Present condition: The two inner toes of the right foot are normal in development, the three outer very much enlarged and resembling small tubers; they are acutely dorsiflexed, and arise from a much thickened sole pad. The left foot is even more deformed, only the inner toe

escaping, and the characteristics described on the right side are more exaggerated. The left leg, thigh, groin, and infrascapular regions are sites of large fatty tumours, while a single large one is also present on the right buttock. When the child is standing there is well-marked lordosis, due apparently to the weight of the tumour in the groin, and possibly to some intra abdominal growths.

Notwithstanding the condition of its feet, the child is able to run about, play football and other games when shod in a pair of boots resembling horse boots.

The skin is everywhere normal in appearance, and a section from one of the tumours had the ordinary characteristics of a lipoma, and presented no evidence of angioma structure. Dr. Rankin kindly took an x-ray photograph, and this showed that there was no bony malformation.

THE third edition of the Hungarian *Pharmacopoeia* will come into force on January 1st, 1910.

THE SCIENCE COMMITTEE OF THE British Medical Association.

REPORT CXVIII.

SOME OBSERVATIONS ON A TWENTY-FOUR HOURS' WALKING RACE.

BY

F. COOK, B.Sc.; E. G. SCHLEISINGER, B.Sc.;

AND

A. H. TODD, B.Sc.

(From the Physiological Department, Guy's Hospital.)

A TWENTY-FOUR HOURS' WALKING RACE, promoted by the Blackheath Harriers, took place at the Stadium, Shepherd's Bush, on September 17th and 18th, 1909. By the courtesy of the secretary and of the club's medical officer, Dr. Munro, we were enabled to make some observations on the physical condition of the competitors. Inquiries were also made concerning their age, mode of training, diet, costume, and the time and nature of any discomfort experienced during the race. Circumstances prevented our making a complete examination of every man before and after the contest, so that the results lack the exactitude of a laboratory experiment; it is interesting, however, to compare them with the many data that have been published within recent years concerning more strenuous and less prolonged feats of endurance, such as running, cycling, and rowing races. For these reasons the observations made are here recorded.

1902

CONDITIONS.

The men were allowed to bring with them attendants, by whom they were massaged, fed, and cared for generally. The race began at 5 p.m., and continued until the same time next day. The weather conditions were as follows:

Temperature.

	Dry Bulb.	Wet Bulb.
September 17th, 6 p.m. ...	60.3°	57.0°
September 18th, 7 a.m. ...	56.4°	54.8°
" " 1 p.m. ...	62.3°	55.1°
" " 6 p.m. ...	59.2°	54.3°

On the second day there were five hours of sunshine. There was little wind throughout the race, and the cinder track was considered by the competitors to be in perfect condition.

The greatest distance covered was 127 miles; 24 of the 50 starters walked over 100 miles.

OBSERVATIONS.

1. Clothing.

Special leather boots were worn in the majority of cases in preference to shoes; besides shorts, long pants or stockings were generally worn. Most of the men had on vests and sweaters, and some wore hats, especially during the day. Others were more scantily clothed. The weight of clothing carried was therefore considerably less than that of everyday attire.

The advantages of boots were apparently: (a) The fixation of the ankle-joint, thus obviating the strain on the flexors and extensors of the foot, which are of no great assistance in walking; and (b) the avoidance of excessive friction and consequent blisters. All the men who were asked said that pants were worn for warmth only, not for support.

2. Cardiac Condition.

(1) *Pulse.*—The average pulse-rate of competitors before the race was from 70 to 80; two were of low frequency (47, 54) and two of high (112, 128), the latter being apparently due to excitement. At the end of the race the pulses were, as a rule, below 100. One competitor, however, whose pulse was 128 at the start, showed a frequency of 160 at the finish. In another the rate was only 52.

The rate of recovery, measured at various intervals after the end of the race, showed a rapid return to the normal value—for example:

From	96 to 88 in 5 minutes
"	100 to 80 in 10 "
"	160 to 86 in 10 "
"	90 to 57 in 20 "

One interesting exception was that of a veteran competitor, 66 years of age, the recipient of numerous congratulations; his increase in pulse-rate, from 100 at 5 p.m. to 108 at 5.40, is probably explicable by excitement.

