Impact of fan use on physical work capacity in extreme heat

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INTRODUCTION: In the context of climate change, identification of effective and sustainable cooling strategies is urgently required. Recent research demonstrates that electric fan use can reduce thermoregulatory and cardiovascular strain at air temperatures as high as 42°C during passive heat stress. However, there is a dearth of empirical evidence relating to the safety limits for fan use at various combinations of air temperatures and humidity, and how their use impacts physical work capacity (PWC). The aim of this study is to provide new threshold limit values for electric fan use during physical work.

METHODS: Sixteen young adult males performed ~20 trials, consisting of 1 hour of treadmill walking at a fixed HR of 130 beats·min^{-1}. The first experimental trial was conducted in a reference environment with no heat-stress (15°C, 50% rh). The remaining trials were conducted at the same fixed HR for a maximum of 1 hour at 35-50°C at various humidities. Each experimental trial was conducted with and without electric fans. The PWC in each heat-stress trial was defined as the total energy expended during 1 hour of treadmill walking and was expressed relative (%) to that expended during the reference condition.

RESULTS: Preliminary data suggest that fans consistently improve PWC at 35°C and up to 80% rh. Fan use appears to be ineffective, and potentially detrimental, at 40°C and 45°C at high water vapour pressures (~60-80% rh). Moreover, fan use consistently impairs PWC at 50°C regardless of rh level.

CONCLUSION: Our ongoing research aims to produce new, comprehensive threshold limit values for fan use during physical work based on biophysical parameters.

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