**The effects of heat- and cold stress-induced changes in whole-body mean skin temperature on sensory, cognitive, and motor functions in people with MS**

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**Introduction:** A unique feature of Multiple Sclerosis (MS) is that changes in core temperature (Tcore) transiently worsen patients’ symptoms. Changes in skin temperature (Tskin) may also trigger symptoms worsening, yet this effect has not been systematically investigated. We aimed to assess the independent effect of increases/decreases in Tskin on MS sensory, cognitive, and motor function.

**Method:** Twelve MS patients (48.3±10.8y; 173±0.12cm; 79.05±17.87kg) and 7 age-matched healthy controls (CTR: 46.6±11y; 170±0.09cm; 72.25±16.03kg) performed three separate 50-min resting trials in a climatic chamber. During trials, ambient temperature progressively changed from 24oC to either 40oC (HEAT), 10oC (COLD), or remained stable (NEUTRAL). We continuously monitored participants’ mean Tskin and rectal Tcore, and evaluated forehead warm/cold thermal sensitivity, memory performance, and pinch grip pre and post-trials.

**Results:** HEAT and COLD trials induced large changes in mean Tskin in MS (HEAT=+3.66°C±0.78; COLD=-4.67°C±1; p<0.001) and CTR (HEAT= +3.27°C±0.43; COLD=-4.86°C±1.32; p<0.001). Tcore remained stable in MS (HEAT=-0.01°C±0.43; COLD=-0.07°C±0.15; p=0.64) and CTR (HEAT=-0.34°C± 0.46; COLD=-0.24°C±0.21; p=0.63). Forehead cold sensitivity significantly decreased in both groups during HEAT (MS=-1.41±2.06; CTR=-1.45±2.57) and COLD (MS=3.81±5.55; CTR=2.71±1.11). Memory performance was not affected post HEAT and COLD in neither group (p=0.63). Pinch-grip force was elevated during COLD in the MS group only (p=0.06).

**Conclusions:** This study is the first to demonstrate that, independently of Tcore, large changes in Tskin affect motor; but not cognitive nor sensory, function in MS. It appears that large drops in Tskin in MS alter motor control during fine manipulation. The classic view that Tcore is the sole responsible for the detrimental effect of thermal stress on MS patients may need revision.