Pulse-rates taken during the race were, on the whole, higher than those taken at the end; a gradual increase was shown, reaching a maximum about midnight, and followed by a gradual fall. Recovery was good, or fair, except in the case of one man who fell out complaining of headache as well as gastric pain. At 12.30 a.m., on retiring permanently, his pulse was 110, at 1.30 it was 106, and at 7 a.m., 64 when lying down, 88 when standing. (This case is referred to later.)

(2) *Blood Pressure.*—Before the race the readings were all high, averaging 150 mm. Hg. This is sufficiently explained by the exposure to cold, the excitement, and the novelty, to the men, of the method of examination. These causes have frequently given rise to readings of 200 mm. or more. During the race only one measurement was made—namely, 140 mm. at 10 p.m. Only two readings, on different men, were made immediately after the race; 120 and 115 mm. were recorded. Twelve readings on different men were made up to an hour after the finish:

After a rest of	5 minutes,	96 mm. Hg.
"	8 "	110 "
"	15 "	115 "
"	20 "	100 "
"	24 "	84 "
"	30 "	110 "
"	30 "	100 "
"	40 "	96 "
"	40 "	70 "
"	50 "	92 "
"	58 "	106 "
"	60 "	98 "

It will be observed that the return to normal took place, as a rule, within 10 minutes or a quarter of an hour, and that the reading after 30 or 40 minutes was frequently below the ordinary value at rest.

(3) *Cardiac Impulse, etc.*—Before the race fifteen men were examined. In three cases only was the impulse found external to the nipple line. The sounds were normal. In six cases taken at random after the race, no sign of right-sided dilatation was found. In five out of six the impulse lay 1 in. or more external to the nipple line.

Three men were examined three days after the race. In one case the impulse was found $\frac{1}{2}$ in. below the nipple and external to it, and in the other two it was in the nipple line. None of these men had any symptoms of heart trouble.

General Appearance.—Observations on the men's general appearance were made at intervals throughout the race. Sweating and flushing were noted during the earlier part; during this time they were continuous, and ran parallel in degree. In the later stages of the contest the competitors were repeatedly swabbed with sponges, whether to supplement or remove sweat is uncertain. In the early morning there was some cyanosis.

The main conclusion which we draw from these results is that a walking race such as this involves no undue strain on the heart. We would emphasize the practical value of noting the recovery-rate of the pulse; this is readily obtainable, and is at the same time a reliable guide to the condition of the compensating mechanism of the circulation.

3. Body Weight.

Before the race sixteen men were weighed, naked; all but one scaled 10 st. or less. One man, 11 st. 4½ lb. at the start, lost 12½ lb. during the race. The nine others who were weighed at the end had lost from 6 to 12 lb., although a considerable amount of food had been taken in the meantime.

4. Urine.

The urines of nine competitors were examined; in some cases samples were collected during the race as well as at the end.

The specific gravity rose, usually to 1030, and in one case to 1038. The acidity, ammonia, lactic acid, and total nitrogen have been determined by Mr. J. H. Ryffel and one of us (F. C.); the results will be recorded in a future paper.

Acetone was found in most of the specimens taken towards the end of the race, and many of these also reduced Fehling's solution. The nature of the reducing substance has not been determined. In one case, that of a vegetarian, the "rest" specimen also reduced Fehling's solution.

Albumen was detected in 4 cases only, and in 2 of these mere traces were present.

The rise in the specific gravity is of some importance, as will be shown later. The presence of acetone seems to indicate that the individual's stock of available carbohydrate is exhausted, and that a considerable call is being made on his body-fat.

The relative absence of albumen, taken in connexion with our other observation, tends to support Dr. Collier's view that "functional albuminuria" depends upon right-sided dilatation of the heart and renal congestion.

5. Food.

The following are types of the diet taken by competitors during the race:

1. Rice pudding, white of egg, milk and tea, barley-water, orange and quinine wine, brandy.
2. Brown bread and butter, rice pudding, stick-chocolate, meat extract, and weak tea.
3. Vegetarian, including, in the majority of cases, eggs and milk.

One man brought with him, but did not consume, a diet of seed-cake, meat-sandwiches, and some rashers of bacon. Food was taken, chiefly, whilst walking, and in the latter part of the race with increased frequency.

The previous diet of the competitors did not vary in any marked direction from the ordinary.

