

Position.

J. H. Kellogg, M. D.

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I want to see how you have profited by what you have learned. Some of you are lying down while sitting up. Never do that. While learning to stand straight, and keep your chests out and keep your figures erect, it would be a good plan to avoid sitting, as much as you can, for, while sitting, you unconsciously forget yourselves, ^{and collapse} I have already told you this, and to keep your muscles strong. When you lie down, lie upon a flat surface, as far as possible, so as to be sure and be as straight as possible. I became very round-shouldered, when a boy and working in a Printing-office, and sitting on the top of a school, for I was too short to stand. I had no out-door sports to assist in making me straight. In those days, it was wicked to go outside of the yard,--the Devil was everywhere, except in our own homes, and it was best to stay right in-doors, so as to be perfectly safe. So we didn't go to school. I wasn't allowed to learn to read until I was nine years old. I believe we have more liberality now than in those days. But I had no opportunity to exercise my muscles, and so I was a very puny boy. I was getting round-shouldered by sitting on a high stool, ~~and~~, and I tried to straighten up. I thought, if I laid myself out perfectly straight when I went to bed, it would make me perfectly straight. I thought if I lay on a flat surface, it would straighten me out, so I put myself against a straight-edge. I sometimes slept on a quilt on the floor, and slept straight out on my back at night, sleeping on the floor, sometimes, without any pillow, on the floor. Sometimes I would put a newspaper on the floor and sleep on that, without having a pillow under my head. I was determined

to straighten myself up. I tried all sorts of shoulder-braces, and they didn't work very well. But all my life, I have been accustomed to sleep without a pillow, and that is an advantage. I think one does not need a pillow; it has a tendency to make a curve in the spine... Some semi-civilized people use a sort of pillow...

I am inclined to think the sitting position an abnormal and unnatural one. It is not natural to sit in a chair. I believe a chair is an unnatural and a disease-producing agency contrivance, and we would be better off without chairs. I dare say that seems strange to a novice, but the more I think of it, the more I am convinced that it is true. When one is on his feet, he is likely to be active. If one undertakes to lie down while ~~sitting up~~ standing up, he is at once in a disease-producing condition, for his muscles have relaxed. In order that the internal part of the body should be held in place, it is necessary that the abdominal muscles should be tense, and that the chest shall be well raised, and that the skeleton should be held up erect. The moment one relaxes, stands on one foot, or leans against something, the muscles are relaxed. Why? Because he is allowing his skeleton to be supported by some object against which he is leaning, hence the muscles are not being exercised. When one sits down, he is almost certain to do this, because he relaxes, when he sits down. It is not safe for one to relax his muscles completely, when in a vertical position, for, in the upright attitude, which is special to man, it involves the risk of displacement of the heavy organs which occupy the abdomen. (Diagram.) Here is the diaphragm of a quadruped. Here are the large organs,--the occupy this portion of the trunk, the intestines occupying the rear portion of the trunk. Now in man, the relative position of these organs is

just the same, but the trunk is in a vertical, instead of a horizontal position. In man, the weight of these abdominal organs is sustained by the abdominal muscles, and these are attached in front and behind to a fixed, bony surface, and, when in a horizontal position, the abdominal organs cannot be very greatly displaced being supported by their position. All these ~~abdominal~~ heavy abdominal organs are at the top of the abdominal cavity. What is to keep them in position?? They are attached to the backbone and the diaphragm, --by what? By the ligaments. But these ligaments are simply folds of membranes; the peritoneal and the ligamental structures are very slight structures; they are altogether insufficient to maintain the weight of these organs, the liver, for example, weighing three and a half pounds. The ligaments which attach the liver here are not strong; they are not capable of sustaining the liver here, and when we take away the support of the abdominal muscles, these organs slowly and gradually fall down. You will sometimes see a woman wearing too heavy an earring, and you will see the ear pulled out of shape --you will see that in savage women, --the ear is badly out of shape for this cause .. This is the influence of this gradual ~~weight~~ stretch of weight upon the tissues, and they are being gradually displaced.. So these ligaments gradually stretch, --not in just the same way as a piece of rubber would be stretched, for in that case, they would be torn; but nature is gradually accommodating itself to the condition of things; nature is seeking to find a point of rest for these organs. This organ is hanging upon a ligament, and the membrane will stretch, and of course the nerves will be stretched and strained by the weight of the organs, and there will be a tension, but nature is seeking to relieve these organs, and so it is let down a little more --to find a place where

its weight will be cured in the natural way... Sometimes these organs become very heavy, temporarily, at least, and the heavy organs occupy the upper part of the chest. Now if the abdominal muscles are relaxed, what is there to hold them in place? And when they are relaxed,, the descent of the abdominal organs begins, and this descent will continue so long as this relaxed condition remains.. The support of the heavy organs depends upon the condition of the abdominal muscles.. Now when one rests on one foot, he relaxes these muscles,--try it and see. When one stands erect, with the chest up, the muscles are tense. But when one relaxes, the chest drops. When one leans over and rests against a wall, he relaxes his muscles. When one lies down upon the floor, the whole body lies down; but when he lies down in this way (illustrating) only a part of him lies down, and still remains in a vertical position, and he is relaxed, but this relaxed position is a dangerous one,--the viscera are beginning to descend, and when this condition is frequent and constant, displacement will sooner or later take place. So I say that a sitting position is not a natural position.

When a person is tired, from exercise or work, what is the natural position? Lying down. When you lie down, the muscles are perfectly at rest. Gravitation is all the while seeking to pull us down; it is all the time dragging upon us, and we have to fight against it. If it were not for gravitation, we could soar like a bird; we could go very high--but perhaps we couldn't get down again.. We have to struggle against gravitation continually, and this ^{struggle} ~~exercise~~ requires a constant exercise of the muscles; it requires a constant energizing of the muscles, and when we cease energizing the muscles, gravity begins to get the better of us, and to pull us out of

shape.. When one stands erect, and in a proper position, and always keeps that position,, he cannot have spinal curvature. Spinal curvature and other deformities come from a relaxing of the muscles, so that gravitation gets the advantage, and then the organs fall , and the body falls into one shape or another , of deformity or curvature, the curvature depending upon the particular attitude,--for instance an attitude like this, (illustrating) will produce double curvature of the spine,--a dorsal curvature to the right, and a lumbar curvature to the left... I remember the case of a young lady who had a bad curvature of the spine, which was the result of standing on one foot while writing lessons in penmanship on the blackboard for the pupils of a school which she attended. She wrote so well that she was called upon to write the lessons, and she wrote them standing on one foot, and after a couple of years she had a bad curvature of the spine .

When the tired man or woman lies down, the ligaments are not on a strain, and so he completely rests. So I advise you to adopt this plan of resting when you are tired,--lie down in a horizontal position, if you have an opportunity to do so; put yourself in a horizontal position, if possible, but don't put yourself in a cramped position. I was reading a foreign work on hygiene some time ago, in which the "American Position" was recommended. What do you think the "American position " is? Sitting with the heels high up against the wall. That position was recommended, because "more blood ran down into the brain" than in any other position, and that by this means, mental activity would be facilitated. But this position (illustrating by diagram), is very bad, and I would not recommend it . By this position, the liver and stomach and other organs , would be crowded out of place, ^{the anterior muscles would be relaxed, etc.,} so that would be a bad position . On the other hand, if

you are lying in a horizontal position, and everything would be at rest, because the viscera lie right against the back, and that is where the ligaments are attached, so there would be no strain, and no displacement, and the muscles would be at perfect rest. You cannot rest so well in any other position as you can in the horizontal position.

A few more words about sitting: This matter of position is so important that it requires especial attention. (Taking stool and sitting down.) In the first place, a chair ought to be of the proper height, so that when you sit in the chair, the feet will rest squarely upon the floor, ^{with no} ~~the~~ pressure being on the under side of the legs. (These are practical points, which you will find of every day use.) This chair is too high for me. In such a chair, your feet will "go to sleep," while you are sitting in it. That is because of the pressure on the vessels of the under sides of the legs; that is where the large nerves run. This chair should be higher, so that the weight of the legs will be supported by the feet as they rest flat upon the floor. Both feet should rest squarely upon the floor. The habit of sitting with one leg crossed over the other is bad, because it twists the body out of shape; it raises one side of the body so that it rests upon the other hip, and the spine compensates for this. I don't claim that this position will twist the spine out of shape, because the body may assume a number of different attitudes, and it is better to make a change of attitude frequently, so that the body does not become tired; but I am speaking of a habitual bad position, as, sitting with one leg crossed over the other, --if these bad positions are habitual, they will result in curvature of the spine.

One important thing, is to be placed in the seat properly.

Many people sit down upon the front part of the chair. This habit comes from the use of chairs which are too high; because, when one sits well back in a chair that is too high, it is impossible for the feet to reach the floor, so he slips forward on his chair, so that his feet can reach the floor. You can't keep the body erect very well in that way, so he leans back against the ^{back of the} chair. One should not endeavor to support himself in this manner. I presume some of you have corns on your backs, where your backs have been rubbed against the back of the chair. Not long ago, I saw a young lady who was in the habit of sitting in this position (illustrating by position.) I induced her to sit up as straight as she could, and this was her position. (Diagram.) There was a little curve left here, --even after she made the best effort that she could. This showed that this curve had been there for months. It had pushed out the vertebrae, and I slipped it in position again. I have done that scores of times. I have found persons who could not get into the proper position, and the spine had not been straightened up for months and months. I pushed the vertebra in place and then the patient was able to straighten up voluntarily. This is a very important point. If this state of things had gone on a few years more, the result would have been a permanent curvature.

In the majority of people forty or fifty years of age, the curves cannot be made straight, because the vertebrae have changed their form; the intra-vertebral cartilages have become thin on one side, and thick on the other side, and have changed their shape, and all the ligaments and structures of the spine have become conformed to this position. The attitudes which we assume in sitting and standing and walking, and in going about--these are the ~~mold~~ moulds in which we grow. I once put a cucumber in a ^{square} bottle, and it grew into the shape

of the bottle,--it was square--it had adapted itself to the shape of the bottle. So our attitudes are moulds in which we grow, and to which we conform. So, when a person is in the habit of sitting with one shoulder higher than the other, he will get to be a one-sided person; he will have a curvature of the spine, and it will be a curvature towards the high shoulder. So this is a matter of importance. Our traditional rockingchairs (illustrating by positions.) If the chair is very wide, one takes what is called "the lying-down position." These are called "lying-down chairs," and the position in such a chair is an invitation to disease. So the chair should not be too wide. This chair is a little too wide for me, because when I sit back in the chair, the front of the chair hits the under part of my leg before my hips touch the back of the chair. I cannot reach the floor, and at the same time sit upright in the chair. I cannot sit properly in this chair and reach the floor with my feet. You will all probably all find the same trouble. I am sure there are some of you who would say, when they sit down squarely in such a chair, they could not reach the back of the chair; the feet will not reach the floor,--the seat is too wide. (Illustrating.) I ~~think~~ am inclined to think that chairs would be better without backs, or else with perfectly straight backs, because they lean back, and the chair that leans back is objectionable, because it invites us to partially recline, or lie down, because, in this position, we really lie down when sitting up. That seems absurd, but we frequently see people lying down in chairs. The moment a person lies down in a chair, he relaxes, and the tendency will be to relax completely, and we cannot do this safely except when lying upon a horizontal plane--in a horizontal position.. The more I think of this, the more I am satisfied that the sitting position is an

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unnatural position, and an unhealthful position, and if we retain it, we must pay the forfeit,--and the forfeit is one of two things,--we must watch ourselves and see that our bodies are held erect,--and it requires "eternal vigilance" to do that --or else we must suffer the consequences --disablement of these important organs, and the evil effects which we will feel, and which we will talk about later.

Just a word further upon this matter of sitting: Suppose we have a chair of the right size,--notice how you should sit down,--the hips touching the back of the chair, the top of the shoulders touches the top of the back of the chair, if it has any back; it is better to have none, and then there is nothing of that kind for the body to depend upon; it is better to sit upon a stool, for in that case we must depend entirely upon the body. But usually, when a person sits upon a stool, he is likely to relax more than when sitting in a chair, because the back of the chair supports him a little--he is held in a more nearly upright position because the chair supports him a little and he is held more nearly in an upright position. But on a stool, when he gets tired, he falls down--the muscles no longer support the trunk. The trunk is simply supported by the ligaments; they hold the skeleton together. Take an articulated skeleton and set it on a stool, and it will fall into this position (illustrating.) The natural effect will be, to drag the spinal column forward, and the head will naturally drop. The skeleton is supported by the ligaments, and not by the abdominal muscles. But the ligaments are not intended to hold the trunk erect; the muscles are the proper means of holding the body in an erect position, and the muscles must be energized, in order to do this. I don't mean to say that you must be all the time thinking about your

muscles. If the muscles are properly developed, they will have a tone of their own, so that they will hold the body erect. The well-trained soldier does not have to give any thought to the matter of keeping his body erect. When he was a farmer, he used to sit on the fence, or on his load doubled up like a jack-knife. In this ^{way the} farmer boy has gotten to be round-shouldered. So when he goes into military training, he must be put under rules for standing erect, -- for instance, at West Point, it is the custom to have freshmen walk with "thumbs out," (illustrating.) We have established the same rule here, so if ^a ~~one~~ student walks with his thumbs in, he is admonished to walk with "thumbs out," because this has the tendency to turn the shoulders out, and to lift the chest forward. Try that. You see the simple turning of the thumbs out has the effect to lift the chest forward, because the two are associated. So, when you are trying to straighten up, turn your thumbs out and that will help you.

Some of these drills are called "Setting - up Drills." One of these drills consists in reaching the arms up as ^{far} high as you can, and then touching the floor with the tips of the fingers. The purpose of this exercise is to stretch the anterior muscles of the trunk which have become shortened. The arms are reached up as high as possible, so as to raise the chest and get a strong curve to the spine. The student there, is kept under continual drill, during waking hours. If he is standing on duty, he must stand with his chest up. You will never see one of those students with his head in this position (illustrating.) The sentinel standing on duty is always ~~erect~~ standing erect, and after a while this position becomes habitual. I have made several experiments upon persons who have cultivated an erect attitude for many years. I remember a Swedish lady, -- a little woman about 33 years of

age. She had been in this country a number of years, and is the mother of several children. She came into the office one day, and I made an examination of her case. I was surprised to find such an erect figure. I asked her if she could bend over and touch the floor with her fingers without bending the knees, and she said she could, and immediately bent over and laid both hands flat upon the ground. I said to her, "You were not born in this country, were you?" "I was born in Sweden." "Born in the country?" "Yes." "And you worked upon a farm?" "Yes." "And when you were working in the fields, you were in the habit of bending your hips and not your knees?" "Yes, my father taught me that; he said it was ungraceful to bend the knees." In Germany, Austria and Italy you will see women working in the fields, and using both hands, bending over at the hips and working on the ground, but without bending the knees,--there would be scarcely any curvature in their backs, and they work all day, bending only at the hips while weeding onions, and other work upon the ground. This girl's father taught her to bend only at the hips,--I asked her why he did so? "Because he said it didn't look nice to bend the knees, and so he taught us to bend only at the hips." It was interesting to see this esthetic sense in a poor laboring woman.

These people are proud of their figures. You probably know what Aristotle says,--"Beauty of form is more desirable than beauty of face." Beauty of form is far more desirable than a handsome face. This is not the case, however, among our civilized people: if the face and the external appearance is only pretty, it makes no difference about the figure, because that is covered up. The dressmaker and the tailor can pad the body up so as to make it appear symmetrical, no matter

how much the body is deformed. This is a part of the hypocrisy of our modern civilization. Civilization cultivates hypocrisy. The sincerity of a genuine savage life is almost unknown in our modern civilization. If we have a decent exterior, it makes no difference about the internal part. But we all know that the immorality and wickedness and sin of our great cities is absolutely beyond comprehension, and never has been equaled in any savage country. The real savagery of the present time is to be found in the slums of our great cities. Truly savage men are to be found in the slums of our great cities, instead of the forests of savage lands.

We must give attention to this matter, then. One of the greatest evils which we have to fight, is this habit of matter of wrong attitudes, by which the body becomes deformed in shape,--but I will talk to you more about this evil, later.

These external deformities are significant,--not simply because they are not esthetic; not because they are destructive of the symmetry of the body, and the beauty of its external appearance, but because of the internal deformities which they create, and by which the body is tremendously impaired. We will take this subject up tomorrow.....

PHYSIOLOGICAL THERAPEUTICS, Oct. 21, 1902.

Wall - Training .

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YOU have been learning the excellent Swedish system, which is the typical system, and it seems to me, is the ~~real~~ foundation for any real scientific gymnastics. It seems to me that all scientific gymnastics must be based upon the Swedish system. In dealing with sick people, I think we should take these things into consideration. Ling well understood this, and so he introduced a system which he called the "Medical Swedish Gymnastics," and we will take up this subject a little later. He taught two systems,--the educational system, which you have been studying, and the medical system. The medical system is based upon the educational system. Medical gymnastics, however, requires an assistant or attendant. I have sought to develop a plan for the use of patients, modifying the Swedish system so as to dispense with an attendant, and that is what I propose to show you.

I do not present this to you, however, as a new system, but simply as a little modification of the Swedish system by which the patient ^{be taught to} may [^]train himself, and do it accurately and thoroughly. This plan requires three things--three pieces of apparatus--a wall, a floor, and a chair. This apparatus, however, you can find everywhere, so we do not need to say anything about apparatus.

We have three sets of movements,--wall-movements, chair movements and floor-movements. First we will consider wall-movements. We put the patient against the wall--shoulders, hips and heels (illustrating.) First of all is breathing in this position.. It is impossible to take this position without strongly contracting the abdominal

muscles. It is common for business men and others to have weak abdominal muscles to take this position (illustrating.) It is difficult for them to get into the right position, especially if they are old people. Mr. E... (the stenographer) will excuse us for taking him for an example of this class. On account of a defect in his eyesight, he has to bring his head down close to his work, and that has thrown his body out of the correct position so long that it would be utterly impossible for him, at his age (sixty-seven) to take the correct positions in these exercises. . . . The result of training patients in classes, is, that many of them, having ~~for some cause~~ grown into the wrong positions, take their exercises with their bodies out of the correct position; nearly all of them do that. Now the more gymnastic ~~work~~ work such patients do with their bodies in the wrong position, the worse it is for them, for the exercise which they take is continually fixing the body in the wrong position. First of all, the position must be right.

