

the patient with whatever preparation might then be in use. I hope, therefore, that some arrangement will be found possible whereby surgeons will be able to treat two series of cases of the same type of disease by operation, administering lead subsequently to every alternate case. Obviously this would not lead to conclusions that could be considered statistically accurate, because the character and malignancy of the cases would vary, and no one man would be likely to have a sufficient number of cases from which to make a true statistical survey. Still, I think any scientific surgeon would be able to come to a more or less satisfactory conclusion in his own mind from such a study.

Secondly, with regard to the treatment of existing disease, it must never be forgotten that the action of lead is probably quantitative, and that satisfactory results naturally depend on the lead reaching the malignant tumour in sufficient quantity without at the same time poisoning the patient. Consequently nothing that can be done to lessen the quantity of lead necessary should be omitted; all large accessible growths should be removed, and in suitable cases x rays may be employed in conjunction with intravenous injections of lead.

I must, too, refer to the extraordinary differences in the susceptibility to the toxic effects of lead observed in patients. It is, however, rare to find a patient with a large growth affected to any considerable extent; it appears that the lead is attracted to the tumour.

It may be thought by some that we have exaggerated the dangers connected with the treatment of cancer with lead. In answer to this we would point out that we have had a considerable experience, and have come to realize that to ensure good results it is absolutely necessary to give the patient as heavy doses and as much lead as can be tolerated.

Results.

I shall say nothing here about the bad effects that may be produced, for, I hope, my colleague Dr. Cunningham will refer to this matter.*

The fact that we have undoubtedly had disasters should be sufficient warning to those who intend to carry out this treatment, possibly with products of unknown toxicity. We hope in due course to be able to establish an organization for those who wish to learn our methods, and to carry out the treatment on proper lines. When, if ever, the history of our endeavours and arrangements comes to be unimpassionately considered, I think it will be found that in no direction could we have acted in any other way than we have done, if we were to protect the public from danger and, at the same time, bring our work to a position of comparative security.

In conclusion I wish to say a few words concerning the general results that we have obtained. I am glad to learn that those best qualified by actual experience of our clinical work to know regard the clinical paper recently published⁷ as being a cautious and moderate statement; for, if we look at our results, as shown in Table III, for the first five

TABLE III.—Fate of Patients: November 9th, 1920, to November 9th, 1925.

	Cases.
1. Admitted, but died before treatment could be commenced	20
2. Died before treatment could be completed...	50
3. Died of intercurrent affections	3
4. Died after treatment (including two deaths from acute nephritis, the result of lead poisoning)	106
5. Died as a result of extensive destruction of growth by lead	4
6. Too recent for results to be estimated	14
7. Complete treatment refused, but patients are living normal lives	9
8. Disease completely arrested	10
9. Believed cured, and treatment stopped	31
	227

years, and care to make an estimate of the percentage of successful cases after excluding groups 1, 2, 3, 5, and 6, or after allowing for a proper percentage of the probable failures that would have occurred in these groups, we find there is left an extraordinary percentage of successes in a class of case that has hitherto never been successfully

treated. When we were putting together this paper my collaborators agreed with me that we should make no attempt to work out this percentage, and I will not do so now, for we have never failed to realize the enormous difficulties still to be overcome, and we are exerting our best endeavours to deal with these before we can allow ourselves any peace of mind.

At present we feel there is sure to be great uncertainty and variation in the results that will be obtained by others. For ourselves I think I may truthfully say that we soon forget our successful cases, whereas every failure is a constant source of worry to us. In such circumstances it is not possible for any human being to form a true estimate of his own work, or to share the optimism which onlookers may justifiably have. Had the work been that of others, no doubt we ourselves should have all been extremely impressed with the results obtained; but the heavy responsibility that rests on us for raising a single hope over this age-long problem is sufficient to weigh down any personal satisfaction accruing from our efforts.

To-night, for the first time, I have suggested that the working hypothesis with which I started in the year 1908, or thereabouts, has now practically reached the position of a generalization concerning the true nature of malignant neoplasia, and that, if this be accepted, a real and substantial foundation has been established from which future researches in regard to treatment may proceed. So far we have explored one line only, but with success that has been, I think, beyond expectation.

