Effect of Wearing a Gas Collection Mask on Time to Exhaustion during the Bruce Protocol

McGee, Joshua E.

Human Performance Laboratory; Department of Health and Human Performance; Texas State University; San Marcos, TX

ABSTRACT

Oxygen consumption (VO$_2$) and carbon dioxide production (VCO$_2$) are important to measure and analyze in exercise physiology and fitness testing. A respiratory gas collection mask (RGC) is required for measurement of VO$_2$ and VCO$_2$, but has been reported to cause respiratory symptoms and inhibit maximal performance in subjects. This study compared the performance of a graded maximal exercise test (GXT) while wearing a mask (MASK) and without wearing a mask (NO-MASK). Twelve adults performed the Bruce GXT under the two different conditions on two separate occasions in random order. Performance variables used in data analysis were time to exhaustion (TTE), peak heart rate (HR$_{peak}$), and rating of perceived exertion (RPE). Between MASK and NO-MASK, paired sample t-tests revealed significant differences in TTE (11.46 ± 1.45 v. 11.70 ± 1.62 min; $p=0.017$), but no differences in HR$_{peak}$ (184.67 ± 12.88 v. 186.33 ± 11.59 beats min$^{-1}$; $p=0.226$) and RPE (8.25 ± 1.55 v. 8.42 ± 0.90; $p=0.723$). Because peak VO$_2$ could not be measured during NO-MASK, predicted VO$_2$, based on TTE, was calculated for both conditions. Post-hoc analysis revealed no significance between predicted VO$_2$ for MASK versus NO-MASK (40.18 ± 6.06 v. 41.19 ± 6.74 ml kg$^{-1}$·min$^{-1}$; $p=0.017$). Thus, while TTE was slightly longer while performing the GXT without a mask compared to with a mask, the impact this 24-min (14-s) difference had on predicted VO$_2$max was not significant. From a practical standpoint, wearing a mask during a GXT does not hinder performance.