

Sweat Rates During Continuous and Interval Aerobic Exercise: Implications for NASA Multipurpose Crew Vehicle (MPCV) Missions

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Aerobic deconditioning is one of the effects spaceflight. Impaired crewmember performance due to loss of aerobic conditioning is one of the risks identified for mitigation by the NASA Human Research Program. Missions longer than 8 days will involve exercise countermeasures including those aimed at preventing the loss of aerobic capacity. The NASA Multipurpose Crew Vehicle (MPCV) will be NASA's centerpiece architecture for human space exploration beyond low Earth orbit. Aerobic exercise within the small habitable volume of the MPCV is expected to challenge the ability of the environmental control systems, especially in terms of moisture control. Exercising humans contribute moisture to the environment by increased respiratory rate (exhaling air at 100% humidity) and sweat. Current acceptable values are based on theoretical models that rely on an "average" crew member working continuously at 75% of their aerobic capacity (Human Systems Integration Requirements Document). Evidence suggests that high intensity interval exercise for much shorter durations are equally effective or better in building and maintaining aerobic capacity. This investigation will examine sweat and respiratory rates for operationally relevant continuous and interval aerobic exercise protocols using a variety of different individuals. The results will directly inform what types of aerobic exercise countermeasures will be feasible to prescribe for crewmembers aboard the MPCV.