Nature of Enclosures.

A CLINICAL STUDY, EMBRACING CERTAIN CONDITIONS INDUCED BY TOXAEMIC AGENCIES ON THE GENERAL AND CARDIO-VASCULAR SYSTEMS, WITH SPECIAL REFERENCE TO DERANGED FUNCTION AND ACTION OF THE HEART.

A Thesis for the Degree of MD.

presented to the University of Edinburgh

by,

Andreas Louis Kropf

M.B. Ch.B.
Ed.

Notes, or Letters written.
July 3, 18

dear Littlejohn,

I have read Krogh's thesis—under protest at the short time given to me to do it in—which should certainly give it to the stars. I also think it would be allowable to compete for a medal. It is a most careful and elaborate piece of work. There is a good deal of it with which I don't agree, but of course it doesn't matter, the point is that it is a thesis that we would be glad to publish as the work of an alumnus.

Yours truly,

G. Howell Galland.
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A. L. Krogh. M.B. Ch.B.
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PART I.

(1) Introductory.

Early in the war with its train of altered physical or mental conditions for so many, there appeared in a group among a fairly definite symptom-complex related under systemi with characteristics varying in degree but sufficiently marked to suggest the possibility of the existence of a disease-process with definite clinical manifestations.

Shortness of breath; a sense of weakness; precordial discomfort; distress or pain; palpitation associated with increased heart-rate, and lassitude comprised the principal manifestations of this group.

And it became clear that the condition was not due to 'strain,' or other cause which rest might be expected to alleviate, but to causes which in spite of periodic visits to hospitals and rest camps tended to bring about a recurrence of the symptoms whenever the effort was repeated.

The symptoms and signs seemed to point to the circulatory as the system which had failed to respond to the demands made on it, and, as the army nomenclature of diseases provided convenient abbreviations, cases were grouped shortly into two classes; V.D.H., or Ventricular Disease of the Heart; and D.A.H. to designate all these conditions when the former was con-
- sidered to have been excluded.

Confining not unnaturally followed, and,
even in medical literature was not entirely absent. Thus
designations such as 'The "Old Man's Heart"' or Cardiac Dis-
abilities in Soldiers' or The Irritable Heart of Soldiers' etc
in their non-committal terminology testified to the fact
that medical opinion lies as yet in a fluid state, and
that no definite ideas on the subject had crystallised.

That the conditions incidental to active service,
a new mode of life for the majority of the sufferers
whose symptoms were first noticed during that period
would provide the explanation thereof seemed probable,
for a similar train of symptoms had been observed
previously, notably during the American Civil War
when 'The Irritable Heart' was first described, and
attributed generally to the prevalence of industrial
disorders and to the fatigue and stress of camp-
-jaure life in young soldiers.

On the other hand, The group of symptoms
thus elicited is not conspicuous in hospital or
in civil practice; for, under normal conditions
of life men of The group under consideration
can train their hearts within their known lim-
itations, and therefore few opportunities for extra-
-ordinary clinical observations had hitherto occurred.

The difficulties therefore of those who
were confronted with the problem of the im-
mediate disposal of cases manifesting the condi-
tion, need, apart from the more routine
considerations of prognosis and treatment were not inconsiderable. Various 'Tests' were resorted to as an aid in classification, but with the difficulty in the interpretation of physical signs, many of which in these cases are obscure, coupled with the necessity of arriving at definite and if possible harmonious conclusions expert guidance appeared necessary.

At the beginning of 1916, the Army medical Department set aside a special hospital at Hampstead for the reception of certain cases, and for the study and treatment of the condition or groups of conditions. There, under favourable conditions and with the help of a picked staff of skilled observers opinion began to crystallise into a scheme for the rapid sift of cases, and for the further observation of the more doubtful ones while undergoing a system of graduated training. Simultaneously the scientific study of the condition proceeded. In the methods adopted and in the results obtained there, it is emphasised that clinical precision is not attained; and no classification is attempted beyond the practical finding based on what the Capacity of the heart for effort is observed to be. Further light on the subject is necessary before further definite settlement on clinical and pathological grounds can be arrived at.

During 1916 the experience in the Mediterranean Zone ran on similar lines,
and, with an increasing number of cases, towards the
end of the Autumn a special Department for the re-
ception of cardiac cases was created — a Section of
a General Hospital and of a large Convalescent De-
partment being set apart for that purpose. An oppor-
tunity thus occurred of establishing both continu-
ity of observation and uniformity of classifi-
cation into the necessary categories.

The preliminary setting which consisted in
the elimination of the cases with manifestations
of the more serious kinds of organic disease, and
of those who would quite certainly be unfit for
a considerable time took place while the pat-
ient was in hospital. After a short period the
remainder were transferred to the depot for fur-
ther observation while their training was being
proceeded with.

These comprised the cases brought
under review in this study. They may
be accepted as a comparatively mild variety
of the condition, and, if thereby we were
precluded from observing some of the more
prominent clinical pictures, then were
compensations in that the cases were
seen in a place at which it seemed be
in future the aim of the physician to ar-
rive in the scene.
(ii) Procedure: Basis of Inquiring + Method of Examination + Test applied.

(i) The Basis of the present study.

The hundred cases admitted from November 1916 to June 1917 with the diagnosis of B.A.H. + V.B.H. are brought under survey.

The number represents the remainder of the total after a certain proportion of cases of the more serious organic diseases had been eliminated at the 1st sifting immediately after admission to hospital. Such cases comprised conditions such as Asthma, congestive, purulent sinusitis, or advanced ileoceleal, gross myocardial disease; Anemia, and marked aortal degeneration.

The remainder viz. 576, after a short stay in hospital of an average duration of 6 weeks, during which they were initiated into the milder grades of the training system, were sent to the Convalescent Depot where they came under our observation till finally disposed of.

(2) The Scope of Inquiring:

(a) Whether from an analysis of the history, remote & recent symptoms & physical signs & the nature of the response to Test-Choice &
and to graduates training, any generalizations of
clinical value might be avoided at.

(f) The utility of the system of graded exercises as
a clinical guide for the estimation of the functional
capacity of the myocardium under varying conditions;
and the indications for the application of this mode
of treatment.

(c) An attempt to arrive at some conception of
the factors which underlie the condition from
a study of the series, and if any such could
be considered preventable.

[As aconception of the behavior of the normal
heart at rest and under effort experienced.
Tally and clinically has changed somewhat
in recent years a short resume of recent physio-
logical studies touching the above questions
is presented. Considered in Part II.]

(3) Method of Procedure: Examination etc.
A full history was taken and a thorough phys-
ical examination having been carried out, a pre-
liminary test of his effort capacity was applied.
He was then placed in one of the stocks for
graded exercises during the whole of which time
he remained under personal supervision and a
record kept of his progress, or otherwise.
This period varied, but never exceeded two
months. The range being about four weeks.
According to his progress sheet he was then classified into one of the Army duty categories (see footnote).

Examination:

The method of examination followed is described in the appendix but will not be fully referred to here. Special emphasis is laid on the history, on the conditions and circumstances under which the symptoms were first elicited, and whether they are correlated in the patient's mind with any particular illness. Inquiries as to physical development and habits as to games or occupation are sought for, and the effects of emotion and the limitations attendant thereon, when and how first experienced.

In the general examination, attention is paid to physique and condition of nutrition and of the muscular system especially; the sense of well-being or otherwise, and the impairment being noted. Each system is then rapidly passed under review.

The Army duty-categories laid down for the classification of cases which are adhered to in what follows are given below:

Class A - Full duty. Equivalent to General Service.

T.B. - Temporarily disabled. Corresponding to Cat. (b) in home classification.

B.1 - Able to march with light equipment a distance of 5 miles.

B.2 - Able to march to and from duty without equipment a distance of 5 miles in all.

B.3 - Sedentary.
In the examination of the circulatory system, the position and size of the heart, and its rate, rhythm and sounds are noted - the patient being recumbent. The preliminary Effort Test is now applied. Before referring to the Estimation of the Response of the Heart to Effort we propose to make a few observations on so-called Tests of Myocardial Efficiency itself.

(4) Tests of Myocardial Efficiency.

It is a maxim generally accepted that the condition of the myocardium, irrespective of the nature or site of the lesion present, is one of the most important considerations in any given cardiac case. And, in any given case in which the condition of the myocardium is in question, varying degrees of departure from the physiological standard may be encountered up to actual Heart Failure. It becomes necessary, therefore, to obtain a working definition of the latter term, a basis which may be found in that proposed by Sir James Mackenzie, as "that condition in which the heart is unable to maintain an efficient circulation during the effort necessary for the daily life of the individual ... the inability of the muscles to supply an efficient force being the chief cause of the failure."

Ref: Mackenzie, Profusion and Treatment of Heart Affections, 1910.
The problem therefore is to ascertain in any given case whether objective signs are absent, if this inability to maintain an efficient circulatory record, and if possible its degree and nature, with a view to prophylaxis.

With this in view various tests have been devised and described, as also those certain methods of a more precise nature based on electrocardiographic and other methods.

A number of these so-called tests, of which one described by Goodall recently may be instance are concerned with readings of the Pulse, Blood Pressure and Respiration, before and after exercise, and from the results obtained an estimation of the myocardial efficiency is arrived at. Similar reactions of the Pulse and Respiration - systolic and diastolic - are used by other observers of which methods we may instance those of Martindale and of Schenckman.

Many other tests have been put to trial, but some depending solely on data such as those mentioned above, have proved of much value; and estimations based on instrumental methods completely fail to elicit the important information which an interpreter of the patient's own sensations alone can supply.

Clinically, a simple test has been found to be of great value; and that described by Lewis and his co-workers based on the rate at which the Pulse falls after exercise has joined with sensations of a certain amount of useful information.

In applying this Test an important fallacy must needs be kept in mind. This resides in the fact that in a diseased heart the rate may not rise on exercise, whereas in a sound organ it may reach a high level. This fallacy however may in a large proportion of cases be avoided if in forming an opinion certain equally important factors to be taken into account.

A Simple Test Described.

We have adopted the following Test in our examinations. From the nature of the problem in the present state your knowledge of approximation only is possible, but it affords some useful clinical data.

1. Pulse rate at Rest + Effects of physical exercise.

Usually a period of 15 to 30 min. elapsed according to the nature of the case before the rest-rate with the patient recumbent was noted. This theory is taken as far as the state, accustomed to his surroundings. He is then asked to rise, and the rate is taken as his assuming the erect attitude. Any subjective signs such as flushed face, dizziness, change of color are important.

2. Test Exercise.

After the patient has been upright for sometime several pulse counts at short intervals are made, and an attempt made to gauge his permanent standing pulse rate. He is then asked to walk down 50 steps, along a short passage and up again. (This test found applicable to a large proportion of the cases.)
The Pulse is then counted in half-minutes up to 5 minutes, or till the decline to the pre-occlusion rate has occurred. Respirations were counted during our earlier work, but this may be dispensed with, as it was found that a more important observation is the quality of the breathing rather than its rate.

Finally, it is important to note if any of the following signs or symptoms accompany or follow the Trend: labored, in contradistinction to "quick" breathing; change in color, pallor; precordial uneasiness, discomfort, or distress; precordial pain into radiation; palpitation; changes in the chemist of the Pulse were, development of extrasystoles. On the preceeding the development of bruits or rhythm which were not present before. And in general a gradual brightening of the signs sensations produced by efforts. As the success in otherwise of these observations depends largely the amount of clinical reliance that can be placed on any Cardiac Test conducted on these lines.

The following grades of reaction afford roughly clinical division:

(a) Pulse returned to pre-occlusion (standing rate) rate within two minutes. Respirations almost slightly accelerated, not labored. None of the signs & sensations mentioned above. "Good Reaction?"

(b) Pulse returned to pre-occlusion rate within 3 minutes. Respirations slightly labored. Slight palpitation that was means precordial uneasiness. Considered to be a "Fair Reaction."
(c) Pulse not returned to pre-estinini rate within 5 minutes. 
Respiration laboured; slight pallor; Giddiness after the test; Palpitation and slight precordial distress; or pain; 
Slight tremors etc. Considered to be a "Poor Reaction".

An important observation relates to the Pre-estinini Rate. 
If it is maintained at a high level e.g. 110, nearly 90% 
the reaction especially as judged by subjective signs anything 
it but from; but, if within the time stated for a good reaction, 
the rate was lower after the Test Effort, than the Pre- 
estinini rate, and no untoward symptoms or signs de- 
developed, it could be concluded that the response to 
practical exercise would be favourable to the patient's form 
accordingly.

(1) Further Testing and Training.

Proponents of the clinical diagnosis draw a 
study of the facts of this history & the results of the clin- 
ical examinations may then be warranted, the patient 
was now placed in one of 3 Testing & Training Groups. 
These exercises (detailed in the appendix) were carefully 
supervised by the Hampted workers, and pass in 
graded fashion from simple bending and stretching 
movements of limbs, to more extended movements of 
joint variations, till in "D section" they approxi- 
imate to a fairly severe Test. 
It was found to facilitate working and observation 
if the patients were divided into 3 groups, by
by combining exercises 4 x 0.3 (15 mins each), C. earth C2
(10 mins each), and the two parts of D. The aim was
to attain the degree of comfort at which all the patients
could do a certain set of exercises, and no difficulty arises
if sufficient time is allowed between each exercise. Subjective
symptoms were noted in each man's case record, and this
together with the observation of each case during his exami-
 nation after undertaking a new exercise made it possible to
obtain an effort record during the states of training which
ultimately largely decided the category in which he was
placed and one in other words our guide for progress.

With exercises C1, C2 and D, a daily morning continued
of about half an hour or even less was taken. Cases
who could not tolerate this mild effort by any means went
up the scale. It confirmed any suspicion existing that
the case was likely to prove of an intractable nature.

Those who reached 'D section' were conducted for
a route march three times a week. This test was of
a more rigorous nature, and provided the ultimate
deciding factor of their return to duty or otherwise.
These marches were graded as to distance which
ranged from 2 to 6 miles, and as to the weight of the
equipment carried.

The above represents a summary of the method
which originally introduced for purely testing purposes
was found to be of use in treatment. Later the
Clinical Section was made to the present
anatomic and possibly therapeutic value which the system
would appear to hold forth.
The physiological work on the heart in recent years has received an impetus from the development of new experimental methods, and much that is of importance from the point of view of the present study has been carried out under the direction of Starling. Two important papers (1) that have appeared in the Journal of Physiology embody largely some of the main features of the problems involved must be especially referred to. And, in what follows the important facts in these and other papers have been summarized and correlated under two main headings, so as to maintain the logical sequence of the argument as far as possible.

This section will be treated under 3 heads:
(1) The mechanism of adaptation of the heart.
(2) The mechanism of control.
(3) Summary and clinical applications - The effect of exercise on the heart.

Ref: (1) On the Mechanical Factors Which Determine the Output of the Ventricles, Patterson and Starling, Jour. Physiol XLI, 1914, Sept.
(2) The Regulation of the Heart-Beat, Patterson, Paper, Starling, Jour. Physiol XLVIII, Oct. 1914.
I The Mechanism of Adaptation.


The myocardium during contraction follows the same general laws as apply to skeletal muscle. Thus in the development of heat or energy in a muscle during a period of contractile stress, the essential factor is the length of the muscle fibres comprising the muscle. The tension is regarded as the measure of the power exerted by the muscle when it passes from the resting to the contracted state. The longer the muscle therefore, the greater the amount of chemical energy, heat production and tension set up when it passes into contraction.

In the heart, the contractile intracellular pressure which is dependent on the various reflexes corresponds to the factor of "load" in skeletal muscle. And the load against which the myocardium has to act is represented by the pressures in the Arter.

Two main factors therefore emerge: viz. the length of the muscle fibres of the heart, determining its capacity or volume; and, secondly, the arterial resistance against which the muscle acts.

The proof that the length of the muscle fibres rather than their tension determines the energy of contraction is found in the study of the changes which occur at the beginning of diastole. A
A direct proportion exists between the diastolic volume, (i.e., the length of the muscle fibres), and the energy set free in the following systole.

Patterson, in one of his papers above referred to, thus defines the "law of the heart": "In passing from the resting to the contracted state the mechanical energy set free is dependent on the area of chemically active surface i.e., on the length of the muscle fibres."

2. Adaptation to Increased Venous Inflow; to increased arterial resistance; and to artificially induced tension of the valves:

In the physiological factors above referred to lies the explanation of the mechanism of adaptation that follows when the heart's work is increased by any such agency as those just mentioned. If the arterial resistance, for instance, be suddenly increased, the heart, which previously had been developing sufficient energy to completely empty itself is now unable to accurately regulate outflow to inflow. There is residual blood in the heart at the end of systole. This process may go on, the heart accumulating to its original residual blood, the residual blood of the last contraction, and the blood that has entered during diastole, so that the muscle fibres must be longer by an amount corresponding to the extra capacity of the ventricle so induced. This process may continue until the requisite energy is reached, so that "Decontractation" may follow along physiological lines of the certain stage.
3. The Meaning of ‘Tone’, and ‘Fatigue’.

