

## Methods

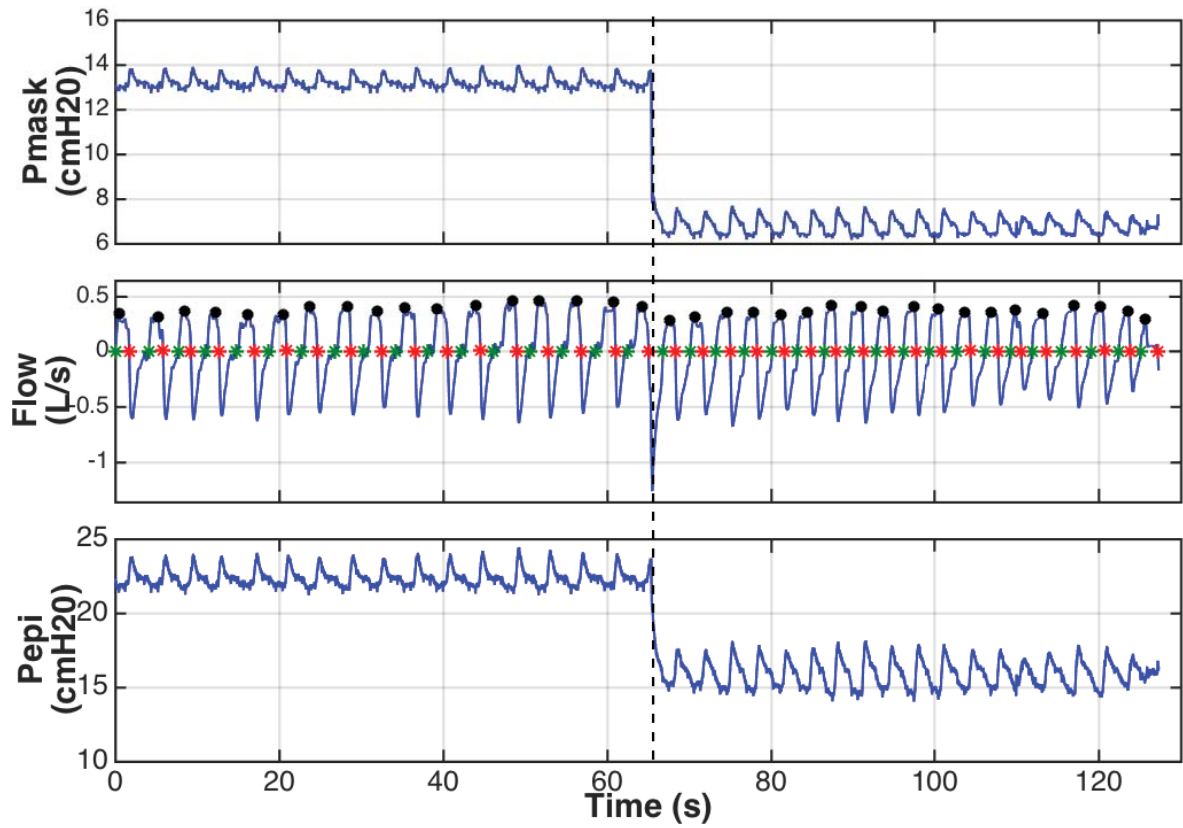
### Detection of Breath Timing and Calculation of Respiratory Parameters

The airflow signal was sampled at 125 Hz and filtered using a second-order Savitzky-Golay (S-G) filter of 0.5s.<sup>1,2</sup> The S-G filter was designed to perform as a bandpass filter with the cut-off frequency of 2 Hz.<sup>3</sup> An amplitude threshold algorithm was then applied to detect respiratory cycles.<sup>4</sup> This algorithm identifies zero-crossing points, peak inspiratory and peak expiratory points of the respiratory signal, and then applies an amplitude threshold to reject false breath-detection. Figure E1 illustrates the detection of breath timing.

For each 60-second window before and following the onset of onset of a reduction in continuous positive airway pressure (CPAP), we calculated the following parameters on a breath-by-breath basis:

- Pmask: nadir Pmask during inspiration.
- Peak inspiratory flow (PIF): peak inspiratory airflow.
- Minute ventilation ( $\dot{V}_E$ ): generated by integrating the flow signal.  $\dot{V}_E$  is then calculated as tidal volume multiplied by respiratory rate.
- Pepi: nadir Pepi during inspiration (corrected for baseline drift).

These parameters were then averaged within each condition (on CPAP and during transient reductions) for each participant.



**Figure S1.** Breath detection and calculation of pressure and respiratory parameters. Pmask is mask pressure, Pepi is epiglottic pressure and Flow is airflow. Dashed line represents the onset of a reduction in continuous positive airway pressure (CPAP). Green and red asterisks represent the onsets of inspiration and expiration, respectively. Black dots represent Peak Inspiratory Flow (PIF).

## References

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4. Schmidt M, Foitzik B, Wauer RR, Winkler F, Schmalisch G. Comparative investigations of algorithms for the detection of breaths in newborns with disturbed respiratory signals. *Comput. Biomed. Res.* 1998;31:413-25.