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Mind over matter? Study reveals for the first time that core body temperature can be controlled by the brain

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A team of researchers led by Associate Professor Maria Kozhevnikov from the Department of Psychology at the National University of Singapore (NUS) Faculty of Arts and Social Sciences showed, for the first time, that it is possible for core body temperature to be controlled by the brain. The scientists found that core body temperature increases can be achieved using certain meditation techniques (g-tummo) which could help in boosting immunity to fight infectious diseases or immunodeficiency.

Published in science journal *PLOS ONE* in March 2013, the study documented reliable core body temperature increases for the first time in Tibetan nuns practising g-tummo meditation. Previous studies on g-tummo meditators showed only increases in peripheral body temperature in the fingers and toes. The g-tummo meditative practice controls "inner energy" and is considered by Tibetan practitioners as one of the most sacred spiritual practices in the region. Monasteries maintaining g-tummo traditions are very rare and are mostly located in the remote areas of eastern Tibet.

The researchers collected data during the unique ceremony in Tibet, where nuns were able to raise their core body temperature and dry up wet sheets wrapped around their bodies in the cold Himalayan weather (-25 degree Celsius) while meditating. Using electroencephalography (EEG) recordings and temperature measures, the team observed

increases in core body temperature up to 38.3 degree Celsius. A second study was conducted with Western participants who used a breathing technique of the g-tummo meditative practice and they were also able to increase their core body temperature, within limits.

Applications of the research findings

The findings from the study showed that specific aspects of the meditation techniques can be used by non-meditators to regulate their body temperature through breathing and mental imagery. The techniques could potentially allow practitioners to adapt to and function in cold environments, improve resistance to infections, boost cognitive performance by speeding up response time and reduce performance problems associated with decreased body temperature.

The two aspects of g-tummo meditation that lead to temperature increases are "vase breath" and concentrative visualisation. "Vase breath" is a specific breathing technique which causes thermogenesis, which is a process of heat production. The other technique, concentrative visualisation, involves focusing on a mental imagery of flames along the spinal cord in order to prevent heat losses. Both techniques work in conjunction leading to elevated temperatures up to the moderate fever zone.

Assoc Prof Kozhevnikov explained, "Practicing vase breathing alone is a safe technique to regulate core body temperature in a normal range. The participants whom I taught this technique to were able to elevate their body temperature, within limits, and reported feeling more energised and focused. With further research, non-Tibetan meditators could use vase breathing to improve their health and regulate cognitive performance."

Further research into controlling body temperature

Assoc Prof Kozhevnikov will continue to explore the effects of guided imagery on neurocognitive and physiological aspects. She is currently training a group of people to regulate their body temperature using vase breathing, which has potential applications in the field of medicine. Furthermore, the use of guided mental imagery in conjunction with vase breathing may lead to higher body temperature increases and better health.

More information: Kozhevnikov M, Elliott J, Shephard J, Gramann K (2013) Neurocognitive and Somatic Components of Temperature Increases during g-Tummo Meditation: Legend and Reality. *PLoS ONE* 8(3): e58244. doi:10.1371/journal.pone.0058244