



Reflections on the article “Correlation of lung function and respiratory muscle strength with functional exercise capacity in obese individuals with obstructive sleep apnea syndrome”

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First, we would like to congratulate Carvalho et al. on their article published in the JBP entitled “Correlation of lung function and respiratory muscle strength with functional exercise capacity in obese individuals with obstructive sleep apnea syndrome” (OSAS),⁽¹⁾ a matter of extreme importance for all professionals working in this area; this clinical condition affects a large number of people, with a direct impact on their quality of life.

An important observation to be made about the aforementioned study⁽¹⁾ is that it has a cross-sectional design, which does not establish causality, that is, it is not possible to know whether the changes in lung function and respiratory muscle strength are due to either obesity or OSAS alone. Support for the first hypothesis may be evidenced in a study by Melo et al.,⁽²⁾ who reviewed studies of lung function in obese individuals and observed reductions in total lung capacity and FVC, accompanied by a reduction in FEV₁; those were the key findings across all samples, suggesting that the presence of a restrictive respiratory pattern is associated with obesity. What can be perceived is that decreased lung capacity is already a characteristic of obesity, even in the absence of comorbid OSAS.⁽²⁾ A study by Tassinari et al.,⁽³⁾ cited by the study in question,⁽¹⁾ reported that no lung function or respiratory muscle impairment was observed in normal-weight OSAS patients and that there were similarities between that group of patients and healthy subjects.

Another limiting factor are the comorbidities in the sample,⁽¹⁾ such as type II diabetes mellitus; it has been reported in a study by Punjabi et al.⁽⁴⁾ that, regardless of adiposity, sleep-disordered breathing is associated with impairments in insulin sensitivity and that using body mass index, which does not discriminate between muscle mass and adipose tissue, as an assessment variable may affect the results found regarding the comparison of the degree of obesity of each individual.

A finding that deserves comment is the lack of correlation between lung function and six-minute walk distance in that population,⁽¹⁾ because the six-minute walk test has been validated in obese subjects, and found to be reproducible, and it has been demonstrated that an 80 m increase in six-minute walk distance is related to clinical improvement. A factor that could possibly explain this finding was reported by Uçok et al.,⁽⁵⁾ who compared individuals with OSAS and healthy individuals: individuals with lower maximal oxygen consumption values had premature leg fatigue. This disorder of the muscle metabolism is associated with high levels of lactic acid in the blood and with decreased ability to reduce these levels during exercise in patients with sleep disorders.⁽⁵⁾

It is incumbent upon us to emphasize that the results obtained are likely to be improved by using a different methodological design and by redefining the study population by limiting it to individuals without comorbidities, thus avoiding a possible selection bias.

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Authors' reply

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First of all, we would like to thank the authors of the letter above for their comments on our article entitled "Correlation of lung function and respiratory muscle strength with functional exercise capacity in obese individuals with obstructive sleep apnea syndrome" (OSAS).⁽¹⁾ In the article, we showed that the patients in our sample, which consisted of obese individuals with untreated OSAS, had reduced lung function, reduced inspiratory muscle strength, and reduced physical capacity. In addition, we found that, in these patients, reduced lung function, but not reduced respiratory muscle strength, was associated with reduced shuttle walk distance. However, no correlation was found between lung function or respiratory muscle strength and six-minute walk distance (6MWD).

With regard to the comment made by those authors regarding the study design, which is cross-sectional and observational and therefore is not the most appropriate for establishing a cause for the reduction in strength and lung function found in our patients, we agree with it. In fact, we consider this to be one of the limitations of our study. We suggested that, in order to establish causality accurately, studies with greater methodological rigor, such as randomized clinical trials, should be performed, given that our study investigated only one group of obese individuals with OSAS and there were no groups for subsequent comparisons. With regard to the presence of comorbidities, this is a common finding in patients with OSAS. The intermittent episodes of hypoxia and reoxygenation present in OSAS can promote oxidative stress associated with the release of inflammatory markers, contributing to

the emergence of comorbidities and of consequences for peripheral and cardiorespiratory muscles, and this can directly affect exercise tolerance. As for the authors' remarks regarding the use of body mass index to assess obesity, we agree that this is not the most reliable method to classify obesity because it does not take body composition into account. Nevertheless, according to an editorial in the BMJ in 2018,⁽²⁾ body mass index remains the most commonly used and widely accepted measure of obesity in adults and children, as well as having a strong correlation with gold standard measures of body fat.

Finally, regarding the comment on the lack of correlation between lung function and 6MWD, we would like to emphasize that the correlation between the two variables is not associated with the fact that the six-minute walk test has been validated in obese subjects and found to be reproducible, as highlighted in the letter above. What a lack of correlation tells us, from a statistical point of view, is that a change in the value of an independent variable (i.e., lung function) did not cause changes in the value of a dependent variable (i.e., 6MWD). Similar results have also been reported by Ferreira et al.,⁽³⁾ who found no correlations between lung function and 6MWD when analyzing obese children and adolescents.

In conclusion, we would like to thank once again the authors of the letter above for the continuing discussion about the methodological aspects and results of our paper,⁽¹⁾ making it possible to broaden the debate on OSAS, a topic that is so current and important in the field of respiratory and sleep medicine.

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