

The Boston Medical and Surgical Journal

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Original Articles.

PRINCIPLES OF POSTURE.

FIRST PAPER.

BY MABEL ELSWORTH TODD, BOSTON.

FOREWORD.

BY E. G. BRACKETT, M.D., BOSTON.

THE significance of the normal posture, and the importance of the part that it plays in the preservation of health need no emphasis at this time, certainly to the medical profession, and hardly to the people in general. However, in the wide interest and enthusiasm which has come in the recognition of the need of attention to this subject, there is much to be learned in the practical standardization in the determination of what the true normal posture may be, and in the methods of attaining this, particularly in the correction from the abnormal. It is also clear that much in the more popular methods of posture correction needs revision, as well as in the conception of what the normal posture should be, and we are therefore glad to welcome the results of the study and experience of those who have been for a

long time devoting themselves to this important subject.

Miss Todd, whose communication follows, has devoted her time for many years to this subject, and has formulated certain principles of true posture and methods of working to this end which deserve the study and discussion of those definitely interested in this work. It is not possible that all of the theories and methods which are presented by Miss Todd will have complete acceptance; there is yet too much to learn in the subject for a uniformity of opinion, but so much of truth, combined with common sense is in this that we are grateful to add to our knowledge from the experience she has gained.

THE subject of posture is so intricate and so closely related to the functioning of every part and organ of the body that we cannot approach it with too much respect. In this paper I shall consider it in its aspect to adjustment of the weight of the body at rest. It is important to start with correct position at rest, in order to attain proper coördination of muscles when the body is in motion.

It is essential to find the posture which will secure to the entire mechanism the greatest unity of force with the least expenditure of effort. In every posture assumed to be true

three tests should be required,—first, does it make for mechanical freedom; second, is it true to anatomical fact; third, does it establish better functioning to one or more organs? Any rigidity in a structure made up of articulated parts prevents coördinate action. Without coördinate action in the human frame the muscles have lost much of their freedom, and normal functioning, therefore, is impossible.

Gravity is recognized as an elementary force. It acts upon the structure as a whole and also upon each separate part. Faulty adjustment in relation to this law causes interference with the proper reaction of articulated parts and free coördination of the muscles. The deeper we study the subject of mechanics, and of posture, the more we realize how far reaching this effect is upon the entire organism.

Place on one side of an evenly balanced rod a fifty-pound weight. If you wish to retain the equilibrium of the rod you must either place the same weight on the opposite side, or apply your own energy to the amount of fifty pounds pressure.

Move the fifty-pound weight back to the center of the rod and no effort is required to hold it up. It is balanced.

Mechanical law explains that the nearer to center weight is maintained, the less expenditure of energy is required to keep it in equilibrium. It is evident, therefore, that if we discover the position of the best mechanical advantage, this position must correspond with anatomical facts. If the mechanical advantage and the anatomical fact are found in the adjustment, it must follow that every organ of our body would have the most normal functioning possible, and energy, therefore, would not be wasted.

Let us place three granite blocks in a perpendicular alignment. If the median line of the structure passes directly through the center of the weight of each block, gravity will then exercise an equal pull upon the parallel sides of each block. Swing the weight of one of these blocks out of its relationship to the center of the whole. If it has to be held in that position a power foreign to itself must be applied. Refer to fifty pound block.

In the human structure the three principal groups of weight are the skull, the thorax, and the pelvis; if these are balanced at center in relation to the median line, all parts of the articulations will be subject to equal weight,

hence there will be no unequal strain upon ligaments or muscles. If any one of these three bony blocks is not supported at the center of the structure it will require muscular effort to maintain it in the position out of that alignment. There is a natural alignment of all the bones to each other. If this natural relationship is disturbed it produces an unequal pull upon muscles and ligaments. Hence, any attempt to hold bones out of their natural alignment involves an unnecessary strain and a waste of energy.