The word ‘Tone’ is used by Starling and his co-workers to imply a physiological condition or fitness of the muscle film of the heart, and its measure is the energy set free per unit length of muscle film at each contraction of the heart.

A ‘good heart’, i.e., one with a good tone, will carry on a force circulation against a high arterial pressure, emptying itself at each contraction.

A ‘fatigued heart’, i.e., one with defective tone can carry on the same circulation, but only when its fibers at the beginning of contraction are much longer, i.e., when the heart is dilated.

The Course of Events in a Heart under Conditions of Fatigue.

The process of fatigue in the heart sets up a physiological limit to the increase of capacity and output under exertion, i.e., starting from a given length, the change from the relaxed to the contracted state is attended with a smaller production of tension than in the fresh condition. This process of fatigue is shown when failure of the process of recovery to keep pace with those of activity occurs during the increased metabolism that takes place with increased arterial resistance, increased venous reflux, or with the increased rate that follows a rise of temperature of the blood.

Ref. (1) Brooks, Annals of Physiology, 11, 1887.
As this process of Fatigue continues a larger amount of residual blood will remain at the end of each systole, and if the factors that have induced fatigue persist the Heart will dilate more and more till the maximum diameter is reached. This means that a fatigued Heart must dilate in order to carry on the same amount of work as the Fresh Heart.

Such a condition may end in (a) Recovery, or (b) Failure of the Heart:

(a) Process of Recovery.

By increasing the supply of blood or in other words of oxygen, or by diminution of the diastolic pressure (i.e., the venous inflow), by allowing in this one hand the restriction of the physiological condition of the Heart muscle, and on the other by alleviating the active distension-effect of the venous inflow, the process of Recovery may be promoted.

(b) Process of Failure:

Fatigue of the Heart may progress to Heart Failure, which occurs when the dilatation which has been is the automatic means of regulating outflow to inflow proceeds to such an extent that the tension of the muscle fibers becomes inadequate in producing a rise of intracardiac pressure.
The Clinical Equivalent to what has been described above is what is implied by the calling into action of the 'reserve force' of the Heart when the body is active and, after exhaustion of the 'reserve force', the impairment of the 'rest force' which follows induces those evidences of Heart Failure when the body is at rest.

4. Variations in output and Volume of the Heart and the factors relating thereto.

(i) Output:
The output of the Heart may be considered as influenced mainly by (a) Venous inflow (b) Arterial resistance (c) The Rate. A fourth factor viz. the physiological condition of the Heart muscle will be referred to later.

(a) Venous Inflow:
It is important to have an adequate conception of what comprises the physiological limits of this term. An 'adequate Venous Inflow' is defined as one which exercises a minimal distending force on the Ventricular muscle during the whole period of its relaxation.

1. Aetoma straining before refers 1.
If the Venous Influx is increased beyond this point, the result varies according as the Heart is "Fresh" or "Fatigued". In the "Fresh Heart" the increased Venous influx may excite an active Tension in the Ventricles, the muscle during diastole. As the Pressure at the Auricular orifice rises, the output is increased. The negative pressure in the Thorax, during inspiration, greatly helps this effect. In a Healthy "Fresh Heart" therefore an increase in Venous Influx means generally an increased output.

But if the Heart is "Fatigued", the blood will remain in the Auricles and Ventricles, and the Heart will dilate more Votes. While the Pressure in the great Vessels rises, but this process, unlike that in the "Fresh Heart", is associated with a diminished output.

The "Compensation" as understood clinically, that may follow in favorable circumstances, depends on the possibility of restoring the balance in the factors above described - the remaining by the Ventricles of an efficient pumping capacity & active being one of the most important.

It should be stated with reference to what has been said before that there is a limit to the process whereby a rise of Venous pressure causes increased filling and increased output, this limit being reached when the Venous pressure
is high enough to produce maximal dilatation - a limit which is apparently set by the connective tissue framework of the heart wall within the bounds of potential control.

(1) Actual Resistance:

It is concluded generally that the greater the actual resistance, the greater will the influx attain its optimum and the output its maximum. But the most important factor in output would appear to be the venous influx prominently discussed, for it has been shown that if the venous pressure is maintained constant, the output of the left ventricle is within wide limits independent of the arterial resistance.

(2) Rate:

The output of the heart increases with increasing rate.

If the pulse-rate is increased, the venous pressure falls. Therefore with increasing rate, the influx must increase if the venous pressure is to be maintained constant. And output, other things being equal, depends on influx. Limitations are imposed by physiological causes, e.g., the process of fatigue. Such process, set in motion by the increased metabolism which occurs with increase of rate, such as for instance follows a rise in the temperature of the blood.

Ref.


(2) also Parrot & Stirling : XLVIII. 1915.

(3) Masudar & Stirling : XLVIII. 1915.

(4) Kandola & Stirling : XLIV. 1912.
Maximum output in Muscular Exercise.

The variations in the output of the heart are very considerable. Thus, in their experimental work, Paterson and Starling found that the maximum output of the heart in a heart-lung preparation amounted to 3 litres per minute for a weight of 50 grams; or for the human heart 18 litres per minute. These figures agree with the maximum output observed by Krogh in the human subject during muscular exercise—the amount varying between 2.5 and 3.1 litres per minute. And by means of these great variations in output the extra amount of oxygen taken in during exercise may be conveyed to the lungs.

Analogue adaptation in Respiratory Mechanism.

The cooperation of the Respiratory mechanism is of great importance during muscular exercise. Mechanically, the descent of the diaphragm and the abdominal portion of the thorax, which accelerates the passage of the blood into the zone of negative pressure in the thorax, involves variations. Physically, it is advantageous. Thus Haldane estimates that the respiratory system is adapted for meeting about 10 times the respiratory requirements during exercise. And attention is drawn to the problem of the regulation of the blood alkalinity, whereby the nervous control of respiration is regulated.

Ref: Haldane. Jour Physiol. 1917. 2
Physiol. & Respiration (1920). 49
Krogh in Hald. Jour Physiol. 1917. 27.
(ii) Volume variation - The Physiological state of the Heart Muscle - Primary or Secondary Dilatation.

The mechanical factors in effecting an increase in the volume of the Heart have been referred to shortly. Another factor of importance is the physiological state of the Heart muscle which is dependent largely on the Coronary circulation.

Thus a rise of arterial pressure will at first cause a slight dilatation till the requisite degree of adaptation is attained. But as the pressure increases there is an increase in the blood supply of the Heart which improves the condition of the myocardium and its contractility, resulting in a shortening of the fibres and a diminished size of the Heart.

(This condition has been verified in the human Heart by orthodromographic measurements after exercise whereby the size of the Heart has been found to be diminished. This will be referred to later.)

This diminution in size is brought about as a result of the increase in the tension at each contraction following the physiological requirement of the muscle fibres, thus enabling a shorter fibre to produce the requisite tension.

Secondary Dilatation:

But on the other hand, if the arterial resistance is not maintained, although the heart may imply itself remain complete, the Coronary supply of blood
is not and so efficient. A secondary dilatation of the heart is one of the factors which meet the need. This event is to be referred to as a gradual diminution of the functional capacity of the heart due to inadequate coronary circulation.

II. The Mechanism of Control.

Reference will be made here only to these factors in control of the heart's action which appear of importance in reference to its response to effort.

(a) The Respiratory Mechanism.

The mechanical factors have been already referred to. On the chemical side, the respiratory centre has an important function to perform in conjunction with other organs the regulation of the acid-base equilibrium of the blood. If the balance is disturbed, afferent stimuli affect the activity of the respiratory centre which causes a slowing of the arterial blood and a reduction of the blood's oxygen content. The respiratory centre is thus inhibited by acetycholine from the respiratory and the cardiac inhibitory centres.

(b) The Vagus and Accelerator Effects.

The acceleration of the heart rate which occurs at the beginning of muscular exercise is due mainly to a diminution of vagus tone and partly to an increase of accelerator tone.

Ref. (1) Haldane: already referred to.
Further the normal steep fall of rate after exercise is due to vagal impulses. This fact has lately been confirmed by Cotton Harris by observing the effects of atropinisation on the heart rate and the effects produced by effort. By the influence of the tonic impulses of the Vagus the Heart rate is maintained at its normal level.

(a) The Composition of the Blood.

The importance of the alkalinity-index of the blood before referred to has received important clinical confirmation in the finding that owing to certain metabolic disturbances the buffer salts in the blood may be diminished, and distressing symptoms of breathlessness result.

Another activity of importance in the fact that during muscular exercise Adrenergic is set free in the circulation - a condition which may result with any reflex rise of Blood Pressure, and, as shown by Cannon and Elliott may follow during conditions of mental excitement, paining stimuli or muscular effort. The effects of Adrenergic on the heart's action are still obscure. But recent work by Bainbridge, Shear suggests that certain effects observed in the portal circulation may have an in 

Ref. (1) Lewis, Barcroft, Milby, etc. J.P.M. Oct. 1916.
(3) Elliott, Jour. Physiol. 51, 1913.
(c) the Influence of Venous Filling & Reflex Acceleration of the Heart.

The increased venous filling that occurs during muscular exercise reflexly increases the Rate of the Heart, and by the more rapid transportation of the blood thus resulting,fulfills the demand on the part of the tissues for fuller oxygenation. That this increase in Rate was of reflex origin has been shown by Knudsen, Starling, and Bainbridge. It has been found that this acceleration reflexly takes place when the venous reflux is increased to a degree adequate to raise the diastolic pressure; the impulses arising from the heart are transmitted by the Vagi.

III

Clinical application: The Effect of Exercise on the Heart.

Clinical Significance of Dilatation of the Heart:

1. To the physiological adaptation of the heart by means of both its self-regulating and controlling mechanism of which a resume has been given above some of the clinical manifestations in the Human Heart may be correlated.

Ref: Knudsen & Starling: Ergics Physiol. XLIV 1912.
Bainbridge: Ergics Physiol. L. No. 2 1915.
many of the problems remain obscure, especially when as so often happens the issue is complicated by the presence of processes of disease in many cases as yet imperfectly understood. But even in the absence of such processes, a good deal of difficulty has been introduced into the subject from the adoption of a somewhat rigid standard in the conception of the kind of picture the "normal" heart should present to the clinical mind, notwithstanding the fact that a heart can only be legitimately viewed in its setting in the physical mechanism as a whole of the individual under consider

ation.

Thus, in the subject of dilatation of the heart some controversy as to the exact clinical significance and implication of the term has taken place.

As has been, under muscular exercise, every heart may be assumed to possess a physiological optimum volume whereby it is enabled to deal most effectively with a particular demand. This volume may be referred to as that at which the greatest amount of energy is developed when the heart enter into a state of contraction; and any of the conditions for its maintenance is that the nervous reflexes ensures a minimal distending force on the ventricular musculature throughout diastole so that at no time can the muscle be recruited as after-loads.
But from what has been said it is clear that experimentally this "physiological optimum" may be overstayed, and yet the heart must be considered to remain within the compass of a physiological process. It is necessary therefore to attempt to define a line of demarcation, and this line appears to begin from the moment when from exerting a minimal distending force during diastole, the venous pressure begins to exert an active distending force. From then onwards, if the process continues, the heart will be working under increasing difficulties, till the time comes when the next systole is inadequate to drive out the reflux during the diastole that has preceded it. Whereas "dilatation" before this demarcation period had arrived has led to an increased output, the output is now either diminished or can only be maintained by venous dilatation. The physiological "optimum volume" is thereby overstayed. But before this stage arrives other factors are controlling nature came into play; such as the increased arterial pressure which follows in exercise, and the increased rate, both of which tend to limit the increase in the size of the heart; the former by the increased coronary circulation, more efficient contractile the myocardium caused thereby; and the latter through the decrease in the venous pressure resulting. Further, with the overstaying of the line
during muscles Exercise warning signals appear. These are more likely to occur in the untrained, frail, or fatigued or diseased Heart than in the healthy organ. Thus in a Fatigued Heart if the effort - demand continues there is no option but Dilatation. For, it is precluded from an improved contractility and musclefibers from the fact that they are in a state of fatigue; and if the Venous inflow continues it must dilate so as to accommodate the volume of Blood during diastole.

To sum up, it may be observed that whereas it is unusual to meet with in the Healthy Heart an increase in size during muscles exercise; indeed, from unimpaired physiological condition & increased rate an actual diminution may occur; it is not unusual to observe an onstepping of the physiological optimum volume when the Heart's expelling force is inadequate or impaired in any way. And, other things being equal, the degree of dilatation will depend on the quality of the Heart muscle as to tone, condition induced by fatigue products, & the products of Tissueaemia or of disordered metabolism, or the absence of adequate oxygenation from insufficient coronary circulation, as well as being the presence of morbid changes in the Heart itself.
(ii). The Clinical Evidence.

1. The employment of the orthodiagnostic method which is the most precise now available in estimating the size of the heart has shown that there was a tendency on the side of over-estimation by the simpler clinical methods previously adopted.

A fact of importance that has emerged from these observations is that there is no fixed standard applicable to every case. The diameter of the heart in health would appear to be a direct ratio of the body weight. And further, it has been shown that the effect of well-directed effort on the healthy heart is to lead to a diminution in its size.

2. Some clinicians think it improbable that the whole truth with regard to dilatation of the heart resides in the simple explanation that the experimental method has suggested. A vital factor must be postulated. Sir James Mackenzie, for instance, draws attention to the fact that people may suffer or even die from heart failure in whom there is no dilatation of the heart. This observation has, however, fruit of the fact that other factors may occur in any given case which preclude the possibility of dilatation taking place.
Thus a heart may fail from a deficiency of circulating fluid, and if there is an inadequate amount of fluid entering from the veins side, one of the main agencies in the production of dilatation is absent. Diastole in fact cannot occur. This fact is well known among the phenomena of shock; then the heart may be contracting with moderate vigour nearly up to the cut, but with no effective result, profound lowering of arterial pressure from insufficiency of circulating fluid resulting.

3. As to the effect of exercise on the size of the heart some observers (1) have found that in healthy hearts, the size is smaller after exercise than before it; and observations made by Nicolai & Zundt found a slight increase in size during exercise in four subjects. Similar observations by Spencer Williamson (2) lead to a similar conclusion. It was only in definitely diseased organs that any enlargement resulted. The most recent observations were made by Maclean & Gardner (3). In 6 of the 11 cases examined by the orthodiastolic method a decrease of the diameter of the heart occurring 100 cm. was found at the end of exercise.

These observers consider this a normal reaction occurring among patients when the exercise produced no symptoms. In the remaining 6, the exercise produced symptoms (breathlessness, pain, etc.) and in these there was no change in the diameter. There was therefore in the symptom-free patients an absence of the diminution in size which one would expect provided conditions of fatigue etc. and disease were excluded.

4. Exercise over prolonged periods.

The orthographic method was applied to some observers to estimate the size of the heart of university men. The effect of exercise over several years had apparently led to no increase in size.

Taking into account therefore the evidence, experimental and clinical, it seems a fair deduction that dilatation of the heart only occurs exceptionally as a result of effort and is then generally an index of alterations in the physiological capacity of the heart muscle induced either from the pressure of fatigue, or altered metabolism or altered blood condition. It is primarily due to altered condition, rather than an index of the muscular effort itself.

Summary and Conclusions.

A. (1) Under experimental conditions the healthy heart's output by which its pumping capacity is estimated is determined mainly by the venous inflow and by arterial resistance. The output is higher the greater the inflow, and the lower the arterial resistance.

(2) The regulation of the venous inflow during muscular exercise is important in that it determines the venous pressure which may be sufficiently high to cause an increase in the size of the heart by increasing the diastolic pressure.

(3) Other things being equal in a healthy heart, an adequate venous inflow is necessary before the heart can attain an optimum volume at which the greatest development of energy during contraction can occur. An adequate venous inflow being one which exercises a minimal distending force on the ventricular muscle during its relaxation.

(4) In a fatigued heart an increase of venous filling pressure with increase in the volume of the heart is necessary to obtain a given output. To carry on the same amount of work as a fresh heart, a fatigued heart must dilate.

(5) Fatigue of the heart may end in heart failure, then the dilatation has reached the stage when it is impossible to produce a rise of intra-cardiac pressure.
(6) On the other hand, if the Heart is rested, and if the arterial pressure is adequate, it may end in recovery, which is brought about mainly by the diminution of venous pressure and increased coronary influx improving the physiological status of the Heart muscle. If the arterial pressure is not adequate, a slow secondary dilatation follows on the initial process of recovery.

(6) Under muscular exercise, the Human Heart possesses great power of variation as regards output, estimated from 3 to 21 litres per minute.

(2) The initial rise of Pulse Rate which occurs at the commencement of exercise is due mainly to the diminution of Venous Time; partly to stimulation of accelerator nerves and to the setting free of adrenaline. The factor of Venous Time is of great importance in maintaining a constant tonic influence on the Heart and conserving its Energy.

(3) By means of the orthodiaphoric method of examination it is found that diminution of the size of the Heart follows exercise. In hearts where this diminution did not occur symptoms had disappeared.

