in family size in the present generation. This has affected the families of both groups, but the nystagmus group less because they came from smaller families to start with.

It has been said that coal miners tend to marry women older than themselves, but this is not borne out by this study. The men with nystagmus were, on an average, 2 years 5 months older than their wives, and the normals 1 year 2 months older. There is no significant difference in the childless state of the two groups since there are two single men in each and four childless couples among those with the disease and six among the controls. The only features of note among the causes of death of the parents are that one father committed suicide, and one mother died of "melancholy" at the age of 74—both in the control group.

Early Life.—Thirty-four of the men with nystagmus and 36 of the controls appeared to have had normal and happy home backgrounds. Eight men in the nystagmus group and five of the controls had their home life disturbed by the death of one or both parents in childhood. One man with nystagmus had been adopted in infancy. Five of those with the disease and six of the controls had had other difficulties at home, nearly all due to extreme poverty. Only one man in each group said that his childhood had been unhappy; the one with nystagmus had been brought up by a harsh step-father; the control's father was a drunkard.

There was, thus, no apparent difference between the early home background of the two groups. The impression throughout was that of extreme family solidarity and of capable family management. In all cases where the mother had died leaving young children, some other member of the family—elder sister, grandmother, or aunt—had taken over the maternal duties. Death of the father had usually caused added economic difficulties, sometimes forcing the mother to go out to work herself, but there was no sign that family relationships had suffered. Some degree of poverty was almost universal, but it was only rarely that any serious lack of food or other basic necessities had been felt. The prevailing tendency among the men was to look back on childhood as a happy period in their lives.

Reasons for entering Mining.—Most of these men became miners because they had no choice, but a positive inclination towards some different occupation was commonest among the

controls (Table XI), who included some highly gifted men who might have gone far in other fields.

Intelligence.—There was a wide range of intellectual ability in both groups. The control group contained a rather larger proportion of men who were more literate and had unusual intellectual ability (Table XII). One man with nystagmus had not learnt to read or write until he went into the army, and several in both groups seemed “slow in the up-take”, but all had sufficient native intelligence to deal with their work and home affairs.

TABLE XI
Choice of Occupation.

Group	Preference for Mining	Indifferent	Other Ambitions
Nystagmus	17	18	12
Controls	11	12	24

TABLE XII
Number of Men by Social Background.

Social Factors	Nystagmus				Controls			
	Above average	Average	Below average	Not answered	Above average	Average	Below average	Not answered
Intelligence	5	33	9	—	10	35	2	—
Wife's personality	11	23	9	4*	11	22	8	6†
Household standards	11	29	6	1	11	22	10	3
Housing ...	19	20	8	0	21	14	12	0
Domestic stress	7	16	24	0	7	9	31	0

* 3 single men, 1 widower. † 2 single men, 4 widowers.

Housing.—Most of the men had been able to get homes of their own without long delay after they got married, housing

difficulties in the past being due to the poor quality of the houses rather than to their scarcity. There was no apparent difference between the two groups in this respect, and their present housing conditions were also similar (Table XII). Nineteen with nystagmus and 21 controls lived either in council houses or in privately built houses of equivalent or even better standard. These were ranked "above average" in the assessment scale. One man in the control series had built his own house with the aid of a building society.

All the rest lived in colliery houses or in houses of similar type, which had been built by private speculators or bought up from the colliery owners when old pits closed down. Colliery houses were ranked as "average" or "below average", according to their quality of construction and state of repair. The best were as well built as council houses, sometimes better, but had no bathrooms, and many of the older ones no sinks. There was a cold-water tap in the passage or scullery, and water had to be thrown away down a drain in the yard outside. About a quarter of the families lived in houses which were damp and dilapidated, as well as inconvenient. One or two of the houses in condemned property were stranded amid colliery waste lands, with slag heaps reaching to their very doors, and looked more like decaying shells than habitable homes. There was, however, practically no overcrowding. Household standards were high in both groups, and often superlative.

