He was inoculated with antistreptococcic serum every fourth day for three weeks, and every sixth day for a further six weeks. After the third inoculation he improved; the pain began to leave him, and he could walk with sticks instead of crutches, and after the ninth inoculation he was able to walk with one stick, had no pain except in the feet, but was stiff in the legs and neck. He continued to make a rapid recovery, and since then he has been quite well. I saw him only a few weeks ago carrying a large sack of potatoes.

There was no history of any hereditary rheumatic trouble.

CASE II.

F. L., aged 34, female, unmarried, consulted me in October, 1909.

She stated that eight years previously she had an attack of acute rheumatism affecting chiefly her joints. She attributed the attack to cold resulting from her having to sleep in a room heated by hot pipes, where she was at business in a millinery establishment in Edinburgh. She apparently recovered, and after six months she returned to Dublin, where her home is, and for almost twelve months she was able to work, although she still had what she describes as twinges of rheumatism, especially in the left arm. After this time, however, she was seized with a very bad attack of acute rheumatism especially affecting her knee-joints, which were extremely painful. She then went to Harrogate for three weeks' treatment, but without any success. From this time on she was a constant sufferer, and her joints became swollen, stiff, and painful, and she became helpless. She had electrical and medical treatment on and off for two years, which relieved her, but only for a time.

In October, 1909, she came to me, and was inoculated twice a week for six weeks, and afterwards once a week for a further six weeks with antistreptococcic vaccines.

Almost immediately she began to improve, and after thirteen inoculations practically all pain and swelling in the joints had gone. The left ankle-joint, however, was still very much swollen and deformed, and after an interval of two months the vaccines were again continued. Eventually the ankle resumed its normal proportions, all pain disappeared, and in July, 1910, the treatment was discontinued as she was quite well. Since July last she has had no trace whatever of the disease, and she can now walk and run as well as ever she did.

I have seen her during the last few weeks, and she states that she is in better health now than she has been for many years. There was no history of any hereditary rheumatism.

CASE III.

M. A. H., female, aged 42, had suffered from rheumatoid arthritis for nearly eight years. It began quite suddenly with acute pain, heat, and swelling in the left wrist, which spread within a few weeks to her knees, ankle-joints, and shoulders.

She had medicinal treatment for two or three years without receiving any permanent relief. She then got considerable relief from electric light baths and high-frequency currents, and for six months after a prolonged course of this treatment she was much better.

In November, 1909, however, she consulted me. At that time she was in an extremely weak and wretched condition, almost cachectic in appearance. She could walk a little only with the aid of sticks, and had to be lifted in and out of a cab.

I found all the joints were more or less swollen and painful, the muscles were thin and weak, and the knee-joints were distorted and stiff. The temperature in the evening was between 99° and 101° at that time, and the heart sounds were extremely feeble. There was no albuminuria. Her teeth were in a very bad state, and the gums were soft, with pus exuding from them. This pus, on examination, proved to contain chiefly streptococci, and a vaccine was prepared. She was too weak at that time to have her teeth extracted, but after ten inoculations she improved a great deal in health, and the joints became less painful, and she could move them a little.

The teeth and carious stumps were then removed, and after a further ten inoculations she lost all pain and could walk with only one stick. She continued to improve, and I saw her in October last, when she reported herself quite well, and able to walk perfectly freely without pain.

In this case the disease appears to have followed upon an infection from the teeth, which had been in an extremely bad condition for upwards of ten years. I have had other cases almost identical with the above in which the pus from the teeth was apparently the focus of infection, causing rheumatism in many forms, but especially rheumatoid arthritis.

CASE IV.

Mrs. O'B., aged 37, came to me in 1908, suffering from what appeared to be the typical symptoms of a progressive rheumatoid arthritis. Her general health was bad. She was yellow and sallow looking; almost all her joints were more or less affected, especially the knees, which were very large, and contained a lot of fluid. Her teeth were very bad, and she was swallowing a considerable amount of pus from the gums. She also had a purulent leucorrhoeal discharge from a chronic endometritis.