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POSTURE AS A FACTOR IN HEALTH AND DISEASE.

BY

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THE subject of the function of the body from the standpoint of mechanics seems to have received from the medical profession in Britain less attention than it deserves. The mechanics of the heart have been the subject of much study, and so have those of the digestive tract; yet it is often forgotten that both the circulatory and alimentary systems can be most seriously interfered with by errors in the locomotory system, more particularly in the bones and muscles which support the body cavities.

This question of bodily mechanics has been made the subject of elaborate study from its anatomical, physiological, and surgical aspects by Dr. Goldthwait of Boston, and he has kindly placed his material at my disposal. I hope that the following sketch of the work already done may stimulate interest in the subject on this side of the Atlantic, and induce practitioners here to continue the study on the material at their disposal.

The examination of recruits during the war showed what a large proportion of the civilized population are using their bodies incorrectly, and the improved physique of men from sedentary occupations after military training showed how readily such errors can be corrected by fresh air, good food, and systematic exercise. Similarly a consideration of the vast proportion of cases of minor ailments which come under the care of the general practitioner will show how large a part faulty mechanics play in their causation, and how important it is that such errors should be treated at their first onset, or, better still, forestalled.

In the production of errors of posture and of bodily mechanics doubtless many factors play their part—such as malnutrition, lack of fresh air, hereditary instability of the nervous system—all of which contribute to depress muscle tone, while this in its turn interferes with the circulation of oxygen and the assimilation of foodstuffs, producing a vicious circle. While it is desirable to break this circle at several points, one of the most practicable and speedy methods is by restoring the mechanics of the skeleton to the normal.

ANATOMICAL CONSIDERATIONS.

It will be asked at once, What are the normal relations of the different parts of the skeleton, for the maintenance of health and the attainment of the maximum mechanical efficiency? This is a question about which there have been differences of opinion.

Drs. Lee and Lloyd Brown studied many hundreds of Harvard University students by means of silhouette photos and found that among these the successful athletes approximated to a type which they have called Class A, and which corresponds to the posture of figures in works of early Greek art, produced when Spartan influence was at its zenith (Fig. 1). Now, it is well known that Sparta paid extraordinary attention to physical fitness, so that this coincidence of types can hardly be due to chance. At the other end of the scale is a type classed by Dr. Goldthwait as D, many of whose members are found to have been subject to chronic ill health; while among hospital patients, the chronic neurasthenics, the visceroptotics, and the pre-tuberculous children nearly all fall into this group, suggesting that it either predisposes to or results from illness (Fig. 2). If the latter, surely it is most necessary that



FIG. 1.—Class A.



FIG. 2.—Class D.

bad mechanical conditions should not be allowed to impoverish still further the vitality of the body. Yet it is rare to find any attention paid by practitioners to this aspect of their cases.

The average individual represents a mean between two extreme types—the slender, loose-jointed individual, represented by the stage contortionist, and the heavy, thick-set John Bull type—but nearly every individual leans obviously to one or other type. The efficient members of each type are found to balance the body in a similar manner, maintaining the upright position with a minimum of muscle effort, while the limbs are ready for movement in any direction with the least possible inertia.

In the efficient posture the vertebrae are kept as vertical as possible, the cervical and lumbar curves, which are of secondary development for the maintenance of the upright position, being flattened as much as possible, so that the muscles in front and behind easily balance one another. Undue increase of these two curves gives a mechanical advantage to the posterior muscles, thus throwing disproportionate strain on the anterior set, most important among which are the muscles of the abdominal wall. Whenever the cervical spine is straightened, the deep fascia of the neck is made tense, and through its attachment to the pericardium, and thereby to the central tendon of the diaphragm, it acts as a suspensory ligament to that muscle and to the heart, enabling both to contract

at better advantage. With a moderate curve in the lumbar region, the body weight is transmitted through the promontory of the sacrum, as it lies in a vertical plane just behind the heads of the femora, and therefore the Y-shaped ligaments of the hip are kept tense, reducing the work of the hip muscles. Thence the weight is transmitted through the front of the knee-joint, keeping the hamstrings tense, and then just in front of the astragalus, making the calf muscle taut. As these include the tibialis posticus and long toe flexors, which are largely responsible for maintaining the arch of the foot, flat-foot is prevented from developing.

