letters to the editor

The following is the abstract of the article discussed in the subsequent letter:

**Sato, Jiro, and Peter A. Robbins** Methods for averaging irregular respiratory flow profiles in awake humans. *J Appl Physiol* 90: 705–712, 2001.—Respiratory flow profiles have been of interest as an output of the respiratory controller. In determining average flow profiles, however, previous methods that align individual breaths in the time domain are susceptible to distortions caused by the great variability, both between breaths and within breaths. We aimed to develop a method for determining typical flow profiles that circumvents such distortions. Our method aligns different breaths by phase of respiratory cycle, which is defined as the angle associated with the point on the normalized flow-volume diagram (a phase-plane plot). Over a number of breaths, median values for flow, volume, and elapsed time from the start of the breath at each phase angle are determined. Because these estimates are mutually semi-independent and in general violate the laws of mass balance, an adjustment was performed such that the volume was precisely the time integral of the flow. The method produced typical flow profiles with characteristics that were significantly closer to the mean values obtained from the individual cycles than those obtained by the technique of Benchetrit and co-workers (Benchetrit G, Shea SA, Dinh TP, Bodocco S, Baconnier P, and Guz A, *Respir Physiol* 75: 199–210, 1989), which reconstructs the typical flow profile from Fourier coefficients.

**Methods for Averaging Respiratory Flow Profiles in Humans**

To the Editor: The manuscript by Drs. Sato and Robbins (3) presents a new method for determining average flow profiles. The resulting average flow profiles are compared with those obtained with our method (2). It is noteworthy that the method of flow profile analysis we used was first published by Bachy et al. (1).

More important is that we have never corrected the respiratory phase inconsistency by shifting the respiratory phase such that inspiration starts with zero flow and expiration ends with zero flow. This is obvious in our article (2) in Figs. 3 and 4, where it can be seen that some of the average flows do not start at zero flow at the beginning of inspiration.

This misconception is reported in several paragraphs and figures of the article by Drs. Sato and Robbins (3). We leave to the authors to estimate the consequences of the changes they brought in our average flow calculation.

**REFERENCES**


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**REPLY**

To the Editor: We thank Dr. Benchetrit for her comments. We did not mean to imply that, in their original study (1), Dr. Benchetrit and colleagues adjusted their plots of the respiratory cycle so that inspiration started with zero flow and expiration ended with zero flow. We also wish to emphasize that we did not do this with respect to the Fourier coefficients obtained from individual breaths. The alignment for individual breaths refers to the experimental data (that is, the data point for which time = 0) and does not refer to any subsequent adjustment of the Fourier coefficients fitted to the individual breaths. We did make one adjustment to the Fourier coefficients obtained after they had been averaged that was not made by Dr. Benchetrit and colleagues. This was simply to adjust the phase so that time zero corresponded to zero flow at the start of inspiration. This has no effect whatsoever on the shape of the respiratory flow profile obtained but merely reflects a slightly different decision in relation to where to start and stop plotting the cycle. This is illustrated in the bottom panels of Fig. 1 in our paper (2). We are grateful for the opportunity to clarify this methodological aspect of our study.

**REFERENCES**


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