If the center of the weight of each of the three bony "blocks" is maintained at the median line of the structure there would be an equal distribution of energy in the muscles around the entire surface of the wall of each "block." Thus by balancing the weight of the thorax at the center of the structure, the least muscular effort is required and the diaphragm and the intercostal muscles are thereby freed for normal functioning. An elevated sternum swings the weight of the thorax forward from its natural alignment in relation to the pelvis and the skull, and inequality of muscular action is the result; this position forces the shoulders back, thus pulling the weight of the shoulders and the weight of the thorax in opposite directions. The diaphragm has thus lost its normal alignment and its functioning, therefore, will be limited. The muscular attachments around the scapula are also contracted to maintain the pull. The ribs in the back are pushed down, crowding the area around the dorsal vertebrae, and the clavicle pressing upon the first rib produces added strain in the dorsal spine. Assuming that the thoracic weight is perfectly balanced, there will be no muscular effort to hold the sternum in a fixed position and the ribs are thereby released.

The position of the shoulder should next be considered. The particular function of the shoulder-girdle is to protect the thoracic wall from the weight and strain of the shoulder and arm structure and the movements thereof. This is attained only when the clavicular attachment at the sternum is free. This being the only bony articulation between the shoulder-girdle and the thoracic wall, equality of muscular action at this point is important. With the clavicular articulation free, freedom can be attained for all muscles of the shoulder-girdle, and the shoulder-girdle can thus be made to protect the ribs and the spine from the manifold



PLATE Ia—1895-1900.
(From *The Delineator*.)

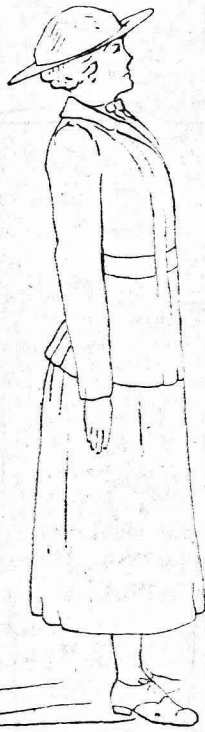


PLATE IIb—Military.

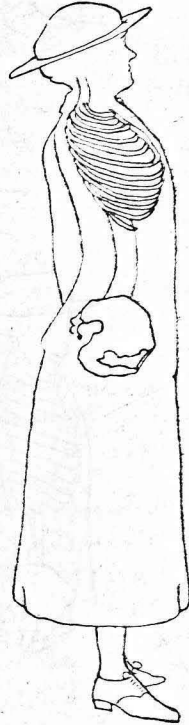


PLATE I AND IIc—Military.



PLATE IIIa—1920.
(From *Vogue*.)

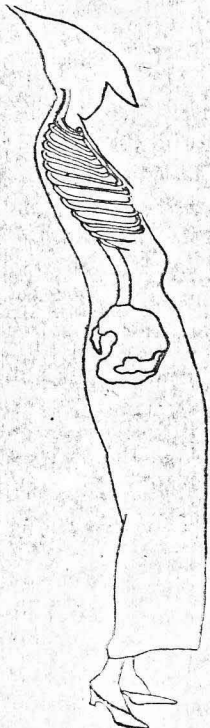


PLATE IIIb—1920.

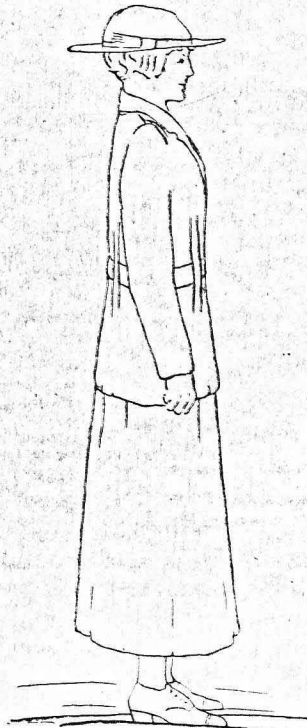


PLATE IVa—Balanced?

