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ORIGINAL ARTICLE

Respiratory muscle strength test: is it realistic in young children?

João Paulo Heinzmann-Filho, Márcio Vinícius Fagundes Donadio*

Centro Infant, Instituto de Pesquisas Biomédicas, Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS), Porto Alegre, RS, Brazil

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KEYWORDS
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Abstract
Objective: To determine the success rate of the manovacuometry test in children between 4 and 12 years of age.
Methods: Cross-sectional study involving children and adolescents from 4 to 12 years of age, enrolled in three basic education schools. All subjects had the anthropometric and respiratory muscle strength (maximum inspiratory pressure and maximum expiratory pressure) data measured. Students whose parents did not authorize participation or who did not want to undergo the test were excluded. The test was considered successful when the subject reached acceptability (no air leaks) and reproducibility (variation <10% between the two major maneuvers) criteria established by guidelines. Failure was defined when subjects did not meet the above criteria. Data were expressed as mean and standard deviation and the categorical variables in absolute and relative frequency. The comparison between proportions was performed using the chi-square test.
Results: We included 196 children and adolescents, mean age of 8.4±2.5 years, 53.1% female. The success rate of the manovacuometry test in children and adolescents evaluated was 92.3%. When comparing the differences between the success rates of preschool children with those children and adolescents of school age, there was a significantly lower success rate in the preschool (85.1%) group compared to the school group (94.6%) (p=0.032). However, no significant differences (p=0.575) were found when gender comparisons were performed.
Conclusions: The manovacuometry test showed a high success rate in both preschool and school population assessed. Furthermore, the rate of success appears to be related to aging.

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* Corresponding author.
E-mail: mdonadio@pucrs.br (M.V.F. Donadio).

PALAVRAS-CHAVE
Testes de função pulmonar;
Força muscular;
Músculos respiratórios;
Estudos de viabilidade

Teste de força muscular ventilatória: é viável em crianças jovens?

Resumo
Objetivo: Determinar a taxa de sucesso do teste de manovacuometria em crianças de quatro a 12 anos.
Métodos: Estudo transversal que incluiu crianças e adolescentes de quatro a 12 anos, matriculadas em três escolas da rede básica de ensino. Todos os participantes fizeram a mensuração das medidas antropométricas, seguidas do teste de manovacuometria (pressão inspiratória máxima e pressão expiratória máxima). Escolares cujos responsáveis não autorizaram a participação e aqueles que não quiseram fazer o teste foram excluídos. O teste foi considerado sucesso quando o sujeito avaliado atingia os critérios de aceitabilidade (ausência de escape aéreo) e reprodutibilidade (variação <10% entre as duas maiores manobras) estabelecidos pelas diretrizes. O insucesso foi definido como não preenchimento dos critérios descritos acima. Os dados foram expressos em média e desvio padrão e em frequência absoluta e relativa. A comparação entre as proporções foi feita por meio do teste de qui-quadrado.
Resultados: Foram incluídas 196 crianças e adolescentes, com idade média de 8,4±2,5 anos, 53,1% do sexo feminino. A taxa de sucesso do teste de manovacuometria em crianças e adolescentes avaliados foi de 92,3%. Quando comparadas as diferenças entre as taxas de sucesso de crianças na faixa etária pré-escolar com crianças e adolescentes na faixa etária escolar, observou-se uma taxa de sucesso significativamente menor no grupo pré-escolar (85,1%), em comparação com o grupo escolar (94,6%) (p=0,032). No entanto, não houve diferença significativa (p=0,575) quando analisadas diferenças entre sexos.
Conclusões: O teste de manovacuometria apresentou uma elevada taxa de sucesso na população pré-escolar e escolar avaliada. Além disso, a taxa de sucesso parece estar relacionada com o aumento da idade.

Introduction

Although respiratory diseases and other clinical conditions in the pediatric population are some of the main causes of morbidity and mortality in childhood,[1,2] many of them have not often been evaluated by objective measures in clinical practice. There are several reasons for this in children, mainly the fact that many tests are not standardized.[3] It is difficult for the subjects to understand and cooperate, there is low reproducibility, and also lack of information on certain methods among health care professionals, as part of the evaluation of many lung conditions and diseases.[3]

In this sense, lung function tests are important tools used to evaluate the respiratory system. They supply objective measures to help diagnose and manage various clinical conditions.[3] Among these, the respiratory muscle strength test is a simple, non-invasive resource, easy to apply, and is used to evaluate the maximum static respiratory pressures, which reflect respiratory muscle strength.[4] It consists of two measures: one directed at evaluating inspiratory muscle strength through maximum inspiratory pressure (MIP), the other to investigate the expiratory muscle strength through maximum expiratory pressure (MEP).[4,5] It is commonly used to determine respiratory muscle weakness and to quantify the severity of certain diseases.[4,6] In the pediatric age range, it can help in the management and follow-up of neuromuscular diseases, lung disorders such as asthma and cystic fibrosis, and it is also used in rehabilitation programs.[4,7]

In clinical practice, respiratory muscle weakness can be associated with hypercapnia, with recurrent infections and inefficient coughing, predisposing to the development of respiratory failure and the onset of more severe morbidities.[8,9] Therefore, in the last two decades, studies[10–12] have been performed to generate reference values for maximum static respiratory pressures in healthy children and adolescents, in order to make greater use of them in clinical practice, due to the possibility of normalizing and interpreting these respiratory findings. Recently, normality values were published for healthy preschoolers and schoolchildren,[10] showing that this evaluation can be performed even in young individuals. The absence of normality values in smaller children has been ascribed mainly to the technical difficulty and the children's lack of understanding while the test is being performed,[13,14] demonstrating that the age factor may be the main limitation to evaluating and using respiratory muscle strength in this population group. However, there is as yet no evidence showing how the success rates of the respiratory muscle strength test behave in different age groups.

Therefore, considering the importance of this resource under different conditions and clinical situations, and due to the absence of information about the success rate of the respiratory muscle strength test in the pediatric age group, the purpose of this study was to determine the success rate of the respiratory muscle strength test in children aged 4–12 years old. The use of this evaluative method at early ages may help achieve a better evaluation and follow-up of