**Head and neck cooling does not improve maximal voluntary torque or rate or torque development during brief maximal voluntary contractions in the heat**

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**Introduction:** Maximal voluntary torque (MVT) is impaired when hyperthermic due to a reduction in the central nervous system’s capacity to voluntarily drive the available force capacity of muscle. Rate of torque development (RTD) is considered more functionally relevant than MVT in some situations and neural drive is a key determinant of RTD. Head and neck cooling can improve endurance performance when hyperthermic, but its effects on neural drive are unclear. The purpose of this study was to investigate head and neck cooling on thermal perception during whole-body hyperthermia on MVT, RTD, neural drive and the contractile properties of the muscle.

**Method:** 9 participants completed two trials in HOT conditions (50°C, 40% RH), involving light exercise before passive heating to a rectal temperature (Tre) of 39.5°C. During one trial, the head and neck was continuously cooled (HOTcool) using a towel soaked in ice water. At Tre=39.5°C neuromuscular measurements were completed to assess MVT, voluntary activation and EMG at MVT normalised to maximal M-wave. Voluntary RTD and normalised EMG were measured over 0-50, 0-100, 0-150 and 0-200 ms. Involuntary RTD at 0-50 ms was measured during evoked octets at 300 Hz. Thermoregulatory and perceptual variables were measured throughout.

**Results:** MVT and RTD, and their neuromuscular determinants were unaffected by cooling (*P* > 0.05). Neck (-20%) and head (-12%) temperature were lower in HOTcool, as were thermal sensation of the head (-36%) and body (-12%) and thermal comfort (body) (-23%). Time to target Tre was increased (71%) in HOTcool, and not all participants were able to reach 39.5°C. Tre (-0.3%) and skin temperature (-6%) were lower in HOTcool (*P* < 0.05), but heart rate was similar (*P* > 0.05).

**Conclusions:** Head and neck cooling did not affect MVT, RTD, or the neuromuscular determinants of these functional variables despite improving perceptions of thermal strain.