

Cardiorespiratory Test in Healthy and Cardiopathic Children

Guilherme Veiga Guimarães e Vitor Oliveira Carvalho

Instituto do Coração - InCor/HCFMUSP, Laboratório de Atividade Física e Saúde - LAtIS/CEPEUSP, São Paulo, SP - Brazil

The maximal cardiorespiratory test on treadmill or bicycle ergometer is used to evaluate the cardiac, vascular, respiratory and metabolic performance in both healthy and sick individuals, in addition to determine the physiopathological causes that limit it¹. The protocols are selected according to the objectives and the experiences of the laboratories that perform them and can be treadmill ramp protocols independent from the ergometer.

Thus, Prado et al² studied the cardiorespiratory and metabolic responses during the progressive exercise test in children, comparing the results with those obtained in adults. The study results demonstrated that the children present lower cardiovascular and respiratory efficiency, as well as higher metabolic efficiency during the test; however, when compared to the adults, the children presented similar levels of exercise capacity.

The use of the cardiorespiratory test in children is not a recent one; Guimaraes et al³ studied their responses during exercise in healthy children and in children with heart failure (HF) secondary to idiopathic dilated cardiomyopathy. The study demonstrated that the metabolic, respiratory and cardiovascular alterations observed in children with HF at

rest, at the threshold and at maximal exercise capacity are similar to those observed in adults with HF. As the heart function at rest did not correlate with the VO_2 peak, the test also showed to be able to differentiate healthy children from those with cardiopathies, at the threshold and at maximal exercise capacity.

Another study published by the same author evaluated the prognosis of the cardiorespiratory test in children with HF⁴. The results demonstrated that the VO_2 peak and the Slope VE/VCO_2 , considered to be the gold standard for prognosis in adults with HF⁵, did not present the same correlation in children with the same cardiopathy.

On the other hand, it was demonstrated that the left ventricular ejection fraction and exercise tolerance had a positive association with prognosis in these children.

The use of the cardiorespiratory test in healthy children and in those with cardiopathies, as demonstrated by these studies, is a safe technique that evaluates the metabolic, respiratory and circulatory responses proposed by them. Therefore, it should be more often indicated to diagnose causes of exercise-induced dyspnea and/or fatigue and evaluate physical performance limitations in this group. The availability of this information can help in the decision-making regarding the most adequate therapeutic, clinical or surgical choice.

Clinical studies with a larger number of children must be carried out to determine the importance of such technique at this age range.

Keywords

Respiratory function tests; exercise test; child.

Mailing address: Guilherme Veiga Guimarães •

Rua Dr. Baeta Neves, 98 - Pinheiros - 05444-050 - São Paulo, SP - Brazil

E-mail: gvguima@usp.br

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Reply

We appreciated the interest expressed by the author of this letter in our article, which describes the importance of applying cardiopulmonary stress test to stratify abnormalities in the oxygen transport system in children.

In fact, the application of cardiopulmonary exercise test allows investigating the relationship between internal breathing (muscle metabolism) and external breathing (cardiorespiratory system) during exercise, in a non-invasive manner, which strengthens the application of the test in children.

Within a pathophysiological context, previous studies have demonstrated the application of cardiopulmonary stress test in children for the purposes of identifying abnormalities in the cardiorespiratory system in physical stress. For example, Guimarães et al¹ observed metabolic, ventilatory and cardiovascular abnormalities in children with heart failure both in ventilatory anaerobic threshold and in maximal exercise. Furthermore, in our previous study², we found that excess body

fat in obese children compared compared to healthy children produces deleterious changes in ventilatory efficiency, reflected by significantly higher values of ventilatory equivalent for carbon dioxide (VE/VCO_2) in the ventilatory anaerobic threshold. This result suggests that obesity in childhood produces, during exertion, an impairment in pulmonary gas exchange.

Another point to be emphasized is the use of longitudinal methodology in the evaluation of drug and non-drug therapies. For example, in the same study previously cited², we have demonstrated that weight loss associated with improvement in aerobic capacity promotes a significant increase in ventilatory efficiency in obese children, which is observed by significantly lower values for VE/VCO_2 in the ventilatory anaerobic threshold after interventions by hypocaloric diet and aerobic exercise training.

Therefore, the use of cardiopulmonary stress test can be a tool for the diagnosis of dyspnea or exercise intolerance through physical characterization of both cardiorespiratory and metabolic responses in children in maximal progressive exercise^{1,3}.

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