

Title \*

An assessment of facial dimensions and their impact on mask performance

Abstract \*

Certain respiratory protective equipment (RPE) must fit tightly to the face of the wearer to provide effective protection, yet it is still unclear as to what extent facial features affect mask performance. This study assessed how facial dimensions affect the efficacy of a given RPE.

We tested a single RPE (3M 8835+) on participants (n=262) who consistently wear RPE at work. Three facial dimensions were measured to limit the demands placed on test participants: face length, face width, and jaw width. Fit factor (FF), representing the ratio of the exposure concentration (detectable particle size of greater than 0.02  $\mu\text{m}$ ) outside to inside a mask, used to assess mask fit, with  $\text{FF} > 100$  constituting a successful fit.

Although 94.7% (n=248) of the study population achieved a successful fit, there was considerable variation among test results: FF median=415; Interquartile Range (IQR)=294-604. FF was log-transformed for regression analyses, which identified FF increases of 11.9% ( $p < 0.05$ ) and 18.3% ( $p < 0.005$ ) per 10% increase in the ratio of face length to jaw width and face width to jaw width, respectively.

These results indicate that in terms of overall fit test success rate the variation in facial features did not have a significant impact. However, when considering the FF score on a continuum, significant differences were associated with facial feature measurements. We discuss the implications of a successful fit and mask performance, considering the observed variation from facial measurements.

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