If you put the patient in the right position and keep him there during his exercise, then his work helps to fix the body in the right position,--and it is important that the right position be maintained. It is almost impossible for a person thirty or forty years of age to conform to this rule. It is difficult for Mr. (the trainer?) to do it. Many ~~of you~~ have the "student stoop," as the result of long neglect of this rule. It is a wicked thing for the teachers who preside over our schools to allow their students to go along from month to month and from year to year cultivating mal-positions. If I were the governor (government?) I would make a law that teachers should be responsible for the physique of their students; and if a crooked stu-

dent was found in the school, and if it was found that the crook was acquired in that school, the teacher should be fined for it. The teacher should be held responsible for deformities acquired in his school.

Students should be taught to hold themselves in correct positions.

The wall is a trainer, as well as a professor, and it does this work thoroughly. (Position.) You say this is an exaggerated position,-- and so it is. You force the head back and you contract the muscles and lift up the ^{Chest} ~~organs~~ but you need not be afraid of that. The patient who has had this stoop for many years, and then puts himself against the wall and gets straight--you need ^{not be afraid} that he will maintain this attitude when he goes away,--he won't do it. He will very soon get back into his old stoop again. Now see how well I have maintained my position here; I think my head went forward half an inch. Put yourself in position against the wall, and then march away from the wall, and then go back again and see if you have maintained your position. I think my head went forward a quarter of an inch. This is an excellent practice for feeling the position of the body and seeing if you can hold that position. The wall is a trainer, and you can train the patient for a little while in this exaggerated position, and then he will be more likely to be able to hold himself in the correct position. This is simply to have the patient keep his chest up and take exercise in this position. For instance, all these arm exercises which you have been learning, and the different crosses which you have been learning,--you have learned to take this position--is this right? (Position.) ("Yes.") One is inclined to get the arms wrong,--; you must get the elbows up on a level. (Illustrating by position.) You can take every one of these positions while standing against the wall--you can get all these different exercises, even the hands to the back of the neck; it is an excellent training, because you bring the ci-

bows against the wall; they don't hang forward,--you can get the elbows back against the wall; this causes a little extra strain upon the muscles. So the wall is an excellent teacher,--I wish I could line you all up against the wall.

There are other arm-exercises, which are excellent, while standing against the wall. First the head,--we will have a carpenter make a platform with an upright plank, for these exercises, and then we will take all the arm-exercises,--we will take all the different crosses, arm-raising forward--this is an excellent exercise, because the tendency is to bring the center of gravity forward. So you have exercise of the muscles by holding yourself against the wall, raise both hands forward,--and what gives more exercise? ("Dumb-bells.") Yes,--and it is still harder to use only one dumb-bell; it is almost impossible to hold yourself against the wall with only one dumb-bell, and if you take two, you can't do it,--it is impossible; but with one dumb-bell to help you, you can raise one arm. (Student does it.) That is right,--it takes a very strong man to do that. You can increase the work by holding yourself against the wall firmly at first, then raising the arms forward, and then, if necessary, you can add a weight--you can use wooden dumb-bells, and thus you can increase the work.

Another arm-movement: With the arms up in this way (illustrating) and then down in this way,--this brings the arms to a cross. Keep the arms out as far as you can and breathe in at the same time. This contracts these muscles very well. (Mr. cries it.) That is right. (Illustrating.) See how my dress hampers me. Women can wear ^a more healthful dress than men can wear. Cross the arms; get them as close together as you can --that makes a strain. Now breathe in.

Bring the arms down,--don't breathe in. (Illustrating.) This combines chest-lifting with this movement--the chest is empty, and as you move the arms in this way, it pulls the abdominal muscles and lifts the viscera with great ~~force and~~ power. It pulls so hard that you feel a little air slip down into your stomach,--the pull is so strong, and the glottis is so tight that a little air slips down the oesophagus--you can hardly avoid it. I don't like the exercise called "the crank in the neck."

There are three stages in this movement,--one is inspiration; the second is expiration, and the third is chest-lifting. In chest-lifting you close the glottis. (Illustrating.) Notice, I have emptied my lungs and lifted my chest up, but I didn't let any air come in. I go through the act of inspiration and with the glottis closed,--notice the effect, drawing the air in at the same time the whole trunk is inflated. Suppose we lift the chest like this --forcing the air out, but at the same don't let ~~any~~ air in --what would be the effect? The ~~air~~ would be drawn in, like this (illustrating.) What does that mean? It means that the diaphragm has been pulled up -- it means that the stomach has gone home to its place, where it belongs. The stomach has been away from home, and this movement has opened the door for the stomach to go home,--the stomach, liver, pancreas, and other organs which have been depressed have gone up to their place. The chest makes the act of inhalation, but you don't draw the air in. The air can't get in from the upper part, so something must be drawn in from the lower end.

These three things occur in ~~this~~ order,--we will start with the lungs empty--hold the glottis--don't let any air in, but put up the arms and raise the chest. (Illustrating.) This makes such a pull

that you will feel a little air slip down the oesophagus ~~down~~ into the stomach. (Repeating illustration.) Did you feel the air slip down? ("Yes.") That is a demonstration of the tremendous lifting power that you get in putting the hands up in this way.. I would like to have you all take this exercise where you sit. (Students exercise.) This is proof of the tremendous suction power that you get by this method. Of course the whole purpose of this exercise is to lift the viscera.

Now, arms-circumduction,--still against the wall. (Illustrating.) There are quite a number of arm-exercises, as, a number of crosses, arms forward-raising, with various modifications, arms forward flinging,--this is a very strong exercise with the body against the wall, etc.

Then, head exercises, such as head backward bending. This lifts the chest away from the wall, and still increases the tension of the abdominal muscles, and the tension on the muscles of the trunk. It is a good plan to practice this with breathing. (Illustrating and counting.) The purpose of this is to hold the forward position--after you get it. Be sure that the patient maintains this position against the wall. Force the chest a little further ~~out~~ forward, and have the patient hold it there.

Here is the forward -bend movement, which is very good. (Illustrating.) Draw the head forward while breathing out. Draw the head forward by means of the muscles attached to the head and chest,--the tendency is to lift the chest. The object of this is to get a good forcible lifting of the chest after the breath is all out.. Empty the lungs; now pull down the chin, and at the same time pull up the abdominal muscles--try that (Students exercise.) Avoid making a great strain upon the muscles of the back,--when you make such a contraction it strains the muscles; but put the chest forward and make a longer

curve in the lumbar region--a long curve in the whole back. Pull the chest forward, and the back will fall into the right position. Now take a deep breath,--breathe out. Draw down the chin--do you notice that that pulls up the abdominal muscles. If you want to pull it down the other way, it is a good ^{thing} ~~way~~ to do that; but you must pull down very hard, and then you can feel the abdominal muscles pulling up. ("You can feel the chest raised also.") Yes--and you must feel the chest come up. You must not get the idea that the purpose of the head-movement is to strengthen the muscles of the neck. It is not the purpose of this exercise to strengthen the neck, but the purpose is to **develop** ~~lift~~ the chest; that is the great purpose of these movements. The ~~whole~~ purpose of these movements is to develop the chest and draw the chest up (illustrating.) As though here was a heavy weight that I could not pull, and if I pull hard enough, I will pull myself up to it. That is what you are doing with the chest in this case,--the head is trying to pull the chest up, and the head gradually yields, because it is not big enough to lift the chest--it is smaller than the chest, so it must gradually yield and come down. That is my theory of it, and I am satisfied that that is the only good we get out of the head-movements,--its effect upon the chest--it pulls on the abdominal muscles.

Sometimes it is a good plan to make little sidewise movement. It would not be good form to use this movement (illustrating) but it seems to give you a little more power. ("It develops the muscles of the neck.") Yes, but that is not the purpose of the movement,--the purpose is to keep the chest up; that is the thing you are after--to get the chest into the correct poise, and you get that by exercising these muscles, and when they become strong enough, they will carry the head in

its proper position. When the head droops forward, it is because the muscles are weak; but these exercises, in two or three weeks will develop the muscles of the neck so as to carry the head in the correct poise; you won't have to be thinking about it, but the head is thus brought in the correct ^{poise} ~~position~~ all the time.

A word further about these wall-movements--but it is very important to consider these head-movements--bringing the head down, and forward bending the head. Back-bending of the head is useful; it is an excellent movement; it lifts the chest forward. There is also a second advantage in this movement,--there is a leverage which aids in pushing the chest up. The wall is a very useful trainer.

Here ~~are~~ is backward-bending,--three stages--first, slowly; then carrying the chin forward in the correct position, and then returning to position; then starting out again. One can modify this, and continue backward movements, going from the wall a certain number of times, and then returning to position. That would be a more advanced position until the body has become able to hold itself in position well. One may also modify this ~~position~~.--when the body is held forward (illustrating.) This will be the forward-wall-standing position. All these movements can be exercised in this position ~~(against the wall)~~--and all the different crosses, and the arms-forward-raising--all these positions can be taken with the head held forward. In the forward bending of the head, turn the head forward slowly; pull the chin down to the sternum, lifting the abdominal muscles at the same time.

There are some bending exercises which are useful, as trunk-bending exercises,--with the hands upon the hips; wing-standing, hips

firm, etc. Have the feet well braced, so as to get all the leverage possible, and you have the "forward-bending," to a certain degree. The head and shoulders are in the right position. Now, forward-bending keeping the eyes fixed on the ceiling. Keep back as far as you can. (Illustrating and counting.) This is an excellent exercise for the muscles of the trunk and legs.

The trouble in taking these exercises, is the difficulty in keeping patients against the wall in the right position. When you get them against the wall in the right position you must keep them in the right position,--the position which brings the muscles into action in the most vigorous way. When the arms bend in this way (illustrating) there may be a rotary movement. (Counting.) Brace the body against the wall so that the hips cannot turn--so that they are held against the wall. You will soon find it necessary to take a rest. Put one foot forward, and let the hips fall forward a little, keeping the shoulders against the wall for a little rest. The muscles of the trunk will continue to ache, and you must relax the tension by bending clear down to the floor. This is the forward-bend position. (Illustrating.)

The purpose of this movement is to completely relax the muscles of the ~~abdomen~~ *back*; the idea is to bend so to completely relax the muscles of the ~~abdomen~~ *back*, and to relax the muscles of the back entirely, and to relieve the strain. It is a downward bend in which you relax the muscles of the trunk. Bend down as far as you can,--bend only one knee, and keep the other straight. This is a movement which is almost necessary. Before resting, after making this external movement for some little time, take this downward-bend movement; then take a rest for a short time, and then go on again. This whole movement is a trunk movement.

Now we come to log-exercise Standing with the head and the

hips and the shoulders against the wall with heel-raising (counting); then with knee, bending (illustrating and counting). Slide up and down the wall, keeping the head and shoulders against the wall; the heels very a little.

We have other leg-exercises, --for balancing the body on one foot, carrying the leg forward as far as you can, while still keeping the hips back. Then the other foot (counting.) The further up the leg goes, the more the abdominal muscles are drawn in, and of course it takes a very strong contraction of the muscles to reach the leg, so it becomes a very vigorous exercise. We can increase the work of the exercise by raising the arm and leg at the same time. (Illustrating and counting.) To-morrow we will take up chair-exercise.

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Exercise for Invalids.

J.H. Kellogg, M.D.

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LET us consider some sitting movements for invalids. I think these movements are very important, because nearly all invalids, as well as most students (not excepting the present company) sit with the back against the chair, -- that is the ordinary sitting-position for the person who sits a great deal is, to sit with the back rubbing the back of the chair. I have met several cases in which persons had corns on their backs as the result of rubbing against the back of the chair. I think it is very important to train invalids to sit in the proper position, and to sit and stand in the proper position. It is more important to learn to sit properly than it is to learn to stand properly, because in sitting, we relax completely, and also, because persons whose occupation is sedentary, sit a great deal of the time. The positions which we assume, as I have already said, is the mould in which we grow up. So it is important that the position of the body, especially of the abdomen, should be correct.

The man whose business is sedentary, -- the book-keeper, for example, or the editor, the proof-reader, or perhaps he is a pianist, or he may have any of the other sedentary occupations -- he sits in a chair in the ^awrong position, and the abdomen is relaxed, the liver will be forced down upon the stomach, and he will be continually suffering injury. When the abdominal muscles are weak, and the abdominal ^{pressure} tension is low, what is the effect upon the liver? ("The venous blood accumulates") Yes. If the pressure is diminished, -- the tension which naturally supports the liver -- if that is taken off, the liver would fill up with blood. So, when a person lets his chest down

and relaxes the abdominal muscles, the intra-abdominal tension is released, and the liver fills up with blood. It is like a sponge in a vessel of water,--when you grasp the sponge, the water is squeezed out, and when you release the sponge the water runs back into the sponge. The liver is in the same condition--the abdominal muscles are the sponges, and when they are relaxed, the liver is distended with venous blood. What will be the effect then? What harm would it do to have the liver filled with venous blood? ("A large amount of blood would be left in the liver.") That is a good point,--the blood would also contain excretory matters, etc., which it is the duty of the liver to remove, thus overtaxing the liver--what else would happen? ("The other parts of the body would be deprived of blood.") Yes; a person would have cold hands and feet if the portal circulation were congested. He might have too much blood in his brain, so that he could not study as well as usual. That is the reason students sometimes feel drowsy,--because of the accumulation of the blood. In some cases we apply the moist abdominal bandage for the purpose of congesting the viscera, putting on an impervious covering for the purpose of relieving the brain.

Is there any other evil? ("Auto-intoxication.") Yes. Auto-intoxication is almost an omnipresent evil, and pathology is resolving itself more and more into auto-intoxication. We find so-called "abdominal dropsy" is often auto-intoxication. The congestion of the liver would produce a tendency to the damming back of the blood, and this would cause asphyxia of the cells which defend the body. The intestinal mucous membrane, the epithelium and the phagocytes, the connective tissue and the corpuscles also, act as defenders of the body--but you have learned all about that. If the venous blood is retained, it has the effect, it has the effect to anesthetize ~~the~~

or asphyxiate these cells, because phagocytes are only active in the presence of oxygen, and when the oxygen is diminished or largely reduced, the cell is bathed with venous blood, the effect would be to lessen the power of the phagocytes and leucocytes, and auto-intoxication results from the entrance of bacteria from the intestinal canal. In Bright's disease and similar troubles, this state of things exists throughout the body, allowing the bacteria of the skin to enter into the tissues and produce oedema,--and that is what oedema comes from. We used to say that oedema came from some mysterious cause,--that the blood was too thin, or that nature was draining off the poisons from the blood, relieving the tissues of these poisons. But we now know that it comes largely as the result of the penetration of the skin by organisms of the skin which have the power to cause the tissues to throw out serum. What is the serum for? To dilute the poisons formed by these germs...

What harm does this lowered resistance do to the liver? It causes the bacteria which naturally thrive in the alimentary canal to find their way up through the bile. The bile having lost its bactericidal properties, these germs would form a colony in the liver. There would be a precipitation of uric acid forming a nucleus for calculi or gallstones, and this slips into the gall-duct and by-and-by drops into the bladder, and that is the beginning of gallstones. Then we have catarrh of the liver, infectious jaundice, etc., which come from the same cause.

There is another thing that happens to the liver. Phagocytes are not only germ-destroyers, but what else do they do? ("They remove certain poisons.") Yes, they destroy and digest exudates, etc., and some of them do something else,--they are constructive as well as destructive. Some of them are engaged in the process of repair and

growth and tissue-building. They are not only tissue-builders, but they destroy imperfectly developed structures. Whereabouts does diapodesis or migration take place? ("Through the capillaries.") Does it not take place in the arterioles? ("No.") No. The blood-movement is too rapid there. It does not take place in the large veins, but it does take place in the capillaries and in the small veins--in the first beginnings of the veins, and in the capillaries---and when the liver is in a state of venous congestion. That means that the veins are dilated, and that the blood is slowed in the veins. That would encourage the process of diapodesis, and they (the phagocytes?) pass down, with these leucocytes into the liver., and that would encourage the tissue-building in the liver and the ^{growth of} connective tissue one of the ways in which hypertrophy of the liver and cirrhosis of the liver comes about--from the excessive production of connective tissue in the liver, as the result of chronic congestion. Now the congestion is produced, not only by bad positions, but by poisons ^{absorbed} ~~which poison the~~ body, and these poisons produce vasomotor paralysis and congestion of the liver, and the over-development of the liver because of its unbalanced circulation. We may have this condition encouraged, and this condition of infection may be brought about by wrong sitting.

See what immense consequences hang upon this fact : Men who have never taken alcohol may have a "gin liver," in consequence of bad habits in sitting, as, sitting with his chin too near his desk, and after death and on a post mortem examination, he might have been taken for a secret drinker of intoxicating liquors, although he was a temperate man. But we have discovered that the "gin liver" is not always produced by gin, but it is often produced by these toxins which are produced in various ways. Alcohol disturbs the stomach and results in putrefaction, and these poisons formed as the result of putrefaction, absorb-

ed into the blood and circulating through the liver, disturb the circulation of the liver, and then through this diaporesis migration we have an abnormal development of the connective tissue of the liver, and that produces cirrhosis. We may have the same thing-congestion from bad position, so it is important that chronic invalids should be taught to sit correctly. I would not spend much time on this, only I wish you to fully understand that it is not a matter of esthetics, or of looks, although that is important; it is a matter of far more serious consequence than any one would suppose who has not studied the subject deeply. So the effort must be made to have chronic invalids sit correctly. And I think it is just as important that the chronic invalid should have exercise in the sitting position as in the standing position. You should have sitting exercises, so that the invalid will learn to sit correctly, and train him in that position ~~which will~~ in which he will form the habit of sitting correctly.

