DIRECT MUSCLE POWER ASSESSMENT: ROLE OF BODY SIZE

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In human movement related sciences, muscle power is generally considered to be an important factor responsible for success of rapid movements performed with maximum effort (e.g., jumping, sprinting, throwing, and kicking). Although the relationship between muscle power and body size has attracted considerable professional attention, this relationship has been often either neglected or incorrectly taken into account when presenting the results from muscle power tests. The aim of the present study was to investigate the relationship between the body size and muscle power assessed through a variety of tests of direct power assessment (maximum muscle power assessed from measured or from assessed muscle force or work exerted during complex movements, such as cycling, running, jumping or throwing, calculated in watts). Presuming a normalization method $Pn = P / S^b$ based on an allometric relationship between the tested power $P$ and a selected index of body size $S$ ($Pn$ muscle power normalized for body size; $b$ allometric parameter), we hypothesized that: the tests of direct assessment of power would reveal the values of the allometric parameters $b=0.67$ or $b=2$, when body size is expressed as body mass or height, respectively. Male physical education students (N=111) were tested on 8 standard tests of direct assessment of power (e.g., Wingate tests on a bicycle and rowing ergometer, Margaria staircase test, 15-second repeated rebound jump test, drop jump, maximal power outputs in concentric bench, squat jump, and shoulder-press throw). The obtained mean (SD) value of the allometric parameters when body size were expressed as body mass was 0.55(0.15), while the same value for body height was 1.15(0.62). The findings regarding the normalization with respect to body mass were close to the hypothesized ones and, therefore, provide further evidence for necessity for applying both an accurate and consistent normalization methods when presenting results of the physical performing tests (Jarić et al 2005). However, the difference between the hypothesized and recorded findings regarding the body height could be a consequence of the non-linear scaling of longitudinal and transversal body dimensions.

References: