THE SWEATING REACTIONS OF THE PALM

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The sweating reactions of the skin of the palm differ from sweating on the remaining parts of the body in nature and intensity. V. M. Bekhterev [1] first indicated this in 1905. He observed pronounced sweating of the palm among two patients when shaking hands.

Kuno [7] and Uchino[9] place the secretion of the sudoriferous glands of the palm into a special type, emotional sweating, arising as a result of various psychic experiences (shame, fear, joy, laughter etc.) in contrast to thermic sweating on the rest of the body. In their opinion the sudoriferous glands of the palm have special sweating centers in the central nervous system which are linked with psychic activity, while the other sweating centers are linked with thermoregulation. Proceeding from the fact that the sweating reactions of the palm are extremely sensitive to psychic factors, Silverman and Powell [8] suggested evaluating various psychic illnesses according to these reactions.

The aim of our work was to ascertain the extent of the consistency of the idea that there exist distinct domains of emotional and thermoregulation sweating.

EXPERIMENTAL METHODS

Under observation were more than 300 children from one month to 12 years of age and 70 adults. Sweating intensity was determined by the electrometric method worked out by N. N. Mishchuk [3]. Sweating was measured on the palm and the back of the wrist of both hands. In a number of experiments the secretion of sweat was determined on the forehead, back, chest, and on the back and sole of the foot. More than 12,000 measurements were made in all at different times of the year. A study was made of reflex shifts in sweating under the influence of the most diverse irritants: heat effects applied to limited portions of the skin (forehead, forearm, shin, foot) by means of a special thermoirritator through which water at a definite temperature (from 0° to 60°) was conducted for ½ -1 minute; application of heat to the entire skin surface (sun bath); changes in the surrounding temperature; physical exercises; intake of food; sleep. In separate experiments (in the summer) one hand was merely immersed in water at temperatures ranging from 18 to 24°, while sweating was studied on the other hand.

RESULTS

The sweating intensity of the palm among children up to two years is comparatively low. It increases with age, attaining maximum value from 2½ to 7 years of age, then gradually decreases. Among adults sweating of the palm is significantly lower in the majority of cases than among children (Fig. 1).

Both among children and among adults the sudoriferous glands of the palm, as do those of the rest of the body, clearly react to temperature irritants. The peculiarity of the reactions, determined by the nature of the

irritant (stimulation of sweating with application of heat, for example, and inhibition with application of cold), precludes explaining palm sweating by the influence of only single emotions. It is sufficient to compare the sweating intensity of the palm among children 7-12 years of age during the autumn-winter period and the spring-summer period, particularly during summer on the southern shore of the Crimea, in order to have made completely clear the relation between sweat secretion of the palm and the temperature of the environment. (Fig. 2).

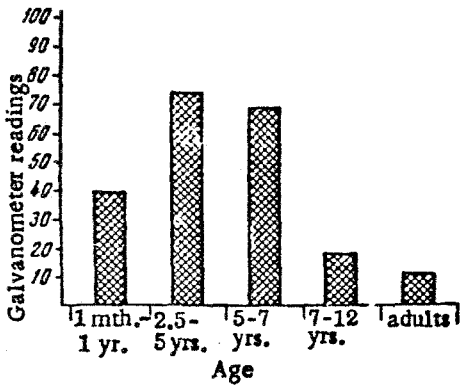

Fig. 1. Changes in the intensity of palmar sweating occurring with age (average values).

In a special series of observations we noted an increase in sweating under the influence of the emotions (reading poetry, laughter, conversation etc.) not only on the palm, but also on the back of the wrist.

Thus, according to our data, there is no basis for supposing the existence of distinct domains of emotional and thermoregulation sweating.

The sweating of the palm, however, has a number of peculiarities. The sudoriferous glands of the palm possess a higher reflex excitability; therefore the induction of sweat secretion as a result of varied stimuli (morning exercises, food intake, etc.) appears sharper and stronger, and its inhibition (for example, under the influence of cold or sleep) much weaker than on the rest of the body. It is apparent from Fig. 3 that reflex inhibition of sweat secretion as a result of brief immersion of one hand in cold water is significantly more marked on the back of the wrist than on the palm.