Another reason for this is found in the fact that the chronic invalid is often too weak to exercise the muscles of his entire body all at the same time. Whatever exercise you take, the muscles of the legs should get the most work out of it; and in our Swedish gymnastics, the muscles of the legs get the most exercise, because they are continually on the strain, and are continually carrying the body. It is only while standing perfectly balanced and the arms like this (indicating), that the legs are not brought into the highest ~~activity~~ degree of activity.

So it is not the most important thing to ^{develop} exercise the legs of the chronic invalid, for he is ~~not~~ ^{not} ~~trying~~ ^{not} ~~to~~ ^{bring} ~~an~~ ^{an} ~~athlete~~ ^{athlete} - a ~~legged~~ ~~tramp~~ ~~or~~ ~~an~~ ~~invalid~~, ~~whose~~ ~~is~~ ~~participating~~ ~~in~~ ~~such~~ ~~athletic~~ ~~are~~ runner or a pedestrian etc. His legs are already strong enough to carry him around, but his trunk muscles are very weak, -- his chest-muscles are weak, *and we should do our best to develop the muscles which are*

particularly weak--the muscles which are disproportionately weak.

It is not going to make much difference with the abdominal organs whether you increase the strength of the leg muscles or arm muscles or not, but it is a matter of tremendous importance whether the abdominal muscles are able to maintain constant tone or not. There are two things which are of the utmost importance in the abdominal muscles, as well as of all other muscles,--and these are tone and strength. Tone is one thing, and strength is another thing. I saw a very feeble woman the other day; her muscles were very soft and small, and yet she had such tremendous tone of the abdominal muscles that I could not make a bit of impression, the muscles were drawn in so tightly, because there was an internal inflammation there, and that had caused a spasmodic contraction of the abdominal muscles; the tone of the muscles had been increased to such a degree that they felt like iron.

Now what we want to do for the chronic invalid, is to increase both the strength and the tone. An increase of strength will generally bring with it an increase of tone. This same woman, when the inflammation was not present, the abdominal muscles would be relaxed. They were swollen and distended; the bowels were filled with gas, ^{which} and distended the ~~bowels with gas~~ abdominal muscles to a great extent, and they felt like cloth. Now if these muscles were ^{made strong} increased by work, the tension would be increased, and the muscles would be contracted sufficiently to support the viscera. It is the natural tone of the muscle rather than the strength of the muscle that is of prime importance after all. We want strength only because that brings tone. When the muscle is strong the tone will be high unless there is some abnormal condition present. We want tone of the muscles because they are

automatic.

We want, then, especially to develop the trunk. If we put the patient through the exercises which bring the legs and trunk and arms into play, all at the same time, the patient will soon be fatigued before we have been able to give him sufficient exercise to accomplish the desired end. We want to improve the breathing, and that is to be accomplished by the development of the abdominal muscles. When the strength of the abdominal muscles is increased, and they contract, the diaphragm is pushed up high, and the result will be a complete emptying of the chest; and when the chest is emptied, the abdominal muscles will contract well and force the diaphragm up high and the air will be forced out of the chest. When the air is drawn in again, the diaphragm which has been habitually acting against the strong abdominal muscles which have been well trained, will force the abdominal muscles out far enough so as to store up a sufficient amount of energy in the muscles, so that they will recoil and lift the stomach up and fill the chest again... More than this, by a strong contraction, of the abdominal muscles, the diaphragm comes down forcibly upon the liver, and other viscera, and giving them a hearty squeeze, they are emptied of blood.

Now let us see what we can do with the chair,--first of all, the sitting position. First we have the fundamental wall-standing position, then we have the fundamental sitting position. In the first place the chair must be of the right height, and the seat of the proper width. If the seat is too wide, then the front edge of the seat will touch the leg, and the patient will not be able to sit back in the chair so that the hips will touch the back of the chair. The hips must touch the back of the chair, so that there will not be a pressure against the vessels under the knee. Then both feet must rest squarely

upon the floor; otherwise, when the chair is so high that the feet hang down, and can only just touch the floor, the vessels beneath the leg will be compressed, and the circulation is interfered with. Now when we have a chair of the right height, and a seat the right width, the shoulders touch the ^{top} back of the chair, and the hips touch the back of the chair. Now, if the body is allowed to relax, the middle of the trunk will fall down against the back of the chair, and that is not the proper way to sit. When you sit, you should sit forcibly, upright in the chair. The only normal condition in sitting, is forcible sitting. You should sit forcibly, and stand forcibly, energizing the body to keep it in shape. You must remember that gravitation is all the while pulling us down,--it is like sin--it is continually pulling us down physically, just as sin is always pulling us down morally. Gravitation, like sin, is always tugging at us to pull us out of shape. It is only when we are lying in the horizontal position that gravitation works with us. All the rest of the time we are fighting gravitation. Sometimes one will say, "I am so tired that I can hardly hold my head up," and down it goes. You don't push it down,--gravitation pulls it down. So when you are tired you have lost your power to battle with gravitation. We are all the time battling with gravitation, but when the muscles become weak, we give up,--gravitation is too much for us, and down goes the head. It is the same with standing: Sometimes we get tired of standing. Sometimes you will see a boy in a class in school, who is tired, and he sinks down in his seat. Gravitation has got the start of him, and he has simply fallen down. When a person is tired, he lies down when standing up, or he leans down on one leg, he lies down against the wall or table,--when a person is in such positions, he is relieved, but the position is wrong and injurious.

When a person sits down, he must still fight gravitation. If we think we are not fighting gravitation when we are sitting down, we are mistaken. When we are tired, we throw ourselves down in a chair, and lie down when sitting up, but we should not do that. This position is that of lying down when sitting up, paradoxical as it may seem. Don't lie down when sitting up. Tell your patients so. Let the hips touch the back of the chair, and the shoulders touch the top of the chair. Why is this necessary? Because the moment you relax the muscles, down falls the chest, and when the chest falls down the sternum and the pubes approximate each other, and the attachments of the recti-muscles are brought nearer together, and the result is a general relaxation... We will suppose the chest relaxes (illustrating by diagram.) The moment it comes down, the abdominal muscles relax, and of course there is a forcing out---

Q. Would not the backward-bend in that position do more harm than good, by pressing the viscera downward?

A. Yes. The chest must be put forward. The right position is necessary first of all. Now we will see what the ~~position~~ wrong position in the chair is, and the reason why. We want the reasons, so you can tell them to others. I am going over this ground systematically, so as to give you the points, because I expect every one of you will teach some one else. The chair has done a great deal of damage to civilization. The chair is an artificial, and an unnatural thing --it is not a natural thing, and the sitting position is not a natural position,--it seems to me to be an unnatural position.. We find that the savage, when he is tired, does not say, "I guess I will sit down upon a stone and rest awhile," but he throws himself upon the ground; and in that position it is proper and safe to relax the

muscles completely. But it is never safe to completely relax the muscles when in an upright position, because the moment you relax the muscles, gravitation gets the advantage of you, and begins to pull something out of shape--the liver, stomach, etc.,--pulling your spine out of shape..

Now I wish you would all remain just as you are for a short time, because I am going to make an examination, and see how many of you are right. (Examining student.) You are sitting on the front of the chair,--that is a common practice,--sitting down on the front of the chair and relaxing the muscles.. Now suppose you try to sit straight, sitting on the front of the chair, and at the same time getting the support of the back of the chair--no one could hold himself in that position long; the muscles of the back would get tired and come down. A person sits three inches in front of the back of the chair, and the same thing is true. If he lets the back rest against the back of the chair, he gets tired. If the hips are brought clear back to the back of the chair, and the upper part reaches the top of the chair, it is not so easy to come down,--you can't get down without slipping forward. If you would sit clear back to the back of the chair, to start with, so that the hips strike the back of the chair, then you get tired and the head will drop forward, but you won't get into the position where the spine will be likely to be forced backward to the seat. Try to correct yourself and you will be tired. A lady once told me that she had been standing up in this way, and it gave her a terrible pain in the back, and she thought it must be wrong. But it meant that the weak muscles were brought into action, and made to do something. I told her to go on in that way, and the pain would soon disappear, and she would have a straight back, and a strong one, instead of a weak one.; that it didn't mean that any injury was being done. Here is a

Here is the correct position (illustrating.) "What is the use of sitting, if the muscles are braced?" In sitting, one rests his legs, and he is no longer obliged to balance his body. When one is in this position and breathes free, see what happens? Every time I breathe, my nose goes forward. Now, whether one breathes freely or only slightly, there is some movement, so there must be a continual ~~ad-~~readjustment of the trunk-muscles, so as to keep in line with gravity. But you no longer have to balance the body when in this position, but you must balance the head or else it will fall backward or forward; but the body does not fall because it is supported; that shows that the muscles are comparatively at rest.

The muscles of the trunk must be developed to such a degree that the tone of these muscles ^{will} ~~must~~ be sufficient to keep the bow of the trunk taut, except when you are completely relaxed in a horizontal position. The tone of the muscles of the back must be sufficient to maintain the back in the proper position. The tone of the trunk-muscles must be sufficient to hold the trunk in the proper position, and the abdominal muscles must have tone enough to continually and properly support the ~~viscera~~, and that will be brought about by proper exercise, with the body in the proper position. Insist upon this point — that in sitting on the ordinary chair, the center of the back must be kept free from the chair. Most chairs are horribly constructed. Many chairs have hollow backs. (Diagram.) Manufacturers see that the majority of people sit in that position, so they make their chairs with this posterior curve. If the chair had any curve, it should this curve (diagram.) The center of the back would be supported by such a chair as this, and if a person sits well back in the chair, he will have support the whole length of it. But the old-fashioned straight-

backed chairs are as good as any , and if we would always sit in that kind of chair, with the hips carried well back to the back of the chair and the shoulders touching the top of it, that would give us as good a position as we could have in a chair .

Chair and Floor Training.

J. H. Kellogg, M. D.

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I think these chairs should be cut down; I think they are a little too high for ladies. We will have them cut down about an inch, for the proper position. First get the proper position, with the feet squarely down on the floor and a little separated. Hips against the back of the chair, shoulders touching the top of the chair, and back free from the chair,--now we are ready for exercise.

First we have the "wing-position. The purpose of this is to press the chest forward. You can't do this very well without compressing the rhomboid muscles. This draws the shoulder-blades back and keeps the chest forward. This position is taken for the purpose of assisting the chest to keep forward; it is a sort of strained position. After the chest is forward, bring the hands to the hips, and this has the effect to fix the chest, and brings it a little further forward. This is the first position. (Illustrating.) Here you have a leverage,--bring the elbows back, and that forces the chest forward. These exercises may be taken in the sitting position.

First we will have head-movements,--head-backward-bend, forward-raise. The purpose of this backward-bending is to correct ~~the~~ curvature of the spine, but it is not to strengthen the muscles of the neck. But when you throw your head back, the chest must come forward; gravity requires that. The knees and hips are in the same position,--this is the advantage of this position--when the head is thrown back, the chest must go forward, otherwise the body will be inclined forward; the head is thrown back, and that lifts the chest up. The chest is lifted

The chest is lifted in two ways: First: ~~First~~ the body pushes the chest up as the head is thrown back; second, the chest is lifted up, because as the head comes back, a strain is made upon the muscles which connect the head with the chest, so as to pull it up. The whole purpose of this exercise is chest-lifting.

Now the forward flexion movement: We make this with the head, resisting as much as possible. We fix the muscles of the back of the neck, so that the muscles connect the head with the front part of the chest or compel it to exercise itself, contracting with the greatest vigor. The whole purpose is to lift the chest up, at the same time pulling on the abdominal muscles. This exercise may be taken in all the different positions, and at the same time we have the advantage that the trunk muscles are exercised in such a way that they must do the work required of them. This sitting position has some of the advantages of the movements taken in the kneeling position.

Now we will take the arm-exercises: This is a very useful arm-exercise (sidewise raising), in which the trunk is compelled to hold itself steady. Arms-upward-flinging,--patients who would not be able to take these exercises standing, whose legs are weak, and they have not the power to balance themselves--they can make movements of this sort on the chair, when they can't perform any other feat. If you will look into the Gymnasium door at the time when you come to your 9 o'clock class, you will see scarcely anybody there over forty years old. It is almost impossible to get any elderly people to take these exercises, and the reason is, that they are better adapted to growing boys and girls and young people generally, than for elderly people ..

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And the Purpose of these movements that I am giving you, is, to reach an elderly class of people, depending upon Br. B..... ~~to give to~~ give you these fundamental Swedish movements... Sometimes you can get aged people to take these exercises when you cannot get them to take floor exercises. They are conscious of their awkwardness. There are, however, a few old people who are enthusiastic, and think they can do as much as when they were young, but they make a comical performance in the gymnasium, and the rest of the patients notice them, and they are sensitive and keep out of it, for they don't want to make a spectacle of themselves.

We may have both arms in this position (illustrating) breathing quickly, at the same time. Get the chest in a good position, and ~~and~~ then breathe. The arms slowly sink,--you never want to breathe ~~quickly then~~ rapidly then. Breathe in as quick as you like, but don't breathe out rapidly. That is not a good thing to do, because the forcible expiration compresses the heart so forcibly as to empty it completely of both the arterial and venous blood, and the filling of the heart is interfered with. If you compress the chest too quickly, you will catch the heart in the midst of a contraction, and force the blood back. There is no harm in quick inhalation, because that assists the heart. But by forcible exhalation there is danger, if it is very sudden, and the heart is very weak...

We have ^{arms-} forward-flinging, breathing in at the same time. It is better to execute that movement raising the arms laterally (illustrating.) and extending them in front, to a sink. But the best of all ^{these} arm-movements is the one that I showed you yesterday, in connection with the breathing. Crossing the hands, starting with the chest empty--

take a deep breath,--you see it is next to impossible. Notice that the air is drawn in--put your hand to your head, near to the vertex--you get a tremendous pull down here .

Some corrective exercises can be taken in this position, which are very valuable. Here is one: Put one hand on the bottom of the chair (illustrating)....Put the other arm up in this way and push as hard as you can. This is a strain-position. Now, in this way (illustrating, and counting.) Try to get in a little more work with each count,--try to reach a little higher, hanging on here all the time . A person may have a spinal curvature (diagram.) Connect this arm with the chair down here, and reach this arm up--the effect will be to put the shoulders in this position--what would be the effect on ~~the spine?~~ [?] ("A curve.")

It would make this change , and draw these two parts together,--what would be the effect on the spine ?

("A curve.") Let this represent the spine (Diagram.) Suppose this is a curvature of the spine. Here is the left shoulder, and here is the right shoulder--it is lowered--what sort of a curve would there be ?

("Lateral.") The pelvis would be tilted, this way,--and that is what we generally have . Now put this ~~patient~~ person in a chair in this position--what would be the effect upon the pelvis? ("Horizontal.") Sitting in the chair in this position would bring the pelvis square .

Then we would have the shoulder down like this . Which arm would you take hold of the chair-seat with? ("The left one.") Yes,--and this arm would come ^{up}--~~and what would be the effect--~~ what would be the effect ?

("To straighten it out .") This is a very valuable exercise. Curvatures which are curable are generally acquired about the ages of fourteen or fifteen, and sometimes younger. We examined a little girl the

other day, who was only two years old. She had a typical young lady's curvature--who was a very precocious child.

Q. If a person has a curvature at thirty years of age, can he be cured?

A. If he can take the right positions in the chair... Suppose the left shoulder is the highest,--which way does the spine curve? ("To the left.") Then such a person should seize the chair-seat with the left hand, and, sitting in the proper position, bring the other hand first to the shoulder; then slowly carry it up as far as possible,--pulling down with this hand, and pushing up with the other. If the curvature can be cured, it can be cured by this means. This exercise must be repeated several times a day--execute this movement about twenty times, and three times a day. This is an important exercise. Here is the curvature (diagram.) This position is for the hip to be elevated while the shoulder is lowered, on the concave side of the curve you will always find one hip higher than the other. Young ladies know that. The dressmaker knows it and she pads it up and covers it up. And men sometimes have their shoulders padded. But women have most of the padding done about the hips, because the deformities are most apparent there, conspicuous thereabouts. When a lady's dress is made in this way (diagram), it will be conspicuous. You can't get this hip down, so there must be some padding around the other hip to bring it up. This is very common, so the dressmaker knows all about these curvatures. Now this hip is higher than the other. When a person sits down in a chair, and endeavors to keep his shoulders square, this hip will be raised--what will be the natural effect of this? ("To straighten the spine that way.") Yes, and that will bring this shoulder up. How will you do that? Suppose I had the left shoulder down,

and my spine is curved toward the right, and this hip is raised a little. Suppose I force myself to raise the opposite hip, and form the habit of sitting on my left hip, and continuously sit on my left hip,-- would that cure this curvature,--but we will take up the question of deformities at some other time. It is an excellent thing for a person having ~~these deformities~~ a curvature of the spine to take these positions, sitting on the hip of the low shoulder, raising the hip of the opposite side. Suppose we adopt that plan. We can raise that hip by crossing one leg over the other. That will also correct the rotation which is likely to occur. Now we take hold of the chair and put one arm up, and by greatly intensifying the effort, we can force the curvature over. (Illustrating.)

Here is another important exercise. Here is a low shoulder and a right high shoulder,--grasp the seat in this way (illustrating), and make rapid flinging movements. This is of great value in cases of this sort. In order to get this arm up, I have to fix the muscles of the opposite side--these muscles have to be made tense. I would like to have you try that exercise. Put one hand against the muscles of the side (illustrating). Now throw the arm, and notice what happens to these muscles down here. (Exercise.) Do you see these muscles contract every time--they contract vigorously. Now put the hand here (illustrating) and put this arm up here, and push up high--as high as you can. Now relax, and push up again,--relax. Do you notice anything? The muscles contract every time. Why? Because, in order to push this arm up as high as possible, your shoulder must be pushed up... Suppose I want to reach that book,--I can only reach to a certain point--what will I do? Raise myself as high as possible and reach up as high as I can (illustrating.) I once saw a giraffe in the Zoological Garden in

New York, reaching up into the top of a tree and plucking off the leaves; and there was a tempting little tuft of leaves that were still higher up, and he wanted them very much, so he stretched out his long neck, and reached up his long head, and ran out his long tongue, and he couldn't quite reach it even then, so he tried this plan of standing on his hind feet, and then he seized his prize. Nature adopts this plan,--of pulling one shoulder down to get the other higher up. These arm-reaching movements of the low side are of great value.