(4) Exercise over a long period of years led to no appreciable alteration in the size of the Heart.

(5) Provided the degree of exercise is within reasonable control, and provided an efficient oxygenation through the Coroner blood exists, the enlargement of the Heart does not occur as a result of exercise.

(6) Failing these requisite dilatation occurs, the degree varying with the degree of physiological inadequacy or with the presence of marked conditions in the heart.
Part III.

In this section it is proposed to revise the clinical features of this series of cases referred to in the Introduction.

The symptoms presented by this group were in the whole uniform, occasionally a particular member of the symptom group being emphasized one another. They were always elicited on effort.

Breathlessness; precordial discomfort, distress or pain; palpitation; exhaustion & godmness being the salient features in the clinical history.

On examination a large proportion of the cases presented a cardiac opus abnormally accented, and responding with vastly increased acceleration of rate and retardation of pulse-deciliation to slight degrees of effort (or spontaneous) associated therewith in one set of cases were signs of more general order in which the nervous muscular system seemed chiefly affected. Defective muscular nutrition, tone, a lowering of vitality & physique were evident.

In another group signs of the general nature were most conspicuous, and effect from the apparent cardiac disability, the general health seemed but slightly affected.

The latter therefore was named the 'Cardiac-type' in character distinction to the former which is alluded to as the 'General-type' in which the effects appear formalised.

The connecting links between these two groups lay in the factors of etiology, both conditions being produced by
a history of a infection or true nature, recent or remote.

In what follows an attempt is made to separate what appears to be a clearly defined group of cases. Whether this group will constitute a new entity or not remains uncertain at present.

The following provisional arrangement has been adopted for the purposes of the present study. It rests on an aetiological assumption, but the clinical advantages of such a classification are many from the point of view of prognosis and treatment.

In a recent analysis of hospital cases presenting signs of organic disease of the heart, Salathé [10] draws attention to four main groups in classifying, the Rheumatic, the Syphilitic, the Arteries valvular and the Mitral which comprise 98% of all cases. Such groups it is clear been confused mainly of advanced cases. But the condition are considered many finds its way into hospital in early stages. It might be named the ‘Toxometabolic group’ to denote that it is mainly based on an aetiological factor residing in one or other of these agencies. And the term ‘pre-syncopal syndrome’ might stand to denote the clinical phenomena observed. Recently, Albee has suggested the term ‘Pano-syncopésia’, signifying palpitation in effort. The objective of this would lie in the empiricism with the many causes of palpitation of a different origin. Significance which would result.

Arrangement of subject matter: I. A description of the salient features of the clinical groups.
II. An analysis of the aetiological factors displayed in the light of possible predisposing or causative agencies.
Subject-matter (continued)

iv. A discussion of the symptoms and their clinical significance.
v. The possible pathological factors and prognosis and treatment.
vi. Summary and conclusions.

Classification Table: (comprising 500 cases)

(i) Main Group A. History of infection; or where there is evidence of disorders in metabolism proceeding therefrom.

- Type General.
  - (a) Cases with organic disease
    1. Myocardium
    2. Valves
    3. Viscera
  - (b) Cases presenting no evidence of organic disease

- Coronary types.
  - (a) Cases with organic disease
    1. Myocardium
    2. Valves
    3. Viscera
  - (b) Cases presenting no evidence of organic disease

The coronary disease and damages to the heart being the main factors.

Group A with the two types represents the main subject of this study. Those under the organic emboli, (a) represent the cases where it was considered that the symptoms and signs of heart disease attributable to the organic condition were mainly the result of other agencies.

(ii) Main Group B. The cases comprising this group are arranged in 10 categories embodying these conditions due to causes other than those considered as forming the aetiological basis of Main Group A. They are as follows:

- The Inactive Heart.
- Effects of strain.
- Neurosis.
- Old-standing organic disease.

<table>
<thead>
<tr>
<th>Category</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Inactive Heart</td>
<td>10</td>
</tr>
<tr>
<td>Effects of strain</td>
<td>17</td>
</tr>
<tr>
<td>Neurosis</td>
<td>41</td>
</tr>
<tr>
<td>Old-standing organic disease</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>500</td>
</tr>
</tbody>
</table>
Section I

Description of the salient features of the Main Groups: (The order is the same as in the classification Table 1, p. 37)

(1) Group A. I Type-General. - The cardiac disability being of post operarum condition.

Presenting a history of infection, recent or remote; with effects general; comprising 193 cases, 134 having 13 cases under the organic sub-div. (a). The cardiac disability being post operarum condition.

The symptoms, in order of frequency, according to which the patient in this group reported their worst: Shortness of breath on exertion, a feeling of weakness, easily brought about, Palpitation on effort, Pericardial discomfort (angina pain), Giddiness & fainting.

On a general examination it appeared at once that the general condition was impaired. The skin was clammy, perspiration easily induced; muscular tone & movement poor; Reflexes were often abnormal - irritability of the spinal response being about equally met with; as were also frequently the body movements; and pallor of limbs induced by slight elevation of the feet, together with postural giddiness testify to abnormal Blood Pressure mechanism.

The History was suggestive. In many cases the condition dated from the contraction of some illness. Therefore also an attempt was made to sustain a chronic effect exhibiting the symptoms, which varied somewhat in degree, but which were never wholly absent.
The physical examination of the heart failed to detect any
important organic alteration. After slight exertion, or in many
cases on emotion there was an increase in the pulse rate which
was maintained at the same level for a long period. This was
soon recognized as one of the cardiac manifestations. Both
the resting and the permanent standing-rate were slightly
below normal, varying between 80 and 90. An increase of the
area of cardiac pulsation was present in 30% of the
cases, but although diffuse, the action was rarely
noticeable. In no case was the apex beat more than 1/2 inch
outside the nipple line. Auscultation revealed alterations
in the cardiac sounds which were subject to considerable
variation according to the degree of excitability of the heart
at the time of examination. Respiratory regularity was
frequently not well marked, and is a useful sign if the
pulse rate is not markedly increased. Its significance
will be referred to later.

The application of the reaction test to this group is noted
below. The reaction and the category of discharge has been
referred to in Part I...

Thus in 180 cases presenting the symptoms described, as
related with no indication of organic disease:

<table>
<thead>
<tr>
<th>Good Reaction: Fair Reaction: Poor E.</th>
<th>Class A.</th>
<th>72</th>
<th>84</th>
<th>86</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. 104. 34</td>
<td>80. 21. 21</td>
<td>57. 4</td>
<td>130</td>
<td></td>
</tr>
</tbody>
</table>

The majority of those who gave a good reaction rose 47%
reached Class A; the remainder of those in Class B rose 43%, repre-
senting their cases. Therefore, who responded sufficiently well
to treatment to reach that class. (30% of this group.)
The Cardiac Type—comprising 190 cases.—Here the Cardiac insufficiency and the Digitalis Action of the heart were the main features.

The symptoms in this group were, in order of frequency: Shortness of breath on exertion; Palpitation; Pericardial distress or pain on effort (very rarely at rest); Giddiness and easily induced feeling of exhaustion. Tinitus was rare. The feeling of lassitude or exhaustion was not a feature of this group as it was of Type I.

In the early stages shortness of breath had been observed after some sudden exertion, such as a short sprint, lifting a weight or going up a few steps, exercise of an even nature such as walking in the level produced little or no discomfort. Abnormal return of diastole was occasionally noticed on any sudden physical change. The further history showed that the condition may have been stationary for a long time. The while the individual lived within his limitations, his a more insidious mode, life beyond it was more its prominence. Thereafter insidiousness proceeded slowly, all, a dull ache or pain became more frequent, and in some cases who had to carry weights or the actual of equipment. There is frequently reference to this pain or pressure caused by the shoulder straps. Fatigue attacks were rare, in a few cases provoking such a tiring sensation did not occur.

The ‘pain’ complained of is a very constant feature, occurring in about 50% of cases, in a definite localized area. In a very much larger proportion was an undefined dull pressure or a dull ache in complaining of.
When the pain is localized the points of maximum frequency were
(1) between the 4th and 5th costal spaces on the left side from the sternum to the left clini-
costal margin. (2) on the left lower costal cartilage (3) in the upper part of the chest along the Pectoral muscles.
From the history one obtains, hyperaemia on the pectoral area
seemed to be frequently present, but, at the stage at which the
cases were seen, this sign could not be constantly elicited.

The history of possible infection or which actiologically
this group is based was obtained in all the cases and
as will appear in the etiological summary table a direct
relation could be traced between the event and the onset of
symptoms in a considerable proportion of cases.

The physical examination of the heart showed no gross
departure from the normal. The area of cardiac pulsation
was diffuse in about 80% of the cases but in case of
definite or marked enlargement of the heart was observed.
Auscultation frequently revealed alterations in the cardiac
sounds. The 1st sound was often in this group short and
sharply, the diastolic phase being shortened, and the 2nd
and at the base accentuated. The interpretation of auscultation
systole in time was a source of difficulty. When the
heart's action was unstable systolic limits frequently
yielded a slightly rough quality which was not present
when the action quickened down. The Respiratory Impulse
was frequently more accentuated, and extra-systoles were more
frequent in this than in the other groups. See analysis of etiology.

The heart's response to effort showed the same
tendency to an exaggerated prolonged reaction, that
in the whole effort tended to improve the heart's action
in this type of case.
The Reactin - Disposal Table computed for 160 cases

(when no organic disease was ascertainable) is as follows:


R R. R. 93 21 14 6 ... 160.

This table shows that 15 cases in this group gave a 'good reactin' according to the standard described, and 93 or approximately 58% returned to Class A category; 67 returned to the B class. In this class the proportion who improved sufficiently to justify their being placed A is 41%.

3. The cases presenting organic Disease - The Relation between the Post-Tarxemic Period of Organic Disease.

Some explanation is necessary for the inclusion of cases of organic disease among the group 'remaining forms' 'Deformity Caection of the Heart', when the Post-Tarxemic Syndrome is present. The conception usually formed is that in these cases the heart is dealing with hearts which are organically sound and that whenever organic disease is present the case is placed upon facts into a different category. But a consideration of these cases makes it clear as will be referred to again later, that be an attempt in many instances the pre-organic state of cardiovascular disease may exist where subjective symptoms and objective signs predominate, or where evidence of definite pathological alteration is lacking. It appears then for logicality correct to include these more pronounced stages with structural changes into the general feature. Thus, in considering the early rheumatic heart, examined as it is admitted that the majority of such cases inevitably show evidence of organic disease, the exclusion of the latter phase from consideration of the evolution of the disease process would impair the clinical conception.
3. The cases of organic disease (continued)

The cases in the present series are considered under two headings:

(a) The cases with evidence of organic disease of the heart in main groups: i.e., those in whom the condition approximated to one or other of the two types described, and in whom a super-added infection formed the common basis in etiology. Total of 22 cases.

(b) Those who presented the usual clinical signs of old-standing organic disease & in whom none of the characteristics of the post-tuberculous effects were observable. Total of 159 cases.

(c) The myocardial group—comprising 28 cases.

The diagnosis of myocardial disease of the Heart in the early stage is notoriously open to question, even when the aid of special investi-
gation has been invoked, and no generally accepted interpretation of the findings in any given case is available.

The most recent work towards this end, even in those cases of the Rheumatic group (Parkes—Report to Med. Res. Committee) has failed to obtain the electrocardiographic evidence on which a certain amount of hope has been based. And for other instrumental means, even where strong presumptive evidence exists, as shown by Heron & Clegg in their polygraphic findings subsequent to successful post-mortem investigation it is impossible to associate the pathological lesions with the individual instance of arrhythmia in the heart. (c) And clinically, many of the Test de-
scribed deal with the question of myocardial effusion and approxi-
mately, but not with the presence of disease therein.

The presence of disease must to a certain extent be deduced from the symptoms. A prior myocardial disease may legitimately be suspected whenever:

1. The symptoms of the disability are markedly protracted.
2. Where there is evidence of alteration in the size of the heart, either permanent or induced after effort; or of the development of new rhythms such as Auricular Fibrillation.
3. When the reaction to effort is very poor, coupled with a history of repeated attacks of an infection which might have led to permanent change in the myocardium or its nerves.

The history as to Infections was as follows:

**Recent:**

Dysentery: 5 cases, 3 of whom: 1 had had Pneumonia, 2 Chronic Rheumatism.

Diphtheria: 5 cases, 3 of whom: 1 had had Acute Rheumatism, 1 Influenza (No pneumatic rift).

Influenza: 3 cases, 2 of whom: 1 had had Pneumonia.

Influenza + Tonsillitis: 1 case: no pneumatic infection.

Tonsillitis: 2 cases: one had had pneumatic attacks.

Thus it will be seen that the Rheumatic form is represented in 6 out of 16 cases. In two cases of Auricular Fibrillation observed in this series nothing was seen than Tonsillitis as a late phase such as embolus or peri-articular ache, pain had occurred in their past histories.

Dysentery as a primary cause of cardiac affliction has not generally been regarded with in the past that the Dysentery form may produce the Toxemic effects.
seen in the 'Infratable Heart' is a matter of frequent observation by all those who may have had to deal with anaesthesia from that condition.

It was in this group that increase in the size of the heart was relatively frequently observed. Thus it is noted in 11 out of 16 cases or in 68 75%. Alteration in action such as the development of a new rhythm was observed in 3 cases.

The Reaction - Disposal Table:
(a) Cases when super-added infection as detailed above - 16 cases.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6.</td>
<td>11.</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>6. 9.</td>
</tr>
</tbody>
</table>

66.2% to B. 3 class.

(b) When anaesthesia was old-standing - no sign of cardiac insufficiency.

|        | 8. 4. | 17% to B. 3 class. |

(2) The Valvular Group - Total 47 cases.

(The more serious cases of valvular disease as explained in the Introduction have been forming eliminated.)

The question of significance in the interpretation of murmurs - especially those heard in time. Probably more difference of opinion exists regarding the interpretation of this sign than of any other simple clinical sign - Despite apparently continuing to differ. The simple clinical guides would seem to direct the way clearly but their application & interpretation is not an easy matter. In deciding whether an organic murmur, the following points should be borne in mind: (1) A rough quality - want as not

in a musical quality being beyond doubt - and the contradicting

the murmur. (2) The size of the heart, and evidence of cyanosis.
(3) The history: A rheumatic history being accepted as strong presumptive evidence.

But we are faced with the possibility of fallacies under each of the 3 heads given above. Thus, organic murmurs may possess a soft, blunting character with little change in the dimension of the heart or its efficiency; on the other hand a very marked myocardial inefficiency may exist without evidence of any organic valvular lesion; and further, histories may be void of important clues. It is this potentiality for envenomment into the many pitfalls that exist which has led to the cry for the total denial of fruits of this order, and for the consideration solely of whether the myocardium is capable of carrying on an efficient circulation or not.

As with the myocardial group, the cases in this group are considered

(a) When the infection which is surpassed is recent. (b) Old-standing cases.

(a) History of surpassing infection:

Recent:

Dysentery, 11 cases of whom 7 had had Acute Rheumatism.

Influenza 1 case — 1 had had Acute Rheumatism.

Vaccinia 2 cases — 1 had had Convulsions; 1 no previous infec.

Enteritis 2 cases — 1 had had Rheumatic; 1 Acute Rheumatism.

Tonsillitis 3 cases — 2 had had Acute Rheumatism; 1 no previous infec.

Remote:

Dysentery, 11 cases of whom 1 had had Chr. Rheumatism.

Influenza 1 case — no previous attack.

Vaccinia 2 cases — 1 had had "goose flesh"; 1 no previous inf.

Enteritis 2 cases — 1 had had Rheumatic; 1 Acute Rheumatism.

Tonsillitis 3 cases — 2 had had Acute Rheumatism; 1 no previous infec.

(4) Old-standing cases. 28: Intellectual Stenosis 5

Intellectual Hemiplegia 23.

23 or nearly 80% gave a history of a Rheumatic condition previously,

in 18 of which the condition was Acute Rheumatism.
The Reactin - Disponal Table.

(a) Vomiting, Vols. Disease


Fluor added injection

2 12 6 3 1 13 2 19

31.67% (10-87)

(b) Without injected Inf.

2 23 2 6 5 12 5 28

7.17% 21.87


All cases in this group presented marked thickening of the Brachial artit. beyond age - defense. These were no real manifestations.

A point of interest in these cases is the relation which such past tumor effects as an considering stand to asthmatic seizures. In some cases a remarkable degree of carotid thickening may be observed in early manhood. That the roots of vascular sclerotic lie in tumor antecedents, although not demonstrated.

ly proved to be supported by a large amount of evidence. And the most common signs, probably exist in such subjects in early objective manifestations as are found in many of the cases which comprise this series — a condition which there is no reason to doubt leads to retrogressive changes in the cardio - vascular system and in the brain generally. This also holds the "irritable heart" of to have may lead to hypertrophy of the heart, and in other ways have pointed out the possibility of asthmatic seizures as a sequel in neglected cases of the condition. And in this as in other research work the patient's


1. May have been noted in cases of the "irritable heart" by previous authors.

2. Mith ... BMJ 1925 #. 103.

3. In a previous..."
A note on the Rheumatic Group.

In considering the aetiology of the cases in the organic group a Rheumatic history was obtainable in 62.6% of cases (total 75.)