THERAPEUTICS.

In view of the important part which good posture plays in preserving the health of the individual, and that which bad posture plays in aggravating or prolonging disease, Dr. Goldthwait recommends certain measures as preventive and curative. The measures on which stress is laid are: Suitable clothing; adequate rest; suitable chairs; a series of simple exercises, with education in correct standing and correct sitting; and external supports for certain severe types of cases.

Suitable Clothing.

Although clothes whose weight is borne from the shoulders are better for the body than those which constrict the waist, yet many modern garments take their bearing from the outer mobile part of the shoulders and induce a hunching of the back and forward projection of the shoulders, in order to prevent them slipping off, which is bad for the posture. They should be cut so that the weight falls on the root of the neck at the back and the inner part of the shoulders.

Anything which constricts the lower ribs and prevents free expansion of the chest is injurious, and it is depressing to find many parents still putting a tight rigid bodice round their girls' chests "in order to give them a good figure." The old-fashioned corset, still in use by the working classes, with its "waist" about the level of the ninth costal cartilage, is equally pernicious, and it is incredible that hard manual work should be possible in such a garment. As soon as the prime of life is past these women begin to haunt the family doctor, complaining of various abdominal symptoms and of general debility.

Rest.

All living cells function by alternations of rest and activity, but it is often forgotten in connexion with muscle training that, while regular exercise is an essential part, exercise as such is not always beneficial; indeed, it may become most injurious, as when applied to an over-stretched, tired muscle—a point frequently neglected in dealing with cases of infantile paralysis.

Because healthy children are benefited by being allowed to play running games, it does not follow that a child with atonic muscles and faulty posture will improve with the same violent exercise, carried to the point of exhaustion in the same faulty attitude. Yet such is largely the principle of physical training carried out in schools. Many people are astonished to find that such a weakly child will get hypertrophy of the muscles and improvement of general nutrition and appetite after lying a large part of each day in the open-air in a correct position, with frequent short spells of exercises designed to give control of the trunk muscles. The same child with ordinary school exercises gets thin and irritable and has a poor appetite. The fact that many growing children are unfit to maintain the upright position continuously for long spells, or for the whole of an adult working day, is not taken into account sufficiently in the organization of schools. To ask them to do so is deliberately to weaken their trunk muscles and initiate the vicious circles previously described. The child of a certain vigour rests these muscles by the varied attitudes of active play; the weakly child, when school is over, slouches in a chair at home and continues the evil process.

It would be beneficial to all children, and is essential for the weaker ones, that they should have several spells each day, more especially after meals, lying on their backs on a hard surface with the spine straight. A small pillow under the lower ribs provides hyperextension of the dorsal

spine and helps weakly children to begin expansion of the chest. This, with the exercises to be described, is quite sufficient treatment for the milder cases of scoliosis, which begin as a postural deformity, easily correctable at first, but soon fixed if a slouch is allowed to persist.

The child who requires remedial exercises for faulty posture will be quite unable to do them correctly while balancing in the upright position, and therefore Dr. Goldthwait lays great stress on the use of *recumbency* for all exercises until a correct use of the trunk muscles has been attained; then the upright balance must be taught. One has only to see a number of children doing the arm movements of the old-fashioned breathing exercise with the spine crooked, the abdomen prominent, and the chin thrust out, their whole attention absorbed by the upper limbs, to realize that it is illogical to exercise the arms until the base of the machine has been put on a stable foundation. Now the upper limbs are the most easily controlled by the brain, while the trunk muscles are the most difficult to co-ordinate; therefore all preliminary exercises should concentrate on the latter. As Dr. Goldthwait points out, the development of force in a particular muscle or muscle group is of little value; what is important is to teach co-ordination; and, again, elaborate co-ordination of the limbs, as in dancing, is of little use if the trunk is still uncontrolled. Whereas, when the trunk is well balanced, all the machinery of the organism—circulation, digestion, etc.—is in good order and the limbs are in the most favourable condition to learn new movements.

Suitable Furniture.

Dr. Goldthwait has pointed out that the attitude of sitting common to weakly children and convalescents—that is, with the spine evenly flexed and the abdomen doubled up—aggravates their weakness by interfering with the organs of digestion and of respiration. Both upright chairs and the ordinary form of lounge-chair, with its simple concave back, conduce to this undesirable attitude. By the simple device of putting a very small cushion opposite the patient's lumbar hollow this can be corrected, and he is able to rest on a slope, of variable inclination, which opens out the lower part of the chest and upper part of the abdomen, while giving complete rest to the spinal muscles (Figs. 3 and 4).

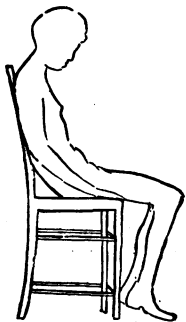


FIG. 3.—Faulty.

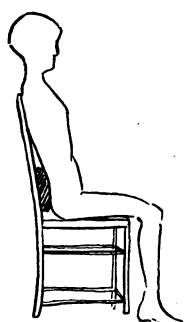


FIG. 4.—Correct.

With regard to school children writing and reading at desks: quite as important as the build of the seat and desk is the manner in which the child uses them. In other words, there are no foolproof desks, while even the evils of an unsuitable height can be reduced by correct sitting. The essential is that the spine shall not be flexed, but kept straight, except for its normal curves, while all the forward inclination is obtained by flexion at the hip-joints. This is a restful attitude which can be held for long periods. The best way to train a child to use it first is by making it sit square on its seat, place the hands behind the head, and stretch the body up tall with the chin in and the abdomen retracted; then flex at the hips until the front of the chest nearly touches the desk, when the forearms may be gently lowered on to it.

For cases who are to be kept long recumbent on the back, and for patients on the operating table, whose muscles are relaxed by the anaesthetic, it is most important to place a small cushion under the lumbar hollow, else the back may become unduly stretched; and it is as bad for the sacro-

iliac joints for the lumbar region to be too flat as for it to have a great lordosis.

Corrective Exercises.

Experience has shown the writer that the following half-dozen simple exercises, designed by Dr. Goldthwait, will rapidly develop the chest and promote a good posture, provided that they are carried out conscientiously at least twice a day. The average parent, if told that they must be done as often as the hair is brushed and the face washed, will be duly impressed with the need for regularity, and soon realizes that the spine is as important a factor in producing a good appearance as the head. Of course, the class exists to whom the value of even those elementary toilet procedures is not apparent, and with such it is difficult to make headway.

1. Diaphragmatic Respiration.

Position: Flat on the back on a firm table or couch.

First movement: Place the hands lightly on the sides of the chest and push them apart by expanding the lower ribs.

Second movement: Inspire slowly and deeply, allowing the epigastrium to expand (Fig. 5).

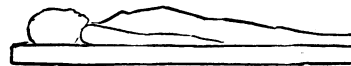


FIG. 5.—Inspiration.

Third movement: Expire slowly and steadily while contracting the abdominal muscles and leaving the ribs stationary, so as to force the diaphragm up into the thorax (Fig. 6).

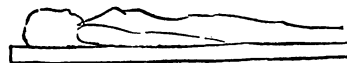


FIG. 6.—Expiration.

Faults.—These two latter movements of abdominal respiration are apt to be difficult for older children, especially girls; they tend at first to let the lower ribs fall and contract the chest before the diaphragm will have had time to relax upwards; and often they retract the abdomen during inspiration, so preventing its descent. Quite young children acquire the movement readily, especially if they are told to swell slowly like a balloon and shrink slowly like one.

2. Stretching Lateral Abdominal Muscles.

Position: Supine.

First movement: Slowly shrug up one shoulder, keeping the elbow straight and pushing from the arm until a strain is felt on the tissues between the lowest ribs and the iliac crest.