There are counting-movements. (Illustrating.) When we do this, there is, ~~a strong~~ with each movement, a strong action of the muscles of the back. When you execute these movements, ^{standing,} the hips will turn a little in spite of all that you can do--unless you are very well trained, there will be a little twisting of the hips, and feeble patients with weak trunks cannot do it easily. (Illustrating.) But when you are taking this exercise in a chair, the hips cannot move,--there is no opportunity for that, so you have only the head to take care of. Keep the body straight and the hips will take care of themselves. Keeping the hips fixed aids in keeping the head fixed. Keep the eyes fixed on the thumb while executing these movements, and you will notice a very strong action of the muscles of the trunk. Now Mr. Case, sit down and execute this movement--arms - forward- reach. Thumbs together. Right arm sidewise fling (counting.) Each time he moves his arms, there is a tremendous effort of the muscles...

This is a one-sided movement (illustrating.) It is much easier to fling both arms together. But when you fling one arm, the movement is so strong that the body has to make an effort to keep itself still.

Another exercise which is very useful, is a swaying movement; it is useful for the trunk. This is a double sort of movement (illustrating.) The arms extend sidewise. This is a movement for exercising the muscles of the trunk, while, at the same time, it is a movement for the viscera. The viscera need gymnastics, and they sometimes don't get very much. It is the duty of the diaphragm to move the liver, spleen, bowels and stomach up and down. This exercise that is secured by the movements of the diaphragm, is necessary for the health of the abdominal viscera. But when the diaphragm is weakened by compression-- and in most women it becomes very weak, because it has no opportunity for work--when the diaphragm is weakened, the muscles are weakened, the bloodvessels become distended, passive congestions occur, and catarrh and various other diseases result in consequence of lowered resistance. This is a splendid exercise for the viscera. (Illustrating.) Of course we have some exercises in the standing position, but this is a very difficult position-- to hold the hips still, and you can't get old people to do it. In the sitting position, the seat holds the hips, so you can give the trunk a good, hearty twist, letting the head go with the arms.. (Counting.)

We can vary these exercises and intensify them a little by turning the head in the opposite direction. (Counting.) This is not a very graceful exercise. You will find that it tires the muscles of the neck very quickly. It gives these muscles a good strain; it forces them to exercise themselves to the very highest degree.

Another exercise which is of value is this (illustrating.) with the two hands nearly together. (Counting.) The feet must be firmly placed upon the floor. (Counting.) This is something like a swaying exercise, or that of a mowing. It is a strong exercise for the muscles

of the trunk. I think I have already called your attention to exercises ~~by swaying~~ of the trunk by swaying back and forth. The moment you get past the perpendicular, the muscles of the back come into vigorous play. (Exercise by class, breathing and counting.) Breathe in when going backward, and breathe out when going forward. You can increase the vigor of this movement by simply raising the heels. (Exercise.) Let the patient practice this exercise until the heels are raised and the feet as far as possible from the chair. An increase must be made from day to day, as the abdominal muscles gain strength. The chair may be made very useful as a trainer, for invalids who need these exercises for the development of the trunk, and have not the power to take them gracefully when standing.

There are some interesting floor-movements which it will take but a few minutes to show you. I think I will give them to you, taking them up at another time.

We can have all sorts of leg movements on a chair,--for instance, this: Put the leg back as far as possible--raise it up as far as possible (exercise and counting.) Now the other leg. Then sitting on the side of the chair, seize the seat and reach the arm up in this way (illustrating.) One can get excellent trunk-exercise in this way. Here is an excellent exercise for curvature of the spine. The right shoulder is lower (exercise.) By this means the shoulder is forced into place. Now I will lie down on the floor and give you a few floor-exercises. The first exercise in the lying position is raising the head forward. Remember that it is not the head that you want to raise,--it is the chest. So in this exercise be sure that the chest is being pulled up, and that the abdominal muscles are being drawn in.

pull the chest up as high as you can, the arms being extended at the side. Be sure and draw in the abdominal muscles as far as possible. (Exercise, and counting.)

Then we have chest-lifting: In chest-lifting, the lungs are completely emptied. (Exercise.) Raise the chest without letting any air get in. Hold the breath and pull the chest up as high as you can. (Floor-exercise.) You can intensify the exercise by raising the head a little. Now raise one leg; then raise both legs. Draw the legs up near the body, then close up to the body. Then extending the legs as high as you can,--then down again. It is sometimes best to let the patient draw the legs up, and keep them in this position. If the patient cannot do that, bring the limbs up over the body (illustrating.) These exercises bring the abdominal muscles into play. Then the legs are balanced, and the abdominal muscles are brought into action, but not so great as when the legs are straight. By degrees, the patient can be trained to raise the legs straight up a number of times. You would be surprised when you come to deal with invalid women, and find how large a number of women there are who cannot possibly raise their legs when extended in this way; a great number of women cannot possibly do it. In some cases the patient is fleshy, and their legs are very fleshy, while the muscles are weak. There are a great number of men who cannot raise their legs, because of the great weakness of the abdominal muscles. They can begin by raising their hands and gradually extending their limbs. It took me a long time to get well by means of this exercise. It didn't help me at first, and then I graduated the exercise by bringing the feet near the body. So there is chest-raising, head-raising, and leg-lifting. Now combine these exercises in this way: Raise the head forward (exercise and counting.) Then take breath,

for you can't breathe ~~during the exercise~~ while exercising, so you should always take breath between the exercises. (Exercise and counting.) When the patient first begins, the exercise can be short. As the muscles get stronger, the time can be increased,--the duration of the exercise may be increased.

This exercise is particularly good for invalid women,--- and for men who have weak abdominal muscles,--hips raising and knees separating (exercising and counting.) Then the same movements are made, the knees being well separated, and the feet being well braced. This brings the muscles of the back and abdomen into exercise very vigorously-- also all the muscles which are concerned in the support of the pelvic viscera.

Another exercise of real value, is that of rolling over and over,--lying out at full length and rolling over. Almost anybody can do that. (Laughtr.) It requires vigorous exercise of the muscles of the trunk,--you can't do it without exercising the muscles of the loins. One can't do this with the muscles of his arms or his legs. It is executed entirely with the muscles of the loins, and hence is a very good exercise. Several people have to try several times before they can do this exercise, especially if they are very fleshy, for the muscles are not strong enough. But if you will try this exercise, and put your hand upon your abdomen, you will notice the contraction of these muscles when you roll over. It is best to have the arms straight.

lying upon the face is a good exercise. Raise the head backward without the use of the arms. (Exercise.) This will correct curvature of the spine.

Exercise in leg-raising, the arms and legs being extended. (Exercise.) At first, not so vigorous as possible; afterwards more vigorous. Try to touch the body with your foot if you can. That brings

a vigorous strain upon the muscles of the back. Then take both the head and feet ~~together~~ and try to ~~gt~~ get them together. Of course you can't do it, but imagine you are going to do it. (Illustrating.) I do not recommend this exercise for gracefulness, but ~~be~~ development.

Another exercise which is a very good one, is the elbow-support, lying in this position. This will ^{correct} ~~ease~~ a curvature. This little girl that I was telling you about, had a flat chest, and a pronounced posterior curvature of the spine, so I had her lie down upon her face on the floor, after having been given a ~~an~~ interesting picture book; and she was interested in the picture-book, and continued examining it till the curvature disappeared...I advised her mother to have her lie upon the floor several hours a day looking at the picture-book. There was no massage, electricity, nor anything else applied,-- she simply lay in this position, and the spinal curvature was corrected.

Exercises may be taken in this position which are valuable. Notice ~~what~~ happens when you take a deep breath. ("Raise the trunk.") By what power is my trunk-weight raised? ("The diaphragm.") So this is an exercise of the diaphragm. The weight of the body is centered upon the abdomen, and the diaphragm has to do the whole thing now. You can't possibly raise the ~~diaphragm w/~~ body without the aid of the diaphragm...This is splendid gymnastics for the diaphragm; by putting the weight upon the abdominal wall, we can bring the diaphragm into full activity. In lying in this position, the head is drawn ~~forward~~ ~~in line~~ backward further still. (Illustrating.) The purpose of this exercise is to correct a posterior curvature. Most business men and most women are round shouldered, and these exercises are very valuable for these cases. As the patient gets a little stronger, they may have a little more advanced exercise--elbow-t~~e~~ ce-lying--the

thumbs behind the ears (illustrating.)

Another exercise,--lying upon the side with the legs supported, the elbow drawn up, and the opposite hand upon the hip, and drawing the leg up in this way (illustrating). This is legs-sidewise-raising. (Exercise, counting, etc.)

Under what condition would you take this exercise? Suppose I ~~you~~ had a curvature of the spine--suppose my spine was curved toward the right--my right shoulder is higher than my left shoulder, and my left hip was higher than my right hip,--you see there is a bowing of the spine towards the right (Illustrating) In this way the weight of the body forces the spine to the proper position, and the shoulders and the hips are drawn nearer together. I think this is more valuable exercise than any apparatus-~~park~~ that such patients could possibly take .

There are many other exercises which I might talk to you about, but these are among the best and most important. I want you to get hold of these exercises which I have been showing you, because, when you come to deal with sick people you will find that a mere systematic education is impractical in many cases, and you have got to have something more direct and more specialized, and better adapted to the patient's strength or condition.

PHYSIOLOGIC THERAPEUTICS. Con., Oct. 28/02.

Exercise--Kind and Amount.

J. H. Kellogg, M. D.

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LET us consider the kind of exercise adapted to each individual,--requiring exercise of short duration; rapid exercise; exercises of speed--running, jumping, skipping the rope; games of various sorts; children's sports, etc. But long exercises are not adapted to patients. Swedish Gymnastics is a perfect kind of exercise for children, because it brings them into continual change, and adapts the movements to different parts of the body. We must remember, however, that children may overdo,--they may run too fast and too far, until they are all out of breath, or until they fall down, or until they have a palpitation of the heart, or until they get the nose-bleed. Still a child is not likely to be injured by this means to the lungs or the heart, for the elasticity of the tissues of children is so great that serious damage is not likely to occur.

We will suppose a girl jumps the rope 500 times in five minutes; she weighs 100 pounds and jumps the rope a hundred times a minute, and jumps three inches from the ground. (Blackboard calculation). That would be equivalent to 150,000 foot-pounds of work in an hour., and in ten hours it would be 1,500,000 foot-pounds. That is too much for a girl. How much can a strong man do? Nine hundred foot-tens. That would be equivalent to walking (not understood.) This girl that skips the rope a hundred times a minute, raising herself three inches each time, does work equivalent to walking almost half a mile in five minutes, which is at the rate of six miles an hour. Children should not be permitted to skip the rope until they are ex-

hausted. The six years'old babe needs the exercise of kicking, because his legs are too short, and need developing. When he gets old enough to creep, this is just the right exercise for him. He should not be asked to walk too early. It is well, also to let him exercise his arms. Children have great strength in their hands; they may take hold of a rope and be raised right up. You would be astonished to see what a firm grip the child has.

Take the boy fourteen to sixteen years of age, -- what sort of exercise would be good for him? I suppose some one would suggest football, but I am not going to recommend that. I don't believe very much in football, because it is a sort of fighting game, and it is just as bad for ten men to fight as it is for two men to fight. Football is nothing more than a sort of rioting which is recognized as legitimate. One team is simply trying to mob another team. It is not uncommon that men are badly damaged in this game. Defensive armor is provided for those who go into a football game -- a man has to have a coat of mail to protect him from the enemy's assaults of the enemy. The savage spirit that takes hold of these men who engage in the game of football, is sometimes something awful to contemplate. A man who is after a ball will not hesitate to throw his whole weight upon a limb of his antagonist, when he knows that the result may be to break a bone, and he will do it without the slightest compunction. If he gets the ball, it is no matter that the man's limb or joint is smashed, -- that is of no account compared with the ball. Human life is of little account in these competitive games. I am opposed to these games, because while engaged in them, men lose sight of the sacredness of the human body, and the welfare of their fellow men. In fact, I don't like competitive games any way. The missionary spirit is not a competitive

spirit. The spirit of competition is the spirit of the world; it is a devilish sort of spirit. The missionary spirit seeks to do good to the man who is down; the spirit of Christianity is to help a man who is down to take a higher standing. But the spirit of the world causes its possessor to seek to get above his fellows, and to suppress them, and to put every obstacle in their way as to get by them. This is not the spirit of Christianity; it is not the spirit of the real missionary. The real missionary spirit is to encourage and help the weak, and for the strong to help those who are weaker than they. The true missionary has in his heart the great fundamental principle, Love your neighbor as yourself,--even to love your enemies. "But," one says, "we don't think of these things when we are engaged in the games." Besides, we know it is human nature, if you can win, to exult over your fellows who have not succeeded, and to brag about it, and to say, "I have beaten such a man. I have excelled such a man; I am stronger than he," and to boast of his prowess to the other man's disadvantage. This is the most natural thing in the world. So it seems to me that these competitive games do not inculcate the right spirit. When there is this spirit in our hearts, there is likely to be heartburnings ~~over some things~~ which grow out of some of these things. I don't know whether there is any competition in lawn tennis or not. I have never seen anything in it worth competing for. I am simply giving my opinion.

Q. By Mr. Case. Did you ever play lawn-tennis?

A. No. I have never seen enough in it to think it was worth while to play the game. I think I would just as soon lie down in a corner or play ball with the wall. If you want a nice game of lawn-tennis, all you need is a ball and a wall, and the floor; with these you can have all the fun you want.

DR. THOMASON: You are selfish.

DR. KELLOGG: If you have a good motive, it is all right,-- for example, you are developing your muscles for the good of others-- to make others exert themselves. But we are a long ways from altruism,--but that is the true missionary spirit,--to help others to better themselves--that is the true missionary doctrine. But that is not the spirit of these competitive games in some of which they have real battles. I don't believe in them. Of course lawn-tennis and croquet are the most harmless of these games. But football is the extreme of competitive games, and I think it is but little better than downright fighting.

I think there is nothing so healthful as exercise. There is nothing so beneficial, good and wholesome as useful work. There is no exercise that is better for a woman than housework, provided the house is well ventilated. There is a variety of good exercise in housework -- for instance, scrubbing, which is splendid exercise. Some of you who don't know what this exercise is, try it and see what splendid exercise it is. The woman who does this sort of work is pretty certain to have a strong back and a good poise, too, because in scrubbing the arms are reached out, the chest is up, and the body is bent at the hips. Sawing wood, and splitting wood is splendid exercise. I had a note from ^{recently} one of the teachers of the Graysville (Tenn.) Academy, and he was speaking about their exercises in school; and he said the principle exercise was teaming and chopping wood. There is no better exercise than swinging the axe and piling ~~wood~~ four-foot wood, piling it onto a wagon and loading and unloading it. This is an excellent exercise for the arms and trunk and legs--the whole body is exercised. The farmer has a most excellent opportunity for splendid exercise. But

there is one thing to be said about these exercises of occupation which is very important, --and that is, that the man who is following some one particular occupation is likely to get deformities from the habitual attitudes assumed in that occupation, --for instance, the farmer who is teaming. He sits on his seat for long intervals between loading and unloading, and he sits all this time in a relaxed position. The farmer is more likely to be round-shouldered than the city man. I have been surprised to see how many farmers are round-shouldered, --and this comes from their bad habits of sitting while teaming, they sit on seats, or on the wood, and are all doubled over like a jack-knife, sitting in a relaxed attitude.

DR. THOMASON: Nearly everything that a farmer does is upon the ground, which gives him a stooping attitude.

DR. KELLOGG: Yes, the tendency of his work is to deform him. But mowing and pitching hay and chopping is splendid exercise. But the farmer has a great deal of ~~bent-work~~ bending work. This is especially true in this country and farmers have round shoulders. But in Germany, Scandinavia, and other parts of Continental Europe, it is not so. The farmers are straight and broad-shouldered, and the chests well up, because the people have learned that it is not healthful for the body to bend it over, unless it is bent at the hips.. So you see a German working away with her hands upon the ground, and bending over at the hips; with straight backs they were working upon the ground. They are able to stoop over, bending only at the hips, and lay their whole hand upon the floor, and they do it with the greatest facility. The consequence is, that when they stand up, they are straight, because they have no crooked back from long bending forward. A carpenter's trade or that of a cabinet-maker, --you can always tell

a carpenter or a cabinet-maker ~~by his gait~~ or a machinist, by his gait and the flexed condition of his arms, by which he shows that he has over-developed the flexors of his arms; they have become so developed that they have wrinkles in the elbows,--just as the man who scowls all the time will have vertical wrinkles in his face. The habitually smiling man will have horizontal wrinkles. The man with a sour disposition has sour wrinkles, and if he ~~is~~ is a scornful man, he has scornful wrinkles. So the man who habitually uses his flexor muscles,--his arm will be drawn up. The man who is in the habit of using one arm in his work, as the blacksmith--that shoulder is the higher, because those muscles have been developed, and got a disproportionate start of the other shoulder-muscles, and so the spinal bow is bent.

There are several other special deformities, but keep this in mind, that if you find a man who has worked some years at a special trade, he is likely to be deformed, in consequence. So the men who work at trades need corrective gymnastics.

~~The~~ Sedentary men get most of these deformities from their habits of sitting, especially the man who writes, the accountant, the engraver, the artist, the teacher who uses microscopes, the professional man, and the general laboratory man, are likely to get the stooped position, and you can recognize it, as I have said, in his appearance without noticing him in his ordinary position. When you examine a patient and find that he has wrinkles across his waist, and al-brown spots and wrinkles across the back,--when you see this, you may know that he is in the habit of sitting doubled over. You call a person's attention to the fact that he assumes a wrong attitude in sitting, and he will ask you how you know. Then you can point to his wrinkles across the back as proof of the fact. When you find a woman

with two or three brown spots across her back, you will always find that she has always been in the habit of sitting in a relaxed position in her chair. I had been examining people ten or a dozen years before I discovered that. I found no mention of this fact in the books, and so I didn't know anything about it.