Acute Rheumatism in 35 - or 46%.

Other Rheumatic conditions in 12 - or 16%.

It is necessary to emphasize the fact that in spite of our search for signs to enable us to arrive at distinctive clinical characters, it has not been possible to separate the early Rheumatic cases clinically from those giving histories of infection other than the Rheumatic valves.

The following table has been compiled from our series of 138 cases when a 'Rheumatic history' obtained. They show the relationship, the time gravity of symptoms & the Reaction Disposal result.

(1) Etiological Table of the Rheumatic Group.

<table>
<thead>
<tr>
<th>Type of Infection</th>
<th>Total Number of Cases</th>
<th>Symptoms starting shortly after Infection (in years)</th>
<th>Reaction time</th>
<th>Symptomatic Acute</th>
<th>Acute on Infection</th>
<th>Acute on Valves</th>
<th>Acute Reaction Time (in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Rheumatism</td>
<td>63</td>
<td>18</td>
<td>1.5</td>
<td>15</td>
<td>1.5</td>
<td>1.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Tonsillitis (sero10 infections)</td>
<td>36</td>
<td>21</td>
<td>1.5</td>
<td>14</td>
<td>1.5</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Paris Lumbago, 6</td>
<td>24</td>
<td>7</td>
<td>1.7</td>
<td>25</td>
<td>1.5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Chorea</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1.7</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

(2) The Reaction Disposal Table of the Rheumatic Group.

<table>
<thead>
<tr>
<th>Good R.</th>
<th>Fair R.</th>
<th>P. R. Class A</th>
<th>111</th>
<th>112</th>
<th>113</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Rheumatism</td>
<td>4</td>
<td>38</td>
<td>18</td>
<td>16</td>
<td>(138%)</td>
</tr>
<tr>
<td>Tonsillitis</td>
<td>4</td>
<td>20</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Paris Lumbago</td>
<td>16</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Chorea</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

Total: 34 10 19 52 15 20 7 18 40 10 7
From the tables here given it will appear that of 63 cases giving a history of acute Rheumatism, 23.8% returned to Full duty.

The remainder or 61.9% returned to categories B2 or B3 (Partial).

In the Allied Rheumatic condition 23.8% returned to Full duty, 41.8% being placed in the grade category. Considered as a whole 26.1% returned to Full duty.

50.4% - Low grade duties.

Reading conjunction with the Etiological Table it will be seen that of 63 cases with a history of Acute Rheumatism, in 15, the average time since infection is 1.5 years; whereas in the remainder (48 cases) the average time is 4.5 years. It is from the former that the higher grade duties have came (in 12 out of 18 cases). So that in the Rheumatic group we have to face the fact already well known that as the time from the onset of the infection becomes more remote, so does the prognosis grow worse in that the possibility of chronic changes having developed becomes greater.

(ii) Main Group B.

The cases were distributed as follows:

1. Untrained Heart, comprising 10 cases.
   - Effects of Strain
   - Nervous
   - 41

It has appeared necessary to enter into a short discussion of the 3 subdivisions from herein, for some authorities have used the terms 'strain' or 'nervous' to denote cases of the condition we have described and the distress presents feeling of difficulty wherein it may not always be easy to define if the above terms in the emphasis found in many instances.
(ii) Main Gp. B. (cnt.)

1. The Immediate Cause: Untraumatic Heart (10 cases)
The criteria followed in placing cases in this group were (a) Age and evidence of immaturity; (b) Habits, occupation in their bearing on the physique generally, and in the Heart; (c) The Previous History; (d) Family History; (e) Results of Examination.

A summary of these facts appears in following Table.

<table>
<thead>
<tr>
<th>AGE</th>
<th>OCCUPATION</th>
<th>PERSONAL</th>
<th>PREVIOUS HEALTH</th>
<th>FAMILY HISTORY</th>
<th>CIRCUMSTANCES ATTACHMENT TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) The average age is 47 out of the 10 cases was 18.5 years. The heart does not in many cases in all probability attain full development till 19 or 20, depending a good deal on the factors in (b) habits, occupation etc.; so that the majority, given case to be the condition in this respect. In 5 the occupation less 'sedentary' in nature than in 2 'light'. (b) In half the cases it was noted that the physique was inadequate, generally with poor muscular development and under weight. (c) To which the size of the heart have a definite ratio. (d) No infection. (e) No previous history of death, and in none of the cases were evidence of 'shock' of any sort. The cause of death might be attributed to the pressure on the heart's weight, physical weight being reduced. The aorta was reached in such a heart much more easily than in a 'good heart' (so defined in the Physique Section) by the dissectors' knives through the skin and 3 cases found the heart considered in the next Section.
The Effects of Strain (Comprising 14 cases).

This group differs from the preceding in (a) the age incidence, (b) the nature of the physique. (c) the degree of effort. (d) physical examination.

Clinical Summary:

<table>
<thead>
<tr>
<th>AGE</th>
<th>OCCUPATION</th>
<th>HISTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recall Health</th>
<th>Brain Health</th>
<th>Family</th>
<th>Circumstances Under Which De三代入</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Physique Defects</td>
<td>3 Old Symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in age 35)</td>
<td>Nothing to note</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Sprinter</td>
<td>Healthy food, but slight symptoms of cold and life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Rover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Cycles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Active games occasionally</td>
<td>1 Bronchitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 Bronchitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 no active games</td>
<td>1 Bronchitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Alcohol</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thus it will be seen that the degree of effort was considerable, and in the absence of other possible causes, we were impelled to give this factor primary consideration. Of the symptoms complained of pain had been emphasized, in very few cases the pain had ceased or had considerably abated on the cessation of effort. Exhaustion was not prominent among the symptoms. In examination the signs were frequently indefinite. The cardiac impulse was diffuse and substantial was considered to be present in 90/2% of cases.

Two of the cases presented a slight degree of hypothyroidism (one a sprinter and another a baker in civil life).

The behaviour of the heart to effort is of a different nature to what is characteristic of a heart in the Torsion Aneurysm (Types B and C). The pulse in general in practically all cases, occurs within the normal limits. This constitutes an important feature.
The diagnosis in cases of strain.

The abnormality is rather a difficult one to define owing to the heavy physiological strain which has prevailed in the subject. As pointed out in Part II, a heart under strain when its physiological optimum is attained, if the effort is maintained, the means of restoration treated, must dilate to meet the continued demand. When that occurs we speak of the condition due to strain having set in. But the clinical diagnosis is not always easily arrived at. And even when enlargement of the heart is present, it may be difficult to ascertain during life which chamber is affected. In discussing the effects of strain on the heart, Professor Russell draws attention to the fact that the visible pulsation, which is in all probability due to the Right Ventricle, may be an indication of a dilated left heart, the Ventricle being lifted into closer contact with the chest wall. In this connection a suggestive explanation is offered of the mechanism whereby that illusion may occur, the fulcrum shifting is produced.

However, the problem of the interpretation of the physical sign in relation to strain of the heart is one on which opinion is still divided. For instance, the employment of the auscultographic method in patients in whom the cardiac impulse was diffuse and abnormal failed to produce evidence of dilatation of the heart. It is suggested that the phenomenon is due to a more vigorous movement of the organ.

The presence of a systolic murmur in the precordial area after the application of an Air-Tubing Test, which we have noted before, may be a useful indication as to the condition of the Left Ventricle, as pointed out by Professor Russell.

Neurasthenia

Comprising 11 cases or 8.2% of the whole.

In the tenic cases under review no pronounced case of the condition which has been described under 'Neurasthenia' by some writers than been encountered.

The clinical picture was devoid of any sharp or well-defined characteristics. In the mental state, slight depression, anxiety, restlessness; tremors elicited by emotion as well as by externi; but always when certain circumstances evoking slight excitement was present. In some cases certain manifestations of nervous instability, varied by affectation, speech or mannerism. Reflexes were generally slightly exaggerated. No sensory changes; the notion of hypoaesthesia or hypalgesia was present, but pain was complained of in about 30% of the cases. This was rare. If a sense involved, the sensation often constricted by the patient varying from slight pruritus to a chill ache. Profuse perspiration on effort was occasionally observed.

Increased excitability of the heart, but no enlargement of the organ was detected. In the hearing evidence of a post-traumatic state was lacking; in the other had the sound in about 50% of the cases followed a definite event which might have constituted an emotional shock in one with a neurasthenic trait. That was present in renal cases the family history left no doubt.
The diagnosis of cases of Neurosis:

It is necessary to emphasize that the term Neurosis as used here is not considered as synonymous with what has been termed a "Cordic Neurosis" by several writers. (This latter term could advantageously be dropped for the condition it was intended to describe is included in the Post-Traumatic syndrome described under Type I in this study.) There has been the additional implication of a sexual origin affixed to it and a sexual Cordic neurosis has been described. (Hess, White, 17th May 1910.)

Needless to say among the afflicting conditions, the sexual are by important in any state where the brain is irritable or unstable either from post-traumatic condition or in such unbalanced by hypersensitive nervous mechanism as be occurring under this heading.

---

Medical Summary of Cases of Neurosis:

<table>
<thead>
<tr>
<th>Age</th>
<th>Occupation</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

As shown in the table below:

<table>
<thead>
<tr>
<th>General Table: Good R.</th>
<th>Poor R.</th>
<th>Poor R.</th>
<th>Class A.</th>
<th>Class B.</th>
<th>Class C.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>13</td>
<td>8</td>
<td>5</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>
The Statistical Factors: Cause and Prognosis.

1. Primary.
   (a) Tonsillitis.
   (i) Rheumatic and allied conditions.
   (ii) Other infections.
   (iii) Tonsillitis, post-infectious etc.
   (b) The Infection on Unrelated Host or Strain.
   (c) Neuritis.

2. Secundary.
   (a) Post-infectious: age, physique, training occupation.
   (b) Affirmative: strain strain, tobacco, exercise.

In the Table that follows the cases are divided into two groups according as the evidence of infection as far as can be ascertained is direct or indirect. Thus in the first column are placed those cases in which the onset of the symptoms delta from a certain infectious illness and followed soon after; in the second column are the cases, where an interval of time has elapsed between the definite infection and the onset of symptoms.

The figures show that:

1. 188 cases had symptoms following directly after a definite infection: i.e. 47.2% of the total infectious, 57.2% of the total series.
2. In 195 cases, an interval had occurred: i.e. in 37.2%.

The total Rheumatic with a history of infection constituted 76.2%;
Of this, the 'Rheumatic Group' constituted 26.2%. 
### Summary of Statistical Table

#### (1) Rheumatic & allied conditions

<table>
<thead>
<tr>
<th>Infection</th>
<th>Total number</th>
<th>Number of patients equated at first symptom (months)</th>
<th>Average duration of symptoms (months)</th>
<th>Number of patients equated after first symptom (months)</th>
<th>Average time from infection to death (months)</th>
<th>Time in months, death date (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Rheumatism</td>
<td>63</td>
<td>18</td>
<td>18</td>
<td>24.5</td>
<td>12+</td>
<td>7 1/2 yrs</td>
</tr>
<tr>
<td>Tonsillitis</td>
<td>35</td>
<td>21</td>
<td>6</td>
<td>14</td>
<td>9 1/2</td>
<td>2 1/2 yrs</td>
</tr>
<tr>
<td>Parotitis, mumps, arthritis</td>
<td>29</td>
<td>4</td>
<td>20</td>
<td>25.5</td>
<td>18</td>
<td>14 yrs.</td>
</tr>
<tr>
<td>Chorea</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>18</td>
<td>10 yrs.</td>
</tr>
</tbody>
</table>

#### (2) Other Infections

<table>
<thead>
<tr>
<th>Infection</th>
<th>Total number</th>
<th>Number of patients equated at first symptom (months)</th>
<th>Average duration of symptoms (months)</th>
<th>Number of patients equated after first symptom (months)</th>
<th>Average time from infection to death (months)</th>
<th>Time in months, death date (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysentery</td>
<td>73</td>
<td>47</td>
<td>8</td>
<td>24</td>
<td>9</td>
<td>16 yrs.</td>
</tr>
<tr>
<td>Dysentery &amp; septica meningitis</td>
<td>13</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td>10 yrs.</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>20</td>
<td>18</td>
<td>6</td>
<td>12</td>
<td>11</td>
<td>3 yrs.</td>
</tr>
<tr>
<td>Influenza</td>
<td>20</td>
<td>16</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>18 yrs.</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>23</td>
<td>11</td>
<td>18</td>
<td>12</td>
<td>1</td>
<td>2 1/2 yrs</td>
</tr>
<tr>
<td>Malaria</td>
<td>12</td>
<td>10</td>
<td>3 1/2</td>
<td>2</td>
<td>3</td>
<td>6 yrs.</td>
</tr>
<tr>
<td>Malaria &amp; Tetanus</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Scarlet</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>6</td>
<td>6</td>
<td>18 yrs.</td>
</tr>
<tr>
<td>Tetanus group</td>
<td>14</td>
<td>4</td>
<td>9</td>
<td>10</td>
<td>1</td>
<td>10 yrs.</td>
</tr>
<tr>
<td>Tetanus</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>3</td>
<td>10 yrs.</td>
</tr>
<tr>
<td>Infective Paratyphoid A</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>18 yrs.</td>
</tr>
<tr>
<td>Paratyphoid B</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pyrexias (indef.)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### (3) Traumatic et al.

| Trauma with chronic infection of appendix | 24 | 2 | 2 1/2 yrs | 22 | 2 1/2 yrs | Indefinite |
| Tuberculosis (30 cases)                  | 7  | 1 | 3 yrs.    | 6  | 6 yrs.    | Indefinite |
| Thyroidism                                | 3  | 1 | Indefinite | 2  | 1 yrs.    | Indefinite |
Comments on the Table of Infections:

(a) The Rheumatic Group

Comprising 130 cases or 26% of the total series of 500 cases.

(i) Direct - 62 or 32%
(ii) Indirect - 68 or 32%

The first represents cases in the early stage of infection - average time from 6 to 20 months.

The second represents cases in the later stages - average time of infection ranging from 1 to 10 years.

The proportion in these two subdivisions is apparent by referring to the Reaction Disposal Table p. 48.

(b) Other Infections

Comprising 267 or 67% of total or 43.8% of series of 500.

Direct - 164 or 62%; indirect - 103 or 38%

The third proportion of the 'direct healing' is more apparent than in the Rheumatic group. Here the disturbances in the early phases assume greater importance.

The Intestinal group:

Comprising 131 cases, of which Syphilis was responsible for 76%. The other disturbances following Syphilis have been a feature of certain types of the infection. The bacteriological and pathological conditions have both been ascertained, but that a certain of infestation, clearly of the Coelic mechanism may persist for a long time after infection has been frequently shown.
In acute cases the extreme tisue state may develop, attended by cardiac dilatation and second echocardiue; the consequent failure being pronounced. All wards of the

tetanum process may be examined if the milder cases of the old standing cardiac disease, some of the typical examples of the "Inflatable Heart"

Tetanum:
Considerable cardiac irritability is occasionally seen, after tetanum. The condition occurs in cases in which anaemia is not pronounced and in whom no embolism can be detected. That the hypoplasia is affected known is affected by the rapid dilatation that may occur in some severe infections from the indolent process...

The Pre-Infarction:
Cases with this condition frequently come in during "epileptic" spas. In a certain number of cases this is the only recent infection. The condition so called has had an interesting subsequent history in that it has been brought to light that the Klebs-Löffler bacillen is responsible for a large proportion of these infections. (Egypt & Palestine zone). The strain of Bacille cardine is thus readily explained.

The Tetanum - Foster Vincent.
This has not been an important factor in the present series, comprising 4.8% of the total. Manifestation

inflammation is but represented by this figure.

The subject has been fully referred to in the literature in recent years.
Recent work lends hope that some light may be thrown on the subject. The discovery that certain definite changes occur in the blood and urine in some cases may lead to the elucidation of this condition.

Thyroidism.
The question of hyperthyroidism is important since it has been held by certain clinicians to occupy an important place in the etiology.

Enlargement of the thyroid occurred in 3 cases; in 2 both lobes and in one the R. lobe only being affected.

In one other case a small Simple goiter causing no symptoms was present. In none of the instances was any of the signs of some disease conspicuous. The acceleration of the pulse after effort differed in no way from the other cases in the series.

The question of hyperthyroidism must remain an open one for the present, since it has been shown that an increase in the weight of the thyroid above the normal may occur under certain conditions without external evidence of enlargement. (2) (The condition is described further under Pathology.)


(a) Predisposing.

(i) Age: The following represents the proportion of the different decades.

