

Filtration Efficacy of Reusable Full-Face Snorkel Masks for Personal Protective Equipment

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Abstract : The Pneumask consists of a custom snorkel-specific adapter that attaches a snorkel-port of the mask to a 3D-printed filter. This full-face snorkel mask was designed for use as personal protective equipment (PPE) during the COVID-19 pandemic when there was a widespread shortage of PPE for medical personnel. Various clinical validation tests have been conducted, including the sealing capability of the mask, filter performance, CO₂ buildup, and clinical usability. However, data regarding the filter efficiencies of Pneumask and multiple filter types have not been determined. Using an experimental system, we evaluated the filtration efficiency across various masks and filters during inhalation. Eighteen combinations of respirator models (5 P100 FFRs, 4 Dolfin Masks) and filters (2091, 7093, 7093CN, BB50T) were evaluated for their exposure to airborne particles sized 0.3 - 10.0 microns using an electronic airborne particle counter. All respirator model combinations provided similar performance levels for 1.0-micron, 3.0-micron, 5.0-micron, 10.0-microns, with the greatest differences in the 0.3-micron and 0.5-micron range. All models provided expected performances against all particle sizes, with Class P100 respirators providing the highest performance levels across all particle size ranges. In conclusion, the modified snorkel mask has the potential to protect providers who care for patients with COVID-19 from increased airborne particle exposure.

Keywords : COVID-19, PPE, mask, filtration, efficiency

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