When you come to examine people internally, you will ^{find that} ~~ex-~~ ~~internal~~ ~~internal~~ deformities which are connected with external deformities; the stooped position, the wrinkles across the front part of the body and the brown spots on the back are always connected with a displaced kidney or stomach, because this habit of stooping has existed for a long time. And there are internal deformities resulting from compression of the chest, and from the downward pressure of the diaphragm.

These deformities sometimes begin very early in life, in consequence of bad positions which have been maintained at school, the pupils sitting at desks while writing, the desks not being of the proper height. A special fault to which attention should be called, is, sitting at desks which are too low, or sitting at desks which are much too high ^{on seats}. When a child habitually sits on ~~these seats~~ this kind of seats, he is pretty certain to suffer from deformities. When the desk is too low, the book is too far away from the eye, the hands get tired of holding the book, and the body gets too near the desk..

Children also become deformed because of being near-sighted. If you find a nearsighted man who wears glasses, he will almost always carry his head in this way (imitating.) He has for so long time been in the habit of bending down to something that he is at work at, and he has done this for so long a time, that he has acquired the habit

of carrying the head forward, and so his chest is flattened, and he has a hump in the upper part of his back. When the seat is too low, the limbs get to aching because of the pressure of the seat against them; so the pupil slips down on his seat till his feet touch the floor, and then he lies down on his seat, and in this manner he gets a crooked spine. It is important that ^{the} such seats should be repaired. right. I have already sent for manufacturers' agents to come to the Sanitarium so that I can talk with them in reference to the manufacture of the new Sanitarium chairs,--chairs of our own pattern, and chairs of the right sort and suited to our needs. I would like to have you give me your opinion on that subject. I would be willing to pay a pretty liberal premium for the best sketch of a chair. It must be a light, good looking chair, and one that will be easy and comfortable to sit in, and which will, at the same time, aid the body in keeping the proper attitude.

Now with reference to exercise for adults,--what exercises are best for adults? Exercises for endurance,--exercises which require a considerable amount of work--these are best for adults. Much depends, however, upon the training which the adult has had. If a man, for instance, has been a sprinter at eighteen or twenty, he will still have a good strong heart at the age of forty or forty-five, if he has not overdone, and he can do better work than the sedentary man. If such a person gets a partial immobility of the chest, it will require a considerable amount of exercise to maintain a healthy condition,--he will require more exercise than the child.

DR. THOMASON: Statistics show that athletes, when they begin to grow old, deteriorate very rapidly, and get to be chronic invalids.

DR. KELLOGG: I suppose the same principle applies here, as to the "chief wranglers" in the universities of England,--they never are

never heard of again, after they win their prizes. They exhaust themselves in working for the prize. Violent exercises are not to be recommended.

But I was going to speak further in reference to the kinds of exercise especially adapted to adults. Here is a business man-- what sort of exercise would you recommend for him? I think that swimming is the best. The next best is walking. There is always an opportunity for walking. Some of our most successful business men are great walkers. Professor Ericsson, the inventor of the armed fighting ship Monitor the vessel that defeated the Merrimac in our great Civil War. You were not alive then, but you have heard of it. We, in the North, were very much worried when we heard that the Merrimac had started up the Potomac, and was going up to bombard Washington. The Southerners had taken an old steamer and had armored it with railroad iron. That was the first armored ship. Mr. Ericsson had been at work on the armored ship Monitor. The Southerners heard of it, and had spies all over the North, and every possible effort was made to imitate the Monitor. The Monitor was not so large as the Merrimac, and had a revolving turret supplied with ^{very} heavy cannon,--one on each side--which was prepared to fire such heavy balls as had never been fired before. These vessels were also supplied with "rams," by which they could pierce the sides of other ships. We were greatly worried for fear the Monitor would not be able to intercept the Merrimac,--but it did, and a great battle was fought between these vessels, ~~Mr. Ericsson~~ the Merrimac was defeated and the danger to Washington was over. It was Mr. Ericsson's brain that gave birth to our "Monitor" war-ships-- armored war-ships. He was perhaps the most inventive genius that this country has ever ^{had}. I think he ranks equal to if not superior to ~~him~~ Edison,--he certainly ranks above him ^{from} in an educational point of view.

This man walked the streets of New York from 9 o'clock to 11 o'clock every night, whether it was stormy or shiny. During that two hours' walk, he would be getting his mind clear, planning new discoveries, and preparing himself for a good night's sleep. And so he maintained wonderful health and energy and activity of mind and body to a very advanced age.

William Cullen Bryant also, who lived to a hale old age, took vigorous daily exercise. Instead of riding in a coach, he walked seven miles to his office every day, and when he got to his office, which high up in a very high building in New York, he used a ladder to go to the top of the building on foot instead of using the elevator. He did this for the sake of exercise,--and he did something more (illustrating heel-raising between two chairs.) He did this 500 times, every morning. This is an excellent exercise for the legs. Try it. It burns up a great lot of old matter in the body, for it also employs the trunk. The next exercise was for his arms. This required no apparatus--simply the use of two chairs. This exercise he called "dipping." It consisted in raising himself as high as he could by his arms, and then letting himself down, then raising himself up again, until he had made "forty dips." This was his morning dose of exercise. This is a good corrective exercise for the chest,--it raises the chest upward and forward, and exercises the muscles attached to the shoulders, scapulae, and exercises the muscles of the trunk, as well. It sets one to breathing vigorously. You can take enough of this exercise to be equivalent to good gymnastic exercise in-doors, but it is better to exercise out-of-doors, if possible.

There is a variety of exercise, as boxing, fencing, etc., that is taken for the health, and there is no doubt some advantage in it, but these exercises are not absolutely necessary. There should be a moral

effect, as well as physical in exercise....I always feel sorry for a horse when I ride him, for I feel that he is getting more exercise than he needs. I feel that I am abusing him while he is carrying me around. Rowing is a good exercise, but when one has been exercising in that way for an hour, in which all his energies have been dissipated into the air, he cannot help thinking it would have been better if he had put that energy into something useful. If we could use all our energies in doing something that would be beneficial to the world, that is the best thing for us to do. When a man comes to die, the things that he will be most thankful for, will be, the things that he has done that will remain behind him, and live after him. When one comes to die, the most terrible thing that he can conceive of, I think, is, that his life is now going to be rubbed out; that when he is gone, it will be like the ripple caused by a pebble thrown into the water, and in a moment the ripple is gone. We should use our energies to the best of our ability to make a permanent impression upon the world,--to set something in motion that will keep going after we are gone. If we are placed in such a position that we can utilize our energies in such a way as to make "foot-prints in the sands of time" that cannot be rubbed out, ~~I am sure~~ we *may* make that our aim in life, and if we do, I am sure we will ever be grateful for the opportunity.

A Word in reference to exercise ~~in~~ for adults in general, and for old age. In old age, the great thing we have to combat, is immobility. You ask an old man to stoop over, ~~bending only at the hips, and~~ and pick up something off the floor, and he cannot get down to the floor, because his spine has become immobile. The ligaments and cartilages have become hardened and shortened, so that they have lost their compressibility. There are some exceptions. A man ~~who had~~ been an officer in the army was once asked how he kept himself erect. He said

he made it a rule, every morning, from the time he was a young man and a soldier, to drop a pin onto the floor, and pick it up off the floor without bending his knees. He did that every morning, and in that way he kept himself straight. He kept himself straight, because in that manner he kept the muscles of his trunk active,--he thus kept the lumbar muscles active and elastic, and thus prevented the immobility of the trunk which comes from the neglect of these exercises.

It is exceedingly important that the old man should have exercise. He needs it more than the boy does, more than the young man does, and more than the adult does, but he has the least capacity for exercise, of either of these classes, and we must remember that. The old man has certain difficulties to contend with, in this respect: His chest and cartilages, which were very elastic in youth, and childhood, and, to some degree, in middle age, have become hardened and rigid, and the cartilages of the ribs become ossified, and the vertebrae become fixed, because the old man has ~~been content to~~ not been able to breathe with his diaphragm, and there has been no chest spasm. This is not so true in the civilized woman as with the old man,--women have more elasticity of the chest than men, because the ribs and sternum are smaller, in women than men, and the body pressing upon the lower part of the chest, the upper part of the chest remains more elastic, and the cartilages do not so early ossify in women as in men. That is one of the advantages of the corset--and the only advantage that it has, that I know of. It preserves and develops the upper part of the chest. But the evils of the corset are so great that they overbalance any possible benefits that may be derived from it. So it is very important to keep these things into consideration in prescribing exercise for the old man.

Another thing in which the old man differs from the young man, is the fact that his heart is weak,--and his heart is weak for the same reason that his arm is weak. When the muscles of the arm degenerate from age, every muscle of the body degenerates from age. He breathes rapidly after a little exercise, because his heart is weak, and because his chest cannot expand and he cannot swell out his ~~chest~~ lungs and take a deep breath, as the boy or the young man can. Suppose you were very thirsty on a hot summer's day, and could only swallow a few drops of water, when you should swallow half a glassfull,--suppose the oesophagus were so constricted that you could get only a few drops down, how rapidly your thirst would come on, because you can't assuage it. That is the condition of the old man,--he can take in only a small amount of air, and the consequence is, that he gets rapidly out of breath.

There is another thing from which the old man suffers,--and that is the predisposition to secondary fatigue. Secondary fatigue is the fatigue that ^{the old} man suffers, not immediately after work or exercise, but the day after. The older a man gets, the farther away the secondary fatigue is postponed, and the more intense it is. The old man may be able to walk as far as a young man, and so he thinks he can go into the harvest-field and do as much work as ~~the~~ any of the other hands. They work together, and by-and-by the young man is tired, but the old man is not, and so he says, "I can do as much as any young man can,--" and so he can for one day--but the next day he has to pay for it; he is laid up with rheumatism; he has soreness in the back, joints and muscles, has a little fever, and is very much exhausted. The old man exercises or works, and he is tired without knowing it. The fatigue-center in the old man, has lost its acuteness, and he does not feel tired, consequently he works harder than he ought. This is like a man who is working in a cold season or a cold country,--he is cold, and he ~~takes~~

drinks alcohol, and that benumbs his sensibilities so that he does not know he is cold. The woman who is wearied with household cares takes a cup of tea, or a cup of coffee, and no longer feels weary,--she is weary, but what she has drunked has so benumbed her faculties that she does not know it. So the old man,--his body is in such a condition that he is not apprised of the fact that he has already done work enough, or when he has exercised sufficiently, and that he should take a rest.

There is another reason that I should mention, why the old man is subject to ~~fatigue~~ secondary fatigue,--and that is this--that his body is saturated with waste matters and the kidneys and liver are less active than in the young person, and so the waste matters--uric acid etc.--accumulate in his tissues to pretty near the point of saturation, and when he ~~exer~~ cannot exercise, there is thrown into the blood a sufficient amount of poison to produce complete exhaustion, but because his fatigue centers are benumbed, he cannot be conscious of fatigue until the next day,--but the actual mischief has been done, just the same.

Recognizing these facts, what shall we prescribe for the old man, in the way of exercise? In the first place, the old man needs a great deal of exercise, but he is so soon out of breath; he gets out of breath before he has done a large amount of ^owork. A large amount of work done by the old man in a short time produces breathlessness. And the old man has a rigid chest and a weak heart. His respiratory field is diminished so that he cannot do a large amount of work in a short time, because he gets quickly out of breath; his lungs cannot keep up with his muscles. What would you prescribe? ("Walking.") Yes; he needs a large amount of moderate exercise. He needs exercise more than ~~young~~ a child does, because his tissues are full of ~~CO~~ poisonous matters which need to be oxidized, and he needs exercise to increase the cir-

ulation of the blood and encourage the action of the kidneys and liver, and consequently he needs a great deal of it. Walking is one of the best kind of exercises for the old man, because by walking, he can do a large amount of work, and do it so moderately that he is not likely to overtax himself, and will not do himself harm, and will not keep on until he has worn himself out.

How much work do you think the old man ought to do to maintain himself in vigorous health? If he did not ~~do any~~ take any other exercise, how much walking should he do in a day? He needs more of this exercise than a young man does. Suppose he is a man of sixty, -- he is not yet feeble, nor an invalid. ("About ten miles.") Yes, nine or ten miles. An English physiologist has worked this problem out. Let us see what it would be. (Blackboard calculation.) He would do work enough to lift his own body 2376 feet. If the man did not wish to do this work by walking, he could do it in some other way, -- for instance, by "heel-raising," William Cullen Bryant's exercise. Let us see how much work he did. He was a good model, for he maintained good health into far advanced life. Five hundred heel-raising was his exercise, -- let us see what that would be. (Blackboard ~~exercise~~ calculation.) It would be equivalent to walking seven and a half miles a day, -- about the amount required. Walking is splendid exercise for the elderly man. Sawing wood, mowing grass, raking leaves, working about trees, working about the farm, caring for the stock, etc., is splendid exercise for the elderly man, moderate hill-climbing, taking a little care not to exercise too violently, is splendid exercise for a man in advanced years. To-morrow we will consider the application of exercise to disease.

Oct 30/12

PHYSIOLOGIC THERAPEUTICS, Con.

Exercise con.

J.H. Kellogg, M.D.

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When we set the legs to work vigorously, the body will draw in food-supplies; an abundance of material is supplied through the legs. Leg-work is the thing for exercise. The purpose is to break down old tissue in preparation for the taking^{of} new tissue. But we generally prescribe this exercise for a boy or a healthy and vigorous young man. He wants exercises for all-round development. So in Swedish gymnastics, all kinds of bodily activities are used, as climbing, swimming, etc. Climbing is the same as swimming. In climbing, one uses the arms and legs vigorously,--only in swimming, one does the hardest work, perhaps, with his legs, while in climbing, one does the hardest work with his arms. These all-round exercises are the things for healthy children and youth; but for adults, especially adult invalids, with whom we have chiefly to deal, require not only work for development, that is not the prime purpose of exercise. It is not a question of development simply, but the patient needs work to wear out his tissues, ^{and} to increase oxidation. The average chronic invalid is suffering from slowed nutrition,--put that down. I want your attention. This is not worth so much to you now as it will be some other time. You may, at some time, be sitting stupidly by, and seeing a patient getting worse and worse, when you ought to be able to help him. So he will slip out of your hands and go off to some other doctor because you didn't know what to do with him. You don't realize the necessity of doing certain things now, as you will them. I am anxious

that you shall all have full command of every physiological therapeutic means, when you get through here. And exercise is one of the most important of these means, and it is necessary to understand these fundamental principles. I don't think we have half a dozen doctors on the face of the earth at the present time, who are able to make use of exercise in a scientific way. I am sorry to know that that is so. But the reason of this is, that they have given their attention to other things, and have not studied these things; but I want you to study them hard enough to have them at command. As I have said, children and youth exercise for development, but old people ^{(especially chronic} exercise for ~~the wear-~~ invalids), the wearing ^{ing} out and destruction of tissues, and the carrying off of waste material.

There is another thing that we apply exercise for, especially in chronic invalids, and that is for the correction of special bodily weaknesses or deformities. And there is still another form of exercise that we apply, and that is for the development of certain regions of the body, especially the abdominal region, and the respiratory region of the body--the trunk.

Walking, as I have said, is an important mode of exercise, especially for these chronic invalids, because it is a moderate kind of exercise, and especially adapted to this class of people, and because it is an exercise in which we can gradually the amount of work exactly. Let's see what kind of walking we have: First we have moderate walking,--that is, walking at one's ordinary or customary gait. We often see a laborer walking along, swinging his dinner-pail (illustrating.) That man is expending a great deal more energy than he needs to do. He is not walking in a way that will tend to give him the

greatest endurance. Again, we see some people walk in this way (illustrating by short, quick steps.) This is a gait that is very tiresome. (Walking at a slow, striding gait.) You will see many walking in this way,--I have rubber heels, so I cannot illustrate this method of walking very well, ^{but the heel comes down first.} The hips are carried too far forward, and the toe cannot get down soon enough. The further the foot is removed from the center, the longer it will take the toe to reach the floor. If the chest is carried forward, when the foot comes forward, it is almost under the body,--when we put it down, it is almost under the chin, consequently the toe will reach the floor. The toe falls a little way in front of the nose, and so it naturally comes down almost as soon as the heel does. But when the foot is forward, you reach the foot out, the toes are a long way from the center of the floor.....Delsarte instructors teach that the toe should be put down before the heel but observe the result of such a method of walking. (Illustrating.) Try that, and see how impossible it is to walk in that way--the toe striking the floor first. Sometimes people do it, but they have paralyzed their foot flexors. You will sometimes see a gentleman walking with a cane, and he walks in this way, because his foot flexors are paralyzed so that he can't walk any other way. The proper way to walk is to let your heels and toes strike together, carrying your chest forward, and the foot naturally falls on the heel and toe together, the heel striking the floor just a little before the toe; that is perfectly natural, and cannot be otherwise. The chest being carried forward, the arms swing like pendulums with a spring attached, so that when the arm goes forward, it is swung forcibly back again. There is muscular effort in swinging the arms in walking, and the purpose of this is to equalize the movements of the body,--to antagonize the tendency of the legs to twist

the body around. Put your hands behind you and try to walk, and you will wriggle round. You often see ladies walking in that way, because they think it is not proper for ladies to swing their arms. You will often see them walking with their arms held close beside them, consequently they have a wriggling gait, but by swinging the arms, the movement of the body is equalized, and this twisting is prevented (illustrating.) The manner of walking indicates a certain state of mind. One can easily study character in the gait, in many cases. A man's gait is often characteristic of his character. When you are familiar with a person, you know him, even at a distance, by his gait. You hear him coming, and you know his step. There is something characteristic in the rhythmic of the step. It is so with horses,--each has his individual gait; no two horses have the same gait. And the human machine is individual; there is no two of them alike. Gait is so characteristic of individual mechanism as to be even imperative. A boy walks like his father. Perhaps a little boy's father may have died when he was young, so he may have had no opportunity to learn to walk like his father, but he does walk just like his father, because he has the same kind of machine that his father had.

