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Short-term thermal adaptation and outdoor thermal comfort in Southern China: a case study of high-intensity outdoor training in summer

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Migrants from various climate zones adapt differently to the hot and humid climate of Southern China. Past studies have provided clear understanding on the mechanism of physiological adaptation to heat. However, psychological adaptation to heat is a complex process and its timescale is generally unknown. This study addresses this gap by investigating the changes in short-term thermal adaptation of university students (n=145) who participated in outdoor training in Guangzhou for two weeks in September 2018. We used a panel study while controlling for the influence of behavioral adaptation on outdoor thermal comfort. By adopting this approach, this study examines the relationship between acclimatization, psychological adaptation and outdoor thermal comfort. We surveyed the same group of students every day regarding their thermal comfort and psychological state over the two-week period. Meteorological variables at the training site were measured simultaneously to calculate the Universal Thermal Climate Index (UTCI). During the outdoor training, students also wore wristband fitness trackers to measure their heart rate, energy expenditure (calories) and exercise time. Students from the Guangdong province and other provinces were the baseline group and contrast group, respectively. Our study demonstrated the changes in physiological and psychological parameters of these two groups over the two-week period. In particular, students from Northern China showed a different rate of thermal adaption compared with students from Southern China. Our results can inform heatwave adaptation strategies and satisfy the thermal comfort and health requirements of people from various climate zones. Our study's methods can also be applied to cities in other climate zones.