A Study of Defence Reaction to Stress

——In the Case of Cold Stimulus——

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This is called the age of stress both in its physical and spiritual sense. None of us can be free from the physical and spiritual stress on us. Thus it is one of the important tasks of health and physical education to know how to live a sound life in mind and body by overcoming stress we feel in our daily life.

In this paper, I describe biological defence reaction such as blood pressure, number of pulse, volume pulse wave of finger tips, effect of cardiac beat, respiration, body temperature, skin temperature, electrocardiogram, electro-myogram, electro-nystagmograph and so on. The experiment is all on living human bodies. The purpose is to know what and how much stress we are under when both lower limbs are halfway submerged in a 5°C cold water as a stressor.

Subjects are respectively five males and females in youth and a middle age, and three males in an old age, and in total, twenty-three.

To summarize the results of this experiment on biological defence reaction:

Blood pressure: Immediately after submergence it rises, but then it begins to fall. Soon after out of water, it restores to normal conditions. Old age is the most seriously affected, then comes youth and then middle age.

Skin temperature: It begins to fall at fingers, and then it goes up and arrives at the plateau higher than normalcy. This continues for some time after subjects are out of water. The temperature, taken at calf muscle which is just above water falls a little after submergence. In the case of females, it soon arrives at the plateau higher than normalcy and stays there like that of fingers. In the case of males, however, it never recovers normalcy, and even when subjects are out of water, it stays normal or below.

Body temperature: After submergence it rises a little and comes to the plateau and stays there.

Effect of cardiac beat: It shows a sudden fall after submergence, which is in a striking contrast with the instances of blood pressure and body temperature. Soon it goes up and restores normalcy all of a sudden, which is a pattern of counter-shock phase.

This experiment shows, as Hans Selye pointed out, a living-body goes through a stage of alarm reaction, a stage of resistance and stage of exhaustion against a cold stimulus. Shock phase and counter-shock phase, however, are not clear to be found respectively, perhaps because the stimulus which we used is too weak. These two phases, inseparate after all because of the mildness of the stimulus, are in complicated and varied states in this experiment.