<table>
<thead>
<tr>
<th>Number</th>
<th>20</th>
<th>20-30</th>
<th>30-40</th>
<th>40+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>64%</td>
<td>32%</td>
<td>98%</td>
<td>15%</td>
<td>100%</td>
</tr>
</tbody>
</table>

In only one group, viz. the Innate Heart did the factor of age appear important, owing to the fact that the cardiac apparatus may remain undeveloped or the development may be delayed.

(iv) Physique: noted to be good: Fair: Mediocre: Poor.

The quality of Physique as an index of the degree of quality of endurance, and of the physiological expectation in the matter of effort is of peculiar importance in cases of this type. The important observation has been recorded that the size of the heart (as measured by orthodentician methods) varies with the body weight. The physiological experimental work on the mechanism of adaptation of the heart has added importance to this question.

Ref. (1) Dröthen, quoted by Maclean & others.
(Cited in Med. Res. Coun.)
## Occupation Table

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Male</th>
<th>Light Work</th>
<th>Male</th>
<th>Moderately Heavy</th>
<th>Male</th>
<th>Heavy Work</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrome</td>
<td>18</td>
<td>20</td>
<td>20</td>
<td></td>
<td>39</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Ship Assistants;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPO; Chemists</td>
<td>20</td>
<td>9</td>
<td>22</td>
<td></td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill Workers</td>
<td>30</td>
<td>9</td>
<td>10</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postmen &amp;</td>
<td>18</td>
<td>8</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saddlers</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Operating</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Workers X2</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confectioners &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Boot Makers</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor Servants:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valets; Porters</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tailors</td>
<td>4</td>
<td></td>
<td>4</td>
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<td>4</td>
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<tr>
<td>Teachers</td>
<td>14</td>
<td></td>
<td>14</td>
<td></td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair Dressers</td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total Male       | 167  | 108        | 117  | 117              |
|                  | (27.8%) | (21.6%)  | (23.4%) |
Comments on Occupational Table.

1. The Sedentary and Light workers comprise 65% of which
   the former number 37%. - The two items of deficiency of
   physique and liability to infectious disease highly in Russia.

2. The Moderately Heavy workers comprise 20% - of the
   moderately heavy workers, the "Engineering Trades" claim 61;
   and of the Heavy 96% comprise miners, benchmen and general
   labourers - the total mining number 11.6% of the whole.

Two facts emerge from this analysis - the one grave and
the other relating to the incidence of infectious diseases
of a certain kind among these classes of workers - viz.
the Rheumatic fever - no fewer than 60% of the miners
for a history of acute Rheumatic or Tuberculosis.

Thus although the conditions as to the development
of physique are more favourable, we have on the other
side of the scale a heavy balance of infection.


(i) Strain or stress.

We are here concerned with strain of varying degree as
the means whereby a pre-existing disability, foreseen
or unsuspected, is brought into prominence, or whereby a disability
is aggravated. Apart from the physical side of strain, the
factor of treatment and emotional tension i.e. the way in which the
injury or disease is subjected to hard work beyond their
physical capability may so be emphasized by rules to
an important element in the production of a
condition to the so-called "inevitable Next of Kin"
apparent cancer (continued)

(ii) Tobacco.

The apparent effects of Tobacco smoke have recently been observed by Parkinson in patients suffering from the condition of the Irresistible Rest. According to his observations, its action lies in increasing the Blood Pressure, increasing the resting Pulse Rate, and in increasing the Pulse Rate, reaching to 130. These very features which characterize the Post-Tobacco Syndrome. The effects were known previously in patients as well as in patients.

It is necessary to emphasize the fact known that there undoubtedly exists an idiosyncrasy to nicotine which may produce serious derangements resulting in those within a week, and pronounced cardiac disturbances have been observed in such cases. But to impugn smoking as the cause in the majority of cases is an error. Indeed, however, describes a condition similar to the Post-Tobacco Syndrome described among smokers who are non-smokers.

In the series of 300 cases recorded here 8.6% were non-smokers; the majority were comprised of light smokers with a low proportion of cigarette smokers.

(iii) Excess: alcohol etc.

The total abstinence comprised 40% of the present series. (In Davis' Report to the Medical Research Committee 53% were in that category.) And a startling Chile affair is the case brought to light in that it would appear as if abstinence led to better results.

The text continues...
Than those who rubbed more freely. Dr. Lewis James suggests that this finding is probably illusory, as abrasions etc. are not consistent with the sedentary or poor physique categories examined. Tachycardia are probably less than their more vigorous, active brethren.

Section III.

Symptoms and Signs and Their Clinical Significance.

(a) Symptoms. (a) General.
   (i) Breathlessness.
   (ii) Exanthemata etc.
   (iii) Tremors; Irresistibility etc.

(b) Symptoms. (b) Special.
   (i) Breathlessness.
   (ii) Pneumonia: Discomfort etc.
   (iii) Palpitation.
   (iv) Giddiness.

(b) Signs. (a) General: Defects in physique; Malnutrition; Flushing; Tremors; Reflexes; Details changes; Gastric, intestinal dilatation; Alteration urinary Blood.

(b) Signs. (b) Cardiac: Precordial pulsations; Sighs here.
   Sounds; Rhythm; Rate; Response to efforts.
Symptoms (continued)

(a) General.

Breathlessness.

As is well known the physiological stimulus to respiration is a chemical one created through minute changes in the carbonicity of the blood by the agency of CO₂. But what was indeed a revelation was the extreme precision of the mechanism whereby the mean CO₂ in the air of the lung alveoli is kept constant at a level which is about 0.6%. The vascular regulation of breathing remains all along subordinate to the chemical regulation.

In investigations by Denny (2) of the percentage of CO₂ in the alveolar air of patients presenting the symptom-complex under consideration a figure a little below the normal (0.6) was found. In these cases also it was found that the time during which the breath could be held was very much shorter than normal, and when air with CO₂ was inspired, the percentage which produced intolerable dyspnoea lay between 0.8. The evidence therefore appeared to point to an intolerance to CO₂, and a possible cause for this was found in an examination of the blood. It was thus discovered that a deficiency in certain substances called Buffer salts existed; the function of which is partly to neutralise the acids and mitigate the effect thereby in the extremely delicate balanced respiratory centre.

(3) Lewis, Collier, Parkeift: P. M. 1916, ii 517.
If such substance be inadequate it becomes clear that under conditions of muscular effort when both CO₂ and lactic acid are produced, an action in the respiratory centre out of all proportion to the normal increase will be produced.

Many other causes may exist for this symptom. But that in many cases it is primarily due to changes in the chemical character appears probable in view of my early note, even after an effort lasting a matter of seconds in cases when no evidence of disease can be detected elsewhere in the circulatory system.

(ii) Reactions: there is some well-being; etc.

In addition to the above, clamminess of the skin, or evident cause, profuse perspiration, tinitus and mental fatigue form a symptom-group in about 60-70 % of the cases. It is attributed finally to a vasomotor force. A lack of vasomotor tone is assumed to exist, but this assumption is not borne out by experimental observation. The cause of the reaction has been found in a study of the effect of pilocarpine on the secretory nerves in patients and controls that there is evidence of hypersecretion in the peripheral mechanism of the former. In some cases an important sign is found in the morcellation of the Rafe abdominal nerve.
This symptom-group is a form that variable and it seems very likely that the varieties are to be found in the changing phases of the disease's metabolic process in the organism. The alterations in the blood to come to be described are suggestive in relation thereto.

(iii) Tremors, irritability etc. Sleeplessness.
This symptom-group was present in about 40% of cases. The 'shakiness' or tremors followed in rotation, and were frequently in another which partly blurs the pathogenesis against tuberculosis of the former. It is as in the former group, a train of symptoms which may be seen after remittance from an illness when tuberculosis of the alimentary affection has been acute. During the disease the muscle groups may be alarmed to exhibit fibrillary twitchings, and the analogy to the action of the form of tuberculosis in producing similar phenomena is striking. The irritability, restlessness and disturbed sleep are frequently observed in these cases in whom the eliminative processes were at all stagnant. These symptoms, certainly evoked with exercise.

(6) Special.
(1) Brethlessness:
It may not be possible to any great ease to prove the cause of Brethlessness which is so constant an accompaniment of Cardiac insufficiency.
When it comes from this cause it is simply an index of the failure of the heart to supply a sufficient oxygenated blood to the Respiratory Centre. One of the constant features of the cases under review was that the symptom was induced by exercise. But the physical signs of heart failure, indeed, physical signs of any kind were in many cases conspicuous by their absence; so that it was extremely difficult to determine its cause. Still from the evidence of impaired function of efficiency of the heart as proved by exercise tests it was legitimate to assume a Cardiac cause.

(iii) Precordial discomfort, Ancestris, Paris.

All degrees of this symptom may be encountered. Precordial uneasiness and discomfort; a sensation of oppression; contraction, and often actual distress are very common, occurring at one time or another in about 80% of the cases. The pain was often described as being of a stabbing character. The localization of the sensation so described was very consistent with its Cardiac origin; although the difference in its pain probably depended largely on the hyperemic state of the heart muscle in the case under consideration.

The area in which the sensation was experienced was generally and the left sterno-thoracic region, usually in the 4th or 5th space between the nipple and sternum.
Radiation was exceptional. As description of pain after the event are notoriously fallacious, and some check is essential, this is generally sought for in the presence of an area of hyperaemia. But as the pain frequently ceases with the ceasing of the effort which has occasioned it, this sign is not generally present if the case is to be cured. Time after time, it is seen for pain to persist after the cessation of effort.

The problem of this Viscero-cutaneous Reflex has recently been studied by Neher in Sweden who in the course of the examination of 100 cases who complained of 'Pain' (defined at stated), elicited hyperaemia in 48 instances. There observed cite an interesting example when the removal of a dental focus (appendicitis, cysts, tonsils) led to the disappearance of the previously hyperaemia.

Hence when occurring in the course of effort it is wise to refer to the term 'Pain', if at all, not even named as a warning signal of the presence of a damage of exhaustion of the heart muscle, in the interpretation of which new thoughts it is necessary to bear in mind the evidence of the nervous system both with regard to hyperaemia and the case under consideration.
Symptoms (continued)

(iii) Palpitation

Palpitation varies greatly in degree, and in the factors which induce its onset. It was complained of approximately 50 years ago.

In some cases it is most sudden, and is then produced by a sudden change of position, such as sitting down, which the patient has described as that he sensations of fulness in the chest followed by increased and forcible action of the heart, and respiration difficulty while it lasts, a description which has occasionally led me to suspect that the heart was in rhythm. That such sensations may be due to a rapid succession of contractions is very probable for we have observed a similar symptom anteriorly. The heart's rate may remain at a high level for several minutes, subsequently while the distinctive sensations abate. The cause is not clear; the visceral element suggests Blood Pressure, possibly a reflex increase of Venticular Pressure consequent reflex Acceleration of the Heart.

A sudden onset of Palpitation of a different type depends on emotional causes, the stimulus rising in the sympathetics. This may be very marked in certain types of cases where the tonic influence of the Viscera is impaired.

On the other hand, Palpitation is perhaps more usually of gradual onset and offset, occurring in the course of a day.
It is then dependent on the increase in the rate of the heart and the patient ceases to be conscious of the sensation when with the cessation of effort decline in the rate of the heart takes place. The heart's action reacts differently to different types of effort, and so does the sensation of palpitation produced. For instance in a given case a march of 3 miles may result in a steady pulse rate of 12 to 20 beats per minute, no palpitation results; whereas in the same case the act of climbing half a dozen times may produce a similar reaction—an increase of 60-70 beats per minute, accompanied by a more sensation of palpitation.

(48) GODMIXS & Fainting.

Goddins so complained of in about 60 to 70 years. It generally occurs after excitement, and is also fairly constantly associated with the early stages of disease. It is described variously by the patient as a feeling of light-headedness, blood return, a dizziness. In questionnaires, one elicits the fact that it is frequently produced by unusual changes. On rising from a reclining position, the vision becomes blurred, the head turns slightly, and a sensation of lightheadedness and unsteadiness is experienced. After a second or two, as with the lifting of a curtain, the ground clears and the transient sensation melts away.
The phenomenon described rises with state of health; it is excessively common after an illness involving depletion, and is an accompaniment of most 'fainting attacks' in initial stages. It seems natural to place its causation in Blood Pressure variations. And the Blood Pressure observations in patients in whom the symptom was elicited lend support to this, the fall of Blood Pressure which occurs on passing from the lying to the standing position being exaggerated in some of the cases examined. Certain observations by Lewis and his co-workers have seem to suggest that the same does not depend on these factors alone, for the symptom has been observed in patients who presented no excessive fall of Blood Pressure on standing. It should be pointed out that the Blood Pressure mechanism is liable to considerable variation in patients; presently the symptoms referred to and a fall which might appear normal in a healthy individual may be sufficient to produce symptoms in such a case.

Fainting attacks with loss of consciousness occurred in 3% of the cases in this series. A few cases occurred at the end of the event; in the others, the history was of 'fainting in panic', when the emotional factor seemed the cause.
Physical Signs.

General:

Evidence of defective physique was present in 30 to 40% cases. The dejected general condition was in many cases associated with signs of gastro-intestinal disturbance which the Dietetic Table shows was present in a considerable proportion of cases. A trail of: appetites, such as hunger, irritability, restlessness, loss of sense of well-being, generally described as characteristic of neurasthenia was frequently met with. But for fear of giving too wide a term, it might be suggested that many cases of so-called neurasthenia would be more truly classified as the organic process we are considering.

Two other signs must be referred to here, viz.: the change in the Blood & Urine.

(a) Blood. (i) The chemical changes in the Blood have been referred to above under 'Blisterness'.

(ii) Examination of the cellular contents has shown the following changes. (1) A considerable lymphocytes in the patients exhibiting the symptoms described. (2) A high lymphocytes count is a feature in these cases. (3) The white count variations noticed in patients than in controls. (4) A considerable rise - 38.6% in patients, as compared with 15.14% in controls occurred after removing the nerve gage due to increase of lymphocytes. (5) The severity of the symptoms approximated to the degree of lymphocytes. (iii) Attempts to find excreta from the blood for positive results.

The following is the summary of Dymond's investigations on the morning changes. 2 main types are described:

(i) When the acidity is increased - 60% of cases, ammonia is increased, and of this, uric acid, amino acids account for 70-80% (normal 10%).

(ii) When the urine deposits phosphates on cooling. Ammonia is normal, but amino acids account for 30-50% of it. After exercise, the acidity falls temporarily, but 1-1½ hours later there is a great rise.

Taken into consideration with the decrease in urea, Dymond suggests that the cause might lie in a disturbance of the liver function.

(iii) Signs: Cardiae.

Dyspnea, Pulse in, Sigo, Heart Sounds, Rhythm, Rate, and Response to Effort.

1. Diffuse Cardiac Pulitation: was present in a certain proportion of cases (30%), but in only a small proportion was it considered to be associated with enlargement of the heart. The position of the apex above the left nipple line, and definition of the limit of cardiac dullness to the left being the main criteria followed. It was not always easy to decide which chamber was involved: diffuse pulitation if well marked to the left was taken as a sign of involvement of the left heart in the majority of instances.
And it seems to the Right of the esophogus process as evidence of Enlargement of the Right Heart. The importance of the correct interpretation of this sign has been referred to by Professor Russell in a recent article (loc. cit.)

The relation of diffuse visible Cardiac pulsation to Enlargement of the Heart has been questioned by recent application of the Orthodiaphoric method which is the most precise we possess. This method has shown that when a diffuse impulse is present, Enlargement of the Heart is not necessarily associated therewith. To interpret the sign, therefore, we must postulate either an abnormal thinness of the chest wall, or an altered position of the heart in which the Right Ventricle is brought into closer contact with the chest wall, or a more uniform movement of the heart. This sign may be well marked in some cases of ‘Kumis’ in which no increase in the size of the heart can be detected.

Larsen’s observations have showed its prognostic value, and according to them no differentiation between the cases who present this sign and those who do not, so far as return to duty is concerned. This is admitted by little value, but it may be estimated that this and cardiac signs, it should not be judged alone, but in its relation to the picture presented as a whole.
Size of the Heart:

It would appear that enlargement of the heart as ascertainable by clinical signs was comparatively rare, occurring in 10% of the series under consideration.

As to the clinical significance of dilatation of the heart, it might be taken to be no the cause of the cardiac disability, but the result thereof. We must postulate a cardiac insufficiency which is in a state of hypotonia, or fatigue, or involved in a process of toxemia or disease before dilatation takes place.

The rate of the dilated heart is generally increased, and a vicious circle in maintaining the cardiac varied. The clinical problem which physiology sets us is to diminish the work of the heart, and consequently to maintain an efficient coronary circulation. (The physiological bearings of these two factors have been considered in Part II.)

3. Alcortini in the Cardiac Sounds.

The variations met with in Cardiac Sounds are many and open to diverse interpretations.

1. Alcortini in quality—un accompanied by Marceria.

In Type I of the Post-Toxemia Syndrome the alcortini of the 1st sound become of the form of being prolonged or lacking in definiteness, in some cases merging with a soft systolic murmur. The 2nd is often prolonged, and diastolic "cuetis" too frequent.
In the For Learrie-type, the 1st sound is short, sharp, and snapping. The diastolic phase is shortened (associated with the "swelling in rate," which occurs at the expense of the diastolic phase), and the 2nd is often sharply accentuated. This characteristic may be well marked in the so-called "irritable heart."

