

EFFECT OF BODY SIZE ON THE STRUCTURE OF PHYSICAL ABILITIES

Nedeljkovic Aleksandar¹, Mirkov Dragan¹, Markovic Srdjan¹, Jaric Slobodan²

(Faculty of Sport and Physical Education University of Belgrade¹, Serbia and Montenegro, Department of Health, Nutrition, and Exercise Sciences, University of Delaware², USA)

Power

Fleishman's (1964) classic work on the structure of human 'physical fitness' served as the basis for the present investigation. By using a factor analysis, he identified three particular components of the physical fitness within the 'strength area': dynamic strength, static strength, and explosive strength. The purpose of this study was to investigate whether the changes in the structure of physical abilities originated from the neglected scaling effects. Based on our previous study (Markovic and Jaric, in press) that evaluated only various vertical jumping performance, we hypothesized that, when normalized, the tests of direct assessment of muscle power (i.e., calculated in W) would measure the same physical ability as the tests of performance-based assessment of muscle power (i.e., the tests of rapid movements where muscle power is assessed through the jump height, running time, maximum limb velocity during throwing or kicking light objects etc.). Physical education students (N=111) were evaluated on twenty three physical performance tests based on isometric and isoinertial strength assessment, as well as on either direct or performance-based assessment of muscle power. When non-normalized data were used, a principle component analysis revealed a structure where the muscle strength and direct and performance-based assessed muscle power mainly loaded three distinctive components. However, when the indices of muscle strength and power were properly normalized for body size, the obtained structure was in line with the hypothesis. Specifically, the outcomes of the tests of direct and performance-based assessment of muscle power mainly overlapped within the same component. This finding strongly suggests that there is no separate physical ability for producing maximal power and for performing rapid movements. Namely, the producing of maximal power is body size dependent while performing of rapid movements is body size independent physical ability. As these two groups of tests measure the same physical ability, the future batteries of physical performance tests could be considerably simplified. Specifically, only the tests of performance-based assessment of muscle power could be employed due to (1) their simple protocols, (2) a simple and inexpensive experimental equipment, and (3) absence of the required additional normalization.

References:

Markovic, G. and S. Jaric. "Is vertical jump height a body size independent measure of muscle power?" *Journal of Sport Science*, in press

Fleishman, E.A. (1964). "The structure and measurement of physical fitness". Englewood Cliffs, NJ: Prentice Hall.

Keywords: Physical Abilities, Test-Battery, Strength and