Second stage: Slowly relax, if possible leaving the ribs up, while the shoulder sinks down. This should be done three times with each limb and then three times with both together.

Faults.—There is a tendency to bring the ear down to meet the shoulder, or to bend over sideways, instead of stretching towards the head of the couch; also to project the shoulder forwards.

3. Single Leg Raising to Exercise the Abdominal Muscles.

Position: Supine.

First movement: Bend up one knee and rest the foot of that side flat on the table; this fixes the pelvis and prevents lordosis, which occurs where the abdominal muscles are too weak to antagonize successfully the erector spinae.

Second movement: Slowly raise the opposite leg with the knee straight and tense.

Third movement: Slowly lower the leg to the table again. Repeat three times each side. Never lift both legs at once, as this induces lordosis.

Faults.—Weakly patients are apt to twist sideways and wriggle as they raise the limb.

4. Exercising Lateral Abdominal Muscles.

Position: Supine.

First movement: Slowly draw up "hip"—that is, pelvis—one side towards the shoulder. This throws into action the lateral abdominal muscles, which were stretched by Exercise 2, and which are always weak in these cases, although usually shortened.

Second movement: Slowly relax.

Faults.—Tendency to draw the shoulder down by the scapulothoracic muscles, instead of localizing the contraction to the abdominal ones.

5. Back Flattening—Supine.

Position as before.

First movement: Attempt to press lumbar vertebrae against table, by lifting the region of the coccyx forward (by glutei) and contracting the abdominal muscles. The instructor should place a hand under the lumbar hollow and ask the patient to compress it. This reduces lordosis.

Second movement: Relax, so that the lumbar curve is restored by elastic recoil.

Faults.—At first patients usually lift the lumbar spine instead of the coccyx. When they have stretched it correctly they are apt to revert to spasm of the erector spinae, instead of mere recoil by relaxation.

6. Back Flattening against a Wall.

Position: Standing with feet four inches from the wall (nearer makes the exercise too difficult); thighs sloping backward till buttocks rest against the wall; trunk relaxed.

First movement: Slowly uncoil back from below upwards so that the spinous processes rest evenly against the wall.

Second movement: Increase the pressure of the lumbar spine against the wall by contracting the abdominal muscles.

Third movement: When the lumbar and thoracic spines are flat against the wall try to flatten out the cervical spine against it while pushing the occiput upwards on the wall. It is, of course, impossible for a normal individual to touch the wall with the whole spine at once; indeed, the cervical stretching should not be attempted until the lumbar region is mobile. This is an excellent exercise for mobilizing a rigid spine without violence.

When the patient is an adept at the above exercise he should first be taught to *stand correctly* by getting the back stretched against the wall as in Exercise 6, and then gently raising him forward to the upright position, while he keeps the back flat and the abdomen retracted. These weakly individuals cannot maintain the position long at first, and should not be asked to do so.

The next stage is to *walk* with the body balanced correctly, and at first it is difficult to teach them not to try to hold up the ribs by hunching up the shoulders, but to push the chest up from below by contraction of the abdominal muscles. The arms must be made to swing freely and loosely from the shoulders.

Finally, some *rapid exercise* should be given to induce deep respiration, such as skipping, but it is harmful to give this until the fundamentals of balance are acquired correctly, and even then it should be stopped short of fatigue. Indeed, with children, once correct control of the body has been acquired, their spontaneous play will provide enough forms of rapid exercise.

Supports.

For elderly people whose muscles are too atrophied to allow of more than a moderate recovery of tone it may be desirable to order some form of external support. These patients are very likely to show signs of strain in the sacro-iliac and lumbo-sacral joints, often associated with arthritis, but their symptoms are readily relieved by a support which corrects the lordosis and supports the pendulous abdomen.