This case I consider probably the most remarkable as, almost as soon as the teeth were extracted and a curetting of the uterus had taken place, the patient improved, and within a comparatively short time, without any further treatment except tonics, the rheumatoid condition dis-

appeared and she became quite well. No vaccines were used, but it seems that the sources of infection were removed in time. I have seen this patient lately, and she is perfectly well and extremely active.

CASE V.

H. G. H., male, aged 34, consulted me in August, 1909. He was suffering from severe pains in the small of his back and along the left sciatic nerve; also in the knees, which were swollen, painful, and hot. He had been treated in the country with medicine, but although he apparently improved, still he never got quite well. He was walking with great difficulty when I first saw him, but he looked fairly healthy and strong, although his temperature in the evening rose a little and the pains had prevented him from sleeping. His history elicited the fact that he had had gonorrhoea six months previously, and was at this time suffering from chronic gleet.

An examination of the discharge failed to find any gonococci, and I inoculated him with antistreptococcic vaccines—in all, ten injections—when he made a complete recovery; and I hear this winter he has been hunting continuously and is quite free from all traces of rheumatism. I should mention that at the same time I treated the gleet by the passing of cold silver sounds and gradually dilating the urethra thereby.

SOME OBSERVATIONS UPON THE DEEP TEMPERATURE OF THE HUMAN BODY AT REST AND AFTER MUSCULAR EXERTION.

BY

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THE following observations are perhaps of interest inasmuch as, while records of the determination of the body temperature of persons suffering from some diseased conditions are very numerous, careful determinations of the temperature of the normal individual throughout the 24 hours are few in number. Pembrey, for example, writing on the subject of the body temperature in the present edition of Schäfer's *Textbook of Physiology*, states that "the observations upon the normal temperature between midnight and morning are so few that it is impossible to give the mean temperature of a day of 24 hours." Systematic observations as to the effect of muscular exertion upon the normal body temperature are even more scanty. In the sanatorium treatment of pulmonary tuberculosis exact information with regard to the variations of the body temperature is most necessary, and for the regulation of the exercise of consumptive patients the effect on the temperature of prescribed amounts of exercise is one of the chief guides. It was the absence of normal standards or controls with which to compare temperature observations made upon tuberculous patients that prompted our inquiry.

Method of Observation.

We first made some preliminary observations as to the relative value of determinations made in the axilla, mouth, urine, and rectum, as representing the deep temperature of the body. We concluded from these observations that determinations made in the rectum give the most accurate records, and that, after the rectum, determinations made respectively in the urine, mouth, and axilla, are the most reliable in the order named. We found that when the body is at rest the temperature of the rectum is a little higher than the temperature of other parts of the body. Our observations showed that—

The average excess of the rectal temperature over the urine temperature is 0.23° F.

The average excess of the rectal temperature over the mouth temperature is 0.9° F.

The average excess of the rectal temperature over the axilla temperature is 1° F.

Immediately after exercise the difference between the temperature record taken in the various ways is much more marked. For example, after a sharp walk we found—

The average excess of the rectal temperature over the urine temperature to be 0.66 F.

The average excess of the rectal temperature over the mouth temperature to be 1.8° F.

The average excess of the rectal temperature over the axilla temperature to be 2° F.

These results agree very closely indeed with those obtained by Pembrey and Nicol in a similar inquiry.¹

We agree with Pembrey's conclusion that the rectal temperature alone represents the internal temperature of the body. For this reason, temperature examinations made in the rectum are the most satisfactory, when accurate data are required, and when it is important to ascertain the existence or absence of slight degrees of fever. The internal temperature of the body, and in consequence the rectal temperature, is very readily raised by any form of muscular exertion. A short walk is sufficient to raise it 2° or more. In sanatorium practice the fallacy of attributing to fever a physiological rise due to exercise is avoided by the temperature observations being taken on waking, or only after a patient has been at rest for one hour. The method of taking the temperature in the mouth is approximately accurate, so long as the individual observed is not in a very cold atmosphere, and provided that the thermometer is kept in the mouth for some fifteen minutes. For recording the temperature immediately after exercise, observations taken in the mouth are valueless. When an individual is febrile and is kept in bed, temperature observations made in the different ways agree very closely, and the higher the fever the closer is the agreement.