From the physiological point of view these alterations may be looked upon as an indication of change in the tonicity, contractility, and well as in the excitability of the heart muscle.

When duplication of the 1st sound was pointed at the apex, it was held to be an indication of the presence of a valvular disease. Similar evidence occurred when the duplication took place to an unmistakable presystolic beat at a future examination.

A Note on the Question of Murmurs and their interpretation is the more class of murmurs with refer to their clinical significance and particularly with refer to "Physiologic" is frequently a problem attended with some difficulty.

From one point of view, such murmurs may be physiological, functional, or organic in nature.

The term "Physiological" as applied to a murmur is strictly speaking a misnomer. It is used by some authorities (among whom is Dr. Karl Kraehnke) to imply the fact that it occurs in hearts which appear quite healthy otherwise, and in whom the murmurs hitherto is not imputed.

(No further text is visible in the image.)
The term 'Functional' is used where it is considered that no permanent structural alteration has taken place, but that some cause such as a diminution in the tone of the cardiac muscle has permitted of slight relaxation of the apparatus controlling the valvular orifice.

Other explanations for murmurs systolici in time at the apex are concerned with such physical phenomena as the driving out of the air during the systolic action from an engorged cephalic vortice. (Albott). Murmurs in the apical or Tricuspid area, systolici line, however, evidence need consideration. As far as they are evidence, if of organic origin, not only of a lesion in the valvular mechanism of the heart, but of the irritation of the heart by a disease-process, involving the possibility of the heart muscle being affected simultaneously; and, if not associated with permanent structural changes, as evidence of myocardial hypertonia or in some cases, of myocardial disease. As a result of the deranged valvular mechanism in either case, changes in the normal blood currents are produced, imposing an extra burden on the heart and resulting in an increased expenditure of energy. Other things being equal, it is reasonable to expect that the process of fatigue will set in at an earlier date in such a heart, and the physiological optimum volume may be reached a vicious circle then likely to start.
From the mechanical side, if a lesion of a valve is
induced experimentally, this permitting of a sudden
alteration in the Blood Current, and in the intra-cordic
pressure, the Heart adapts itself at once by dilatation.
It's 'suffuse force' is thus exceeded upon and a
decided change which may not be apparent for a
long period thereafter, depending on the physiological
condition of the myocardium is produced in the Cardiac Tissues.

It appears a legitimate deduction therefore that although
a murmur due to murmur may not be a cause of heart
failure, it introduces an added burden which may
be an important factor in accelerating that event.

Abstract from the Report - Original Data y cases presenty:

<table>
<thead>
<tr>
<th>Type of Case</th>
<th>Good Results</th>
<th>Fair Results</th>
<th>Poor Results</th>
<th>Class</th>
<th>A</th>
<th>T</th>
<th>B</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case presenty: no murmur</td>
<td>5</td>
<td>10</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>2</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Functional</td>
<td>6</td>
<td>14</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>13</td>
<td>2</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Organic</td>
<td>3</td>
<td>15</td>
<td>5</td>
<td>6</td>
<td>-</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From the above table, when the presence of murmurs were
taken into consideration, the important difference is observable
between the 3 groups. In the Permanent 3. categories, the
no-murmur group comprises 5.6.5.2; in the murmurs group 7.4.9.

Davis has analyzed the caliber of discharges in
case of murmurs, (the flow 4.5 dimensions) and in
cases presenting no murmurs. Of cases presenting no murmurs...
(cont.)

8 cases presenting no murmurs 13.5% returned to full duty 18% were found to be unfit.
8 cases presenting murmurs 14.2% returned to full duty 29% were unfit. The fallacies in such a generalisation is obvious as too severe to permit of their being used as evidence.

3. Rhythm alterations.

It types are amply met with (a) Respiring Irregularity (b) Dicrotic Pulse - Atrial Fibrillation was found in 2 cases.

(a) Respiring Irregularity:

This type of irregularity is present as a physiological sign in the heart up to the age of 20 or some years after (maturity). It is due to respiration, a slight increase in rate accompanying inspiration, and a decrease occurring with expiration. It is best alleviated by announcement.

The influence of infective disease in the heart has an important bearing on mortality. This is mediated, for it is found to be well marked or exaggerated in the course of recovery from some illness with infective nature. It is referred to some authorities when occurring under such conditions, pulse rate that being increased, as a sign that the heart has escaped infection.

In the analysis of this irregularity two main eliminations are necessary: (a) Cases over 50 years of age. (b) Cases with a Pulse Rate of 110 or over.
The following summary embraces the factors that have appeared of importance in estimating the clinical significance of this sign:

(i) Age:
The respiratory inequality declines after the age of 26, and in the majority of cases is absent after 30. But (a) when a recent infection has occurred it may be present after 30, and has been present in some instances up to 36 years of age. (b) In cases of Marasmus, especially when the action is of the torpid style, it may be absent after 30.

(ii) Pulse Rate:
The significance of the inequality becomes fused with the Pulse Rate. The presence of this sign in bell manes with a pulse of 80-90 in a case where recent infection has occurred is of profound significance. If the Pulse Rate is over 90, other factors must guide the diagnosis.

(iii) Infestation:
It is relatively frequently present in the cases fusing a history of Infestation. When the Infestation has recent 80% of cases (within the age limit) form a positive result. When the Infestation was remote the proportion was from 40 to 50.

(iv) Dilatation of the Heart, or Defect in Skeletal Tone. When there is muscular hypotonia, or when dilatation is present, the inequality is but faintly present or it may be absent. If however a history
(continued)

If a history of infection is present, especially if very recent, the sign may be well marked without any clinical sign as above-mentioned.

(v) Varicocele:
In 20 cases analyzed, the sign was well marked in 10 or approximately 50%. In this condition, clinical significance is negligible. Extravagations of varicocele are usually associated with marked respiratory distress.

(vi) Organic Disease of the Heart:
It is absent in cases presenting inorganic nervous disease. It was present in 25% of cases of valvular disease of the heart. It is frequently seen in old valvular disease when a recent infection has been suspected. With a pulse rate of over 90, it is then of great prognostic significance, density that the hyposthenia is not purely functional.

(c) The Echocardiograph
The clinical significance of this sign is still somewhat obscure, and further observation, especially with regard to after-infection, is necessary. It is refused by some clinicians as being of little importance if not the cases in which it occurs. The response of the heart to effort remains unchanged. But such a prognosis does not lack sufficiently far into the future.
The following is a short analysis of the cases in which extrapyramidal occurs with frequent frequency in the series under review. Their Reaction–Disposal Table is given:

<table>
<thead>
<tr>
<th>Age</th>
<th>History</th>
<th>Reaction</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>(i)</td>
<td>Rheumatic</td>
<td>15</td>
</tr>
<tr>
<td>29</td>
<td>(ii)</td>
<td>Diphtheria</td>
<td>9</td>
</tr>
<tr>
<td>33</td>
<td>(iii)</td>
<td>Diptheria (Rheumatic)</td>
<td>4</td>
</tr>
<tr>
<td>34</td>
<td>(iv)</td>
<td>Non-specific</td>
<td>6</td>
</tr>
<tr>
<td>35</td>
<td>(v)</td>
<td>Enteric group</td>
<td>3</td>
</tr>
<tr>
<td>36</td>
<td>(vi)</td>
<td>Gas effects</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>(vii)</td>
<td>Emphysema + chest</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>(viii)</td>
<td>Acute on isom.</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) 73.8% were under 30 years of age. Extrapyramidal symptoms are not uncommon from the age of 30 upwards; but cases so far the cases were found, they were rare. Rheumatic fever alone furnished 80.7% of the whole. (b) 26% of the cases were found to have symptoms of rheumatic fever, and 10% of that to have only.

Thus are certain reasons why the presence of extrapyramidal symptoms should be seriously considered when forming a prognosis in any such case. Among these are the following:

1. The presence of extrapyramidal in the course of acute infections, e.g., Rheumatic, Diphtheria, Pneumonia, when we have good collateral evidence that the brain may be irremediably affected.
(ii) The evidence so far presented here: viz that a history of infection is obtainable in a considerable proportion of the cases, while although the connection is not as direct as in the case where the epispadias appeared in the curse of an infection, there are strong reasons for regarding it in the light of cause effect.

(iii) The fact that ectopytosis may in some cases be exceedingly numerous after exercise, and occur persistently with effort - the cases in which this occurs being a poor reaction as a rule.

(iv) The fact that ectopytosis or amnion after middle life when changes go on determining factors are known to begin in the myocardium.

(v) In some cases, in whom ectopytosis was present, the subsequent onset of Arrhythmia Fibrillata was observed. This may be only a coincidence, but is noteworthy.

(vi) The experimental evidence of ectopytosis first clearly shown by driven by stimulating areas of the Annimali semilunares removed from the pacemaker. The direction of the rhythm from the normal area may be only temporary; on the other hand, when the conditio is constant the efficiency of the heart is improved.

The Rate of the Heart and the Response to Effort.

In cases presenting the Post-Tetralogy Syndrome, the rate of the heart in its response to effort is affected in 3 ways: (1) There is an increase in the permanent standing rate; (2) an augmentation of the immediate response to effort; (3) a prolongation of the period of decline of the rate of the heart after effort.

The factors which produce these effects are the increased activity of the accelerator mechanisms, and an impairment in the tonic influence of the Vagus to the tonic inhibitors of the latter. The normal chief decline is due.

(i) The Permanent Standing Rate.

This is difficult to determine with accuracy. In the few cases examined it was raised above normal, it being rare to meet with a rate greater than 80. In 300 cases analysed the figures were as follows:

<table>
<thead>
<tr>
<th>Rate</th>
<th>70-80</th>
<th>80-90</th>
<th>90-100</th>
<th>100-110</th>
<th>110+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>117</td>
<td>93</td>
<td>60</td>
<td>20</td>
<td>300</td>
</tr>
</tbody>
</table>

(ii) The Effect of Effort on the Rate of the Heart.

(c) Immediate increase.

The immediate increase in the rate after exertion is in excess of what occurs in a healthy heart; but in addition to the factor of diminished Vagal tonic influence, the high post-exertion rate is partly responsible for this result.
Thus, as seen in the following table, the ratio of increase with the pulse rate as also the time of decline:

<table>
<thead>
<tr>
<th>Pulse Rate</th>
<th>Ratio of immediate increase (1st 10th min)</th>
<th>Time of Decline</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-80 (control)</td>
<td>1 : 1.40</td>
<td>2 minutes</td>
</tr>
<tr>
<td>80-90</td>
<td>1 : 1.48</td>
<td>2+</td>
</tr>
<tr>
<td>90-100</td>
<td>1 : 1.56</td>
<td>3+</td>
</tr>
<tr>
<td>100-110</td>
<td>1 : 1.60</td>
<td>4+</td>
</tr>
</tbody>
</table>

The increase in the standing rate and the prolongation of the period of decline are the important factors in the heart. Thus so far as the cardiac economy is concerned, an exaggerated immediate response may occur in a heart which was quite healthy and is met with occasionally in an efficient athlete's heart.

6) The period of Decline

Considered from the point of view of the economy of the heart muscle, the re-establishment of the pre-excitonic rate offers a favorable prospect with the current within a certain point of time if the pre-excitonic rate was not overly increased. This factor is of considerable importance in estimating tolerance to continuous effort, and if used in conjunction with other criteria provides a useful basis of opinion on the condition of the cardiac mechanism post-excitonic.
Section IV.

Pathology.

Summary of evidence of pathological changes in (1) Nervous system, (2) Circulation, (3) Muscles of metabolism, and (4) Nervous system.

(1) Nervous System.

(2) Evidence of functional disturbance in the nervous system are occasionally a common feature. Thus, the men may exhibit a degree of susceptibility to functional disturbances, thus sometimes of the type met with in cases so-called neurasthenia.

(3) Disturbance in the vascular mechanism lead to the subjective phenomena of vasodilatation, and are sometimes attended with symptoms in the peripheral circulation and is associated with the Cap Renous syndrome. The spinal cord is frequently in such cases para and evidence of debility are marked.

(4) The condition of hypersensitiveness of the central nervous system is probably associated with increased irritability in the spinal cord. That the central nervous system may be involved in an infective process is well known, but the frequency with which this occurs has been emphasized by the important work of Orr and others. Thus pains in the Cutaneous area to the tenderness in pressure of skin and muscles of the psoas may be accounted for.

Orr MSS. Journal Woodcut Press 1918.
(a) Increased muscular contraction; excitability of the peripheral nerves; twitching, tremors; increased reflexes are occasionally observed. This reaction of the neuromuscular apparatus is analogous to that shown under the influence of certain toxins of the sympathetic system. The mechanism controlling the secretory neuro-endocrine glands is likewise hyperexcitable as evidenced by the increased action of the sweat glands.

(b) Vagus Sympathetic
The acceleration of the respiratory impulses is probably due to an effect on the vagal terminals, as is also the slow return of the pulse rate after exercise to its pre-exercise level. The results of atropinization of controls and patients does not indicate any alteration of vagal tone. The accelerated cardiac rate appears to depend mainly on a excitation of excitability of the accelerator mechanism. There is evidence that the cause of this reaction is the sympathctic system, and not merely in the fact that the heart is more susceptible to sympathetic stimulation.

(2) The Circulatory System

(a) The Blood
In nearly all cases presenting typical symptoms examined by means of a technic known as present which was mainly increased by exercise. The lymphatic pathway predominating.
Bacteriological examination of the blood failed to produce evidence of Bacteremia.
In the chemical constituents in certain cases presenting breathlessness as a main symptom a decrease of buffer salts such as Sodium Bicarbonate, Sodium Phosphate existed.

(b) The Heart.

(1) The indications of alternation in the nervous control have been allowed to. The slow decline of the Pulse rate to its pre-ventricular level is due partly to vagal partly to sympathectonic disturbance. Assuming an increase in sympathectonic stimulation it is known that the effects following such stimulation persist for sometime after cessation of the stimulus. In two particulars the Vagus furnishes evidence of being affected. In the respiration respiratory irregularity which occurs in many cases under 30 presenting a history of recent infection; and in the respiration of the heart which occurs in some cases of fainting.

It has been found further that the heart in a certain number of cases is vulnerable to adrenaline. It has not been definitely proved that the amount of adrenaline in the Blood is increased in these cases. But should there be an increase as is suggested by some recent investigations, under occurring under conditions of emotion, pain or protracted effort, it's augmentation in sympathectonic actin would be an added explanation for some of the phenomena observed.
(ii) Enlargement of the heart occurs in a small proportion of cases, and is conditions by the quality of tone of the heart muscle; by stasis induced by fatigue or toxemia, and by morbid processes in the myocardium. Dilatation beyond the physiological optimum is a tell. The heart is very susceptible.

Although pathological confirmation is not available, there is reason to believe that focal irritations exist in the myocardium in some cases, and that some of the variations in rhythm and irritability may be caused thereby. The history of infection in cases that present persistent extrasystoles is suggestive, as is also the subsequent development in such cases of such lesions as types of altered rhythm or Atriales Filadelfia.

No conclusive evidence is obtainable in early cases from instrumental or electro-cardiographic observations of myocardial disease.

(iii) The vasomotor mechanism is frequently in a state of irritability. Flushing is normal in some cases, but no evidence of retardation of the circulation through the systemic vessels is obtainable. Sparing of blood in the arms channels is sometimes present. Important variations in the veins reflex pressure thereby result. Variations in blood pressure may be very marked. In many cases the systolic pressure is usually raised after exercise. Pathological muscular ataxies are present in a considerable proportion of the cases.
The organs of Metabolism & of Internal Secretion.

The relation which changes and alterations in metabolism bear to some of the altered states observed in the blood and urine has not been definitely settled. Thus in organs such as the liver, kidney, which regulate blood-alkalinity, a certain amount of evidence of metabolic transference is at hand. The urine shows a marked increase of amine-acids and a diminution of urea which as suggested by Ommund may be due to a disturbed function of the liver in failing to deaminise the di-amines and arginines. The effect provence on the quality of the urine is also suggested. And the role of Basichrom & Tannin in the effect of adrenalin on the portal pruimen indicates the presence of a circulating block through the liver. The result which is to produce convey stagnation in the large vein channels may be an important clue in the elucidation of the facts of "exhaustion".

Thyroid.

An increase in the Internal Secretion of the Thyroid has been held the responsible for those symptoms which have been described in some of the cases of the present series. That these cases do not present manifestations typical of Hyper-Thyroidism as occurring in Graves Disease is admitted. On the other hand we know that the activity of the Thyroid gland is increased in many Toxicum Conditions, and increase which may occur without any obvious signs of enlargement of the gland.
Indeed visible enlargement is no criterion as shown by W. Nee & Dunn who dissected the Thyroid glands of men who died from various causes in action & in whom no visible enlargement existed, the weight being found to be much in excess of the accepted normal.

