Adaptation to Cold of Tropical People in Relation to Local Cold Tolerance and Linguistic Approaches

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Background

In this globalization's time, many people change their habitats. Thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different. Thermal sensation and comfort level are not the same in all climatic areas; people's perceptions and linguistic expressions also vary from culture to culture. People in different climate zone may have different thermal sensations or preferences even under the same climatic conditions. Humans have special heat and cold tolerance ability depending on their climate areas. Ethnicity determines the people's heat/cold tolerance power. Humans need to adapt to the impacts of climate change. The tropical natives who stayed temperate area longer were expecting to be more acclimatize to cold. Adaptations to cold may reduce the occurrence of accidents and improve human performance as surviving in the cold.

Purpose

- Compared the cold tolerance of Bangladeshi (tropical) and Japanese (temperate) people to local cold exposure by cold induces vasodilation (CIVD) [study 1].
- Questionnaire survey investigated the linguistic differences between Bangladeshi (BD) and Japanese (JP) respondents [study 2].
- Investigates the effects of the duration of stay in temperate area on cold adaptation of tropical indigenes [study 3].

Methods

The eight tropical and 14 temperate males students participated in first study. The subject's left hand middle finger was immersed in 5°C water for 20 min to assess their CIVD response (experiment room controlled by 25°C with 50% RH) [study 1]. A total of 1141 university students (932 in Bangladesh and 209 in Japan) responded to a questionnaire survey [study 2]. Eight Bangladeshi participated in third study that conducted one and half year long by four times CIVD experiments [study 3].

Results

There were significant differences between the BD and JP groups in temperature before immersion, which were 33.04 ± 1.98 and 34.62 ± 0.94 °C, and time of temperature rise after cold water immersion, which were 5.35 ± 0.82 and 3.72 ± 0.68 min, respectively ($P < 0.05$) [study 1]. For the Bangladeshi respondents, the closest feeling of thermal comfort was 'neutral' (66.6%) followed by 'slightly cool' (10.2%), 'slightly cold' (6.0%) 'slightly hot' (4.1%) and 'cold' (3.8%). For the Japanese respondents, the closest feeling of thermal comfort was 'cool' (38.3%) followed by 'slightly cool' (20.4%), 'neutral' (14.6%), 'slightly warm' (13.1%) and 'warm' (10.7%). 51.4% of the Bangladeshi respondents chose 'higher than 29°C' as hot weather and 38.7% of the Japanese respondents chose 'higher than 32°C' as hot weather. In the case of cold weather, 43.1% of the Bangladeshi respondents selected 'lower than 15°C' as cold weather and 53.4% of the Japanese respondents selected 'lower than 10°C' as cold weather [study 2]. No significant correlations between CIVD indexes within four times experiments. CVT (coefficient of variation of finger temperature during immersion) of subject 1 was 22.0% and 11.3%; subject 2, 25.5% and 15.0%; subject 3, 26.6% and 10.0%; subject 4, 28.2% and 10.8% in Exp.1 and Exp.4 respectively. [study 3].

Conclusion

The Japanese group (temperate) has a higher tolerance to local cold exposure than the Bangladeshi group (tropical) evaluated by the CIVD test. Japanese subjects grown up temperate areas so they gain higher local cold exposure power than Bangladeshi. It seems that subject had effect of 'duration of stay' and long time stay at temperate area might improve the local cold adjustment ability.

It is considered that the tropical (Bangladeshi) subjects have adapted to a hot environment since they were born in and are used to performing in a hot environment, so a cold environment might be difficult for them. 'Cool' was the most comfortable thermal sensation for Japanese but for Bangladeshi was 'neutral'. The most comfortable thermal sensation for Bangladeshi and Japanese people was different. It is seemed that the Bangladeshi respondents are more sensitive to cold weather, whereas the Japanese are more sensitive to hot weather.

The thermoregulation of a newcomer subject to a new climate zone is at first difficult to adapt; after that, gradually gain fine control. Long-time stay in a temperate area might improve local cold adjustment ability. Insulative adaptation could be observed after repeated mild cold immersions in which a significant metabolic response is not evoked.