All the subsequent observations upon temperature recorded in this paper were determined by placing the thermometer some 4 cm. into the rectum and retaining it there for one or two minutes.

THE NORMAL BODY TEMPERATURE AT COMPLETE REST.

To eliminate any fallacy due to muscular exercise the nine normal individuals observed were kept in bed throughout the period of observation—a period which varied from twenty-four to forty-eight consecutive hours. Food was given in the ordinary meals at 8.30 a.m., 1 and 7 p.m. During the night the individuals were aroused from sleep sufficiently to allow of the temperature being taken, and sleep was very little interfered with. In the case of No. 4, No. 8, and No. 6 the observations both for day and night were checked and confirmed by a very large number of subsequent determinations. The nine

FOUR-HOURLY TEMPERATURE OBSERVATIONS.

(1) Of Seven Males.

No. of Case.	A.M.					P.M.					A.M.	
	4	6	8	10	12	2	4	6	8	10	12	2
1	96.6	—	97.2	—	98.2	98.4	98.4	98.8	99.0	98.8	96.4	—
2	96.9	97.2	97.8	98.0	98.3	98.5	98.5	98.6	98.5	98.5	98.1	97.1
3	97.4	—	97.7	—	98.4	98.6	98.6	—	98.1	—	97.6	97.2
4	97.2	97.4	97.7	98.2	98.4	98.6	98.6	98.6	98.6	98.6	98.1	96.8
5	97.6	—	97.6	98.6	98.8	99.0	99.2	99.2	99.2	98.6	—	96.6
6	96.6	96.8	97.4	98.6	98.8	—	99.0	99.0	98.8	98.2	97.4	96.8
7	96.8	97.4	97.8	98.4	98.6	98.6	98.8	98.8	98.6	98.2	97.6	97.0
Average	97.0	97.2	97.6	98.3	98.5	98.6	98.7	98.8	98.6	98.4	97.5	96.9

(2) Of Two Females.

No. of Case.	A.M.					P.M.					A.M.	
	4	6	8	10	12	2	4	6	8	10	12	2
8	97.4	97.6	98.0	98.5	98.8	99.0	98.9	99.0	99.0	98.2	97.4	97.4
9	97.7	97.7	98.5	98.7	98.5	98.4	98.4	98.2	98.1	97.6	97.0	96.5
Average	97.5	97.6	98.2	98.6	98.6	98.7	98.7	98.6	98.5	97.9	97.2	96.9

Average of Seven Males and Two Females.

	A.M.					P.M.					A.M.	
	4	6	8	10	12	2	4	6	8	10	12	2
Average	97.1	97.3	97.7	98.4	98.5	98.6	98.7	98.7	98.6	98.3	97.4	96.9

individuals comprised seven men and two women, all between 20 and 35 years of age, and all enjoying normal health in every respect.

The following curve, which is prepared from the foregoing records, shows the average daily variation in the temperature of these nine individuals. It will be seen that the general feature of the curve is a rise during the hours of activity and a fall during the usual hours of rest and sleep. The minimal temperature occurs between midnight and 4 a.m., the average for the nine individuals was 3 a.m. The average minimal temperature observed was 96.8° F., the lowest being 96.4° F. and the highest 97.4° F.

Curve showing the daily variation in temperature of nine normal individuals at complete rest.

From the minimal level, the temperature rises gradually until the period of sleep is completed (the average waking temperature being about 97.6° F.), and thereafter it rises rapidly until at 10 a.m. the temperature is 98.4° F. From 11 a.m. till 6 p.m. the temperature remains practically steady between 98.4° F. and 98.8° F., the highest point usually being reached between 4 and 6 p.m. After 6 p.m. the temperature begins to fall again, but only gradually. When the period of sleep is reached, the fall continues rapidly until at about 2 a.m. the temperature curve is again at its minimal level.