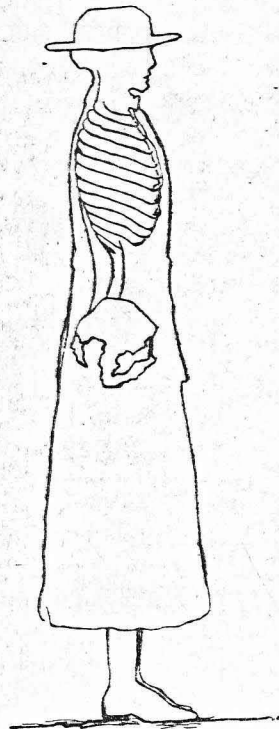


PLATE IVb—Balanced.

activities of the arm. Freedom of action of the muscular attachments of the clavicle and spina scapulae would give breadth to the shoulder-girdle, and bring the acromion directly above the median line of the ribs at sides, thus protecting the ribs from the irregular contractions of the arm and shoulder muscles. This position of the shoulder-girdle would be similar to the wooden yoke on which the Hollanders carry their water pails.

By this adjustment the vertebral border of the scapula will assume its normal alignment to the dorsal angle of the ribs, *i.e.*, the perpendicular line of the dorsal angle of the ribs and the vertebral border of the scapula will be parallel. The ribs will thus be freed from uneven pressure of clavicle and scapula, and equalized pull of all muscles of shoulder is attained. With the clavicular articulation free, the humerus will hang directly under the acromion, with equal pull on all muscular attachments between the arms and the ribs. The arms will thus hang in line with the crests of the ilia. This position insures freedom for the action of the lungs and the heart, and for proper flexibility of the dorsal spine. Any muscular effort to hold the chest wall and shoulder superstructure out of this normal alignment in relation to each other is interfering with the freedom of muscular action for normal functioning of thoracic contents.

If there is no antagonizing pull between the shoulders and the chest, the diaphragm is free to functionate normally, *i.e.*, to deepen the cavity of the chest, and to stimulate peristalsis. There will be greater freedom for the action of the intercostal muscles at the dorsal angle of the ribs, thereby securing larger capacity to the back of the lungs. The lung expansion cannot be complete in a fixed or tense wall; the mobility of the ribs must be retained at both their extremities, the spine and the sternum.

A fixed position of any of the articulations of the body out of their natural alignment necessitates compensatory action to relieve the strain. If this compensatory action falls upon a part of the structure where normally no movement should be induced (such as the sacro-iliae) there is an inequality of muscular action and a friction imposed upon all adjoining parts.

The particular articulations which are the most important for normal posture are femur

with pelvis, ilium with sacrum, sacrum with fifth lumbar; to these must be added, of course, the position of the sternum and of the clavicles. Of the first three, only one is a legitimate joint. The head of the femur in its relation to the acetabulum is the articulation on which the muscular coördination between the torso and the legs depends. Any loss of freedom in this joint imposes compensatory movement at the fifth lumbar and a strain on the sacro-iliae due to the inequality of muscular pull.

A lifted sternum and forward thorax increases the lordosis of the lumbar spine, thus stretching the abdominal wall and increasing the obliquity of the pelvis, thereby removing part of the support of the fifth lumbar and increasing its tendency to slide forward on the sacrum. This increases ligamentous tension and prevents muscular freedom of all pelvic muscles. If the center of the pelvis is directly under that of the thorax and of the head, we have the median line passing through each. The relation of the sacrum to the fifth lumbar will then be equal in pressure around the entire area of the articulating contact. This allows the pelvis to assume a normal position. When the normal position of the pelvis is maintained the quadratus lumborum and psoas muscles assume their normal responsibilities and the muscles of the pelvic floor will also have equality of action. The normal muscular support of the femur in the acetabulum will be the result, *i.e.*, the psoas and the iliacus at the front and the pyriformis and the obturators at the back will have equal pull upon the femur. The head of the femur will then be free in its articulation with the acetabulum. This insures normal muscular coördination between legs and torso without disturbing the natural alignment of pelvis.

