

Cardiorespiratory fitness is often misdiagnosed

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A recent study by the University of Eastern Finland shows that scaling maximal oxygen uptake and maximal workload by body weight confounds measures of cardiorespiratory fitness. It has been a common practice in exercise testing to scale the results by body weight and, according to researchers, this practice should be abandoned. More reliable data on cardiorespiratory fitness can be observed by using lean mass proportional measures. The results were published recently in *Clinical Physiology and Functional Imaging*.

Exercise tests, such as the maximal cycle ergometer exercise test, are used to evaluate cardiorespiratory fitness. Maximal performance refers to an individual's metabolic capacity. While the size of an individual is an important determinant of the maximal workload and [maximal oxygen uptake](#), the absolute values should be scaled by [body size](#) or composition to enable comparison between individuals. Body weight has traditionally been used to perform body size related scaling in [exercise testing](#).

Scaling methods, when measuring the function of the human body, have been causing scientific debate since the mid-1600s. Scaling by [body weight](#) has been criticized, because body fat, per se, does not increase metabolism during exercise.

University of Eastern Finland researchers were the first to publish a methodological analysis of the relationship between capacity variables and body composition in healthy 7-8 year-old children, all children having similar maturity status. Measurements were done as part of The

Physical Activity and Nutrition in Children Study. Children performed a maximal exercise test with a respiratory gas analysis. The children's body composition was determined by dual-energy X-ray absorptiometry (DXA) and a high quality impedance method. The agreement of the methods to define [body composition](#) has been demonstrated in an earlier study.

The present study shows that exercise test results scaled by lean mass were the best to measure cardiorespiratory fitness. For this purpose, both DXA and a more easily accessible impedance method can be used to assess lean mass. Scaling by body weight introduces confounding by body adiposity. Fat mass determines more strongly by body weight scaled measures than the performance in the exercise test. Furthermore, scaling by body weight did not fulfil the statistical criteria set for scaling purposes.

However, scaling by body weight is reasonable when assessing an individual's functional capacity, which refers to a composite measure of the adiposity and cardiorespiratory fitness. Weight proportional measures are also valuable indicators of the composite health risk of the adiposity and cardiorespiratory fitness. By using body height proportional measures, it was also possible to avoid confounding by adiposity. However, height is not as precise an indicator of individual muscle tissue as lean mass.

It is a too common practice to scale exercise test results by body weight. According to researchers, this represents a historical burden, and scaling by lean mass should rather be done to avoid confounded interpretations of cardiorespiratory fitness. "In practice, adipose subjects may be diagnosed too easily to have poor cardiorespiratory fitness, although this might not be the case," says Specialising Physician Tuomo Tompuri, the first author of the article.

"It is paramount to note that confounded methodology can be reflected in the scientific conclusions. Exercise physiologists are aware of the problem, but in clinical practice or in biomedical scientific research, the problem has been taken into account too rarely."

"It is vital to understand what is being measured. While measuring cardiorespiratory [fitness](#), it is important to take differences in body size correctly into account in order to enable correct scientific conclusions about the significance of [cardiorespiratory fitness](#) on human health."

More information: Tuomo Tompuri, Niina Lintu, Kai Savonen, Tomi Laitinen, David Laaksonen, Jarmo Jääskeläinen & Timo A. Lakka.

"Measures of cardiorespiratory fitness in relation to measures of body size and composition among children." *Clinical Physiology and Functional Imaging*: early view 27.8.2014. [DOI: 10.1111/cpf.12185](https://doi.org/10.1111/cpf.12185).

Tompuri, T. T., Lakka, T. A., Hakulinen, M., Lindi, V., Laaksonen, D. E., Kilpeläinen, T. O., Jääskeläinen, J., Lakka, H.-M. and Laitinen, T. (2013), "Assessment of body composition by dual-energy X-ray absorptiometry, bioimpedance analysis and anthropometrics in children: the Physical Activity and Nutrition in Children study." *Clinical Physiology and Functional Imaging*. doi: 10.1111/cpf.12118

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