Wife's Personality.—In general, the atmosphere found in the homes was one of ease and friendliness. In the rough grading that was made (Table XII), the wives who were rated highest were all women of exceptional fibre who had weathered many difficulties themselves, and retained a warmth and serenity of character which might well lend strength to members of the family in sickness or trouble. Some were highly intelligent women, whose social poise would have done them credit in any station of life. The middle or average group were not specially remarkable in any way, but were practical and cheerful women, who took things as they came. Those who were, by comparison, rated "below average", were sometimes efficient housewives, but their ability to create an atmosphere of calm and confidence was below the general standard. Some of them were obviously over-anxious and easily agitated, and others complained unduly about their difficulties. Very few, however, seemed seriously mal-adjusted, or failed to cope adequately with their household duties. There was no overall difference between the wives of the men with nystagmus and those of the controls.

Domestic Stress.—An approximate comparison of the total amount of domestic stress in the two groups is also shown in Table XII. In the nystagmus group this refers to the home situation up to the time of certification, as subsequent difficulties were mainly a result of the illness. Stress has been classed as "above average" when events had taken place which were likely to have caused serious emotional strain over some length of time. The nature of the event itself was taken as being a more reliable index than the man's apparent subjective reactions. Seven men in each group had been subjected to severe stress according to this reckoning. Three men with nystagmus and four controls had lost their wives—sometimes in tragic circumstances—and had to endure either the anxieties and practical difficulties of a widower with young children, or the loneliness of living on their own. Two men with the disease and one control had suffered on account of the serious or fatal illness of a daughter. One man with nystagmus lived with an overwrought wife and an epileptic stepson in an overcrowded, damp, and rat-infested house. One control, whose housing conditions were not much better, had a wife of low intelligence and an idiot hydrocephalic son of nineteen, who sat rocking himself in a chair in the only living room from morning till night. One man in each group had unusual marital difficulties—the control had separated from his wife. Three men had been certified with nystagmus soon after a severe domestic tragedy.

TABLE XIII
Number of Men by Stability of Character.

Group	Highly Stable	Normally Stable	Unstable
Nystagmus ...	14	22	11
Controls ...	22	9	16

Patient's Personality.—On the whole, the patients seemed less able, but more stable, than the control group. Here, personal stability was measured by the man's long-term performance at work and in his family life. From the sum total of information, including past industrial, social, and economic history, and home background, and the comments of their wives, it was possible to grade them as in Table XIII.

Neither group contained any seriously unstable men, and they all managed the problems of work and family life adequately. One with nystagmus and one control (who had been converted

from a Communist to a Jehovah's Witness) were eccentric to the point of mild abnormality. The only frankly obsessional man was one of the control group, who suffered from chronic dermatitis, and had kept a note-book for the last 25 years in which he recorded the progress of the disease. The diversity of types in both groups was considerable, and there were no traits by which patients with nystagmus could be recognized. The control group had a larger number of men who combined unusual gifts with great strength and balance of character, and some seven of these would have stood out as leaders of men in any trade or profession. Only three of the men with the disease came near to the same level. On the other hand, the control group also contained a large number of men who were tense or embittered. Twenty-two of those with nystagmus, as against only nine of the controls, were solid straightforward men, with simple tastes and no outstanding characteristics, but eminently sound and sensible. The men with nystagmus seemed, on balance, more "ordinary", and comparison with patients seen in day-to-day clinical work suggests that they were more typical of the rank and file of the local mining community.

Social and Economic Result of Nystagmus.—In 1942, the full rate of compensation, excluding children's allowances, was 35s. per week, and this meant only a bare subsistence if incapacity continued over a long period. Often, the rate of compensation was reduced while the man was still unfit to work, or no suitable work was yet available. Some men, who had to stop work on account of nystagmus, were never compensated at the full rate at all; fourteen had severe financial difficulties, and five of these were off work for over two years.

Only four families applied for Public Assistance; the stigma attached to it is so strong that it was resorted to only in the very direst extremity. Sometimes relatives outside the immediate household were able to give some help, and in nine instances the wife went out to work herself to supplement the family income. Many more would have done so if work had been available for them, but the opportunities in their district were very limited. Two of the wives broke down in health as a result of combining the household duties with a full-time job, and some of the others managed it only at severe cost to the general welfare of the family. Sometimes, when a family had managed to subsist on partial compensation without any other supplement to the income, it was difficult to see how it had been done. Only four of the men with nystagmus were now earning as much as they might have expected to had they not been ill, and 26 had their

incomes reduced by 50 per cent. or more. Some were still trying to get permission to return to underground work, but without success.

