What does 'fitness testing' really test?

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The author suggests that differences in performance in fitness tests between pupils in a single year group are closely linked to physical maturity. If this fact is ignored, unjustified assumptions about levels of fitness will be made. While being of great potential value in raising levels of knowledge and awareness, 'performance tests simply determine the obvious, and do no more than distinguish the mature child from the immature child'.

The use of performance tests of physical fitness such as those described by Christopher Wibberley in the previous article may be justified from a pedagogical or psychological viewpoint. They may be valuable teaching aids in stimulating interests, introducing new concepts in health related fitness, or in helping children to understand their bodies. They are not, however, generally based on sound physiological foundations, and are of little value in the complex analysis and assessment of children's fitness. Much of the data is meaningless, not capable of rigorous interpretation and more likely to cause confusion than solve problems.

Performance tests are primarily dependant upon motivation and maturation. Several writers emphasise the use of means, standard deviations or norm tables to compare subjects – but how can tables constructed on the basis of chronological age provide worthwhile information about children at different levels of skeletal and biological maturation? For example, in any 3rd-year class of boys, 20% of the group may be pre-pubertal, 20% at puberty stage 5, and the rest somewhere in between. We have documented the effects of growth and maturation on performance elsewhere (1), but in order to clarify the role of testing I will outline some of the major factors in relation to Wibberley's tests.

Muscular strength, endurance, and power output (tests 2, 4, 5 and 6) are specific to each muscle group, and there is no single test which is able accurately to define an individual's muscular fitness. Tests such as sit-ups and press-ups are notorious for their reliance upon motivation! Sexually immature children have low levels of male hormones (androgens), and maximal strength-gaining potential is not possible until adult levels of androgens are achieved. The extent of the development and performance of muscle is also dependent on the relative muturation of the nervous system, which is not complete until sexual maturity is reached. The immature child cannot be expected to respond to strength training, or achieve the same performances, as the mature child. When this information is combined with the fact that immature children also have a lower concentration of the glycolytic rate-limiting enzyme phosphofructokinase (PFK), the value of comparing the muscular fitness of children of the same chronological age but different biological age is put into perspective.

Flexibility is joint-specific, and there is no single indicator of body flexibility. It is a popular belief that young children are very flexible and then gradually lose this flexibility as they grow older. The scientific evidence for this premise is extremely limited, and 'flexibility' seems to vary with the test administered. Variations of the 'sit and reach' or 'stand and reach' test (test 7) are by far the most popular tests of flexibility; however, during growth the legs become proportionally longer in relation to the trunk, and this change in the trunk length/leg length ratio will undoubtedly influence scores to such an extent that the use of norms with growing children must be questionable.

Sprint velocity (test 1) increases with maturation, and it seems that great increases in speed development occur during two phases. The first phase, which occurs at around 8 years of age, but with wide individual variations, is probably due to the development of the nervous system and the improvement in the co-ordination of arm and leg muscles. The second phase, which occurs around 12 years of age for girls and between 12 and 15 for boys, is related to the increase of body size and the concomitant increase in muscular strength and power. Comparing the running speed of children at different stages of maturation is therefore of limited value.

Wibberley's tests 3 and 8 claim to measure *endurance,* but in fact test 3 is predominantly dependent upon anaerobic metabolism and does not adequately assess the fitness of the cardio-respiratory system. Younger children are severely disadvantaged when working anaerobically for the reasons described above – in particular, the low concentration of PFK. The step test (number 8) does not last long enough to ensure a 'steady state'; and, as the work rate is dependent upon body weight, subjects of different weights cannot realistically be compared with one another. Using the 'resting' heart rate in the calculation is not valid, as the pre-exercise heart rate or anticipatory heart rate is dependent upon a whole range of factors, including anxiety, and will probably change from test to test due to habituation.

Even when assessed correctly, it is of questionable value to classify children at different stages of development according to an index of cardio-respiratory of fitness. During puberty there is a dramatic increase in boys' ability to consume oxygen which corresponds to the time of peak height velocity and increased secretion of androgens. These changes result in hypertrophy of skeletal and cardiac muscle, stimulation of red cell and haemoglobin production, and the proliferation of metabolic enzymes which together make possible large increases in cardio-respiratory fitness. Pre-pubertal children have a limited ability for cardiac hypertrophy and metabolic enzyme synthesis, and do not seem to respond to endurance training as well as more mature children and young adults.

In summary, I would suggest that performance tests simply determine the obvious, and do no more than distinguish the mature child from the immature child. They may be of great value as a pedagogical tool, by raising levels of knowledge and awareness, but they are of limited use in the assessment of children's fitness. Before teachers spend many hours attempting to assess fitness (while really assessing the potency of the motivational conditions under which they were collecting data of questionable value!), perhaps we should think carefully about what fitness testing in schools really achieves.

Reference

1. Armstrong, N. & Davies, B., The metabolic and physiological responses of children to exercise and training. *Physical Education Review,* 7: 90-105, 1984.