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Relations between Muscular Strength of Upper Arm Muscle Group and the Values of Various Physical Measurements (Report No. 3)

——Study of Pull-up Exercises Made Viewing from Weight-Corrected Upper Arm Circumference and Weight-Corrected Skinfold Thickness——

By *Sadayoshi Imae**

As to the heights, weights, upper arm circumferences, upper arm skinfolds, back skinfolds, abdomen skinfolds and pull-up scores of 635 male university students (18–21 years, excepting members of sports clubs), measurements were determined.

Based on the values of the measurements obtained:

1. Using the following formula, weight-corrected upper arm circumferences were calculated from the upper arm circumferences and studies were made of pull-up scores in three groups of those whose weight-corrected upper arm circumferences were under 26 cm, between 27 and 28 cm and over 29 cm respectively.

Y = Upper arm circumference—a X

[a indicates the regression coefficient of the upper arm circumference against the weight deviation from the standard weight, and X indicates the weight deviation from the standard weight (± %).]

2. Weight-corrected total skinfolds were calculated from the total skinfolds (total of upper arm, back and abdomen skinfolds) using the following formula, and studies were conducted of the pull-up scores of those whose weight-corrected total skinfolds were under 34 mm, between 35 and 44 mm, between 45 mm and 54 mm, between 55 and 64 mm and over 65 mm respectively.

Y = Total skinfold—a X

[a indicates the regression coefficient of the total skinfold against the weight deviation from the standard weight, and X shows the weight de-

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viation from the standard weight (± %).]

3. Studies were made of the pull-up scores on both bases, i.e., weight-corrected upper arm circumference and weight-corrected total skinfold, and results were obtained as follows.

(1) In the comparison made between the students whose weight-corrected upper arm circumferences were under 26 cm and those whose values were between 27 and 28 cm, it was known that the pull-up scores of the latter were significantly larger than those of the former ($P<0.01$); and as for the comparison made between the students whose values were between 27 and 28 cm and those whose values were over 29 cm, the pull-up scores of the latter were significantly larger than those of the former ($P<0.05$). Fig. 3

(2) In the students whose weight-corrected total skinfolds were under 54 mm, almost no differences were seen in their pull-up scores, however, in the students whose values were 55 mm, their pull-up scores decreased remarkably and significantly ($P<0.01$), and in those whose values showed over 65 mm, their pull-up scores decreased far more remarkably and significantly ($P<0.01$). Fig. 7

(3) In the case of weight-corrected total skinfolds:

① In the students whose total skinfolds were under 34 mm, no significant differences were noted in their pull-up scores between those whose weight-corrected circumferences were 26 cm, those whose values were between 27 and 28 cm and those whose values were over 29 cm.

② In the case of 35 to 44 mm, the pull-up scores of those whose weight-corrected upper arm circumferences were under 26 cm were significantly smaller as compared with those whose values were between 27 and 28 cm ($P<0.05$), however, no significant difference was noted between the pull-up scores of those whose weight-corrected upper arm circumferences were between 27 and 28 cm and those whose values were over 29 cm.

③ In the case of 45 to 54 mm, the pull-up scores of those whose weight-corrected upper arm circumferences were under 26 cm were significantly smaller as compared with those whose values were between 27 and 28 cm ($P<0.01$), and in the comparison made between those whose weight-corrected upper arm circumferences were between 27 and 28 cm and those whose values were over 29 cm,

the pull-up scores of the latter were significantly larger than those of the former ($P<0.01$).

④ In the case of 55 to 64 mm, almost no differences were noted in the pull-up scores of those whose weight-corrected upper arm circumferences were under 26 cm, those whose values were between 27 and 28 cm and those whose values were over 29 cm.

⑤ Also, in the case of 65 mm and over, no significant differences were seen in the pull-up scores of those who weight-corrected upper arm circumferences were under 26 cm, those whose values were between 27 and 28 cm and those whose values were over 29 cm.

As stated above, the weight-corrected upper arm circumference functions as a positive factor against the pull-up exercise, while contrary to this fact, the weight-corrected total skinfold functions as a negative factor when the value gets larger in excess of a certain value.

Of the students of the age subjected to the study this time, those who had their weight-corrected upper arm circumferences larger than 27 cm and their weight-corrected total skinfolds under 54 mm demonstrated that they had a body composition advantageous in practicing pull-up exercises.