Physiological effects of massage

Introduction

The interest in the therapeutic applications of massage which has increased so rapidly within the last twenty years and numerous investigations are undergoing by able physiologists for the purpose of determining with exactness the physiological effects of the various procedures included under the general term *massage*, and thus obtaining a correct basis for their therapeutic use. Many of these experiments have been repeated and verified in the physiological laboratory. Experiments clearly show that every function of both animal and organic life may be powerfully influenced by some or all of the numerous procedures of massage.

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Effects of Massage upon the Nervous System.

All the different procedures of massage produce a decided effect upon the nervous system through the influence of the manipulations upon the nerve endings of both the cerebro-spinal and the sympathetic -nerves, which are found in so great abundance in the skin and muscles, the former in connection with the special senses of locality, temperature, pressure, and weight; the latter more especially in connection with the glands, blood vessels, and thermic mechanism located in the skin and muscles.

1. Direct Stimulating Effects.

Vibration and nerve compression may be made to act directly upon nerve trunks, thereby causing powerful stimulation not only of the peripheral nerves but of all the nerve centers with which a nerve trunk is connected.

Friction is an effective means of exciting languid nerves.

Light percussion simply increases nervous irritability, while strong percussion may cause so great a degree of nervous irritability as to exhaust the nerves, and thus produce a benumbing effect.

Tapping, slapping, clapping, and hacking are the most effective means of exciting nerve trunks.

Beating and vigorous hacking are especially useful for exciting the nerve centers, and hence are especially applicable to the spine.

The nerve centers may also be directly excited by deep vibration and by strong percussion.

2. Reflex Effects

The reflex effects of massage are very remarkable and exceedingly interesting. All the procedures of massage produce powerful reflex effects. Some of the most striking effects are produced by very light stroking, especially when applied to certain reflex areas. Percussion and vibration are also powerful means of producing reflex effects, which include not simply muscular action, but increase or decrease of vascular and glandular activity, and general tissue change.

3. Sedative Effects.- The sedative effects of massage are equally as marked as the stimulating effects.
Strong percussion relieves pain.
Sedative effects are also produced by gentle stroking -the so-called hypnotic effect, doubtless, through reflex influence upon the nerve centers.
Very marked sedative effects are produced by derivative friction and kneading.
Centrifugal friction (rubbing down) diminishes the blood supply of the brain, and hence lessens cerebral activity.
Light friction over a deep-lying organ diminishes its blood supply by increasing the activity of the overlying vessels, thus causing the blood to go around instead of through it.
Massage of the soft parts above a joint, and movements of the next joint above, relieves pain by emptying the lymph and blood vessels of the part.

4. Restorative or Reconstructive Effects. - Mental fatigue is relieved by massage, through its effect upon the circulation and the eliminative organs. The toxic substances produced by mental activity, are more rapidly oxidized and removed from the body, while the hastened blood current more thoroughly repairs and cleanses the wearied nerve tissues.General reconstructive effects are experienced by the entire nervous system through the improved nutrition induced by massage.

Effects of Massage upon the Muscular System

Massage, when skillfully administered, has to do chiefly with the muscles. That form of manipulation which consists simply of skin-pinching excites the nervous system and the surface circulation, but has little influence upon the muscles. When we reflect that the muscles constitute one half of the bulk of the body, and receive one fourth of all the blood of the body, it is at once apparent that any procedure which acts directly upon them must have a decided influence upon the whole body. Although the muscles constantly receive a certain blood supply, this supply is comparatively small except during activity; consequently, it may be said that “the muscles are well fed only when exercising." When the muscle is inactive, the blood goes around it rather than through it ; but the moment activity of the muscle begins, there is a great increase in its blood supply, even before any acceleration in heart activity has occurred. Massage may serve to a considerable extent as a substitute for exercise by increasing the blood supply of a muscle, just as exercise may be considered a sort of massage, through the pressing and rubbing of the muscles against each other. When properly administered, the manipulations of massage act upon the muscles in such a way as to produce suction, or pumping effect, pressing onward the contents of the veins and lymph channels, and thus creating a vacuum to be filled by a fresh supply of fluid derived from the capillaries and the tissues.

Specific Effects of Massage upon the Muscles. - Massage in its specific effects upon the muscles, may be said to accomplish the following results:

1. To Encourage Nutrition and Development of the Muscles. The increased blood supply of the muscle induced by massage naturally improves its nutrition. Experience shows that, when systematically and regularly employed, massage produces an actual increase in the size of the muscular structures. The muscle is also found to become firmer and more elastic under its influence.

Massage feeds a muscle without exhausting it, in which respect it differs from exercise; nevertheless, it is not a complete substitute for exercise, for the reason that exercise brings into active play the whole motor mechanism - nerve center, nerve, and muscle - while massage affects chiefly the muscle.The improvement in the nutrition of the muscle, as regards increase in size or firmness, is seldom noticeable for the first three or four weeks, and the most marked effects should not be expected until after two or three months.