The average temperature of the nine individuals during the hours they were awake was 98.5° F., and for the hours when they were asleep 97.2° F., the average temperature for the twenty-four hours being 98.1° F. The average maximum daily range of these nine persons was 2° F. The so-called normal temperature of 98.4° F. actually represents, then, the normal temperature of the average healthy person, of ordinary habits as to sleep, for some sixteen hours only out of the twenty-four. During the night the temperature is normally at a lower level.

Sleep seems to be the most important factor in determining the daily fluctuation of temperature occurring in individuals when at complete rest. We found that if a condition of wakefulness be maintained during the hours usually devoted to sleep the customary fall in temperature is delayed and reduced in amount. Conversely, we found that sleep, during the usual active periods of the day, resulted in the temperature failing to rise again to its usual level.

THE EFFECT OF MUSCULAR EXERCISE UPON THE NORMAL TEMPERATURE.

To obtain information as to the effect of exercise of various degree upon the normal body temperature we carried out an extended series of careful observations, in the first place chiefly upon ourselves. The records thus obtained we subsequently confirmed by further observations both upon ourselves and upon other normal individuals. We found the rise of temperature produced by definite amounts of exercise to be so consistent and constant that we were able at will to raise our temperatures from normal to any point up to 103° F. simply by pre-

scribing to ourselves varying degrees of muscular effort. By dint, too, of constant observation we were able to guess to within a point or two what our temperatures would be at any time of the day and after any kind of exercise.

Method of Observation.

In the first place, we ascertained the degree to which the temperature is raised as the result of walking for one hour at various rates on an accurately measured route of 3 miles of level road. The various individuals observed rested before the commencement of any prescribed walk until the temperature was at a normal level. The temperature was taken immediately before starting the walk, and subsequently on the completion of each mile. The prescribed pace was very carefully regulated, so that it should be uniform throughout the hour's exercise. To a very considerable extent the various walks were performed on the same route and under similar conditions as to road, weather, etc. It would be a long matter to give a detailed record of all the observations made. It is sufficient if we give a summary of the results, and, as typical of the detail, the actual records of some of the prescribed walks.

Walk of One Hour at a Uniform Pace of 2 Miles an Hour.

	Dr. B.	Mr. C.	Mr. P.
Temperature at rest ...	98.6° F.	98.9° F.	98.6° F.
After 1 mile ...	99°	99.6°	99.4°
After 2 miles ...	99.2°	100.4°	99.6°

Walk of One Hour at a Uniform Pace of 3 Miles an Hour.

	Dr. B.	Mr. C.	Mr. P.
Temperature at rest ...	98.6° F.	98.8° F.	98.8° F.
After 1 mile ...	99.2°	99.8°	99.4°
After 2 miles ...	99.6°	100.5°	100°
After 3 miles ...	100°	100.5°	100.2°

Walk of One Hour at a Uniform Pace of 4 Miles an Hour.

	Dr. B.	Mr. C.	Mr. W.
Temperature at rest ...	98.6° F.	98.7° F.	98.6° F.
After 1 mile ...	99.3°	100.2°	99.1°
After 2 miles ...	100°	100.7°	100°
After 3 miles ...	100.4°	101.1°	100.2°
After 4 miles ...	100.7°	101.1°	100.5°

Walk of One Hour at a Uniform Pace of 5 Miles an Hour.

	Dr. B.	Mr. A. H. B.
Temperature at rest ...	98.7° F.	99.3° F.
After 1 mile ...	99.6°	99.6°
After 2 miles ...	101.1°	101.4°
After 3 miles ...	102.2°	102.2°
After 4 miles ...	102.2°	102.4°
After 5 miles ...	102.5°	103°

Walk of One Hour at a Uniform Pace of 6 Miles an Hour.