The supra renalis stands in an analogous position with regard to the increased intrarenal glomerular which has been shown to take place under certain conditions 1 as might frequently obtain in men of the type presented by many of the cases here considered. Then might be a certain condition induced by toxic renal condition which renders the organ identical to adenalin - Brunner 2 in researches on the perfused heart has shown that the action of Adenalin is either depressor or augmentor according to certain conditions, the most important of which would appear to be the Calcinio content of the Blood. In view of the known importance of Calcinio as an excitator - factor, the condition of altered Calcinio metabolism of which the same affords evidence in many cases might explain the condition necessary for the adenalin intolerance described.

In conclusion, from the pathological and clinical evidence, it would appear that either as a result of toxemia, or of metabolic changes which we are at present unable to supply all the links in the chain of disease but which are probably induced by the toxemic agencies, a train of symptoms or signs are produced, manifesting a clinical picture with manifestations varying in degree in certain somatic tissues, but which may be regarded as possessing a common etiological basis in a history of an infective process. The condition ensuing may vary from such slight disturbances as presented by some of the milder cases described, through phases with apparent symptoms and impaired cardiac capacity, to one where definite signs of marked changes are present. The phase may be so incipient that the unity of the disease-process is not appreciated. Thus the pathogenesis of the Rheumatic form offers many instances which can be illustrated, and then to no doubt that in many of the cases of the condition described be an witnessing the early stages of organic disease. The degenerative changes of the myocardium that are occasionally seen after 60, or also the clinical degeneration that may occur at a younger age, also in all probability proceed from such origins. It would, therefore, offer a legitimate hope to entertain that in a recognition of these phases gouty as an early stage would become fruitful results in the elucidation of cardio-vascular problems.
Section V.

Prophylaxis and Treatment.

(A) Prophylaxis.

(1) General considerations.

Assuming that the underlying process in the condition described is trauma or injury, with possibly changes in metabolism, resulting. Therefrom, the Prophylaxis must be based on: (1) the possibility or otherwise of removing the cause; (2) if not removable, on a consideration whether the effects on existing or otherwise, and (3) the possibility of removing remaining causes and if applying successful treatment.

(1) If the source of infection can be localized and removed or successfully treated, the main symptoms may clear up. Such instances have arisen when a diseased portion of the faeces is isolated from the source of infection. This demonstration at all events that in its early phases, the causal agent has no permanent effects. On the other hand, and unfortunately more frequently, the source may be excessively obvious and defy all attempts at curing. The condition continues with sinister persistence. The gross changes stand revealed. Wherefore, the evidence does not lead to direct and early discerned source of infection, the Prophylaxis as to complete cleanliness should be guarded. This is especially so when changes in metabolism are evidenced.
Profuse (continued)

(2) The effects on the General and Circulatory System are at present inadequately known, and like the patho-physiological processes involved are elucidated, the factors in Profuse must remain obscure. The condition, under the condition, behoves one to weight frequent occurrence when universal appears to have set in. In the healing, considerable variability from time to time, is often a feature, and the capacity for effort may even be considerably restricted; yet, for reasons which are difficult to ascertain, symptoms may recur; and as time wears on the variations in Blood Pressure and slight hardening and thickening of the Elastic, especially when combined with a Rheumatic history or with evidence gallic acid metabolism in kidney or liver. Clear no doubt that only permanent changes have set in.

(3) As to the predisposing causes which have been alluded to under etiology two emerge as appearing gain-effective in the matter of Profuse - The physical training as induced by the physique, and the occupation. Analysis of history shows that with any sedentary physique and occupation one must get a kind of train to predispose to the various gain infectious process and fairly been so affected, the organism responds in non-effective fashion, it is with more difficulty cleared than the in which antecedents give different order provided. These facts although quite obvious must be taken account of in Profuse in every case.
(ii) Special Considerations affecting Prognosis:

We shall refer to the following points:

1. Past history as to training etc.
In addition to consideration of physique and occupation, attention should be paid to any rheumatic tendency in any previous.

2. The value of the infective element:
(i) The importance of the rheumatic process is recognised in any analysis made of cases of this condition. In the present series 42.4% of the whole returned to duty; in the Rheumatic group 26.1%.

When the history tells from Rheumatic contracted a considerable time previously, the prognosis is bad.

(ii) In case of Biphtheria and Influenza, there is usually no latent period as occurs in Rheumatic. If the virus while infected is carried, the prognosis is good. Very marked improvement has been observed in some cases, in whom recent Biphtheria existed of the heart; it seems likely occurs.

(iii) In the Intestinal group where the toxaemia from is localised to the tissues, the prognosis is fair. But frequently the condition may subside for a time with marked improvement only to recur at some later date, unless the disease has been completely removed in the first instance. Such cases are frequently seen when a known infective such as that proceeding from a dysentery since has been present.
3. Length of time since infection:
Generally speaking, the more recent the onset, the better the chance of combating its progress. And even when it is remote, stating for some time, the longer removed from the time of onset, the less likely will be the complete disappearance of symptoms.

4. Type I - General. Type II - Cardiac.
In the latter type with less general disturbance and better nervous muscular state, there is better tolerance of graduated training, and improvement is more rapid.
Cases in Group I as a rule get worse as the effort is prolonged. Those in Group II improve with effort of the kind.

- Group I: 47%
- Group II: 53%

The less removed, the general disturbance, the better the prognosis.

5. Facility with which symptoms are produced:
It may be found the main effort of rising, or performing some simple action such as steeping a few steps may be sufficient to produce such symptoms as dyspnoea, tachycardia, nervousness, or even a momentarily accelerated pulse rate.
Such a simple test provides a useful guide to the severity of the condition, but in all such cases testing needs to be prolonged.
(6) React in to Test-effect.

In interpreting the results of any test-effect the following factors are important: (1) The Permanent-standing pre-eustachian Rate (2) The Time of Decline of the Pulse-rate after Effort (3) The presence of Dyspnoea, with symptoms arising from the function of the labia in relation to Test-effect application.

1) If the Pre-eustachian Rate was not unduly high (under 90 per min.) and, if after a suitable Test the Pulse Rate Declined to the Pre-eustachian Rate within the stipulated time (as judged by clinical observation), with no Dyspnoea or other despicable emotion, the Prognosis in such a case is far as this Test goes is sound.

(Note. This observation is one of the factors besides the period of Decline of the Pulse after eustachian. It is usually stated that if the period of Decline is prolonged the Prognosis should be guarded, but that the converse is not the case. The finding has been in agreement with this observation when this is the only factor considered.)

ii) With a Pre-eustachian Rate of under 80, and even if the period of Decline is within the required time, undue moderate Dyspnoea, precordial weakness, in other subjective phenomena be present, the Prognosis should be guarded.

(iii) If the Pulse Rate is 90 or above, Decline to the Pre-eustachian Rate even within the time-limit, is not accompanied by symptoms, the high Rate should render the Prognosis favorable. For such a patient when tested will be found unfit for much or prolonged effort. The whole Prognosis, therefore, is favorable.
Profuse (continued)

(6) Treat ment will oft en be follow ed up .

(iv) If after the B ecklin T est , decline of Pulse rate does not occur within the time-limit, and if Profuse ro tten subjective phenomena are present, the Profuse is bad.

(1) Cases in which systolic murmurs are present are "acute." The type of case where difficulty arises is that in which a systolic murmur is present with maxima intensity at the apex, with no history or characteristic pointing to an organic lesion, where no obvious enlargement of the heart is present.

If in such a case the reaction is of the Ir retable type, with an exaggerated response to slight effort, the period of decline frequently occurs only partially, there Profuse is bad as to tolerance of effort as long as the condition is present. The murmurs in such a case must be considered as creating an additional difficulty. Hence in such a case the prophylaxis has to extend, it being itself as the type of case be an en- hising, an indication of an added myocardial distalization to time.

When on the other hand, a murmur is present in a heart whose sensibility is not increased, or pulse rate not raised at rest, considerable effort can be tolerated. But the pulse rate while the effort tends to higher than in a normal control, and the heart must be considered as more liable to fatigue which will set in sooner (than in a normal control) with prolongation of the effort than would occur in a normal control under similar conditions.
(B) Treatment:

(a) General measures—hygiene etc.

Certain factors in environment are of importance. Freedom from smoke, grime and anxiety; rest; physical exercise; and the encouragement of activity rather than sedentary pursuits are essential precautions. Light occupations such as gardening or workshop work would be great help to the majority. Many of the type that come within the province of the present study. It was new found necessary to prohibit smoking. Patients who experienced genuine discomfort from their symptoms if denied that smoking will act as an appetizing agent will voluntarily renounce their own consumption.

(b) Rest:

It has been a common experience that in the majority of cases rest in bed affords the curative. This is human experience, noted by some clinicians who still adhere to it. In some cases of the deleterious effects of rest in bed have been amply confirmed. As one would expect the response to effort after such a spell is invariably worse than before it. Two exceptions are made: (1) When the Pulse Rate is 120 or thereabouts, and subjective symptoms are present. (2) When Pericardial Pain is present at rest and aggravated by passive movements. (This is a rare exception.) In such cases, massage, deep breathing, the keeping of
an abdominal belt; a dry dieting with attention to
the organs of elimination and sleep; a short walk
in the cool at stated intervals, or rest in between will
meet the deficiencies of the present season.

(c) Special Measures.

(i) The question of Digitalis:
The administration of Digitalis has followed as a matter of course in
cases with manifest signs of cardiac weakness since
its introduction in the middle of the 19th century. This
was followed by a return to Digitalis, and the belief,
which had until recently remained unchallenged, that the solution
was only partial. Thus, it had been observed that it
was in heart in which the disease process appeared in an
advanced stage. When objective signs of failure were present
then Digitalis proved its most dramatic effects. When,
as in cases, when no gross manifestations existed, the
drug seemed without power to alter the condition. These
observations were partly explained when it was recog-
nized late that the action of Digitalis depended on the
nature of location of the disease process, the restriction of
the contractile rate in such conditions as Angina Pector-
alis being due to its action on the functional tissue
vessels where function is then impaired.

Then put in trial in cases such as an instance
where it is not improving the form of Digitalis Therapy
Digitals Therapy has been found to be without effect in reducing the rate of the heart, or in improving its response to effort.

(1) Alkaline Indications

Following the observation of the diminution of the buffer salts in the blood in certain types of the condition, alkalines such as sodium bicarbonate or magnesium carbonate were administered in large doses in chosen cases.

In many respects the clinical appearance of such cases resembled one of the conditions described by Cole as the effect of accidosis attended by anaesthesia. In particular the paradoxical phenomena were rather striking. But unfortunately although in a few cases temporary improvement resulted, no permanent effect was observed during the period the case remained under treatment.

(a) Graduated Exercises

Originally introduced for the purpose of helping in the further lifting working of patients, their therapeutic value has since been ascertained.

The exercises and their form have been referred to in the Introduction and in the appendix (a) and need not be further illustrated.

The results of the various groups to treatment by exercise may be summarized as follows:

(a) Exercise followed by marked improvement.

(b) In the Type II of the Post-Digitalis Syndrome, unless the heart action is unstable and Preaccidental distress Pain is provoked, improvement rate 11.7%.

The rate of improvement was high in the early days of the treatment. The condition has been noted as being improved. Improvement rate 11.7%.
Graduated Exercise (Continued)

2. Case of Diminished or Untrained Heart.
   Improvement rate 60%.

3. Cases where slight effects of strain are present.
   1. Cases of standing with an organic valvular disease with
      a Pulse Rate approximately to normal and no organic
      heart disease. Improvement Rate 12%.

4. No rapid improvement followed in
   1. Cases where anemia or other condition of the body,
      which is often inadequate.
   2. Cases where the cardiac condition is probably normal.

5. Cases where organic valvular disease is a suspended disease
   and a properly graduated plan known no harmful effect results.

(c) Exercise over harmful and should not be advised:

1. When Pulse Rate is over 120 in cases.

2. When my slight movements provoke discomfort, dyspnea
   and dizziness.

The patients should be tried in three phases and with
right confidence carefully made to start again from the
bottom of the scale.

Patients react differently to different types of
Exercise. Thus, a certain set of exercises such as one
of these may be tolerated successfully by
an individual who may not develop the necessary
stamina for a week, and vice versa. A patient may
tolerate a moderately long walk well in one a short hike,
or swimming action may cause distress.
With the more advanced type of service (as described in the first) route marches an undertaking. This produced a Race in which the capacity for endurance was increased.

Each route march was conducted in person, and complaints and signs noted. On examining the Officer's record thus obtained, it was clear that the record matrices should be carried on by the medical matrices which the same patient presented from time to time. It is obvious that the cause may be, it does not lie in permanent structural alterations, but rather to certain afevers which produce an effect in the vital reactions.

At the end of this period, which lasted in an average 2 months, according to a patient's Officer's record, (the kind of duty to which the case would be likely to return had to be taken account of to a certain extent) he was classified into a duty category as partially disabled.

[After anthrax: Unfortunately the evidence that was necessary to complete the records was not obtainable. Working in a phase when number of cases was considerable, one of the divisions from which a large number of the cases was derived being far from a distant front, while the observations were incomplete, no difficulties in attempting to trace cases less significant. Of them that remained (approximately half of cases) 3 months after this record was closed 16 had been readmitted away to their old disability. Of those approximately half returned to their previous category, the remainder being bound into lower ones.]
Summary and Conclusions.

1. Under certain conditions, a train of symptoms is produced by effort with characteristics as follows: Breathlessness, Palpitation, Preceding Discomfort, distress or Pain; Giddiness, Fainting, and Convulsion. These symptoms occur in cases in whom no organic disease can be observed.

2. An analysis of 500 cases presented symptoms and signs while undergoing muscular effort, and persisting after the effort had terminated, brought into prominence a group exhibiting the symptom-complex as described above in whom a common basis resided in a history of Infection, either recent or remote.

3. Such a history obtained in 76.6% of the whole series. The Rheumatic group comprising 26%, and other Infectious and Toxic conditions 50.6%.

The Remaining Cases in the series of 500, or 23.4% were classified under: (a) The Insidious Heart. (b) The Effusive Stomach. (c) Nervous. (d) Old-standing Organic Disease of the Circulo-Vascular System.

4. Of the 76.6% in whom a history of Infection obtained, in 48.7% the onset of the symptoms was directly referable to the Infection; in the remainder, or 27.9%, a varying interval of time had occurred between the date of infection and the onset of the first symptoms.
5. The group aforementioned stands out clinically in two types: (1) Those cases in which the condition appears to be general in its effects on the system—refers to a Type I; and (2) Those cases in which the cardiac phenomena predominate. In this group the symptoms of a general cardiac although not absent are inconspicuous—refers to a Type II.

6. In both types the symptoms are produced with undue facility by effort. In Type I, breathlessness, Exantheme, giddiness, and occasionally fainting in order of frequency. In Type II, breathlessness, delirium,增值 enfermedad, distress or Pain in the order named.

7. It has not been found possible to divide the cases into groups according to the nature and character of the infecting agent. The only infection that produces effects with characteristics of its own is the Rheumatic fever, and that only in its later manifestation. In the early phases these characteristics are not conspicuous.

Evidence of deranged metabolism exists in a certain proportion of the cases. But in the present state your knowledge the separation of these cases into a definite group has not been found possible.

8. Whereas Infection & Toxemia appear with in a proportion of cases disturbances of metabolism induced thereby stand out as the main physical factor, certain predisposing elements are important. Of these, defective physique and inadequate training in youth, as the sedentary nature of the habits and occupation are of importance in that
8 (continued) in that they not only predispose to, but aggravate the condition when developed. Among aggravating factors are strain, tobacco, alcohol and sexual excesses.

9. The following are the features among the symptoms and signs which appear to be worthy of note:

(i) Breathlessness has been found in a certain number of cases to be associated with a decrease in the buffers salts of the blood. An intolerance to 
CO₂ thereby results.

(ii) Pain is relatively infrequent. Preceding nausea and discomfort are extremely frequent. They are often associated with a hyperventilating central nervous system, and do not necessarily imply an exhausted myocardium. When severe these symptoms are induced by effort. They should be accepted as a signal for the reassessment of the patient.

(iii) The Blood Pressure exhibits considerable variations in cases of this group. From this cause probably arises giddiness, precordial or after effort. A rise of systolic pressure associated with thickening of the arteries is occasionally met with in an unmasked form at an apparently early age in at least some cases.

(iv) Under conditions of muscular effort in patients the symptom giddiness or even faintness is among the commonest referred to. It is frequent in the Type I referred to, where it is associated with a debilitated cerebral condition. It is a symptom rarely referred to in the vegetative system and is seen as a sequel of preciosity.

(v) The immediate high increase of the Rate of the Heart after any exertion appears to be due to increased myocardial action.
Q. V. (cordemia)

A diminution of vegetal tone although not proved to exist, is probably also an important feature. Further, the heart appears to be intolerant to the actinic quiescence which is known under certain conditions of muscular effort and pain to be found in the circulation.

