

O'Connell DG, Higgins S, Jumper JD. The Impact of Disposable Face Masks on Dynamic Lung Function in Healthy Young Adults. Combined Sections Meeting, San Antonio, TX, February, 2022.

Purpose/Hypothesis: The purpose of this investigation was to measure the effects of wearing a disposable mask on dynamic lung function in young, healthy adults.

Number of Subjects: Twenty subjects (10 Males and 10 Females) participated in this investigation.

Materials and Methods: This IRB-exempt investigation involved subjects being measured for height and weight prior to participation in dynamic pulmonary function testing. Subjects participated in three unmasked (UM) and three masked (M) seated trials using a nose clip and calibrated Microloop Spirometer (Accuracy = $\pm 0.03\%$). Sets of trials were randomized with 60-sec rest between each seated trial and 60-sec rest between sets of trials. Subjects forcefully exhaled through a Vyaire filter for all tests and through a breathable facemask made from non-woven polyester and polypropylene with elastic ear loops for the M trials. Three trials for Forced Expiratory Volume in 1-sec (FEV_1), Forced Vital Capacity (FVC), FEV_1/FVC ratio, and Peak Expiratory Flow Rate (PEF) were measured on the spirometer and averaged for statistical analysis. Trials that did not meet ATS guidelines were repeated. Statistical Analysis: Paired t-tests (SPSS26) were used to test for differences between M vs. UM breathing conditions (mean of three trials) and significance was set at $p \leq 0.0125$ using Bonferroni correction. Descriptive statistics (mean \pm standard deviation) for dependent variables are presented below.

Results:: Subjects were 23.35 ± 1.55 years of age, 68.5 ± 4.58 inches tall, and weighed 166.38 ± 35.36 lbs. All dynamic pulmonary function tests were significantly reduced during the M vs. the UM condition. Mean UM and M FEV_1 values were 3.76 ± 0.972 L/sec and 2.53 ± 0.758 L/sec, respectively ($t(19) = 8.33$, $p \leq .001$). Mean UM and M FVC values were 4.37 ± 1.190 and 3.17 ± 0.904 Liters, respectively ($t(19) = 6.58$, $p \leq .001$). Mean UM and M PEF values were 6.30 ± 2.06 L/sec and 3.26 ± 1.21 L/sec, respectively ($t(19) = 9.34$, $p \leq .001$). FEV_1/FVC UM and M values were $86.78\% \pm 6.26$ and $79.70\% \pm 6.60$, respectively ($t(19) = 5.11$, $p \leq .001$). Wearing a mask caused a 32.7%, 33.0%, 48.3% and 8.16% reduction in FEV_1 , FVC, PEF, and FEV_1/FVC condition, respectively.

Conclusions: Breathable ear loop disposable facemasks significantly reduced FVC, FEV_1 , FEV_1/FVC and PEF in young adults.

Clinical Relevance: Children and adults throughout the world have been strongly encouraged/required to wear various types of facemasks throughout the COVID-19 epidemic. In the current study, Mask use drove FEV_1/FVC towards the Post-bronchodilator GOLD criteria for obstructive disease in this young healthy population. One can hypothesize M use during exercise or work would cause a reduction in lung function in healthy subjects, the elderly and in those with cardiorespiratory pathology, negatively affecting their ADLs, functional fitness, and metabolic energy reserve.