	Dr. B.	Mr. C.
Temperature at rest ...	98.5° F.	99.3° F.
After 1 mile ...	99.8°	101.1°
After 2 miles ...	101.1°	101.8°
After 3 miles ...	102.2°	102.6°
After 4 miles ...	102.5°	103°
After 5 miles ...	102.7°	103.4°
After 6 miles ...	103.1°	103.4°

Easy Running for One Hour at a Uniform Pace of 5 Miles an Hour.

	Mr. C.
Temperature at rest ...	98.6° F.
After 1 mile ...	100°
After 2 miles ...	101.2°
After 3 miles ...	101.5°
After 4 miles ...	101.5°
After 5 miles ...	101.5°

Easy Running for One Hour at a Uniform Pace of 6 Miles an Hour.

	Dr. B.	Mr. P.
Temperature at rest ...	98.8° F.	98.8° F.
After 1 mile ...	100°	100.2°
After 2 miles ...	101.4°	101.1°
After 3 miles ...	102.3°	101.8°
After 4 miles ...	102.3°	102°
After 5 miles ...	102.4°	102.2°
After 6 miles ...	102.4°	102.2°

Of these records, those of Dr. B. and Mr. A. H. B., Mr. P. and Mr. W. are rather more typical of the average normal person than those of Mr. C., whose temperature is somewhat more readily raised by exercise than is usually the case.

Summary.

The deep temperature of the body is raised to a very definite extent by various degrees of exertion as represented by walking at various rates per hour, the greater the exertion the more marked being the rise of temperature. For example:

Walking for one hour at the rate of 2 miles per hour raises the temperature about 1° F.

Walking for one hour at the rate of 3 miles per hour raises the temperature about 1.5° F.

Walking for one hour at the rate of 4 miles per hour raises the temperature about 2.1° F.

Walking for one hour at the rate of 5 miles per hour raises the temperature about 3.7° F.

Walking for one hour at the rate of 6 miles per hour raises the temperature about 4.3° F.

Running for one hour at the rate of 5 miles per hour raises the temperature about 2.8° F.

Running for one hour at the rate of 6 miles per hour raises the temperature about 3.4° F.

This means that a normal individual starting at rest with a temperature of 98.6° F., if he walks for one hour—

At the rate of 2 miles per hour, will raise his temperature to about 99.6° F.

At the rate of 3 miles per hour, will raise his temperature to about 100° F.

At the rate of 4 miles per hour, will raise his temperature to about 100.6° F.

At the rate of 5 miles per hour, will raise his temperature to about 102.3° F.

At the rate of 6 miles per hour, will raise his temperature to about 103° F.

If he runs at the rate of 5 miles an hour he will raise his temperature to about 101.4° F., and if at the rate of 6 miles an hour to about 102° F.

In our experience the above records hold good if the weather conditions are reasonably favourable, the roads in a fair condition, and a reasonable amount of clothing is worn. Under converse conditions the records will be higher. The following records, for example, show the effect of bad roads. The walk was over the same ground on both occasions.

Mr. C., a Walk of 4 Miles in One Hour.

Good Road.				Heavy Road.
Temperature at rest	...	...	...	98.7° F.
After 1 mile	...	...	...	100.2°
After 2 miles	...	...	...	100.7°
After 3 miles	...	...	...	101.1°
After 4 miles	...	...	...	101.1°

It is to be noted that, whereas walking for 5 miles and 6 miles in the hour raises the temperature to 102° F. and 103° F. respectively, easy running for an hour at the same rates only raises the temperature to 101.2° F. and 101.8° F. This is what one would expect. It is certainly less effort to run than to walk when the pace exceeds 4 miles an hour.

The Rate at which the Temperature Rises during Exercise.