The slow return of the Pulse-Rate after resumption of pre-existent Rate is due to relaxation in the establishment of vegetal control, and partly to the fact that the effects of the sympathetic stimulus persist for a considerable time after the stimulus has ceased to act.

(10) The respiratory irregularity which is present as a physiological sign up to the age of 20, and is due to reflex influence is frequently present in an exaggerated form in cases presenting a history of recent infection. Thus 88% of the cases within the age limit possessing such a history exhibited the irregularity in marked degree. When the infection was remote, the proportion was 40-50%.

The clinical significance of this sign was found to vary with age. (9) Pulse Rate (10) Infection (12) Enlargement of the Heart (5) Menorrhea (6) Organic Disease

(11) The importance of the sign varies with age and the history of infection. Thus in an analysis of cases presenting the sign 66.6% furnished such a history, the Rheumatic group representing 35.7%.

Certain reasons are advanced why the respiratory shows test be interpreted as in sometimes taught in forming a prognosis in any given case.
10. Enlargement of the heart was present in approximately 15% of the cases. It was conditioned by the quality of the myocardial tissue, and the presence of the products of fatty or the action of toxic symptoms.

Dilatation beyond the physiological optimum was very exceptional when the factors abovementioned did not obtain.

(b) In this connection, reference may be made to the ortho-
chirographic findings in the estimation of the size of the heart. Which showed that at the rest of exercise, the size of the heart
lies in patients the presented few symptoms actually diminishes.
This appeared to be a normal reaction, for in patients within
symptoms were marked. This diminution in the size of the fa-
does not observe.

11. Difficulties is frequently experienced in the interpretation of
murmurs in the auricular region systolic in time.
Such murmurs are generally the effects of abnormal condition,
and not the cause thereof, and it would appear a delib-
erate deduction that although any given murmur is ob-
viously not a cause of heart failure, it introduces from
a consideration of the evidence clinical and experimental,
an added burden which may be an important factor
in accelerating that event.

12. Cases of organic disease (15% of the series) are included in
the occurrence of these fatal toxemic effects.
as representing the advanced stages of the same disease-process against which the early and milder phases can be seen in Types I or II described. Inasmuch as many cases in this early phase eventually show evidence of changes of permanent character, the exclusion of cases of so-called chronic course after death from a consideration of the disease-process as a whole would leave the clinical conception incomplete and inadequate.

13. The pathological effects so far as would not produce evidence of widespread changes. Thus the blood and urine show instances of altered metabolism in which the liver and kidney appear to play a part, as also such organs as intestinal secretion as the thyroid and suprarenals.

14. From a consideration of the symptoms and physical signs alone, it is frequently impossible to arrive at conclusions of practical value for the purposes of prognosis or the estimation of the effect of the capacity of the individual. A simple test-effect of measure employed initially and supplemented by observation of the response to other specific experiments.

In this test importance is laid on (1) The standing Rube Rube. (2) The immediate reaction of the heart to a Rube-effect. (3) The time of decline of the Rube Rate to the Rube rate after a Fair Effect. (4) The presence of otherwise of dyspnoea, prostrated movements or pain, giddiness or any other sensations.

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15. Considering the Reaction of the Sepsis as a Whole to Effort, it has been found generally that cases of the Type I. disclose

infectious prolonged effort badly, symptoms of tachycardia, etc.

infiltration; whereas cases of Type II., where the general condition is not markedly impaired, as a rule improve under a moderate gradated degrees effort.

16. The Profusion depends on the following factors:

(a) Previous history as to Training, The condition of the Physi.

ology & The type of occupation followed. (b) The Type of defect.

- how much of time since Injury. (c) Whether the condition is of the Type I Genus or of the Type Cardia.

The presence yearly organic changes. (d) The facility with which symptoms are produced. (e) The Reaction to Rest.

-effort, and to graduated Exercies.

17. Graduated Exercies remain the chief anchor of health. They can applied in all cases, except when (i) The Pulse Rate is unduly high, and dyspnoea a common feature (ii) The Postural Pain is present at rest.

The observation was frequently confirmed of the Valsalva's effect of Rest in the large majority of cases.

18. The followings Sepsis react well to graduated Training:

(i) Cases of the Post-Toned Sepsis Syndrom Type I. Cardia Reckard.

(ii) Cases of Tachycardia and Untrained Heart.

(iii) When slight effects of strain are present.

(iv) When old-standing organic disease without functional in.

filtration is present.
(ii) Only slight or limited improvement was observed in
(a) Cases of Type I - Severe disease, where the mental
condition was improved and a state of Debitility might be
said to exist.
(b) Cases in which the Cardiac condition is partly normal.
(c) Cases of organic valvular disease with superadded
infection.

The last two are particularly unfavorable types, but in
all others in those of the disease are cleared or healed.

(iii) With regard to cases of myocardial disease few observations
were undertaken before than have been made. The benefi-
cial effect is undoubtedly when (a) no cardiac symp-

tom is present. (b) Residual distress and pain
are absent.

Unless these cardiovascular are of a pronounced degree
never it would be a mistake to assume "Rest" in
such cases; for the application of conspicious rested
effect, quite apart from the improved function; reestab-
lishes the patient's confidence and helps out
the only hope of attaining any success in treatment.
In the Appendix that follows reference is made to:

The structural features and the fault testing and training are briefly described.

2. In Appendix B: Extracts from a few test sheets on those from cases being on the Post-Examiners process: refers to:
   (i) Two cases illustrating Post Examiners Effect Type I, when the Condition of the System as a Whole is affected and the effects would appear to be widespread.
   (ii) Case illustrating the condition when the Condenser System would appear to be mainly involved.

   (iii) Condition when it is difficult to decide if permanent structural alterations have occurred.

   (iv) An example of permanent changes in the bubbles from the long standing without benefit of the condenser.
Appendix

1. After usual data as to age, service at home or abroad etc., enquiring is directed as to Nature of Complaint, the immediate cause of referring, etc. In the History and the circumstances under which the symptoms were first experienced.

2. (a) Present History: Training, habits, occupation, tobacco etc.
   Family
Family

Present Health: Especially as to history of infectious recent or remote.

(b) Effects of Training: Effects on skin; illness since enlistment.

3. General Examination: Attention to following points:
   Physique a muscular development, weight, color, temperature, size of organs, peristalsis, abdominal, intestinal, and renal, palpation.
   (The patient lying member, Major Examination)
   Pulse: Rate, Compulsibility, Cauda of anterior caval (noel)

4. The Response of the Heart to Effort:
   (a) Postural: Reaction of the heart due to change from recumbent to upright position, effects such as diuresis, profuse perspiration.
Test Exercise (continued)

(b) Accurate permanent standing Rite. Several cards necessary.
Test: The patient is made to walk down up to 50 steps. The
Pulse is counted immediately after in 90 minutes. This in-
mmediate increase in the length of Time is decline from accurate.
Symptoms during after Test of first importance: E.g. Laboured
in Cerebrospasm to Queasy Breathing; Cold; Obrous Diction;
Sensetive & Paroxysmal Jolts; Dizziness or Pain; Palpitation;
Giddiness. Development such as Respirations, or other change
in the character of the Pulse. Development of Bonini's Bradyctyly.

The following Grades of Reactivity were adopted for Raleff Classi-
fication:

1. Pulse returns to normal level within 2 minutes. React
atonic; no labored. No sensations or disagreeable feeling. "Good React.
2. Pulse returns to pre-existing rate within 3 minutes. Res.
reactive slightly labored; slight Palpitat. but no unusual
cardiac sensations. Considered to be a 'Fair React.'
3. Pulse not returns to pre-existing rate within 5 minutes;
Respirations labored; labored; Paroxysmal Diction; Pain.
Slight Atrocious etc. Considered to be a 'Poor React.'

An important consideration in the application of any
Test Exercise is the permanent standing Rate which is of
more value than the Rate of the Heart during, Resency.
The value of the Test resides in the constant evidence of
The Reactivity of the Heart as proved both from a study of
the behaviour of the Pulse, and from subjective symptoms.
Any Test yielding a constant of these subjective facts
must yield fallacious results.
(1) Response to a gradual system of Exercises & Training.
The system employed will be as described (The system followed at the Military Hospital at Hampstead was that adopted)

Exercise A. (15 min.)

Heels raise, feet close.
Knee backward bend.
Knee forward bend.
Knee raise; arms bend.
Arms upward stretch.
Trunk turning a bending,
Foot sideways place.

Exercise B. (15 min.)

Heels raise, knees bend.
Arms sideward stretch th.
Trunk Exercises as in A.
Side march.

Exercise C1. (15 min.)

Heels raise, knees bend.
Arms stretching.
Trunk bending as before.
Side march.

Exercise C2 (15 min.)

Arms Trunk Exercises as before.
Knee raising.
On the hands down (Postural matrix).
Side march.

Finally, after 10 days of the Ambier's ARTS exercise, patient was able to undertake C. Q. A - the knee raising & there

Deep breathing and Rest between the Exercises as indicated.

Exercise D. (30 min.)

(a) Heels raise, knees bend, arms stretched. (b) In the hands down & arms.
Arms stretching & trunk turning.
Foot & leg place, sideways.
Lying on back or leg raising.
Side march.

Knee raising, Omar march.
An alternate feet high.
Kneel & jumping.
The transition from ARTS to C.R. is very slight, but Bacnia 0 who disease markes of considerable repair. After about a week of C.R. the enzime case is able to maintain B.S. with D. Bacnia route success can then be poor. The most common route is found to be the 'bypassing lymphoidkomple,' since cases which can tolerate a fairly long march may remain not to the end unable to perform such activities. Dysfunction in B.S. is common.

Route marches:
If patients can tolerate most of the Bacnia in D. Bacnia, they are taken for a route march at first, with varying extent varying from 2 to 3 miles. This usually begins after they have been 6 weeks under treatment. These marches are principally of value for restoring the mind's confidence in their powers, as also for the purpose of placing them in activities suitable to their new needs limitations.

Rest for an hour is usually required after the performance of a route march, or in a march. But sedentary habits are discouraged & the men are advised to take part in some light occupation. James over the minds of their prescribed courses.
Appendix B.

Notes from Case Sheets illustrating the Pre-Tetanic effect Occurred:

The following 2 cases are illustrating the Tetanic process.

   Patient complained of exhaustion, shortness of breath, feverishness after effort.
   Followed shortness of breath much worse. Duration: 3 months. RH occupied.
   Chest: Sherrington shows pales. Frequent attacks of Tetanus.
   Youth. After subst was broken into a room an hour or so. "No actinic fever. Two months ago another
   attack of Tetanus, after which he felt much worse." Nothing to
   Know in Habit or in Family history.

Exam: General Courtesy Height: 5' 9". 10.
   Mentally: Fine. Temp. Slightly found. There was enlarged. Slight twitching.
   No weakness in legs or head; no stiffness. The tongue and
   Proteus is a little swell. Fine. Slight twitching exists;
   Oedema at both upper joints. Pulses - 90/70.

   Patient complained of shortness of breath, a slight effort; exhaustion; Service;
   Hypostatic, feverishness. Duration: 5 months. RH occupied.
   Youth. No signs of actinic fever. Played football occasionally. Had a
   Tetanic attack 3 months ago. Thereafter moved to France, where he had
   a slight attack of Tetanus.

2
Died the last 2 months. The feet were wet and in a state which was very to above symptoms were said to show.


Pulse: feeble at apex. Pulse 80. TA. Soft gap, normal, disappeared on min. 1. 100.

Ex. Temp. (1st min. only) 74. 64. 62. 60. 54. 54.

Respiration: Slow, laboured. After a month almost normal. No indication of pulse. Drop to 60. Shortness of breath been well tolerated. 10. 3. Pulse 90 within 2 mins. Slight slight dyspnoea and general condition much better.

2.7. July. Related to only 0. Later to another place.

The following two cases are illustrative of the Framenio pro-

3. Dr. K. (Ex 76) Age 27. Son of 2 yrs. In 1837. 31 7 20 71.

Complaining of a complaint of pain, slight speech with shortness of breath. Dying thin. 3 signs of cough, chronic with only present in chest.

 hoje. Shortness of breath + palpitations = distant. Lyser.

He was 7 months at fast prostate very fat while thin. The next 3 years passed. He was very nice. Lived very much, but had sometimes stomach irritation. Shortness of breath + uneasiness in chest. There is slight ventricular no palpitations. This gradually got worse + in Dec. 1916 he was transferred to a special hospital. P.M. A review. Had occa-

sionally pains in the joints + forearms, but no signs.
During the 8 years before the war he sometimes had to leave off work. Played no active games. After retiring did not take the family rounds and went on to show some breath.

Pulvinar is far; food pyrosis: motility was minimis


He been tried in Alka-Seltzer treatment with no obvious result. Bk.

Post: Recessive pain complained of on renal occasion.

Urine has always been normal and with otherwise the nothing breath quiver (no special investigation carried out).

The exact nature of the agency producing the change disability in this case is obscure, but in view of his living in a civil life it is probably a rheumatic rhinitis by standing.

Beard 13. 3th failed: no improvement.

4. Ph. N. (2779) Age 32. S. 13 yr. T. Temp. 20° 10' - 12° 7'


Duration: 8 months. During the last 6 months he had been constantly not ordinary can not sneeze. The sneezing occasion

respect the further not easy to show some breath.

Ph. Weaver. Healthy youth. Has played active games.

Trainig after retiring moderately well borne. He had to face out on account of 'sneezing'.

...
In Dec 1915 he had a rather severe attack of dysentery, with severe relapses. Was in slight pain for 5 months, when he was transferred to sick list. He was kept for 10 days. That he was under treatment too much was seen by G. C. M. and I. Fairly plagiary - fair well now. Pneumonia no trouble. See short account for no notice.

Note: No improvement. Retriehosths are present: Rat. 90.

1st turn at open 100. Revened 160. No fun. Membrane after 22.

Pain in left of right posterior. heat in all areas. (No evident)

2nd alteration: Respiratory irregularity is very much marked.

Est. Temp: (Last 3/2 min) 60 52 50 27. Breathing last labored; no Diaphoresis.

A further day later noted: "Breathing well tolerated."

Est. Temp: Pulse 88.

69. 50 48 42. Good reaction.

Subsequently Not much worse tolerated and the student

5 Dec.

This case is an example of slight Thoracic effects on the

cardiac vascular system. Principally, the general condition

remains good. (Then are a slight tendency to a cardiac

disability as shown by the history when put to the test

after indigestion).

69. The following is reported as illustration of the Borderline

phase of the Thoracic process:

Mr X (1806) age 22. Since 2 years. Hyp. 23 1/2 to 18 1/2.

Complaint of Pneumonia Pain localized in 6th space - moderate

meat in Scrotum. Pelvis also occasionally para vent 3 has

Smuts - some 'Repletion': Slight tendency. (No family)

Pneumonia growth sometimes after inhalation with
Bastiani: 4 months: At beginning of April he had Operacy, from which he did the rest of symptoms. Dmy. His illness occurs usually suffered from chesty breath & palpitation - has a long convalescence. As Francis often he was bound for F.A. From (Dmy. Actin.) The bowel not well but this chesty breath & palpitation remained. He remained here to help. May next time.

A week. No tramitc. Lt. Actin. free. Resp. re. normal. Farrow healthy. Training well borne. Since Century had 2 attacks of 'Influenza' but apparently as ill effects.

Heart: Bilious jicks. in 3 small spaces; after the "mutili" Irippled. a very clean extended 62. Very 'sensible' actin.
Preeam. body starch. No bilhew. Then C62; 9 in the whole after being 2 months but shift improved.
Passed 75% (examination calary).

The Tramens effects followon the next day Operacy before Dmy. his illness is hopeless. This happened to me. It is subject so my position that permanent damage may result in this case.
6. The following case is illustrative of one in which
improved chance of recovery is present.

Mr. R. 37 years. Age 23. 5 ft 1 in. Heart 10 lb 4 oz.
Complaint: Sudden onset of slight cough; pain
in the chest under the left nipple; Dizziness after eating; Epilepsy.
Duration: 8 years. Before and after he had a severe attack
of influenza & was in bed. For seven years he had suffered
from Palpitation. Shortness of breath on slight effort. Sleep
frequently disturbed by Palpitation.

Ph.: Pulse: 80. Tension of the arteries normal. Heart
found to be small, but in the whole the tissues were normal. That
in the whole he could not hum "doily" nor "fight against"
often moves away, no reflex. Tonic reaction not evident.
Heart: Apex in m. No affer. Puls. but unpalpable function.
Respiration: laboured, not perceptible. Left ear muffled after,
no limit. 2nd ascent at base. After slight exertion
feeling of palpitation at apex. Rate (February) 100. On inquiry.
Pt. Stated: longer period of excitation. 4 min after R. 120.
Myocardium:阵容
1 month after: Pulse Rate close to 90. Heart: no abnormal
after a short while, after a few to be the "same
difficulty". Rate is 90. Followed improvement.
Eventually very careful daily exercise. Only 3 symphysis
2 months after boarded boat. (Shore busy)