



Publication

Wilson et al. 2021. Anaesthesia

The effect of respiratory activity, non-invasive respiratory support and facemasks on aerosol generation and its relevance to COVID-19.

Aim of the study

This study aimed to measure total human aerosol emissions during exertional respiratory activities and make comparisons with emissions during respiratory therapies.



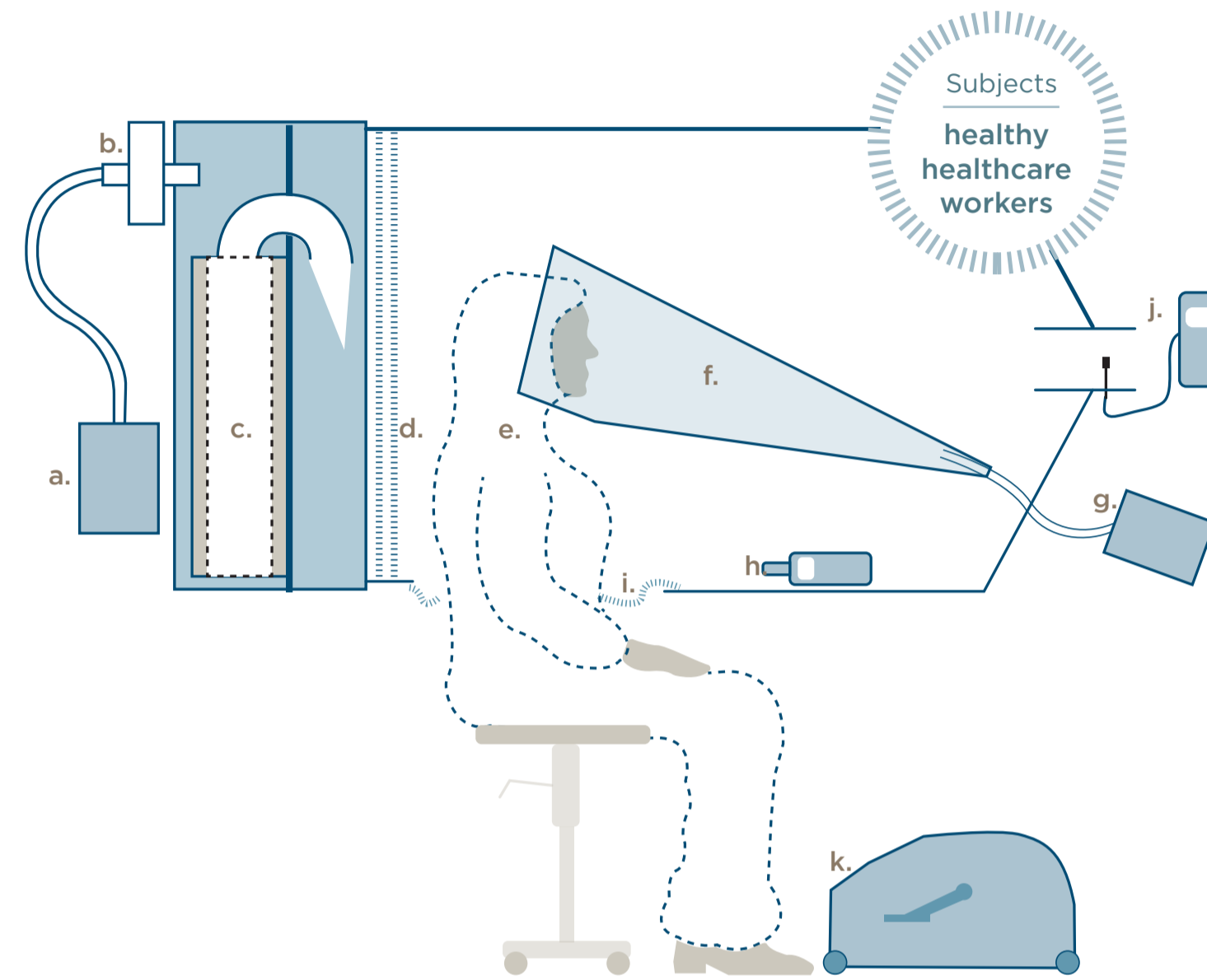
Key Points

“[Exertional] respiratory activities... generate substantially more aerosols than non-invasive therapies...”

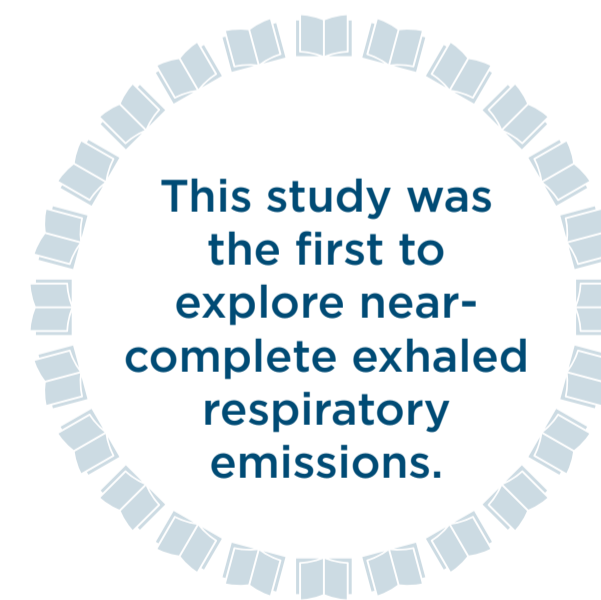
“Exertional respiratory activities are the primary modes of aerosol generation...”