The records given show that the temperature is raised quite gradually by the exercise at whatever pace it is being done. The question suggests itself, Does the temperature recorded at the end of the hour of walking or running represent the highest point to which the temperature is raised by walking or running at any particular rate? or will continued exercise of the same character result in the temperature being still further raised? We find that the former is the case. It requires some forty-five or sixty minutes' exercise to raise the temperature to its maximum, but after that it remains constant, even if the exercise is continued for a very long period, so long as the conditions remain unaltered. The following record illustrates this fact:

Walk of 17 Miles at a Uniform Pace of 3 Miles an Hour.

This walk was taken by one of us (Dr. B.), between 12 noon and 6 p.m., along a fairly level turnpike road. The roads were in good condition and the weather cool. The following is the record:

	Temperature.	Pulse.	Notes.
At rest	98.9° F.	68	
After 1 mile	99.3° F.	108	Road level.
After 2 miles	99.6° F.	106	Level.
After 3 miles	100.0° F.	106	Undulating.
After 4 miles	99.8° F.	108	Level.
After 5 miles	99.8° F.	100	Undulating.
After 6 miles	100.0° F.	104	Undulating.
After 7 miles	100.0° F.	100	Slightly downhill.
After 8 miles	100.0° F.	102	Undulating.
After 9 miles	100.0° F.	102	Slightly downhill.
After 10 miles	100.0° F.	100	Slightly downhill.
After 11 miles	100.0° F.	100	Slightly downhill.
After 12 miles	100.3° F.	118	Uphill for last quarter.
After 13 miles	100.3° F.	100	Three-quarters up, a quarter down hill.
After 14 miles	100.0° F.	96	Downhill.
After 15 miles	100.0° F.	100	Level.
After 16 miles	100.0° F.	102	Level.
After 17 miles	100.2° F.	116	Last half uphill.

It will be seen from this record that on the completion of the third mile, after one hour's walking, the temperature had risen to 100° F. and the pulse-rate to 106, and that the temperature and pulse-rate remained constant throughout the remainder of the walk—namely, a further 14 miles. The slight variations in temperature and pulse which occurred were obviously due to slight variations in the condition of the road. For example, the rise in temperature and pulse-rate to 100.3° F. and 118 respectively after the twelfth mile was due to the effort required

to walk uphill during this mile. The road continued uphill through three-quarters of the next mile, hence the continued slight rise in temperature at the end of the thirteenth mile, although the downhill of the last quarter brought down the pulse-rate to 100. The uphill nature of the last half of the seventeenth mile in a similar way slightly increased the pulse-rate, although it only raised the temperature by 0.2° F.

Rapid Fall of Temperature Raised by Exercise during Subsequent Rest.

It is characteristic of the normal person that the temperature raised by exercise rapidly falls to a normal level on the cessation of the exercise if it is followed by absolute rest. Our experience is that temperatures raised in this way fall to normal within 60 minutes if the subsequent rest is complete, and that this is the rule, however high the temperature may have been raised. The pulse-rate falls in a similar way. The following are characteristic examples:

	Dr. B.	Mr. P.
12.40 p.m. Temp. raised to 102.4° F., pulse to 150...	...	102.2° F.
12.45 p.m. Absolute rest	102.0°	134...
12.50 p.m. " "	101.8°	98 ...
12.55 p.m. " "	100.8°	94 ...
1.00 p.m. " "	100.5°	90 ...
1.5 p.m. " "	99.8°	84 ...
1.10 p.m. " "	99.5°	76 ...
1.15 p.m. " "	99.3°	80 ...
1.20 p.m. " "	98.9°	80 ...
1.25 p.m. " "	98.7°	76 ...
1.30 p.m. " "	98.6°	75 ...

The Degree to which Exercise will Raise the Temperature.

