Respiratory function and symptoms post cold air exercise in female high and low ventilation sport athletes

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PURPOSE:
Cold weather exercise is common in many regions of the world; however, it is unclear whether respiratory function and symptom worsen progressively with colder air temperatures. Furthermore, it is unclear whether high-ventilation sport background exacerbates dysfunction and symptoms.

METHODS:
Seventeen active females (measure of the maximum volume of oxygen [VO(2max)]: 49.6±6.6 mL·kg⁻¹·min⁻¹) completed on different days in random order 5 blinded running trials at 0°C, -5°C, -10°C, -15°C, and -20°C (humidity 40%) in an environmental chamber. Distance, heart rate, and rating of perceived exertion (RPE) were measured within each trial; forced expiratory volume in 1 second (FEV1), forced vital capacity (FVC), forced expiratory flow at 25%-75% (FEF₂₅₋₇₅), and forced expiratory flow at 50% (FEF₅₀) were measured pre- and post-test (3, 6, 10, 15, and 20 minutes). Respiratory symptoms and global effort were measured post-test spirometry.

RESULTS:
Mean decreases were found in FEV1 (4%-5% at 0°C, -5°C, -10°C, and -15°C; 7% at -20°C). FEF₂₅₋₇₅ and FEF₅₀ decreased 7% and 11% at -15°C and -20°C, respectively. Post-exertion spirometry results were decreased most at 3 to 6 minutes, recovering back to baseline at 20 minutes. Respiratory symptoms and global effort significantly increased at -15°C and -20°C with decreased heart rate. High-ventilation sports decreased function more than low-ventilation participants but had fewer symptoms.

CONCLUSIONS:
These results indicate that intense exercise at cold air temperatures up to -20°C is achievable; however, greater effort along with transient acute bronchoconstriction and symptoms of cough after exercising in temperatures colder than -15°C are likely. It is recommended that individuals cover their mouth and reduce exercise intensity to ameliorate the effects of cold weather exercise.