Performance, acute health symptoms and physiological responses during exposure to high air temperature and carbon dioxide concentration

Human subjects were exposed for 3 h in a climate chamber to the air temperature of 35 °C that is an action level, at which the working time needs to be diminished in China. The purpose was to put this action level to test by measuring physiological responses, subjective ratings and cognitive performance, and compare them with responses at temperature of 26 °C (reference exposure). Moreover, CO₂ was increased to 3000 ppm (CO₂ exposure) at 35 °C to further examine, whether this change will have any effect on the measured responses. Compared with the reference exposure, exposure to 35 °C caused subjects to report feeling uncomfortably warm, to rate the air quality as worse, to report increased sleepiness and higher intensity of several acute health symptoms. Eardrum temperature, skin temperature, heart rate and body weight loss all increased significantly at this exposure, arterial oxygen saturation decreased significantly, while the percentage of adjacent inter-beat cardiac intervals differing by > 50 m (pNN50) decreased significantly, indicating elevated stress. The performance of addition and subtraction tasks decreased significantly during this exposure, as well. Increasing CO₂ to 3000 ppm at 35 °C caused no significant changes in responses. Present results reaffirm the selection of 35 °C as an action level, and show that concurrently occurring high CO₂ levels should not exacerbate the hazards.

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