## When stroke epidemiology meets weather and climate: a heat exposure index from human biometeorology

Investigating the relationship of stroke and weather is complex. 1°C of air temperature difference in a warm climate may not necessarily mean the same in a cold climate (1). In the thermal environment, in addition to considering air temperature and air humidity, wind speed can reduce the thermal stress conditions and different radiation fluxes can modify the thermal perception directly. Vapour pressure of the surrounding air, which affects human ability to cool down the body through transpiration, is also of importance. The effect of wind velocity becomes stronger when the body is sweating or under cold conditions. Development of adequate methods in assessing the relationship of weather and stroke needs to be locality specific and takes other relevant indicators into account such as physiological, behavioural and other characteristics to reduce ecological bias (2).

The concept of physiologically equivalent temperature (PET), as a single thermal index similar to air temperature with a widely known unit, °C, is used to consider the energy exchange of the human body under the standard conditions in an outdoor setting (3–5). In short, it contains meteorological and thermophysiological parameters described above and was initially created to characterise and evaluate the thermal bioclimate in a physiologically significant manner. It is then assumed that large differences between air temperature and PET may arise in certain periods of the year such as winter time in the northern hemisphere or summer time in the southern hemisphere (Fig. 1). The application of PET assessment can be carried out by a RayMan model (4). It also helps to assess cold stress (PET < 4°C), heat stress (PET > 35°C) and extreme heat stress (PET > 41°C). This can be linked to assess disease events in extreme weather conditions. With this shared value, pooling worldwide data for meta-analysis can generate valid and reliable comparisons and further assist translating the findings into clinical and other medical practice.

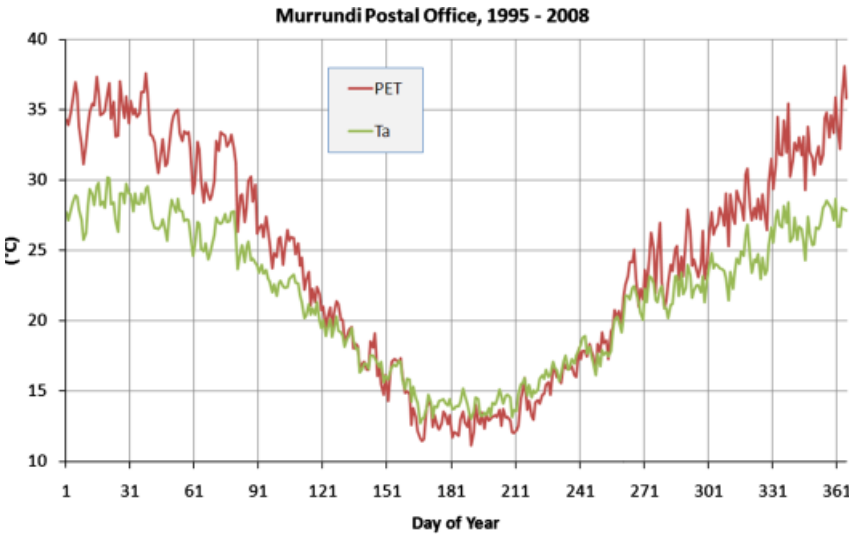


**Fig. 1** Mean air temperature ($T_a$) and physiologically equivalent temperature (PET) in Murrundi Post Office, the Hunter Region, Australia between 1995 and 2008.

Ivy Shiue[1]* and Andreas Matzarakis[2]

[1]Sydney Medical School, University of Sydney, Sydney, Australia
[2]Meteorological Institute, Alberts-Ludwigs-University Freiburg, Freiburg, Germany
*Correspondence:* Ivy Shiue*, Sydney Medical School, University of Sydney, PO Box M201, Missenden Rd. NSW 2050, Sydney, Australia.
E-mail: jshi6969@uni.sydney.edu.au

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## Cardiovascular autonomic dysfunction in acute stroke

The spectrum of cardiovascular autonomic dysfunction in stroke is still inadequately studied. We aimed to compare the results of cardiovascular autonomic function tests (AFTs) between stroke patients and healthy control subjects, to investigate the impact of stroke location, size, volume and severity on AFT parameters.

All patients with stroke admitted to the Stroke Unit of Royal Brisbane and Women's Hospital between September 2004 and September 2006 were considered for inclusion after obtaining written consent. Age-matched volunteers who did not have any systemic disease and were not taking any medications known to affect the autonomic nervous system were recruited as control subjects.

The AFTs were performed in the stroke patients within seven-days of stroke onset and repeated at one-month. Control subjects underwent identical testing on a single occasion.

The heart rate (HR) response to deep breathing ($HR_{DB}$) and the Valsalva manoeuvre (VM) was measured using the Colin BP–508 machine (WR Medical Electronics Co., Stillwater, MN, USA) according to standard protocols (1–3). Tilt study was performed for