

EFFECTS OF A MOUTH-HELD HEAT EXCHANGER ON BREATHING AIR TEMPERATURES

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Inhalation of cold air, in addition to increased respiratory heat loss, may cause breathing discomfort and provoke asthmatic reactions. Nasal breathing prevents parts of these effects due to the air-conditioning function of the upper respiratory tract. Ventilation during exercise, however, most often requires mouth breathing. Special mouth valves or face masks have been developed to allow for a more efficient heat and moisture regain of expired air during exercise. A study was undertaken to evaluate whether a breathing aid of this kind had any significant effect on breathing air temperatures and subjective sensations.

Seven, healthy, male subjects (mean age = 29 years) performed a bicycle exercise test in a climatic chamber at -15°C on two separate days. One test comprised breathing through a mouth-held breathing aid (Lungplus) (LP). A second test comprised the same protocol with breathing through the same mouth piece, but without the heat exchange function (NOLP). The rate of work was stepwise increased until exhaustion. Temperatures of breathing air were measured in the mouthpiece approximately at the level of the mouth opening. Sensation of physical exhaustion, breathing air temperature, breathing resistance and breathing discomfort were recorded using rating scales.

Both inspired and expired air temperatures were significantly higher with LP than with NOLP for all work rates. At a work rate of 150 W t_{in} was 12.9 and -3.5°C and t_{ex} was 28.2 and 26.5°C for LP and NOLP, respectively. Breathing ex air was felt significantly warmer with LP than with NOLP. Sensation of physical exhaustion, breathing resistance and discomfort did not differ between conditions.

In cold environments a breathing aid of the type investigated in this study, in addition to lowered respiratory heat loss, reduces breathing discomfort and, presumably, lowers the risk of broncho-constriction. This kind of device should enable asthmatic and sensitive persons to work under climatic conditions that otherwise would provoke breathing problems.