Method



The sampling chamber consists of: a. Domestic air filter b. Respiratory filter c. Air pump d. 2-layered electret filter e. Non-woven overalls f. Sampling Cone g. Optical particle counter h. Hygrometer i. Non-porous skirt j. Hot-wire anemometer k. Portable exercise cycle. n=10 subjects



This study was the first to explore near-complete exhaled respiratory emissions.

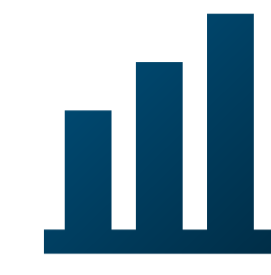
A novel chamber with an optical particle counter was used to sample at 100 L/min, capturing most of the total particles emitted over relevant size range of 0.5 to 25 µm.

Exertional respiratory activities

- Talk
- Exercise
- Shout
- FEV
- Cough

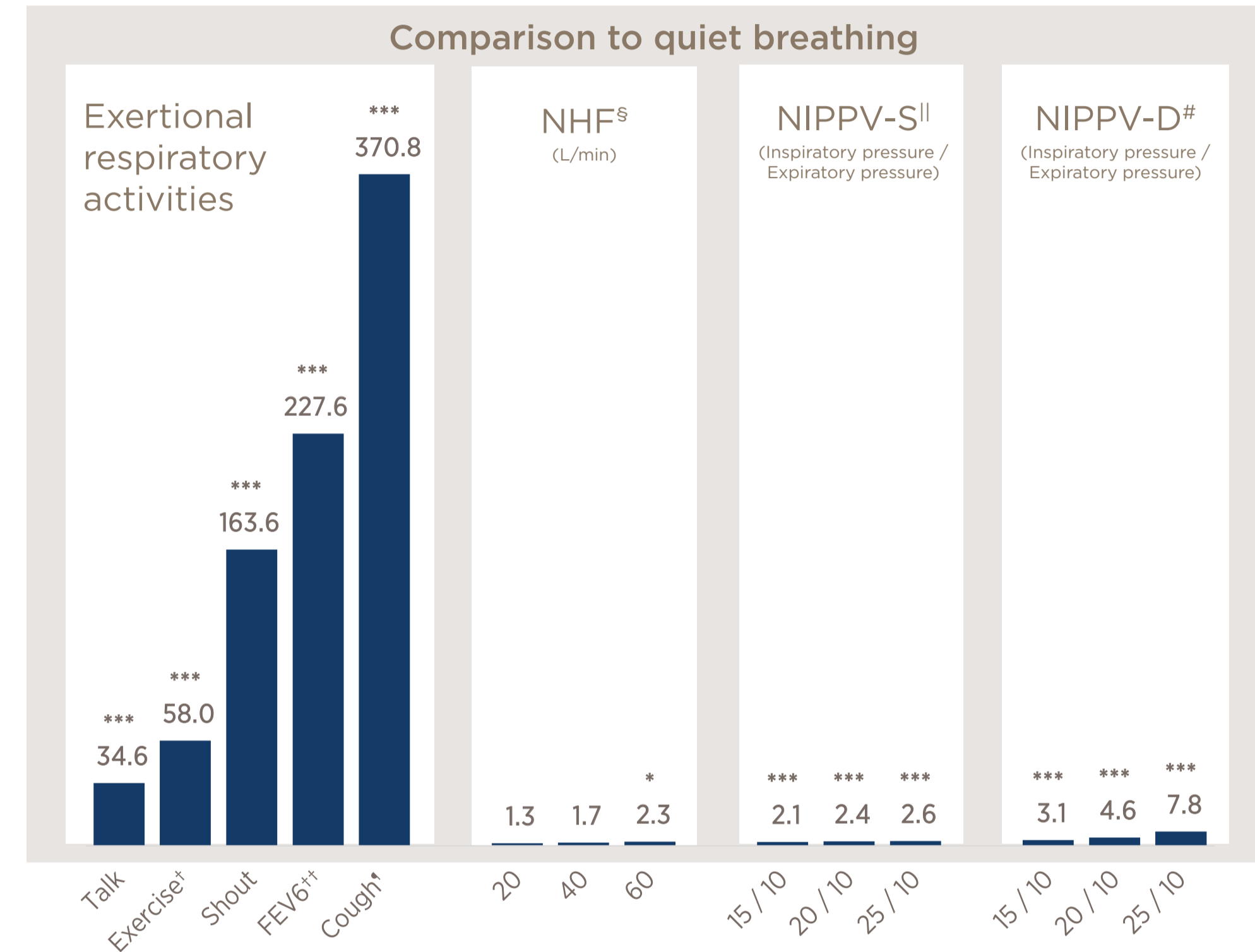
Respiratory therapies

- NHF
- NIPPV-S
- NIPPV-D



Results

Fold changes of average total particle counts during exertional respiratory activities and respiratory therapies compared to quiet breathing alone.



The average particle counts during exertional respiratory activities increased between 35 - 371 folds compared to quiet breathing (p < 0.001)

The average particle counts during NHF at 60 L/min and NIPPV-S/D increased between 2 - 8 folds compared to quiet breathing (p < 0.05 - 0.001)

*p < 0.05, ***p < 0.001, †exercise was used as a proxy for symptomatic breathing, ††six forced expiratory manoeuvres, †††six coughs, †nasal high flow, ††noninvasive positive pressure ventilation - single limb, ††noninvasive positive pressure ventilation - dual limb.

Further reading



PubMed Abstract



Full paper