Efficacy of universal masking for source control and personal protection from simulated respiratory aerosols in a room

Dataset Description

# Introduction

Masks block aerosols produced during coughs and exhalations (“source control”). Masks also slow and deflect cough and exhalation airflows, which changes the dispersion of aerosols. Factors such as the directions in which people are facing (orientation) and separation distance also affect aerosol dispersion. However, it is not clear how masking, orientation, and distance interact. We placed a respiratory aerosol simulator (“source”) and a breathing simulator (“recipient”) in a chamber and measured aerosol concentrations for different combinations of masking, orientation, and separation distance. When the simulators were front-to-front during coughing, masks reduced the 15-minute mean aerosol concentration at the recipient by 92% (p < 0.0001) at 0.9 and 1.8 m separation. When the simulators were side-by-side, masks reduced the concentration by 81% at 0.9 m and 78% at 1.8 m (p < 0.0001 for both). During breathing, masks reduced the aerosol concentration by 66% when front-to-front (p = 0.0056) and 76% when side-by-side (p < 0.0001) at 0.9 m. Similar results were seen at 1.8 m. When the simulators were unmasked, changing the orientations from front-to-front to side-by-side reduced the cough aerosol concentration by 59% at 0.9 m and 60% at 1.8 m (p < 0.0001 for both). When both simulators were masked, changing the orientations did not significantly change the concentration at either distance during coughing or breathing. Increasing the distance between the simulators from 0.9 m to 1.8 m during coughing reduced the aerosol concentration by 25% when no masks were worn (p < 0.0001) but had little effect when both simulators were masked (4% decrease, p = 0.7090). During breathing, when neither simulator was masked, increasing the separation reduced the concentration by 13%, which approached significance (p = 0.0737), while the change was not significant when both source and recipient were masked (8% decrease, p = 0.3235). Our results suggest that universal masking reduces exposure to respiratory aerosol particles regardless of the orientation and separation distance between the source and recipient.

# Methods Collection

* A respiratory aerosol simulator (source) and breathing simulator (recipient) were placed in a 10’ x 10’ environmental chamber.
* Aerosols were coughed or exhaled into the chamber by the respiratory aerosol simulator.
* Simulators were tested with and without face masks.
* Aerosol concentrations for 0.3 to 3 µm particles were measured using aerosol optical particle counters.

# Citations

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