Compensation difficulties had left little mark on the men, and "compensation neurosis" was only found in one. Compensation had usually been settled fairly quickly, payment often coming through within a few weeks. The somewhat complex machinery of the old act often entailed many visits to different doctors, in both the early and later stages. This was always tiresome, and the fact that compensation rates were based on the amount of oscillation present rather than on the degree of incapacity, was felt to be thoroughly unfair. Compensation was not regarded as an end in itself, but it resulted almost inevitably from a man's admitting incapacity from the disease. Some men had worked for years with miners' nystagmus, knowing quite well what was wrong with them, but deterred from seeking medical advice by fear of losing their jobs. In the past, it was well known among the miners that a man who was known to have had nystagmus stood practically no chance of ever being allowed to work underground again; surface jobs were scarce, and the chances were that he would become totally unemployed. If he lived in a tied colliery house, he was faced with the prospect of losing his home as well as his means of livelihood.

An exceptional demand for labour in the mines at the time when the present series of men were certified greatly eased their resettlement problems, but even so, they often had considerable difficulty in getting back to work. One man, who could not get work at his colliery, was offered a job in a quarry, but was turned down when it was discovered that he had nystagmus. He later succeeded in joining the Navy, and is now a worker in a naphtha plant. Another man tried repeatedly to get work at the colliery and finally managed, with some difficulty, to get passed as fit for work by the medical officer at a munitions factory. In the interim, he had to do the housework while his wife went out to work to support him.

The men with nystagmus had shown initiative and persistence in getting back to work, often in the face of much discouragement from doctors as well as from employers. Where colliery officials had been helpful, this was much appreciated. One man, who was still troubled by attacks of unsteadiness, had been given a job in the lamp room. His symptoms did not interfere with his work there, and the embarrassment which they caused him was minimized by the kindness and consideration of his fellow workers. Where the colliery was unhelpful, the difficulties were much greater. One of the men who is now doing factory work

was passed as fit for work after a year, but was enforcedly idle for another $2\frac{1}{2}$ years. He tried repeatedly at the colliery, and his medical history told against him for other forms of work. In relating the story he expressed no bitterness, but showed clearly how unhappy he had felt, and how welcome help in resettlement or even some slight show of interest would have been. The economic results of the illness were usually worse than the physical ones, but worst of all was the feeling of being waste material of no further use or interest to anyone.

Disease seen through Wife's Eyes. — During the course of the social investigation, comments volunteered by the wives of the men with nystagmus provided some additional clinical information. A most distressing aspect of the illness was the change in temperament which sometimes went with it. Of 37 wives who discussed the effects of the illness sixteen had noticed marked changes during the acute phase; ten wives had noticed some changes, but stressed them less; eleven had noticed physical symptoms only, or no symptoms at all.

The symptom which had seriously worried some of the wives was bad temper, which was specifically mentioned on eighteen occasions, though often it seemed to represent no more than the irritability which may go with any illness. The alternative general change in temperament noticed by the wives was expressed in the phrase, "he went quiet," which implied a general listlessness and loss of interest in outside affairs. Where any general mental change had been noticed by the wives, it could best be summed up either as an increase in tension or as loss of energy. The mental condition improved *pari passu* with the other symptoms of the illness, and its severity did not seem to bear any relation to the man's general stability of character. Depression, when present, seemed no different to that found with any incapacitating illness.

Headache was commented on frequently by the wives, and next in frequency was the movement of the eyes. Several wives noticed particularly that coming into a brightly lit room out of the dark would bring on violent oscillations.

The most troublesome physical symptoms affecting normal life were unsteadiness on stooping, and loss of balance and direction when faced with bright lights. Unsteadiness was sometimes illustrated by the observation that when a man bent down to tie his shoe-laces he fell over forwards. This was mainly an inconvenience as far as the social results were concerned, but the effects of dazzle might be dangerous. Several men had narrowly escaped being run down when the lights of oncoming traffic sent them staggering across the road, and some of them, after five years, still had to be escorted if they went out after dark.