The weight of the skull upon the atlas should be perfectly balanced. The occipital condyles should rest evenly upon the superior articulating surface of the atlas. This attains a balanced and equalized relationship between the atlas and cervical vertebrae, thus giving normal perpendicular alignment to all supporting muscles at the base of the skull. In this balanced position of the skull the forehead will be slightly in advance of the chin. The perfect poise of the head would be the natural result of the normal alignment of the pelvis and the thorax, through the equalized maintenance of

muscles supporting these parts, and through the reaction of the normal curves of the spine, *i.e.*, if the lordosis of the lumbar spine is reduced the cervicle spine assumes a more perpendicular position. It is impossible to correct one part of the body without influencing its reflex.

In the following plates are shown the abnormal adjustments forced upon the bony structure by the varying posture of the past twenty years. Nos. 1, A, and 3 A and B.

Plates No. 4, A and B, show the result of maintaining a well balanced position.

When there is effort to maintain the weight of an integral part of a structure out of its alignment with the whole, equalized coordination between all parts is lost. This interdependence of all articulating parts of the human structure requires, a close study of the relationship of the articulations to each other, before normal adjustment of the whole can be attained. Reaction between parts is constant, due to the varying adjustment of weight to the median line of the structure.

Therefore to correct one part, one must note the relationship of all others, or friction will be the result. In assuming this attitude toward body mechanics, definite, specific proof must be ascertained of the mechanical, anatomical, and physiological advantage of certain positions over others that might appear on the surface to be equally good.

Most of us waste daily more energy than we use. Every man considers a waste of fuel in running his automobile a crime against his pocket-book. It is no less a crime against our organism to waste energy through mechanical misadjustment, *i.e.*, such adjustments as would necessarily produce greater friction in the organism in performing its functions.

The special features to be emphasized in summary are:

- First, balance of weight of pelvis, thorax and skull;
- Second, position of shoulders and sternum;
- Third, relation of head of femur to acetabulum;
- Fourth, the position of the fifth lumbar.

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Stop here

BODILY MECHANICS AND MEDICINE.*

By LLOYD T. BROWN, M.D., F.A.C.S., BOSTON,

Orthopedic Surgeon to Out-Patients, Massachusetts General Hospital.

THE term bodily mechanics was chosen instead of faulty posture because faulty posture is only one of the results which may occur when the human body, considered from a mechanical point of view, begins to get out of line. It may be and often is one of the first symptoms to occur and may be present without any immediate effects in much the same way that carious teeth and adenoids and constipation and many another condition may exist for an indefinite time without any ill effects. Because our attention has been brought to the condition of the eyes and the teeth so much in the last few years we are all paying much more heed to the possible effects of eyestrain and poor teeth than we ever used to do. These are only a part of the whole human body or mechanism and is it not important that we pay attention to the machine as a whole as well as look after some of the small but important adjustments?

The reason why no attention has been given to the question of the mechanics of the body is that very few people agree as to what is good mechanics and what is not. One doctor will say that he himself has always been very round-shouldered and pot-bellied and that he has never had any trouble and that he knows lots of men who are the best athletes who have even worse posture than he has and who never have any trouble. Also, that they know people who hold themselves very well, who are much of the time under the doctor's care or are not well enough to do one half of the work that they should do. All of this is perfectly true but it does not change the fundamental principle which is involved in the mechanics of the human body. This principle is that the use of the body in faulty mechanical alignment is always a potential of trouble. As Dr. Lee has aptly expressed it, those people "with a bad mechanical use of their bodies who are without symptoms, may well be regarded as having compensated for their defects in the same way that we speak of a compensated heart lesion. The majority of individuals with heart disease have for a considerable period no symptoms attributable to their heart. Likewise it is ex-

* Read at the Massachusetts General Hospital Out-Patient Department Staff meeting, April 7, 1920.

