The effect of gender and respirator brand on the association of respirator fit with facial dimensions.

Abstract

This study examined the association of facial dimensions with respirator fit considering the effect of gender and respirator brand. Forty-one subjects (20 white females and 21 white males) participated in the study. Each subject was measured for 12 facial dimensions using anthropometric sliding and spreading calipers and a steel measuring tape. Three quantitative fit tests were conducted with the same subject wearing one size of three different brands of half-mask respirators resulting in a total of nine fit tests. Linear mixed model analysis was used to model respirator fit as a function of gender and respirator brand while controlling for facial dimensions. Results indicated that the gender by respirator brand interaction was not statistically significant (p = 0.794), and there was no significant difference in respirator fit between males and females (p = 0.356). There was a significant difference in respirator fit among respirator brands (p < 0.001). Because correlations between facial dimensions and respirator fit differed across gender and respirator brand, six separate linear mixed models were fit to assess which facial dimensions most strongly relate to respirator fit using a "one variable at a step" backward elimination procedure. None of the 12 facial dimensions were significantly associated with respirator fit in all six models. However, bigonial breadth and menton-nasion length were significantly associated with respirator fit in five of the six models, and biectoorbitale breadth, bizygomatic breadth, and lip width were significantly associated with respirator fit in four of the six models. Although
this study resulted in significant findings related to the correlation of respirator fit with menton-nasion length and lip width (the dimensions currently used to define the half-mask respirator test panel), other facial dimensions were also shown to be significantly associated with respirator fit. Based on these findings and findings from previous studies, it is suggested that other facial dimensions including bigonial breadth, biecoorbitale breadth, and bizygomatic breadth be considered when designing half-mask respirators, and that face length and lip width alone may not be appropriate in defining test groups whose fit is intended to be representative of worker populations.

DOI 10.1080/15459620701709619
Alternate Journal J Occup Environ Hyg
PubMed ID 17957562