Discussion

After the first world war, there was a tendency to explain coal miners' nystagmus in terms of "shell shock", and Rivers (1922) draws a parallel between the two diseases, and suggests that the disability is psychoneurotic, being largely due to a repressed fear of danger. This view is underlined by Culpin (1925), who asks a question which still remains to be answered, "What sort of man acquires it?" Culpin (1932) describes his findings in 36 cases in a free interview with a brief examination of the eyes, but no control group appears to have been examined in the same way. He groups these cases under the headings of hysteria, anxiety, obsessional state, pathological truculence, and doubtful genuineness; six were normal. In a re-investigation of the psychiatric aspects of the disease, Stern (1948) diagnoses psychological abnormality including malingering, in 43 out of 47 cases; but fifteen of his 23 controls also appeared to be psychologically abnormal.

On the other hand, in the present study conducted upon a small but random sample of cases, more than half the affected men put up with their symptoms for more than a year before becoming certified—and certification in 1942 brought no gain, real or fancied, since the full compensation rate was appreciably below what could be earned by working. The physical differences between the men with the disease and the normal group were very small or absent, and as workmen the men with nystagmus were, if anything, slightly better than normal before breaking down. In hard times they held their jobs as well as the next man, and they were as good as normal both as husbands and as householders. They do, however, differ from the control series in some respects. They came from slightly smaller families, they had smaller families than the usual, and they seemed to be rather less intelligent than the normal group. Owing to the limitations of the method of control, however, these differences may well have been due to the fact that the men who volunteered to be the control group were more intelligent and public-spirited than the usual. But the medical, social, and industrial behaviour of the men with nystagmus in this study does not seem to be that of inadequate individuals, who have a changeable occupational history, who report sick upon slight provocation, and do not put up with disabling symptoms for as long as possible before seeing a doctor.

However, it must not be denied that the syndrome of coal miners' nystagmus contains psychological elements. For example, there is no doubt that at the onset some of these men

are acutely irritable. This appears to subside fairly quickly after removal from the working environment. It is gradually replaced by anxiety, and later by depression, because the administrative machinery and lack of rapid resettlement causes them to be compulsorily unemployed, living upon a pittance. This depression seems to be the depression of unemployment, and in the past of underpayment, rather than the depression of a pre-existing neurosis. It seems clear that the medical assessment of recovery from this disease needs to be made from the symptoms of which the patient complains, and not from the movements of the eyes. After certification and an initial rest of a few weeks, resettlement to standing or sitting work in a good light should be as rapid as possible. Jobs in the dark, or which mean stooping, should be avoided. An attempt, however, should be made to return those whose *symptoms* recover quickly, to coal-face work, provided that their condition is assessed at frequent intervals. This retrospective study shows the great need for further work upon this problem, directed especially towards a follow-up of acute cases.

Summary

(1) A clinical, occupational, and social survey of 47 coal miners certified with nystagmus five years before, has been made, and the results compared with a similar study upon volunteer normal miners of comparable ages and occupations.

(2) More than half the men had symptoms for more than a year before becoming certified. There were four times as many men severely disabled as had gross oscillations of the eyes.

(3) Physically, the two groups were similar in height, weight, and chest expansion. The men with nystagmus had slightly more rapid pulses and higher diastolic blood pressures than did the controls. Occupationally, the men with nystagmus were as good, if not better, workmen than normal. They graduated to the coal face earlier than the normal men and did not suffer more unemployment. Four per cent. of the men with nystagmus ultimately returned to, and remained at, the coal face without specific treatment. The rest found a wide range of work, usually in good light, and not requiring stooping.

(4) The medical and accident histories of the men with nystagmus were not noticeably different from those of the controls.

(5) Socially, the two groups were comparable in respect of personality of wife, household standards, and domestic happiness. The controls were slightly more intelligent, with more outside

interests. Men with nystagmus come from, and have, slightly smaller families than normal.

(6) A diagnosis of gross neurotic predisposition does not seem justified from this study. It is suggested that the nature of the symptoms warrants the anxiety displayed, and the subsequent unemployment and financial hardship, the depression.

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