We also have the muscles of the abdominal wall, particularly the rectus abdominis. Upon these deep-lying tissues largely depends the balance of the weight of the torso upon the head of the femur, and the determination of the obliquity of the pelvis. Therefore freedom of all these tissues is absolutely necessary to insure perfect balance of the weight of these parts.

Book Reviews.

Hygiene of Communicable Diseases. BY FRANCIS M. MUNSON, M. D. Paul B. Hoeber. New York. 1920.

An excellent manual of information, available at the present time concerning the epidemiology and the management on sea and land of communicable diseases, is contained in this volume, "Hygiene of Communicable Diseases." The subjects of epidemiology, prophylaxis, and sanitation are presented in concise, readily accessible form, in such a way as to be of practical value to the physician, sanitarian, sanitary engineer, missionary or medical officer. The carefully headed sections, sub-sections, and paragraphs, make this book an unusually helpful one for reference in emergencies. A chapter devoted to a new subject, sanitary measures following great disasters, is of considerable interest and practical value. Naval sanitation, railway sanitation, municipal and rural sanitation, and sanitation in schools, prisons, and industries are among the topics to which detailed consideration is given. The second part of the book describes diseases spread by oral and nasal discharges, the fecal-borne diseases, the venereal diseases, insect-borne diseases, diseases spread by infected animals, and wound infections. This book is an excellent treatise of an important subject.

Publications from the Dermatological Research Laboratories of Philadelphia. Vol. II. 1920. Collected Reprints.

The Dermatological Research Laboratories were instituted in 1912 by a citizen of Philadelphia and supported by him for four years. During this time, the work of research was mainly on the lines of psoriasis, and resulted in the publication of a number of essays on this subject. Later, it was found that the laboratory facilities authorized a broader research and the production and study of new chemical compounds designed to destroy the germs of vari-

ous infectious diseases were undertaken. At first, the investigations dealt chiefly with mercury compounds; later, they began the elaboration of arsenic compounds. At about this time the supply of salvarsan threatened to be cut off on account of the war, and a successful attempt was made in the laboratories to reproduce this complicated chemical compound. Under the name of arsenobenzol, salvarsan was made and distributed to hospitals and physicians throughout the United States. The profits made from the sale of this drug have been and are being used to support the medical research laboratories, and this has resulted in the publication of over seventy contributions to science.

The present is Volume II of the Collected reprints of the laboratories' publications, and comprises thirty-two papers, published in a number of different periodicals. The director of the staff is Dr. J. Frank Schamberg, his assistants being Drs. John A. Kolmer and George W. Rajjiss, and a majority of the papers are by these men, sometimes with the assistance of the auxiliary staff. Naturally, syphilis, and especially its modern methods of treatment and the study of the chemical compounds used therapeutically, are the subjects of a large number of the essays. Some studies of the etiology of influenza, of the pneumococcus, and of the diphtheria bacillus, are included. As would be expected from the names of the authors, these essays are all of high scientific value, and offer a notable contribution to the American literature on these important subjects.

MEDICAL REGISTRATION IN MASSACHUSETTS.

The results of the May examinations conducted by the Board of Registration are as follows:

GRADUATION FROM	REG-ISTERED	RE-JECTED
Massachusetts College of Osteopathy		3
Kentucky School of Medicine		1
Tufts Medical School		2
College of Physicians and Surgeons of Boston	1	2
Middlesex College of Medicine and Surgery	1	7
College of Physicians of University of Southern California		1
Woman's Medical College, Pa.	1	
Laval		1
University of Valdimir		1
University of Maryland		1
University of Lisbon	1	
College of Physicians and Surgeons of Baltimore		1
Baltimore Medical College		1
Fordham	1	
	5	21