Collection and evaluation of physical performance of grade 5 to 12 high school students with anthropometric data and hand strength data

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Goal: The target of the exercise was the collection of anthropometric data, hand and arm strength data as well as height and body weight, in order to reveal the process of physical growth of grade 5 to 12 high school students and to record the increase in maximum strength of their hands and fingers.

Methodology: In addition to age, 15 anthropometric and 20 strength parameters were captured.

For the statistical analysis, the mean and standard deviation for each parameter per school grade was calculated separately for males and females and subjected to various statistical tests. The maximum flexing strength of the hand and individual fingers were measured at measurement point 2 (middle of the pinkie) and 4 (middle of the middle finger) by the hand and finger dynamometer HFD 200.

A collection of 22 hand grips of various sizes were used to determine the optimal diameter of the hand grip subjectively. Patents are to be applied for these.

Results: The ranked standard values of the maximum strength of the hand and individual fingers, as well as the anthropometric parameters, deliver for the first time a basis for the evaluation of the strength of hands and fingers of children, adolescents and young adults under standardized biomechanical measuring conditions. The ranked standard values of the anthropometric parameters contribute to updating the normal body proportions of children, adolescents and young adults. The acceleration probably stopped ten years ago. Comfort hand grips were developed from the subjective optimum hand grip, the diameter dependent on age, sex, and load to be carried.

Conclusions:

1. In order to precisely measure and compare maximum strength among different hand sizes under growth conditions requires the definition of and compliance with standardized biometrical measuring conditions.
2. An update of the standard anthropometric values is necessary since the last comprehensive standard values were published more than 20 years ago and, due to the acceleration of body growth since then, they can only be applied approximately.
3. For optimal application of force the comfort diameter and not the anatomic grip diameter should be used.