**Face Masks whilst ExeRcIsing Trial (MERIT): a crossover randomised controlled study**

Authors: 1Nicholas Jones, 2Seren Marsh, 1Jason Oke, 3Kurosh Nikbin, 4Jonathan Bowley, 1FD Richard Hobbs and 1Trisha Greenhalgh

Affiliations:

1. Nuffield Department of Primary Care Health Sciences, University of Oxford
2. Undergraduate medical student, Jesus College, University of Oxford
3. Undergraduate medical student, Kings College London
4. Undergraduate medical student, University of Nottingham

Corresponding author: Dr Nicholas Jones, GP and Wellcome Trust Doctoral Research Fellow

Nuffield Department of Primary Care Health Sciences, University of Oxford, Radcliffe Primary Care Building, Woodstock Road, Oxford OX2 6GG.

Email: nicholas.jones2@phc.ox.ac.uk

Contact details for presenting author: Seren Marsh, Undergraduate medical student

Jesus College, University of Oxford, Turl Street, Oxford OX1 3DW

Email: seren.marsh@jesus.ox.ac.uk

**Abstract**

Introduction and purpose: Physical exertion is a high-risk activity for emission of aerosols, but there is controversy around whether facemasks are safe and acceptable when exercising. We aimed to determine the safety and tolerability of healthy young adults wearing different types of facemask during moderate-to-high intensity exercise.

Methods: Crossover randomised controlled study, comparing a surgical, cloth and FFP3 mask to no mask during 15 minutes of exercise separated by 5 minutes rest. In a non-inferiority analysis, the primary outcome was changes in oxygen saturations (non-inferiority margin=2%) and secondary outcomes included changes in heart rate (non-inferiority margin=7bpm).

Results: 72 individuals aged 18-35 (mean 23.1 years) completed the study. Changes in oxygen saturations and heart rate did not exceed the pre-specified non-inferiority margin with any mask type compared to no mask. At the end of exercise the estimated average difference in oxygen saturations for the cloth mask was -0.07% (95%CI -0.39 to 0.25), for the surgical 0.28% (95%CI -0.04 to 0.60) and for the FFP3 -0.21% (95%CI -0.53 to 0.11). The corresponding estimated average difference in heart rate for the cloth mask was -1.20bpm (95%CI -4.56 to 2.15), for the surgical 0.36bpm (95%CI -3.01 to 3.73) and for the FFP3 0.52bpm (95%CI -2.85 to 3.89). The cloth mask was felt to be most difficult to exercise in by 56.3% of participants (n-=40) and the FFP3 by 38% (n=27). Wearing a facemask caused additional symptoms such as breathlessness (n=13, 18.1%) and dizziness (n=7, 9.7%). 33 participants broadly supported facemask wearing during exercise, particularly indoors, 18 would agree to this if it were mandated and 22 were opposed.

Conclusions: Exercising at moderate-to-high intensity wearing a facemask appears to be safe in healthy, young adults. There was most support for wearing a surgical facemask during indoor exercise if needed to reduce the spread of COVID-19.