CAUSES OF DISTRESS.

Blistering of the feet caused much distress, but in one case only, that in which rubber shoes were worn, was this sufficient to cause withdrawal from the contest.

The almost invariable cause of retirement was abdominal pain, and this most striking symptom is one which we would emphasize. It was of a gripping nature—in general, referred to the epigastrium, accompanied in some cases by vomiting, and in all by nausea. Eructation also occurred. It was particularly noted that in these cases the heart presented no abnormal feature (except in one instance, mentioned above, where the gastric pain was accompanied by severe headache). As explanations of the condition the following suggestions present themselves:

1. The psychical reaction, which normally initiates the secretion of gastric juice, is deficient, owing to the concentration of the attention of the walker upon the race, particularly as food was usually taken whilst walking.

The increased specific gravity of the blood, as evidenced by that of the urine, tends to prevent the secretion of fluid into the stomach, and at the same time promotes the rapid absorption of liquid from the lumen of the gut. Consequently, solid masses of food are present in the stomach, and, stimulating active but inefficient peristalsis, lead to pain.

2. It is generally accepted that during muscular activity the splanchnic vessels are constricted, in order to increase the blood supply of the muscles. From this one may infer anaemia of the stomach, and, consequently, decrease of the flow of gastric juice. Should this condition appear to be causing distress, carminatives should be administered as a rational line of treatment.

3. The acid gastric juice being decreased in amount, and the food being largely of a carbohydrate nature, conditions favouring excessive bacterial fermentation are present. The occurrence of eructations supports this idea, and suggests the administration of charcoal.

The use of carbonates, which seems to be a general practice amongst trainers, is contraindicated by the above considerations.

Inquiry amongst habitual walkers showed that chronic stomach trouble is unusually prevalent at middle age; this condition of "Walker's Stomach" may be due to continued irritation produced as above.

We would therefore suggest that in future contests of this kind competitors should take much more fluid than at present seems to be the custom. The appearance of

intermediate metabolites in the urine, the stiffness of the muscles, and other symptoms, lead us to believe that such products of metabolic activity are inefficiently removed from the system. The introduction of more fluid would remedy this deficiency of excretion, which we hold to be of far greater importance than deficiency of nutrition.

Repeated experience contradicts the popular conviction that large quantities of food must be taken in order to "keep up the strength" in contests of this kind. For instance, soldiers bearing heavy clothing and equipment have frequently marched for many hours with no food, provided that a sufficiency of water is available. Experiments on animals, too, show that external work can be performed for some days on a water diet only.

These facts serve to justify us in advising the consumption of little or no solid food during the race; we think that in this way the gastric disturbances would be entirely obviated. In order to avoid the depressing mental effect consequent upon the withholding of all food, albumen water, or some such preparation might be given. This would only be as a concession to the men's preconceived ideas, and not with the object of providing nutriment. The use of a little alcohol as a readily diffusible and oxidizable stimulant in the last stages of the race seems to be free from objection.

Although a walking race such as this seems to involve far less risk of over-exertion than has hitherto been supposed, it is, as a general test of a man's physical capabilities, in our opinion, much less satisfactory than running, and infinitely less so than a contest of the nature of a football match, which brings into play the full exercise of every faculty as well as that of every muscle. It appeared, indeed, that endurance was the most potent factor in determining a competitor's position at the finish, and it quickly became evident that to estimate a man's chances from consideration of his physical appearance was absolutely impossible. This conclusion was shared with us by several physiologists who were present.

The mental factor in contests of this kind is worthy of careful consideration, the man of fine sensibility needing enormous self-control in order to compete on equal terms with the man of blunter temperament. This was recognized by the Committee in the provision of music during the night, and was also exemplified in the obvious mental and physical improvement which followed the rising of the sun.

The expenses of this investigation were defrayed from the British Medical Association's grant to Dr. Pembrey, who has added to the many other kindnesses shown to us that of suggesting the lines which the present research should follow. We are also greatly indebted to Mr. A. Sandison for valuable assistance in many of these observations.

REPORT CXIX.

AURICULAR FIBRILLATION: A COMMON CLINICAL CONDITION.*

By THOMAS LEWIS, M.D.LOND., D.Sc.WALES.

(From the Research Laboratories of University College Medical School.)

