

**Development of The New 3D Test Panel for Half-Mask Respirators
by 3D Shape Analysis for Korean Faces**

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ABSTRACT

Two dimensional facial anthropometric data, face length and lip width, have been widely used to construct the test panel for fit testing of quarter and half-mask respirators. This study was performed to suggest the new three-dimensional (3D) fit test panel, constructed based on facial 3D data, for respirator fit testing.

Three dimensional surface data were obtained using a 3D laser scanner; facial data from 102 volunteers (70 males and 32 females). The collected digitalized data were used for shape analysis utilizing the Procrustes algorithm.

The results were as follows;

1. Facial shapes between genders were statistically significantly different. The misclassification error rate was 2.99 %.
2. Facial shapes of all subjects including both genders were categorized into 4 different facial types by cluster analysis.
3. The new 3D fit test panel containing both facial shape and length information data was developed. The panel was composed of the shape information on x-axis which were expressed as A, B, C, and D, and the lengths information on y-axis that were classified 4 groups ranged from 103.7 mm to 133.5 mm.

The new 3D fit test panel for Koreans, developed utilizing shape information as well as length information was constructed. The concept for developing the 3D test panel can be applied for other ethnic groups having different facial shapes.