Thermal and heart rate changes among personal protective equipment (PPE) wearers in a 6-minute walk test

KM Padmavathy[1], M Noorzaid[1], S Rohith Sharan[2,3], A Siti Nur Rasinah[1]

[1]Cluster for Integrative Physiology and Molecular Medicine (CIPMM), Faculty of Medicine, Universiti Kuala Lumpur Royal College of Medicine Perak, Ipoh, Malaysia, [2]Provas Medical Centre and Research Institute, Chennai, India, [3]Centre for Medical Education, University of Dundee, Scotland, UK

ABSTRACT

Introduction: During COVID-19 healthcare professionals were at risk of thermal stress while wearing Personal Protective Equipment (PPE) on physical activity. They experienced symptoms of discomfort such as headache, dehydration due to excessive sweating may decrease both cognitive and work efficiency. Previous studies explored the thermal effects of wearing facemask and PPE on physical activities of varying intensity and duration. **Objective:** To evaluate the changes on temperature and heart rate during a 6-Minute Walk Test (6-MWT) while wearing different kinds of PPE. **Materials and Method:** This study involved 90 participants aged between 18-27 years and standardized 6-MWT, a submaximal exercise test as an intervention. A quasi-experimental design, subjects were randomly assigned to either Control, Facemask, or PPE group; a pre-test and post-test measurements of heart rate, blood pressure, aural temperature, and oxygen saturation were done. A 6-Minute Walk Work (6-MWW) (distance x body weight), an improved outcome measure for 6MWT was calculated and data analysed using one-way ANCOVA. **Results:** Mean differences in heart rate [15.15±4.49;17.82±3.40; 21.65±5.88 (BPM)] and temperature [0.04±0.09; 0.04±0.02; 0.38±1.5 (0C)] among three groups respectively, before and after 6-MWT. PPE group showed significant differences in both heart rate and aural temperature ($p<0.05$). Interestingly, 6-Minute Walk Distance (6-MWD) and 6-MWW [25970.63±7097.18; 27957.24±7936.64; 25328.16± 6873.17(Kg.m)] were less in PPE group than other groups. The energy was expended as rise in aural temperature rather than work or functional capacity. **Conclusion:** The increased responses in thermal and heart rate were significant in a group with PPE than without PPE due to an increased metabolic rate and the existence of thermal microclimate while wearing PPE. This study recommends designing appropriate cooling strategies to minimise the side effects of wearing PPE while in longer working environment.