I should have said something about the shoe, in walking. When we prescribe walking exercises, we should prescribe the shoe also. We need some kind of shoes, or else we will wear out the soles of our feet. The Mexican has no trouble in this respect, because the soles of his feet become very thick and like the hoofs of a horse, because he has been barefoot all his life, and his feet look like those of a camel and the skin becomes half or three ^{eighths} ~~quarters~~ of an inch thick, and his foot is cracked and furrowed like those of a camel. Such a man don't suffer from stone-bruises; he don't get slivers into his feet; he has no trouble in this respect, for his covering is as tough as raw-hide

Most people, however, require some kind of protection for their feet. A Mexican who wants a shoe, will take a piece of sole-leather, place his foot flat down on it, and with a pencil, mark out the shape of his foot on it, and then cut out the circumscribed piece for a sole for his foot. Then he cuts holes along the sides of the sole, and then puts ^{soft} leather thongs through these holes and over his feet, and between his great toe and the rest of his toes (illustrating.) The foot being spread out upon a flat surface, the body is well supported and free to move. (Drawing diagram of foot.) Do you see the principle to which I am trying to call your attention? A strong arch of the foot is very important for the strength of the foot. When the foot is tired and overtaxed, the ligaments which hold the foot in the form of an arch relax and the arch of the foot falls down and flattens out upon the floor or the ground,--the arch of the foot is broken down, and that is what we call "flat-foot." Great care must be taken, when we advise exercise for people, not to give them long walks, if they are feeble, and not accustomed to walking; and they must have a shoe that will support the arch of the foot, not wearing loose shoes, slippers or sandals. Persons that wear such things, suffer in consequence of weakness of the feet, the feet not being able to sustain the weight and the work brought upon them. A person's legs may be able to do the work required of them, while the feet are not able to do the work required of them. Our feet are very much abused. The average civilized woman binds her feet in some such manner as does the Chinese lady, although not to so great an extreme. The feet don't have a proper opportunity for development, and so they are weakened.....

Q. Is a low heel necessary?

A. Yes. The patient should have a very low heel and broad toes. Of course the shoes should not be made so large as to be

clumsy or a weight upon the foot, but the shoe should be light, with a reasonably thick sole. And there should be plenty of room for the arch or instep of the foot. I think most shoes are made with too low an instep....If we had no leather, we could use felt shoes. A felt shoe is very much warmer than a leather shoe, and it is very much healthier. If you are troubled with sweating feet, a felt shoe or a cloth shoe will cure that. Leather has no outlet for the ventilation of the feet, and it confines the secretions of the feet. A leather shoe so saturates the feet with perspiration that it produces an odor and a rank smell in the feet. If a person has sweaty feet, he has a perfect Golgotha of germs and fetid matter which have been accumulating in the nerve-cells. And you can't wash and sterilize your shoes, and so they are always filthy. Leather is the worst material out of which shoes could be made. Its only good quality is, that it is durable and flexible. Wooden shoes might be used, with rubber heels and soles. We might also have shoes made of hair, or have papier mache shoes, but a leather shoe is not the proper thing for the feet.

Now, as to walking exercises again: We have two kinds of walking exercises. We might divide them, as regards the amount of work required, first, into moderate walking; second, rapid walking; and third, running, for running is a kind of walking -- it is walking at a "right smart rate." Of course we may have slow running or rapid running. We can classify walking in another way,--in regard to the amount of work required in going a certain distance. The rate of walking determines the amount of work to be accomplished in a given time. If we want to increase the amount of work in going a given distance, we can go up an inclined plane, or we can climb a hill. Tomorrow we will consider the kind and amount of exercise, etc.

PHYSIOLOGIC THERAPEUTICS Con. Nov. 5, 1902.

J. H. Kellogg, M. D.

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The Signs of the Body,

THINGS TO BE INCREASED.

1. Blood-count. { Heart,
 Vessels.
2. Leucocytosis { Anabolism
 Katabolism.
3. Metabolism.
4. Nervous activity,--Gland action.
5. Elimination.
6. Alkalinity of the blood.

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WE have come to a time when physiological therapeutics is "in the air,--" when the spirit of physiological medicine is abroad. Doctors and editors of medical journals are anxious to get hold of anything they can upon this subject. I had a letter the other day from the editor of a medical journal of wide circulation begging me to write six or eight articles on vegetarianism for his journal. He said he believed in it, and wanted to lay it before his readers. Doctors are ready to give attention to articles on physiological subjects; they have heard much about drugs, and they want something new. They are willing to listen to new ideas, even if they are very much opposed to doctrines which

they have been taught,--the old conservative doctrines. I am exceedingly anxious to have every one of you who shall go out from here, an able exponent of all these principles. I should be sorry if other schools should get the start of us in this respect. It would be disgraceful to us. When we first began, it was thrown upon us as a reproach that we were not altogether orthodox in our advocacy of vegetarianism and opposition to drugs. But that day is past, and there is a rapid march in the progress of the world in this direction at the present time,--and that is the case, not only in this country, but in other countries as well. There is published in Italy, a medical journal supported by some of the best medical authorities of that country, and the name of the paper is, "Riforma Medica," which means "medical reform." Now if such a paper had been circulated in this country a few years ago) (?) every writer who contributed to it, would have been dubbed a "fanatic" by the profession. I received a letter from Dr. ~~Ottosen~~ Olsen telling of ^{great} medical progress in Denmark during the last few years. When Dr. Ottosen first opened medical work in the Skodsberg Sanitarium, there was another doctor of the same name in that part of the kingdom, and that doctor was very anxious not to be mixed up with the Dr. Ottosen at Skodsberg. So he published in the newspapers, in a very prominent way, an article notifying the public that he was not "the fanatical Dr. Ottosen who has charge of the Skodsberg Sanitarium;" that he had nothing to do with him, and had no sympathy with him nor with his fanatical work. That was a pretty strong protest. Dr. Ottosen states that just last week, the same Dr. Ottosen who had thus protested against him, came to the Skodsberg Sanitarium with his wife, spent two or three days there, and were delighted with what they found there. He left his wife there to take treatment, and to take cooking lessons, and to get acquainted with the institution and its methods.

institution and its methods. She became familiar with their methods and principles, and adopted them in her home. That was a wonderful change. Dr. Ottosen had bitter opposition for a number of years because he took a strong stand for our principles. But these principles ^{and methods} have won. They have not made converts of every one who has come in contact with them, but they have won the respect of the people. We cannot expect that every one will be converts to our methods, but we can command their respect, and, in order to do that, we must put them on a scientific basis. Dra. Ottosen has taken a seven years' medical course in Denmark, and graduated with the full qualifications for practicing medicine,--and Denmark is the hardest country in the world to graduate in--but he has finished his medical education there, so they can raise no criticism against him upon that ground, and he has met with wonderful success. The king and queen have also visited the institution, and probably that has made a change in public sentiment. We have a great many kings and queens who visit us here, for every man is a king and every woman is a queen, so we can feel just as proud as Dr. Ottosen, so far as that is concerned.

People are finding out that there is much in these principles that tend to heal,--that physiology, bacteriology, chemistry, etc., are all placed on a scientific foundation, and it all points to physiologic therapeutics. We have not had physiologic therapeutics before, because medical practice has been almost altogether empirical instead of rational. Rational medicine was not known nor dreamed of, until within the last fifty years. About fifty years ago, Dr. Oliver Wendell Holmes wrote an article entitled "The Rip van Winkle M. D.", in which an old fashioned doctor is represented as falling asleep, and waking up after the lapse of fifty years, and finding the doctors practicing rational medicine? This poem was written fifty years ago, and to-day it is ful-

the tonic which is given might be quinine, or it might be alcohol,-- alcohol makes a man feel strong by benumbing the sensory centers ; it a narcotic. I have tried the experiment of making two men lift as hard as they could, and afterwards gave them a couple of ounces of brandy apiece, and then made them lift all they could again; but they could not lift nealy as much as they could before; they felt as though they could, but they could not. The same thing is true of smoking. I once asked an eminent lawyer who was a great smoker, if he made his strongest appeals to the jury directly after smoking. He said, "No, I am careful never to smoke just before addressing a jury; I learned that many years ago." A woman is weak and languid and tired,--she takes a cup of tea. She is no longer languid and does not feel fatigued, but she is fatigued; she is not rested. The thein of tea , or the caffenin of coffee is a great deceiver, but the greatest deceiver of all is strychnia. A man is weak. He takes a dose of strychnia, but the strychnia gives him no strength. There is a strychnia pill on the table,--it can no nothing; there is no energy or strength in it. All the power it has is to make a man think he is strong when he is not strong, by irritating his nerve-centers and deceiving his nerves. That is irrational medicine, and it is practiced from day to day by hundreds and thousands of doctors. These two meyhods are far removed from each other,--as far as black is from white,.or truth and error .

When you go out into the world and engage in the practice of your profession, you must go as the apostles of a great truth,--of reform truth. But, at the same time, you must not get so far away from the other doctors as to give them the idea that you are setting yourselves up as a separate sect; you must not do that. You can go no farther than to take the position of a Christian physician who understands and

practices rational medicine. Above all other men, the physician is most needed. He must see the hold on life loosening, whether it is king or peasant, whether it is a humble laboring man or a money-king. And it makes no difference how high or how humble the station of the doctor is-- he may simply be a humble country doctor, ~~and~~ the king bows his head to the doctor and obeys his orders implicitly. There is no man on earth who has such responsibilities upon his shoulders, and has such noble opportunities, and, when we come to the last analysis, who has such kingship as the doctor.

The study of rational therapeutics will give you power that you could get in no other way. I have heard of doctors going away from this school, and then relapsing from these principles and giving drugs to their patients, when there was no necessity for it, but they did it because they did not know what to do,--they were ignorant; they had not been thoroughly imbued with the principles of rational medicine. So I am anxious that you should get a thorough knowledge of these principles. I couldn't tell you what I know of rational medicine, if I could talk to you a year., and I am wondering how we are going to get these students to know rational medicine thoroughly. It seems impossible, during the time you are to remain here, for you to get more than a glimpse of it. We have some graduates, and how did they come to learn rational medicine?...

Two or three years after you go away from here, you will begin to appreciate these things, if you have learned them thoroughly. If you have not, you will have a patient, and will not know how to cure him in a ~~natural way~~ rational way, so you will fall back on the nerve-foolers. He is in pain and you give him morphia and he is comforted. The next day, the pain is still greater, and you must give him a larger

dose of morphia. The next day the pain is still greater, and you must give your patient a bigger dose, and so on, until the patient has a second disease,--he has the morphia disease. There was once a lady here who had this trouble, but she became discouraged and went to Philadelphia, and was treated by one of the most prominent physicians there, and took morphia. After being in the hands of this doctor about three months she was taking about seven or eight grains of morphia a day. She had severe pains in the stomach; she had hyper-secretions in the stomach; she had dreadful attacks of migraine, and this doctor went to work to cure her on a meat diet, but this made her steadily worse, and she became emaciated, and a mere skeleton. She was finally obliged to come to the Sanitarium. She came here with the morphia habit attached to her, and in a far worse condition than when she went away. This was very humiliating to her former doctor, for he had said that he was going to cure her, and did everything he could for her. We took the morphia away from her and gave her no meats at all, and in a few months she was a plump, rosy-~~woman~~ checked woman. That is the difference between rational medicine and irrational medicine,...

We have such experiences all the while, and we are struggling all the while to get along without drugs, because, as I said, they are nerve-foolers and deceivers. There are conditions in which drugs may be used rationally,--for instance, if a person has a wild animal in his stomach, it is rational to send something down into the stomach to kill it. If he has a tape-worm in his stomach, it is right and rational to take something that will kill it. But the important thing is, to take such a dose as will kill the tape-worm, and not be large enough to kill the patient. That is the reason it is not easy to kill the tape-worm of a little boy. We had a boy with us at the Sanitarium, named Tommy. He

had a tape-worm, and had gotten into a wretched state...It was difficult to give the boy a dose big enough to kill the tape-worm without killing the patient boy. Tommy was well known and the neighbors used to ask him, --"Tommy, how is your t_w?" We had quite a battle in that case, . One Sabbath morning I sat down by him, and I said, "I will hunt for that tape-worm. " In about four hours I captured the tape-worm, and you can imagine the rejoicing that took place when we found that we had the entire tape-worm. I had to use several drugs, but they were all addressed to the tape-worm and not to the boy, and the result was good. In that case the use of drugs was rational, and we were practicing rational medicine.

I want to impress upon you to get all you can of rational medicine or physiological therapeutics; because sometime you will be gone, and the Lord only knows where you will go to; you may be thousands of miles away; you may be on the other side of the earth, and you will be the last resort for some poor sufferers there, in their struggle for life, and you should be supplied with everything possible for the saving of life. Don't get so interested in "Pathology," "Histology," and other studies which are merely subsidiary, and stepping stones to the real thing you are going to use, ^{as to forget that} the only thing that you are going to use in the world is Physiological therapeutics, --preventive medicine, curative medicine, hygiene--rational therapeutics.

We have studied the physiology of exercise, and of different kinds of exercise, and now we have come to the point where we are considering what sort of exercise prescription to make for different patients. We have talked about exercise for boys, for girls, for adults, and for old people. And now we are going to talk about exercise for different classes of invalids.. We have been considering this thing, --

that it is nature that heals. In the use of physiological therapeutics we are cooperating with nature--that is, we are cooperating with God. I was reading, this morning in Colossians, and was much impressed with the 10th verse,--"That ye might walk worthy of the Lord unto all pleasing, being fruitful in every good work, and increasing in the knowledge of God." That is what we are doing, in the study of physiological therapeutics. We are studying God, and we are exhorted to increase in the knowledge of God. (11th v.) "Strengthened with all might, according to his glorious power, unto all patience and longsuffering with joyfulness; (12th v.) Giving thanks unto the Father which hath made us meet to be partakers of the inheritance of the saints in light; (13th v.) Who hath delivered us from the power of darkness, and hath translated us into the kingdom of his dear Son." The New Version reads, "Who hath delivered us from the tyranny of darkness." What a terrible tyranny that is. What is the contrast here? Darkness and light; ignorance and knowledge. Translated from the tyranny of darkness into the kingdom of knowledge and truth. What a privilege. We are being delivered more and more from this tyranny of darkness from day to day." (14th v.) "In whom we have redemption through his blood, even the forgiveness of sins." (15.) "Who is the image of the invisible God, the firstborn of every creature," speaking all the time, of Christ the Life. (V. 16.) "For by him were all things created, that are in heaven and that are on earth, visible and invisible, whether they be thrones, or dominions, or principalities or powers: all things were created by him, and for him." This is Christ. (V. 17.) "And he is before all things, and by him all things consist," by him all things hold together. (18.) And he is the head of the body, the church: who is the beginning, the firstborn from the dead; that in all things he might have the preeminence. (19.) For it pleased the Father that in him should all fulness dwell. (20.) And having made peace

through the blood of his cross, by him to reconcile all things unto himself; by him, I say, whether they be things in earth or things in heaven. (21.) And you that were sometime alienated and enemies in your mind by wicked works, yet now hath he ~~quickered~~ reconciled (22.) In the body of his flesh, through death, to present you holy and unblameable, and unreproveable in his sight : (23.) If ye continue in the faith grounded, settled, and be not moved away from the hope of the Gospel which ye have heard, and which was preached to every creature ~~under heaven~~ which is under heaven, whereof I Paul was made a minister."

This puts before us the great fact that the life with which we are dealing is Christ; and that power which we see manifested in the body is God. It is the same Power that heals and creates. See then, what significance there was in the remark of Dietl in reference to the healing power and the fact that nature heals,--and this is the first law of therapeutics which we must never forget--he says that "Nature creates and ~~maintains~~ nature maintains; therefore nature has power to heal."

Now we want to raise the question, How does nature heal? And what are the methods by which nature maintains the energies of the body against all the enemies about us. We must, in this study, consider what we call The Defences of the Body. There are two things to be done, in this work,--there must an increase of activity, and a diminution of activity. There is a regulation of vital power continually taking place within the body.. We say that in the defence of the body, there are some of its activities that are to be increased, and some that are to be diminished. We will first notice the vital processes that are to be increased, in the defence of the body against disease.

As the first of these, we will write down Blood-Movement. (Writing on blackboard.) It is the blood that heals. That fact has been

recognized ever since John Hunter's time. He made an experiment by cutting into ~~the~~ a nerve leading into the limb of an animal and watched to see what happened. He found that the leg was paralyzed ~~in~~, but it lived; it was warm as before, and the leg remained alive. He made another experiment on the same ~~limb~~ animal, ~~on~~ another limb,--he ligated all the arteries leading into that limb--he tied them. (Not understood.) He cut out a piece of the artery (?) In a few days and after a time, sloughed off and died. So John Hunter proved that the life is in the blood. That exactly agrees with what we read in the Bible. Before John Hunter's time, it was supposed that the life was in the nerves, or ran along nerves of some sort. The ancients believed that the arteries were simply a means of conveying air to the body, because they were found empty after death. They were called "air-carriers," because that is what the word "artery" means.

Hunter
Hewey proved that the blood is the life by ^{that} simple experiment. The ancients believed that the soul kept the body alive, and kept it circulating along the nerves. But John Hunter showed conclusively that the life-power is in the blood. Several eminent European authorities have called attention to the fact, in recent times, that it is the blood that heals. "Nature creates and maintains, and therefore nature has power to heal." We know this. Suppose here is a part that is wounded,---here is a solution of continuity--a wound. How is this wound cemented together again? The blood-vessels increase in size, the leucocytes are poured out, swarming upon this wounded surface, building up the tissues around the edges of the wound until it is gradually drawn together and the gap is healed. This is all being done by the blood and by the leucocytes that have escaped from the blood-vessels, and by migration have ranged themselves along here, and these surfaces are healed,--it is done by the blood; it is the blood that heals the

wound.