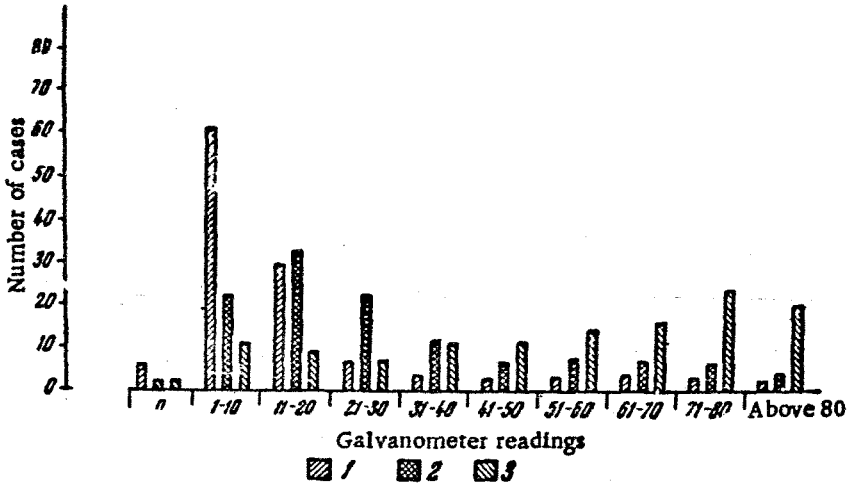

Fig. 2. Intensity of palmar sweating among children 7-12 years of age.
1) during the autumn-winter period; 2) during the spring-summer period; 3) during summer (under the conditions of the southern shore of the Crimea). The number of cases is given in percentages.

Sweating of the palm depends upon the individual peculiarities of an organism; among excitable persons it is relatively great even during sleep.

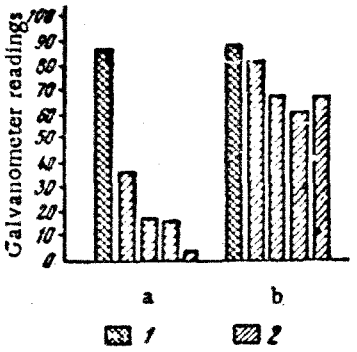

Fig. 3. Sweating on the back (a) and palm (b) of the right wrist of a ten year old child after immersion of the left hand in water at a temperature of 24°. 1) Initial level; 2) after 2, 4, 6 and 8 minutes following immersion.

Sweating of the palm in virtue of the high reflex excitability of its sudoriferous glands, is ordinarily greater than in areas of "thermoregulation sweating." In the presence of strong heat effects (the sun bath) or heavy physical exercise, the sweating of the palm, on the other hand, is lower, since the maximum output of sweat by the palm is less than that of the rest of the body. During maximum sweating the skin of the palm is covered with sweat in the form of a thin, glistening layer. Never are there observed on the palm or sole of the foot large drops of sweat.

These sweating characteristics correspond with the particular functional significance of the sweat glands of the palm, the physiological role of which consists in wetting its surface. The sweat covering the palm (and also the sole of the foot) prevents its slipping; a moist palm not only facilitates better grasping and holding of an object, but also improves the conditions for cutaneous sensory perception [4]. Again, Katz [5] showed that the moisture of the fingers exerts a considerable influence on the sensitivity of touch discrimination between smooth and rough objects. V. L. Minor [2] notes that the palmar perspiration fields are located exactly on the zones richest in receptor apparatuses.

The very form of the sudoriferous glands of the palmar surface of the fingers is adapted to lubricating the skin and softening its outer keratinized layer. Sebaceous glands are absent from the palms and soles of the feet, and the sweat, lubricating the skin, makes it more elastic, softer and less subject to injury. The ducts of the palmar sudoriferous glands form at their outlets expansions like small reservoirs or goblets in which the sweat accumulates and from which it flows out over the surface of the skin. On the other parts of the body perspiration is immediately ejected on to the surface of the skin. Such excretory dynamics promote the best evaporation of perspiration from the surface of the body. On the palms perspiration is less subject to evaporation, but is, on the other hand, easily squeezed out on any contact of the skin.

Our observations show that, in spite of the specificity of the sudoriferous glands of the palm, palmar sweating preserves the fundamental regularities characteristic of the rest of the body. Therefore, there is no foundation for separating the secretory activity of the palmar sweat glands into a special category of exclusively "emotional sweating." All the more is there no basis for distinguishing in the central nervous system special centers for each of these types of sweating, as F. Kuno and S. Uchino maintain.

SUMMARY

Studies with the electrometric determination of sweating (Prof. N. N. Mishchuk's apparatus) on a great number of children and adults have shown that sweating becomes more pronounced at the age of 2.5-5 years. It was demonstrated that the sweat glands of the plam are very sensitive to reflex reactions and therefore the intensity of perspiration of the palm under normal conditions is comparatively higher than on other parts of the body.

However, the maximal intensity of sweating on the palm is lower then on other parts of the body. That is why sweating of the palm is lower under great thermal influence.

The results obtained do not confirm the separate existence of sweating areas regulated exclusively by emotion or thermal-mechanisms.

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