To achieve this any support must bridge completely across the lumbar hollow—a requirement that is more often forgotten than remembered by belt-makers. In women, if they are not too heavy, a well fitting corset may suffice. Dr. Goldthwait has a useful method of reinforcing the corset in its pull round the pelvic bones by attaching 6-inch webbing to the side seams to form an outer belt, which fastens in front by small straps and buckles. Another useful device of his is to apply inside the back of the corset a leather shield carrying two upright steels of only moderate spring, so that the corset continually pulls the patient back against these, thus reducing the lumbar curve. For men a leather support with similar steels is useful; it should support the lower ribs at the back, but not reach above the umbilicus in front, so that respiration is free. Supports of this type do not interfere with development of the trunk muscles, while they prevent overstrain of the weak muscles when fatigue sets in, for in adults the amount of rest that should be practicable for children is rarely obtainable.

NOTE BY DR. GOLDTHWAIT, Boston, U.S.A.

A paper such as Dr. Forrester-Brown has presented is worthy of much greater consideration than is commonly given to scientific communications, since the principles underlying it are fundamental, dealing with structure or the anatomy, and function or the physiology, the two great basic subjects of medical education. That all persons are not made alike is obvious to all who really observe the human species, and that these variations, because of their varying activities, must be associated with variations in

physiology should hardly require argument. A racehorse must have a different physiology from the Shire or Clydesdale, and the same should be expected of the different types in the human family. The more our patients are studied from this point of view the more easily are the conditions understood.

The way the body is used is naturally important if the world's standards of high efficiency are to be obtained. The drooped relaxed figure is less good from every point of view than the erect alert figure, and with recent studies the practical appreciation of this fact (this was shown most strikingly by the war experience) has found scientific confirmation.

Suggestions such as Dr. Forrester-Brown has made are not only of value from the point of view of general health, but of the greatest value in understanding and controlling the chronic patients as they present themselves for treatment. It is with these that the results of the two features mentioned by Dr. Forrester-Brown—that is, structure and peculiarity of use—are most easily seen, and once such appreciation is had, relief is hopefully to be expected.

After thirty-five years of practice dealing almost wholly with the chronic patient, the belief has become increasingly more certain that, until these features are recognized, the chronic patients will continue to represent the great reproach to our profession that they are to-day.

THE SYMMETRICAL UREA COMPOUNDS AS CHEMOTHERAPEUTIC AGENTS.

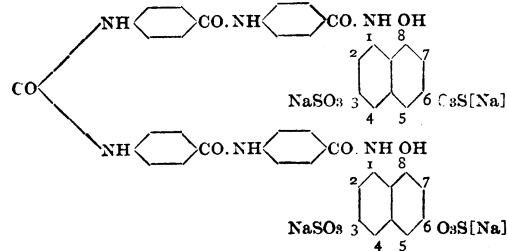
BY

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It has been my aim for some years past to find a drug or drugs suitable for use in the acute stage of disease. The first preparations introduced were colloid manganese hydroxide (1917) and manganese butyrate (1920), the latter being still the best preparation in use for furunculosis. But, to combat widespread infections caused by the staphylococcus and other Gram-positive and Gram-negative micro-organisms, it has been necessary to search for compounds capable of conducting more electricity to the host's protective substance (protein particles in the plasma) than can manganese butyrate. I should, perhaps, mention here that, according to my view of morbid processes, disease occurs when the protein particles in the plasma generally, and those constituting the protoplasm of the leucocytes locally, have to part with some of their electrons at the bidding of an invader, be it a micro-organism or a chemical intoxicant.¹ In the search for more efficient conductors two paths lay open: (1) the preparation of an organic compound of manganese possessing a vehicle with a larger nucleus than butyric acid; (2) the preparation of an organic compound made up of an enormous vehicle and depending for the conductor action upon the liberation therefrom of one or more positively charged sodium or hydrogen atoms. Search along the first path proved fruitless, but along the second path fruitful. With the assistance of Dr. F. H. Fairbrother of the British Dyestuffs Corporation, and Dr. J. Thomas of the Scottish Dyes, Ltd., the chemotherapeutic armamentarium has been enriched by four compounds, whose uses form the substance of this article.²

SUP. 36.

"Sup. 36" is the symmetrical urea of para-benzoyl-para-amino-benzoyl-1-amino-8-naphthol-3-6-sodium sulphonate.



The action of this compound depends, I believe, upon the liberation of positively charged and conductor functioning