Children’s Thermoregulation Is Still Being Built

A child’s body surface area to mass ratio makes heat harder to manage.

At a Glance

Children's thermoregulation is not fully mature until adolescence. A child's comfort setpoint is different from an adult's. Putting children in classrooms designed for adult comfort is thermal stress. [1]

Summary

Thermoregulation in children develops gradually through childhood and adolescence. Thermoregulatory setpoint, the body temperature around which the thermostat operates, is fully established by approximately age 15. Younger children have narrower thermal comfort bandwidths (lower tolerance for temperature variation) and different sweating thresholds than adults. [1]

Body weight distribution also affects thermal sensation. Children have higher surface-area-to-mass ratio than adults, meaning they lose heat faster in cool environments and gain heat faster in warm environments. A child aged 8 has approximately 1.5 times the surface area per kilogram of body weight compared to an adult. This surface-area disadvantage means children reach thermal discomfort at smaller temperature deviations than adults. [2]

Schools in India, particularly those in Tier 1 cities with air conditioning, design thermal comfort for adult occupancy (teachers, staff). Classroom thermostats are set to adult comfort: typically 22°C. For children, this is often uncomfortable cold. Children cannot adjust the thermostat. They sit for 45 minutes at a time in classes that feel uncomfortably cool. Over 200+ school days per year, March to November, this is sustained thermal discomfort. [3]

Biothermal Microconditioning in schools reduces forced uncomfortable cooling. Areca palm clusters deployed in classroom corners provide local cooling without global setpoint reduction. Teachers remain comfortable. Students, with different thermal needs, can choose proximity to clusters. A child feeling cold can move slightly away. A child feeling warm can stay nearby. Adaptive comfort without forced compromise. Schools deploying clusters report improved student comfort, reduced complaints, and improved concentration (thermal discomfort impairs cognitive function). [4]

Biothermal Microconditioning also provides psychological benefit: children experience a school building with living plants, not just mechanical systems. Biophilic spaces improve mood and reduce stress. Easy Retrofit to schools. One day deployment. Students' thermal comfort improves. Learning improves. [5]