2. To Excite Muscular Contraction. - A smart blow upon a muscle is one of the ways by which contraction may be excited. By a succession of blows, one following another with sufficient rapidity, tetanic contraction of a muscle may be induced.

Strong vibration will also cause tetanic contraction of a muscle; but very rapid and strong vibrations are required to produce tetanus. In voluntary tetanus (ordinary muscular contraction) the number of impulses received by the muscle per second is ten to twenty. It is evident that the rate of vibration required for producing tetanus must be as great or greater. And consequently mechanical means of some sort must be applied, as the highest rate of movement which can be communicated by the hand directlyare ten to twelve double movements per second

3. To Increase Electro-excitability of the Muscle. - Numerous experiments have shown that massage increases the electro-excitability of a muscle, as indicated by the fact that a smaller number of milliamperes of current is required to cause contraction of the muscle after massage than before.

4. To Remove the Effects of Muscular Fatigue. - Toxic substances are produced as the result of muscle work, and that the phenomena of fatigue are due to the influence of these substances upon the nervous and muscular systems.

Effects of Massage upon the Bones, Skeleton, and Ligaments.–

Massage is capable of influencing such hard structures as the bones, ligaments, and cartilages, is clearly demonstrated by numerous facts and observations. A bone has essentially the same blood supply as its overlying muscles. It is for this reason that the same exercise which causes increase in the size of a muscle, at the same time induces growth in the bone to which the muscle is attached. The bones and joints of persons who are much addicted to exercise are decidedly

larger than those of persons who have made little use of their muscles. This is especially noticeable in comparing the large, strong hand and knotty knuckles of the labouring man with the puny band and straight, slender fingers of the man of sedentary pursuits. The blood vessels and lymphatic are largest in the vicinity of the joints, and the change of fluids affected by joint movements, resulting from the action of the muscles upon the bones, necessarily produces increase in the nutrition of the parts, and consequently an increased growth in the cartilages, ligaments, and other structures of the joint.

It is now known that the red matter of the bones is the blood forming tissue of the body. This fact gives a new importance to massage, since the acceleration of the circulation of the blood through the muscles must improve the nutrition of the bones as well as of the muscles, thus favourably influencing the blood-making processes both as regards the quantity of the blood produced and its quality.

Effects of Massage upon the Circulation.
Massage profoundly affects the circulation, both general, and local, its effects differing, however, according to the mode of application and the part acted upon. General massage increases the rate and the force of the heartbeat, as does exercise, with the difference that it does not raise the arterial tension as does exercise, and does not accelerate the heart to the same degree, though producing a full, strong pulse. This is due to the fact that the influence of massage is chiefly upon the peripheral circulation.

The vigour of the circulatory activity is increased not only in, answer to the greater demand for the removal of the poisons resulting from oxidation as in exercise, but through the mechanical assistance afforded by massage, in moving the blood forward, in the venous and lymph channels, and in setting up reflex activities whereby the small vessels are dilated and their activities quickened. The reflex influence of massage acts as a tonic for the heart, while the dilatation of the vessels decreases the resistance so that the heart acts more freely and efficiently in performing its functions.

Effects of Massage upon Respiration.
These effects may be thus enumerated:

1. Increase of Respiratory Activity. - Massage, as does exercise, increases the depth of the respiratory movements. This is doubtless in some measure due to the reflex influence of massage, but must also be attributed in part to its effect in bringing into the circulation waste products requiring elimination through the lungs, and in increasing oxidation, or CO_2, production, which necessarily accompanies the increased heat production resulting from the effect of massage upon the muscles.

2. Increase of Tissue Respiration. - It should be kept in mind that the function of respiration is not confined to the lungs. Respiration begins and ends in the lungs, but the most important part of the process is affected in the intimate recesses of the tissues themselves. Massage is certainly a most efficient means, increasing tissue metabolism, by which oxygen is

absorbed by the tissues and CO_2, taken up by the blood. This process takes place chiefly in the muscles, through the oxidation of the glycogen, of which they contain one half the total bodily store. Hence it is that massage, by acting directly upon the muscles, increases the tissue respiration by promoting circulation and general tissue activity.

Local Effects of Massage.

The local effects of massage may be briefly stated to be:

1. Increase of blood and lymph circulation.
2. Increase in both constructive and destructive tissue change.
3. Absorption of waste or effused products.
4. Development of the muscles, ligaments, and other structures acted upon.
5. Increased heat production and tissue respiration.
6. Reflex or sympathetic effects upon the vasomotor centers and through them upon the large internal organs,-the liver, spleen, stomach, intestines, kidneys, and the general glandular system of the whole body.

Conclusion

Massage is known to affect the circulation of blood and the flow of blood and lymph, reduce muscular tension or flaccidity, affect the nervous system through stimulation or sedation, and enhance tissue healing. In practice, many massage therapists use more than one technique or method in their work and sometimes combine several. Effective massage therapists ascertain each person's needs and then use the techniques that will meet those needs best.