Now it is the blood that heals every damage of the body. When we come to the subject of leucocytes, we will see more clearly the importance of regulating the blood-movement. What the sick part needs is more blood. I wish I could get this principle stuck fast into your minds so fast that you would never get rid of it --that the sick part needs more blood.; it needs a more rapid movement of blood through the part; an increased movement of blood is necessary. If there are exceptions to this rule, they must be rare. Of course we are not talking accidents now. ^{aneurisms, etc.} What happens when we have an increased volume of blood through the parts? We have an increase of oxygen, and that brings life and activity through the cells, and more carbonic acid gas is carried off. Carbonic acid gas stupefies and asphyxiates the cells. Here is an animal asphyxiated by carbonic acid gas,--and why? Because the individual cells are asphyxiated, and so the blood stays in that part,--what do we call that condition? ("Stasis.") Carbonic acid gas accumulates in a part and that asphyxiates the living cells of that part, so their activity is lessened, and there is a stasis of blood,--is there anything else that occurs? Actual tissue ~~poisoning~~ formed.. There are other tissue poisons--leucomaines, they used to be called. A few years ago, we used to hear a great deal about ptomaines and leucomains, (Not understood) the leucomaines being the ~~remains of~~ alkaloids developed from the metabolic activity of living organisms (2) and ptomaines, being the alkaloids developed in dead substances (?) These leucomaines accumulate in the tissues and pass into the cells. Now an increased movement of the blood brings oxygen to bring in life and activity to the cells, and carry off the accumulated CO₂ and to complete the oxygenate the leucomaines. If we bring in more blood a

more oxygen, that gives us more complete oxidation and lessens the toxicity of the excretory elements, and the tissues are kept in a state of activity.

All the activities of the body ^{finally} depend upon what? Protoplasm. And protoplasm depends for its activity upon oxygen.. In what part of the cell is the real activity? In the nucleus of the cell. What is the cell made up of?--What substance enters into the cell? ^(Protoplasm) Yes, but there is a special kind of protoplasm,--what is the name of it? Nuclein. When the nuclein breaks down, what is the product? Uric acid. Uric acid is an oxidized nuclein.. Anything else? The xanthine bodies, antonin, etc. We also have another influence, under certain circumstances,--caffein and theobromin. These products are all highly toxic,--and there are many more. These poisons accumulate about the nucleus, and the consequence is, that it is ~~is paralyzed~~ paralyzed. So we need to increase the movement of the blood and carry these poisons away, and thus keep the nucleus free and active in its work. So an increased movement of the blood is the thing of primary importance. We find that that is the thing the body does in the case of a sting or wound, and so that is the thing for us to do. Whenever there is a sting, there are toxins introduced beneath the skin, and there is a redness,--there is a dilatation of the vessels, a pouring out of the serum and a swelling of the part. What is all that for? The leucocytes come down there to remove some of the cells that have been killed by the toxins. The blood-vessels have been dilated, and the serum has been poured out to dilute the toxins so that the cells will not be killed.

First, there is a contraction. Why is that contraction? When the virus is introduced beneath the skin there is a sudden contraction,--and why? It is to shut up the vessels so that the poison won't get in-

to them; it is to prevent poisoning. Here is the reason why you should watch and see what nature does in healing disease,--every single thing that is done by nature ~~in healing disease~~ has a curative purpose. And we are coming to understand these things much better than we used to do, thirty or forty years ago, because then we knew nothing about physiological chemistry nor bacteriology. But the principles were plain, when we saw them and accepted them. We received this truth and stuck to it, and now the world is coming to see it more and more .

One of the first men who wrote upon this subject was an eminent German physician. He wrote a very able work showing that nature has ^{the} power to heal; that nature can cure. Dr. Bigelow afterwards took this subject up in this country,--he and Dr. Oliver Wendell Holmes both took it up, and they were the first men in this country to present these fundamental principles to the ~~world~~ people, and these principles have ever since been working their way among the profession, until now they are being generally recognized by the profession as correct,--they are coming to recognize these principles and to use them.

Increased heart activity involves increased blood-movement. In many diseases we find increased heart-action,--for instance, in fever, there is increased heart-action, also an increased movement of the blood-vessels. We have two hearts,--a central heart, and a peripheral heart. Through the peripheral heart we have a rhythmical movement of the vessels, when these small vessels are active, that is tone. When there is high tone ~~in the vessels~~, there is great activity of the vessels,--and what will be the color of the skin? A bright red. And when the tone is lost, what will be the color of the skin? A dusky red. That indicates venous congestion.. The vessels are not active, consequently the blood accumulates in the skin, whereas, if they were active, they would be forcing the blood rapidly along ..

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The Defences of the Body:

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THINGS TO BE INCREASED.

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|----|-----------------------------------|---|-------------------|
| 1. | Blood-Count | { | Heart, |
| | | | Vessels. |
| 2. | Leucocytes. | { | <u>Anabolism,</u> |
| | | | Katabolism. |
| 3. | Metabolism. | | |
| 4. | Nervous Activity, --Gland-Action. | | |
| 5. | Elimination. | | |
| 6. | Alkalinity of the Blood. | | |

----- X -----

WE will return to our subject. It will be well for you to have your medical ideas boiled down, concentrated and classified, so that you can have everything at command, and can readily find anything you want. Otherwise it is like trying to find a needle in a haystack. If you had a thread tied to the needle and had hold of one end of the thread, it would be easy to find the needle. A principle is like a needle in haystack with a thread tied to it, and which you have hold of. You gather together around that principle all the facts relating to it, and you can draw out of your store of knowledge everything that is connected with that principle, because they all cling to the principle. A principle is like a tree, around which you can gather facts like buds and leaves on a tree; they are like the leaves and buds of a tree-- you can find them. You get a new fact which is related to a principle, and get it into your mind in connection with the principle,-- it is not new principle, but an outgrowth of a principle--as soon as you find a

fact connected with a principle, put that with it, and keep these principles and facts together. But if you try to keep them separate, you will lose some of them. You may learn twenty things, and unless you have them boiled down and classified, you will find, in a couple of days, that you can remember only a few of them. But if, instead of that, you have facts arranged about principles, like the leaves and fruit on the branch of a tree, you can find what you want when you get hold of the principle of which they are the outgrowth. When you get hold of the branch of the tree, the ^{stem, and} leaves and fruit are all there, the fruit being on the stems. You can find the fruit by finding the branch and following it up to the stem. So with a fact which is the outgrowth of a principle, -- follow the principle up and trace it out to the right point, and there you will find the thing that you are after. I have just been making an application of this principle to myself: Some twenty years ago, we had here in the Sanitarium, a lady by the name of Tait. I missed her name twice. In those days I knew everybody's name, because I had to see everybody, so I charged myself with the memory of every one's name. But I forgot this lady's name. In a letter which she wrote me, she complained that our room-clerk, named Roberts, -- she said that she hated him because he had not given him the right rate for her room, and she did not like him a bit, -- that she hated him. So I immediately correlated her name in this way, -- I said "Robert;" I knew I would not forget that name. Then I said, "Robert, room, rate, hate, Tait." The incident was the thing that bound those five things together. So there is a principle that joins things together and holds them together and keeps them together, and they can't get away; the principle correlates them together into a group and keeps this group together, and they can't get away. I didn't forget that lady's name. So the principles that you learn here, if you can group them together and use them. So we are

anxious that you shall ~~get here~~ have the knowledge that you get here so correlated together that you can find it and use it when the occasion arises. This may seem a little dry to you, and that you ought to be going faster, but you will not be going faster unless you observe these principles of correlating your knowledge so you can use it in a practical manner. I am dwelling on these principles, because they are most important. If it were not for these principles, I would simply wander around in a maze of perplexity.. When a brother would say to me, "What would you ~~suggest~~ for suggest for such a patient?" I would not know what to say; I would be completely "stumped" forty times a day.. But I keep these principles in my mind so they will help me.

Now the principle, or foundation of physiological therapeutics is to remove the cause, as far as possible. That is preventive medicine. Second, we must increase some of the activities. Third, we must diminish some of the activities.

We were talking about inflammation the other night. Inflammation is ~~an inflammatory process~~ a curative process. Yet, at the same time, some of these processes may be too intense. One of the products of inflammation is a pseudo-membrane. Here is a man with typhoid fever: Suppose this inflammation is on a broad surface,--it does no particular harm. Here is a patch of membrane spread all over here--it does not do any particular harm. Suppose it is in the mouth--it does no particular harm. But suppose it is in the larynx,--here is a place where the surfaces approach very closely together. Now suppose this pseudo-membrane begins growing down here (diagram) and keeps growing in, and keeps getting thicker and thicker--by-and-by the opening will be closed and the person will be choked. So, in this particular location, it is very important to limit the inflammatory action and lessen this process, because of the mechanical injury.

In the case of inflammation of the lung, the very same thing happens. (Illustrating by diagram.) Suppose this is the chest-cavity and here is the lung. Now there are a few tubercles present, and they cause a pouring out of secretion. The whole cavity is filled by serum--the serum fills the whole chest-cavity,--here is the serum--the patient may die of compression of the lungs. There are two things to be done here, one of which is to lessen the secretion if we can; and the other would be, to draw off some of this fluid. So we would not raise the vital action, but increase the elimination.

We were talking about increasing the vital activities. One of these was blood-movement. This has relation to the heart and the smaller vessels,--we might pause and talk upon that subject. Here is a man that has a heart that is too weak to do the work that is required of it, what might be the cause of that weakness? It might be dilatation of the heart. It might be that the heart is enfeebled by toxins. We must do something to encourage that heart,--to increase the vigor of its contractions temporarily. We will remove the toxins as far as we can, and do something to increase the vigor of the contractions of the heart.--something that will raise the blood-pressure; that may be necessary to overcome obstructions. It may be necessary to hasten the blood-current. On the other hand, we may want to increase the blood-movement,--but we will talk about that matter later.

The next thing we were to talk about, was the increase of metabolism. We want to increase metabolism in obesity,--we have talked about that--what else? ("Diabetes.") What else? ("Uric acid diathesis.") Are there any other conditions in which we need to increase metabolism? We sometimes need to increase oxidation in infectious diseases, because we want to burn up the toxins. At the same time there is generally increased activity in metabolism in infectious diseases

and the rapid burning up of toxins (and waste matters?)--we want to ~~to~~ increase local metabolism in many cases.

In hypopepsia, we want to increase glandular activity of the stomach. We also want to increase glandular activity of the skin in some cases

We must also uncrease nervous activity,--we need to increase the activity of the nerve-centers,--mention cases in which we need to increase this activity. ("Coma.") There may be important cases in ~~which~~ diabetic coma in which this activity will need to be increased,-- any other ~~cases~~ coma? ("Renal coma.") Any other ^{case?} ("Poisoning from drugs.") Yes,--for instance, in a case of opium poisoning. I remember we had a case, some twenty three or four years ago--a couple of years after I took charge of the Institution--I was suddenly sent for to go and see a man; I was asked to come down town and bring a battery with me. I didn't think the doctors wanted to see me, but they wanted to see the battery. I had the only battery in the city. When I got there, I saw a man who had been committing suicide by taking opium. I found the room full of doctors and people, and the man was breathing four times a minute, and his pulse was 16 a minute. He had been in this condition five or six hours, and was getting worse every minute, and it seemed as though he would die. I applied the battery, although I knew it would not do any good,--I applied galvanism and the faradic battery. In the meantime I had some flannels and things got ready, and I suggested that as the application of electricity did no good, it was possible that the application of hot and cold water might do good. The ~~the~~ hot applications were made as hot as could be borne, the patient being rubbed with ice between the intervals. Applied a hip and leg pack (?) covering the whole pack with blankets, and it wasn't two minutes before

that patient began to breathe, and he soon began to breathe quite vigorously, and when a really hot fomentation was applied, the patient actually spoke--he gave utterance to audible sounds, and you ought to have seen the excitement of that room--full of people. I never saw such excitement in my life over this man who was simply resurrected, ~~from the dead~~ ~~dead~~. His pulse came up to 60, and his respiration came up to 12, and everything went off wonderfully well, and it seemed as though the man was constantly coming up. Just then a thunderstorm came up, and there came a terrific thunderclap, and it seemed as though it struck the house, and at this terrific electric explosion, the man ceased to breathe, and he died right there. I always thought that stroke of lightning had something to do with that man's death. It was not enough to affect the rest of us, but he was so nearly gone that he collapsed under the strain. But it was wonderful to see how those hot and cold applications ^{roused} ~~restored~~ the activities of the nerve-centers, the spinal cord, and brain, and the respiratory centers. Here is a man in asphyxia,-- is it not necessary to do something to rouse the respiratory center in asphyxia? Why, there is a wonderful advantage in doing that,--and we can do it. And the cardiac centers must sometimes be aroused--and we have the means of doing it. This is a wonderful feature of physiological therapeutics,--we have the means of accomplishing the very things that should be done....

What else needs to be done? ("Increase elimination.") Yes. That will encourage glandular action, and that is what is needed. What else do we need? ("Encourage elimination.") How do we encourage elimination? ("By water-drinking.") A most important thing is to introduce more fluid into the body ^{care} as to dilute poisons and waste matters (?) and the kidneys will take ^{care} of the surplus water, with the assistance of the skin.

skin.

Is there anything more that needs to be done ? ("Increase the vital resistance .") Increase the general vital resistance , also the destruction of toxins. It is the whole body that fights disease, so we must increase the general vital resistance. When there is sickness in some part, the whole body assists that part. Suppose, for instance, I had a phlegmon or abscess in my hand, --pus is formed in my hand. If you should examine ^{the blood of in} my hand, would you get a hint from that that there was anything wrong? ("Yes.") It would be the presence of leucocytes, ~~then~~ you would be sure to find leucocytes there . The blood would not show you that there was anything wrong, --it would not show you where the trouble was, but you would know there was some trouble there . Where do the leucocytes come from? The bones and ^{red} marrow, and from the lymph-glands. So every lymph-gland ~~is the~~ doing something for the body--every lymph-gland in the body is doing something for this trouble. You get a sliver in your finger, and there is a little pus formed around the sliver, and there is a little suppuration there. Every lymph-gland in the body goes to work to assist that finger, and every cell in the red marrow of the bones does the same thing--every one of these bone-cells goes to work for the help of that finger; the spleen, the liver, and all other parts of the body are at work for that finger. I hope you w n't forget that, because it is a matter of great importance . It shows that the whole body is a unit, and that every part of it is taking care of every other part of it .. That is an important phase is it not ? Every member of the medical school should be taking care of every other member of the medical school, and every member of the church should be taking care of every other member of the church. Every member of the community should ought to be taking care of every other member of the community, and doing

his best to help him. If there is somebody that is doing wrong in the community, somebody has got infected with some mental, physical or moral disorder, and it is the duty of all the rest of the members of the community to help that one. That is just what we see done in the body. So whatever we can do to increase general vital resistance, that thing will help any part of the body that is sick. That is a thing we should never forget. When we are dealing with a sick man, we should not make a sort of artillery attack all at one point, because it is the whole body that must cure that part; the curative process is not confined to that part. If, for instance, you have an inflamed joint,--that is not where the disease is centered altogether--it is in the entire body. If a man has the rheumatics, or has ~~some kind of disease~~ the gout,--is that where the real disease is? No. He has diminished alkalinity of the blood. And he has, perhaps, something the matter with his liver; it is not doing so much work as it ought to do in destroying uric acid. He may have ^{deficient} ~~diminished~~ activity of the skin and kidneys, and so the whole body is at fault.

Then we will say there is destruction of toxins, or microbes--they are destroyed by the leucocytes,--is there anything else that destroys microbes in the body? The antitoxins which are manufactured by the body--the toxins which destroy toxins. The serum of the blood destroys them; the germicidal products of the various fluids of the body destroy them; let us note what they are. First, the mucus of the nose--is that germicidal? ("Yes.") The saliva of the mouth,--is that germicidal? ("Yes.") The gastric juice is germicidal--the hydrochloric acid. The pepsin is germicidal--the pepsin has power to destroy germs. The mucus of the stomach is germicidal. The same is true of the mucus of the intestines. How about the bile? That is germicidal. ("Every se-

cretion of the body is germicidal.") Yes. Every secretion in the normal body is germicidal. All these fluids are inhospitable to germs, when the body is in a normal state. When a man gets into such a state that the secretions are not inhospitable to germs, and various sorts of pathogenic organisms grow in them, that man's body is a deteriorated organism. All the normal secretions are germicidal. Even fresh milk has this property. Typhoid fever germs when put in milk, are destroyed.--unless there are too many of them. Of course a single drop of secretion of any sort, has not power to destroy an infinite number of parasites; the germicidal power is limited,--for each fluid there is a certain limit. And we might have germs enough, so that the germicidal property of any of these fluids would be overcome.

The most powerful of these fluids is the gastric juice--the organic hydrochloric acid which is normally secreted from the blood has wonderful power as a germicide. The pepsin has this power, and the serum of the blood has this power. But when a man has got in such a state, for instance, that germs can grow in the mucus of the nose, the mucus of the nose has lost its germicidal power, and the man has catarrh. When the serum of the mouth has lost its germicidal power, the man gets a coated tongue; he has coated teeth, and his teeth begin to decay. No person can have decayed teeth so long as the germicidal power of the saliva is what it ought to be. I got hold of this idea some time ago, and I read a paper before the Dental Association of Battle Creek on this subject, and I found them very much interested in it. They had asked me to read a paper on this question before them, and I did so. I proved to them in this paper, from information which I had gathered from gastric analysis and other sources, that decay of the teeth comes from a disordered state of the stomach, and not from a disorder of the teeth.

I called attention to the fact that it has been claimed and taught by the profession that a man's digestion is bad because his teeth are bad, and I proved to them that they were exactly upside-down in that theory. There was great interest in the paper, and it was quite hotly discussed, but they finally gave up that theory, and to understand that the decay of the teeth is due to lowered vital resistance. ~~When an animal~~ ~~When an animal~~ When an animal, or a race of animals begins to decay, the evidence of weakness begins first in the bones. That is a biological fact. The bones of the body are the parts that have the least resistance. The reason of this is, because they contain the smallest amount of protoplasm; their vital activity is less than that of other parts. They have the smallest blood-supply. They are less vascular than other parts of the body, consequently they have less resistance than other parts of the body. Those parts of the body which have the greatest resistance are the softest parts of the body; they contain the most blood which is a perfect tissue-fluid and consequently has the highest resistance.....