It would seem that in the normal individual muscular exercise must be of a severe character to raise the body temperature much above 102° F. The highest after exercise temperatures that we have observed in the normal are 103.4° F. (Mr. C.), 103.1° F. (Dr. B.), and 103.1° F. (Mr. A. B.). These high temperatures were in each case the result of very fast walking—namely, at the rate of 5 or 6 miles an hour. Amongst other records of somewhat high temperatures resulting from different kinds of exercise, the following, perhaps, is of interest:

Dr. B., 40 minutes' fast bicycle ride against a strong head wind. Temperature at rest before start 98.6° F.; immediately after ride 102.7° F. The temperature taken simultaneously in the mouth registered 100° F., and rose in the course of 10 minutes to 100.5° F.

Higher temperatures as the result of muscular exercise have been recorded by Leonard Hill and Martin Flack.² For example, temperatures of 103.6° F., 103.8° F., and 105° F. were noted by these observers in athletes on the completion of a 3 mile running race.

CONCLUSIONS.

These records, which show the rise of temperature which occurs in normal individuals as the result of exercise, are of interest apropos of pulmonary tuberculosis in several respects.

It has frequently been stated that a rise of temperature following exercise is a characteristic sign of pulmonary tuberculosis, and, in fact, that the disease can be recognized by such a rise. This obviously is not the case. Again, a rise of temperature occurring in a consumptive patient after exercise is by many considered to be evidence that the patient has inoculated himself. What is termed auto-inoculation may have taken place, but the fact of the temperature being raised, even to a considerable extent, is in itself no evidence of such autoinoculation.

It is a fact of some interest in this respect that the consumptive in good general condition, but with well-marked physical signs and with bacilli still in his sputum, will often be found to have a lower temperature after a given amount of exercise than a healthy person who has done exactly the same work. The rise of temperature in the consumptive in such a case is not due to an auto-inoculation, it is a physiological rise as a result of the exercise.

Finally, since it is the practice to regulate the exercise of consumptives in no small measure by noting the effects

of given amounts of exercise upon the temperature, it is clearly of great assistance to have a knowledge of the effect of such exercise upon the temperature of the normal person.

REFERENCES.

- ¹ *Guy's Hosp. Rep.*, vol. lvii, and *Journ. of Physiol.*, vol. xxiii.
² *Journ. of Physiol.*, vol. xxxvi.

THE PRESCRIPTION OF GLASSES.*

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PATIENTS who seek the aid of a refractionist may be divided into two groups: (1) Those whose vision is not sufficiently acute for the requirements of their daily life; (2) those who seek relief from eye-strain resulting from abuse of their ocular muscles.

I propose to deal shortly with this latter group. Duty to the patient does not necessitate restoring normal visual acuity; this may be the result, but should never be the aim.

The indications are: That causes as well as symptoms require treatment. Such causes often lie in a breakdown of the patient's general health. The eye-strain from which relief is sought is but a group of symptoms. Both causes and symptoms require treatment, not the latter alone. Apart from questions of general health, organs that have broken down under stress, with muscles that are fatigued, and structures inflamed and painful, will have to be dealt with. The treatment proper to such conditions in the case of any other organ in the body should be pursued in the case of the eyes.

We should endeavour (1) to remove the cause by improving the general health, and (2) to keep the inflamed parts at rest. The second requirement may have to be enforced by the use of cycloplegics, but most usually it will be sufficient to prescribe such glasses as will relieve the ciliary muscles of the greater portion of their task, and afterwards to substitute graduated exercises for the ocular muscles. This ideal can be obtained by gradually decreasing the strength of the prescription, and so allowing more and more work to be done by the muscles themselves.

Here, then, we have two indications: First, that we should not in all cases rush into prescribing glasses, since rest may sometimes be better enforced by temporary paralysis of the ciliary muscles with cycloplegics. Secondly, the prescription should not supplant but supplement Nature's efforts, and eventually, by altering their strength, the muscles themselves should be left to do as much of the work as possible.

The first prescription should not be looked upon as permanent unless the underlying cause is to be considered as unvarying and incurable. An example of the effect of bad health on the ciliary muscle may be of interest.

A woman, aged 40, suffered from periodical attacks of traumatic neurasthenia, and when first she consulted me was given—

—2.5 Ds.
 —1.0 D. cyl.

for both eyes, and with these obtained vision $\frac{3}{60}$.