[A Preliminary Communication.]

It is well known that in the late stages of mitral stenosis, and in cases of general cardio-vascular degeneration, the pulse is frequently continuously and extremely irregular. The type of irregularity is remarkable in that in radial and cardiographic curves it defies analysis. The nature of the arterial curves has given rise to the term *pulsus irregularis perpetuus*, and it has been supposed that the rhythm of the heart producing it has its origin in the node of Tawara (hence the term "nodal rhythm"). The condition is extremely common.

Facts are now at my disposal permitting of two conclusions:

I. That a rhythm arising in the neighbourhood of the node gives rise to a totally different clinical picture. This conclusion is based upon a detailed examination (polygraphic and electrocardiographic) of a case of paroxysmal tachycardia, in which it can be demonstrated that auricle

and ventricle contract together. This rhythm is a rare clinical phenomenon.

II. That the irregular pulse of mitral stenosis, etc., already referred to, is due to fibrillation of the auricle.

The second conclusion is based upon the following evidence:

1. The clinical irregularity presented by arterial and heart apex curves is unique. The rhythm is entirely disorderly, and the sizes of the beats do not correspond to the pauses which precede them. Fibrillation of the auricle results in a similar action of the ventricle, and its action under these circumstances is unique experimentally.

2. Electrocardiograms taken from patients exhibiting the irregularity show a number of irregular waves, apart from the ventricular curve; they are more clearly defined in diastole. They are found in no other disorder of the heart's action. They disappear when, in a paroxysmal case, the irregularity vanishes, and are therefore due to a temporary and disorderly action of some part of the heart wall. Cardiographic curves give no evidence of such a disordered action in the ventricle. Fibrillation of the auricle yields curves which are identical in every respect, and no such curves have been obtained by any other experimental means. Further, the waves on the experimental electrocardiograms can be shown to correspond to the fibrillary movements in the auricle, by means of synchronous tracings.

3. The venous curves in the clinical irregularity is of the ventricular type; all the prominent waves occur during ventricular systole, and there is no wave corresponding to a normal auricular contraction. The same statement applies to the venous curves in fibrillation of the auricle. The clinical and experimental curves are of the same nature.

The facts point clearly to the conclusion that the irregularity in question is the result of auricular fibrillation, and the conclusion affords an explanation of several otherwise obscure facts. It provides us with a rational understanding of the disorderly nature of the ventricular rhythm, for it is dependent upon the irregular auricular movements. It explains the slowing which is obtained by digitalis in those instances in which auriculo-ventricular conduction is known to be frequently impaired—namely, in cases of rheumatic origin; for digitalis is known to increase the hindrance to the passage of the impulses where conduction is already damaged. Further it explains the difference between the type of venous pulse in the irregularity considered, and that due to what is termed "nodal extra-systole." It is in accord with the now generally accepted fact that the rhythm is supraventricular in origin; it harmonizes equally well with the evidence that the auricle is active in certain instances where the irregularity is present—for example, the auricular hypertrophy found at autopsy in cases succumbing with the irregularity present and of long duration. Finally, it suggests a plausible explanation of so-called "nodal bradycardia." This condition may be regarded as auricular fibrillation and spontaneous auriculo-ventricular heart-block. The full evidence, including the curves, will be placed on record at an early date.

THE Herbert Spencer Lecture before the University of Oxford will be delivered by Dr. G. C. Bourne, Linacre Professor of Comparative Anatomy, who has taken for his subject, "Herbert Spencer and animal evolution."

A REUTER'S telegram from Peking states that considerable progress has been made in the suppression of opium smoking in the northern provinces and in Yunnan and Kwangtung, less in the central provinces, and very little in Szechuan, Kweichau, and Shensi.

THE resolution adopted at the meeting of medical practitioners on November 10th, organized by the Chelsea Division of the British Medical Association, as to payment to medical practitioners for midwives' calls, was considered by the Fulham guardians at a meeting on November 19th, but its full discussion was adjourned to a later date. Meantime it may be said that one member of the council held that though medical men could not point to any passage in the Act which gave them a definite claim upon guardians in this connexion, it was the undoubted duty of guardians to guarantee the payment of his fee to any medical man called in to save life during childbirth.

* The expenses connected with this work have been defrayed by grants from the British Medical Association and the Royal Society.