Now this destruction of the microbes is so important, that we may inquire if we have the means of increasing the ~~germicidal~~ germicidal power of the body. We have, and we will see to what extent this work may be carried on. Toxins are manufactured by germs, and the body makes enzymes of substances which are capable of destroying these toxins. There are various organisms which have this power.

I should have said a word further as to the destruction of microbes, and will take up that thought for a moment. This destruction of microbes is carried on by the leucocytes. In which parts of the body is this destruction of germs by leucocytes the most active? (not understood.)

Each microbic organism requires a special media for its development. We find that they cannot grow in healthy fluids; but when these fluids become deteriorated by disease, then these organs begin to grow. But they cannot live, when in contact with living cells. Did you ever see a patch of mold growing on a vigorous, healthy tree? ("NO.") Did you ever see mold growing on grass which was growing vigorously? ("No.") Now suppose we tramp some of that grass down,--or suppose a wind blows some of it down, and it remains lodged--is it possible for mold or mildew to grow on it? ("Yes.") Why? Because that grass has lost its vitality. So long as grass or a tree is healthy, germs, fungi, or other parasitic organisms cannot grow in contact with them, because they cannot grow when in contact with living cells. There is something about the contact of living cells with these organisms which is poisonous and destructive to them, so you don't see fungi growing on a healthy tree. So when you see fungi growing on a tree, you know there is something the matter with that tree. So with a man,--when we see fungi or germs growing on him causing psoriasis or similar diseases, we say of such a man that he is like a tree that is diseased and has mold or fungi growing on it. He is in the same situation as this tree, and in both cases it is because the organism has deteriorated.

decayed

When a man has ~~ulceration of the~~ teeth, he has ulceration of teeth. Ulceration of teeth is the most common of all diseases of the teeth. Caries of the teeth is a form of ulceration, and is due to germs. The different organisms which produce the different kinds of caries have been found out. If it were not for these microorganisms there could be no decay of the teeth; a tooth might wear down, but it would not decay. There are certain parts of the mouth, especially, where we find toxins,--where is that? ("In the tonsils.") Yes. Tonsils

capture germs like a filter, and then they destroy them. But suppose some very virulent organism gets into the throat and tonsils,--suppose, pose, for instance, Loeffler's bacillus gets into the tonsils? They swell up and swell up, because they are feeding on germs. Then there is another swelling up a little farther on, outside, in the glands of the neck. What does that mean? It means that there is another protective barricade that is being built up--another line of soldiers--and there may be formed ^{still} another line. So whenever there is found a large lymphatic gland, it means another effort to destroy these microorganisms. Further down the tract--the entire surface--two thousand square feet--is covered with cells that are phagocytes that are capable of capturing these organisms which they find in the lungs and elsewhere, and preventing their entering the blood. When you get down into the lymphatic glands you find the same thing. It was formerly supposed that they were making digestive fluids (?) but they are now known as lymphatic glands, and the fluid that they are making is germicidal.

Q. I thought the lymph glands were not true glands?

A. They fight germs, anyhow. The lymph glands are there to fight microbes and similar organisms, and they are capable of defending the body to a certain degree against ~~germs~~ the germs that invade the alimentary canal.

Let us see how important that work is, in regard to the alimentary canal: There are some of these organisms continually present in the alimentary canal--what organism is always there? The bacillus coli communis. It is there all the time, ready to "pounce down upon us," so to speak, and we should not forget that; this is a "sword of Damocles that is hanging over the head of every living person. There is

nothing except this thin mucous membrane, and the cells that cover it-- that is the only thing that stands between any man and death, because the bacillus coli communis is always present--it is there all the time; it is a deadly germ, and is capable of doing deadly work, the moment the defence ceases. Did you ever notice game lying up in butchers' shops, that had been killed a few days before--what was the color of the game? ("Blue.") What does that blue color mean? ("Loss of CO₂.") I hardly think so at that time, because respiration ceases at death,--what does it mean? ("Decomposition.") And that means that sulphur and hydrogen have been combined, making a sort of sulphate of iron,--at any rate, it means decomposition. Examine an animal within forty-eight hours after death, and you find the skin germs and intestinal germs have penetrated the entire body; the body is full of them. Why? Because the resistance is broken down, and there is nothing to hinder the action of these germs, and they rapidly crowd into the body. Suppose you take a slice of bread and put some mold on it,--how long would it be before that piece of bread would be all covered with mold? It would rapidly extend until the slice was all covered with mold. So it is with germs,--they travel through an organism very rapidly, as soon as the resistance is broken down, although the leucocytes are making a constant fight, and the connective tissue and all the cells of the body have more or less power to resist germs and microbes.

Toxins are resisted and destroyed by antitoxins. These antitoxins are formed by certain glands in the body. What are some of the glands that make antitoxins? ("The suprarenal capsules.") Yes. They are an extremely important class of toxins, and they seem to neutralize, not only the toxins of disease-germs, but the toxins naturally formed in the body. Are there any other glands that form antitoxins? ("Thy-

roid gland.") Another? ("The pancreas.") Possibly the pancreas, and possibly the spleen,--any others? The thymus glands. And it is possible that the lymphatics may do something in this line, and possibly the tonsils. Is there any other organ that destroys toxins. The liver. Any other? ("The kidneys.") Possibly. But the liver is the great toxin-destroying factory. That is the great organ which has for its duty the destruction of toxins,--it actually destroys them--and it also destroys the xanthine bodies. Suppose a man takes ten grains of uric acid,--the liver destroys half that uric acid. Dr. Hall (?) the author of (not understood), has made a close study of uric acid, and he has shown the same thing. He has visited the leading chemists of Europe and studied their methods, in order to perfect his own, and he shows that the liver destroys half the uric acid in the body. The livers of dogs destroy a larger proportion of uric acid than do those of men. The dog destroys about nine-tenths of the uric acid of the body by his liver. In consequence of this, the dog can eat meat with impunity to an extent which man cannot, because his liver has power to destroy and burn up such a large proportion of uric acid. But while meat may be tolerated by a dog, it is not good for man ...

We will begin experimental work in physiological therapeutics Sunday afternoon.

PHYSIOLOGICAL THERAPEUTICS Con. Nov. 11, 1902.

Defences of the Body (con.)

J. H. Kellogg, M. D.

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ACTIVITIES TO BE INCREASED .

1. Vital resistance.

2. Blood movement.

3. Leucocytosis.

4. Metabolism.

Anabolism, {
Haematosi
Glandular action,
Fat formation,
Digestion.

Katabolism {
Oxidation,
Blood alkalinity,
Hepatic activity.

5. Nervous activity.

6. Elimination.

7. Destruction of toxins.

8. Destruction of bacteria.

9. Heat production.

10. Heat elimination.

ACTIVITIES TO BE DIMINISHED.

1. Blood-movement.

2. Blood volume.

3. Nervous irritability.

4. Metabolism.

5. Heat production.

6. Heat elimination.

THREE are things that need to be done in combating disease. This is the method by which nature defends the body against the attacks of disease-producing or pathogenic agents. We have here a basis or standard against which to hold up the different agents we are studying, to see what certain things are capable of doing, so as to learn the adaptability of different agents to different purposes.

In every disease, some one or more of these things must be done. We must also see the reason why. We will first see what we need remedies for, and we must also have a foundation for our therapeutics. This is an outline of the things that nature does in combating disease. I think they can all be included under these heads.

Let us take exercise, for example, as we have been talking about exercise, and let us see how many of these different things can be done by means of exercise. Let us look at Vital Resistance,--will exercise increase vital resistance? ("Yes.") How do we know that? We know it by the fact that the man or animal who lives out-doors and is engaged in vigorous activities has elastic muscles and vigorous limbs; that animal is a more resisting animal than those who do not lead an out-door life of exercise. Goats, for instance, are almost immune against tuberculosis; everybody knows that to be a fact. The dog is a hunting animal, and when he is let to run about as the dog naturally does, he is strong and vigorous, and is not subject to tuberculosis. The same thing is true of man. The men who live in the city are tuberculous, while in the country there is very little tuberculosis. The men who live in the mountains where they must continually exercise their limbs, are not particularly subject to tuberculosis. On the other hand, we see that animals and men who live indoors and lead an idle life, are an easy prey to disease, while those animals and those men who lead an out-door life

and have a great deal of muscular exercise are hardy and vigorous and resistant. You never heard of such a thing as a prize-fight being declared off because one of the parties had taken a cold, or had come down with typhoid fever, or had la grippe. The man who has got himself up in such good ~~condition~~ fighting condition that he is able to meet one of the strongest and most skillful fighters on earth, is able to meet every germ that comes along. Wouldn't it be a fine thing to live high enough to be able to lick every germ that comes to attack us?

We might do that by exercise, because properly directed, ^{exercise} will lift a man up to the point where he will be in good fighting trim and able to meet every disease-producing opponent. So exercise is one of the things that has power to increase vital resistance. How does it do it? It increases the movement of the fluids in the body and cleanses them. Exercise aids the body, as does the inclination of the mountain-side aid the running stream, and mixes with the air and the oxygen and the oxygen burns up the poisons in the water and keeps it clean. But when the water gets into a hollow place, this cleansing process cannot occur, and the water forms a stagnant pool, and by - and by there is a green scum formed over the surface of the pool, and infusoria and microorganisms of every kind grow in it; frogs creak in it, and it is covered with slime, and is a noisome place, and the water becomes absolutely dead-ly.

That is the same thing that happens in the body. The body of the active man is like the dashing, leaping mountain stream which is full of oxygen. His body is full of life. A stream of matter is rapidly flowing through his body. He eats well, and he eliminates well, and the food is all burned up and the waste material is all carried out of the body--there is no cinders left in the body of such a man, and no uric acid left in it,--uric acid is a cinder--it is half-burned tissue.

There are many other cinders in the body. Imperfectly oxidized ~~tissues~~ substances are cinders. If there is not sufficient oxygen taken into the body, these substances abound in the body in great quantities, and all the bodily functions are interfered with. These substances clog the system,--the liver and other organs are clogged by these unoxxygenized substances, and the organs, in consequence, cannot do the work required of them. The Israelites could not make brick without straw, so the liver cannot work without oxygen. But the man whose body is constantly active and engaged in abundant exercise, is in a state of high v vital resistance.

To increase the blood movement and the heart's action : The activity of a part depends upon the movement of the blood passing through it. The activity of the miller's wheel depends upon the ^{rapidity} of the current passing over it. Now all the wheels of life are run by the blood, and consequently the more rapid this blood-movement is, the more rapid is the vital movement of the body. Mental and all other kinds of activity are quickened by the increase of the blood-movement.

Leucocytosis: We know, by actual observation, that exercise will increase ~~leucocytosis~~ blood-count of a man, and then send him out doors for an hour ^{exercise}, and he comes back with his skin well filled with blood. Take another blood-count, and you will find that there is an increase of ~~leucocytes~~ white cells to the amount of perhaps ^{15% to} 25%. This was shown by Winternitz and others some years ago.

Metabolism: Exercise will increase metabolism. How much? We can't tell. We can make a man work or exercise, and after his exercise we can weigh him, and we find that his weight is diminished. Mr.... said he lost eight pounds in six and a half hours by mountain-climbing. So, if the body can be reduced eight pounds in six and a half hours by

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exercise, there must be very active ~~katabolism~~ metabolism. Weight is not restored by drinking water, so it must be that by exercise there is a loss of solid tissue.

Now we come to ascertain just how much we lose by exercise, and how much metabolism is increased by exercise. We can tell how much work a man does,--and that means a change of matter. We can't have any mechanical work done without some change of matter,--how will we get at that? ("Exercise increases the fluid in the body.") How can we tell how much? Every one of you ought to be able to tell that, because we have considered all the necessary principles. We will take up this question now, and you will see how simple and easy it is. We will take a man walking. The man's weight is the burden that he lifts when he walks. He takes about two and a half feet to an ordinary step, and he lifts himself an inch and a half at each step,--how many steps must he take to lift him a foot? ("Eight.") If the man walks eight steps taking two and a half feet in a step, in order to lift himself one foot, how many feet will that be? ("Twenty feet.") So he lifts himself one foot in walking twenty feet. Now suppose the man weighs 150 pounds,--now if a man in walking twenty feet has lifted himself one foot, how much work has he done? ("He has lifted 150 foot-pounds in walking twenty feet.") (Blackboard operation,--dividing 5280, the number of feet in a mile, by 20, the number of feet he travels in order to lift himself once, vertically, and the quotient, 264, shows the number of times that he ~~can~~ lifts himself--150 pounds-- vertically, in traveling a mile; then 150, his weight, multiplied by 264 equals 39,600, the number of foot-pounds he lifts in walking one mile.) This is the amount of work he does in walking a mile. Now can we tell how much tissue has been burned in doing that work? How many foot-pounds are equal to an English heat

unit? ("772.") Then (blackboard operation, --dividing 39,600 by 772) he would lose 51 heat-units in walking a mile.... So this man, in walking a mile has consumed the energy represented by 51 heat-units. How many heat-units do we get from an ounce of fat? ("One thousand.") Dividing that by 51, the result is practically 20, --what does that mean? It means 1/20th of an ounce of fat tissues or fat has been consumed by this man in walking a mile, --and he has done more--he has burned up four grains in heat production by muscular work; the muscles are excited to work, a large amount of blood is brought in, the temperature is increased, and this elevation of temperature by work has the effect to stimulate the thermogenic apparatus in the muscles. So heat-production is generally enormously increased by muscular effort. Multiplying by 5 (blackboard calculation). So we have one fourth of an ounce ($\frac{1}{20} + \frac{4}{20} = \frac{5}{20} = \frac{1}{4}$). Now if a man burns up 1/4th of an ounce of fat in walking one mile, how far would he have to walk in order to burn up one ounce? ("Four miles.") Now a man would burn up half an ounce of sugar in walking that distance, would he not? ("Yes.") You see that exercise does increase metabolism, and increases it in such a way that we can measure it, --that is the beauty of it--we are able to measure, and know exactly ~~how to give exercise to a man~~ how to give exercise to a man so as to increase his metabolism.

Oxidation: Exercise, as we have seen, increases metabolism, so it must increase oxidation. Now Dr..... a French physician, some years ago, made some experiments on the influence of exercise upon ~~uric acid~~ toxins--uric acid, for example--and he found that in the case of the man who takes exercise, there is ^{at first,} an increased amount of uric acid in the body, but after he accustoms himself to exercise, there is a diminution of uric acid. Then Bouchard has made some interesting experiments

in which he found that in the case of a man of sedentary habits, the urine had a high degree of toxicity; but when this man exercised out-doors, the toxicity of the urine was diminished. That was because of the more complete oxidation in the man who exercises out-of doors. Then we know, by our own experience; after leading an indoor life for a while,--our skins are sallow and pale; but after a little out-door exercise, we return fresh and rosy, because of the oxygen which has been pumped into the blood while exercising out-of-doors, and has given us a higher degree of life .

Alkalinity of the blood: Exercise increases the alkalinity of the blood. This has been proven by experiment. Exercise increases hepatic activity. The man who is inactive becomes jaundiced and sallow. The man who is daily in the habit of exercising vigorously so that his blood is pumped through the liver with vigor and activity,--that man has a clear skin and a clear eye. But the man who is idle has a dingy sclerotica and skin. A dingy sclerotica means impure blood, an inactive liver etc. A dingy skin means impure blood. The man who has a dingy skin, has not only a dingy skin, but he has dirt all through his skin, in his muscles and in his brain. He is dirty all through. Why is the sclerotica dingy? Because in its natural state, it is perfectly white. Now over the sclerotica is the mucus membrane which is, normally transparent. But when a man's liver is inactive, his body is not purified, and so this membrane which covers the sclerotica is no longer clear. So a man's sclerotica is dingy because his mucous membrane is full of impurities. If this white paper were covered with glass, it would be white, but if the glass gets dirty, it is no longer white; and the same thing is true of the sclerotica. So the appearance of the sclerotica is a very important indicator as regards the state of the entire body; be-

cause when the body is so dirty that the mucous membrane of the sclerotica is opaque, then you have evidence that the whole body is in the same state.; it is no longer "full of light." It is full of darkness,--and "how great is that darkness!" This condition of the body is indicated by a dingy sclerotica,--and a dingy skin means the same thing . If a man has a dingy sclerotica he has a bad taste in his mouth,--what does that mean? It is the man that has the bad taste,--it is not the tongue. I once heard a story that will illustrate this condition: A missionary from the Sandwich Islands once told the story of the shipwreck of twenty sailors on those islands. When the natives, who were cannibals, told him about the shipwreck of a crew of twenty sailors, he asked him where they were. The savages made him understand that they had eaten all but two of them. The missionary asked him why they didn't eat them. The answer was, "They taste too much like tobacco." That may be true, or it may not be true, but I have often thought of some men that I have met,--their sclerotica was dingy, and their skin was dingy, and they were in such a filthy condition that even a cannibal would be repelled by their flavor. The whole man is tinctured with these organic impurities. Sometimes, when an animal is jaundiced, it is yellow,--the brain of that animal is in the same condition. We sometimes make post mortem examinations of ~~men~~ men whose brains were just as yellow as their skin. So, when the sclerotica is dingy, the whole body is in the same condition. This is a matter of much importance.

Exercise encourages hepatic activity,--and how? (Illustrating by diagram.). Suppose here are the lungs, here is the diaphragm, and here is the liver, the stomach, etc. Here are the abdominal muscles in front, and the diaphragm above.. When a man exercises, the diaphragm is made to move up and down with greater vigor, and every time the diaphragm comes down, it ~~presses the liver~~ compresses the liver, pressing it

against the anterior abdominal muscles. So every time the diaphragm contracts it gives the liver a ~~heartly squeeze~~ healthy squeeze. ("It is very interesting to watch it, with the X-ray.") As the diaphragm goes up and down it compresses the liver, and also all the abdominal organs.