Six weeks after the first visit she came again to say that the glasses which had suited her admirably were now of little use. In this brief interval she had had another attack of neurasthenia, and was not yet convalescent. It was found that her vision was restored by reducing the spherical part of the combination from —2.5 Ds. to —1.5 Ds. In other words, her apparent myopia had been reduced by one dioptré. She was, therefore, given new glasses of this strength. As her health and strength improved the apparent myopia once more increased and, the new glasses becoming unsuitable, she reverted to her former prescription.

In September, 1910, she had another attack, and exactly the same phenomena were repeated.

There is a perfectly simple explanation for this case. When the patient was in good health the tone of her ciliary muscle caused the lens to be slightly convex, and, since the effect of a convex lens in front of a myopic eye

is to increase the myopia, her apparent myopia was more than her real myopia; but when her general health was below par the ciliary muscle shared in the general weakness and lost its tone. The result was that the lens lost its convexity, and so the apparent myopia became less, and the real or static refraction of the eye, which is a myopia of one dioptré less than the apparent myopia, remained.

The oculist must be cautious in prescribing glasses which are correct in the sense that they restore the normal visual activity to *each* eye. It must be remembered that the two eyes are required by Nature to work together in harmony.

The oculist must not only be painstaking and capable in what may be called the mechanical part of his work, but he must cultivate the art of judging with accuracy the patient's character. He should endeavour to picture to himself the pathology of the patient's condition and trace effects to their causes. Cases of refraction should not be classified and pigeon-holed with their definite treatment appended, but each case should be regarded as unlike any other and treated on its own merits. Two important questions must be answered: (1) Is the prescription to be considered as permanent? (2) Under what conditions are the glasses to be worn? If the patient can be restored to normal health and vigour, glasses may eventually be dispensed with or reduced in strength. Such is the logical conclusion. The practical result is often very different, for it must be remembered that it is much easier to become accustomed to the use of glasses than to discontinue their use. This fact should make us chary of prescribing glasses for constant use on every occasion. Unfortunately in many cases the existing cause—for example, neurasthenia—does not surrender to treatment, and here glasses in some form or another must be considered as permanent.

The answer to the second question may be decided on the patient's symptoms. For example, if a patient complains of headaches which are definitely brought on by near work, the indication is to assist Nature by prescribing glasses for near work.

It is impossible in a short paper to attempt more than to indicate a line of thought. It has been my aim to point out that, although in some cases it is sufficient to regard the eye as an imperfect optical instrument and one that can be improved by mechanical means, in others it must be regarded as an organ which has as great a claim to be treated on rational lines as any other.

THE ETIOLOGY OF IRITIS.

BY

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WITH reference to the interesting article on the etiology of iritis by Mr. T. Harrison Butler in the *JOURNAL* of April 8th (p. 804), some details of an analysis of 159 cases from the ophthalmic wards of St. Bartholomew's Hospital may interest your readers.

The cases were all those of primary iritis occurring between 1883 and 1900. I found that it was extremely difficult in many cases to determine the cause from the notes, but it was possible to divide the cases up into rough groups as follows:

			Per Cent.
Group I:	Syphilitic—(i) Certain	46	72 ... 45.28
	(ii) Probable	26	
Group II:	"Rheumatic"	...	26 ... 16.35
Group III:	Gonorrhoeal—(i) Certain	13	24 ... 15.09
	(ii) Probable	11	
Group IV:	Toxaemic	...	16 ... 10.06
Group V:	Gouty	...	2 ... 1.25
Group VI:	Osteo-arthritis	...	2 ... 1.25
Group VII:	Obscure	...	17 ... 10.6
Total	...	...	159

I. Syphilis.

Syphilis accounts for from 45.2 to 28.9 per cent. of all cases, according as we include the less certain cases or not. One of the certain cases and five of the probable

* Abstract of a paper read before the Croydon Division of the British Medical Association.