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Heating chair assisted by leg-warmer: A potential way to achieve better thermal comfort and greater energy conservation in winter

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Abstract: Balancing thermal comfort and energy conservation has long been a hot topic in modern society. A potential way to achieve this purpose lies in extending the comfortable temperature range in buildings. This study aims to achieve better comfort and save more energy by combining heating chairs and leg-warmers. In this study, a series of experiments was conducted at the temperatures of 14, 16, 18 and 22 °C, respectively. During the tests, 16 subjects (8 males and 8 females) were exposed to cool environments with different heating modes (no heating devices, heating chairs and heating chairs with leg-warmers). The obtained results showed that the combination of heating chairs and leg-warmers were superior to heating chairs. Heating chairs assisted by leg-warmers exerted greater influence on reducing cold sensation, improving comfort and acceptability (more than 80% of subjects voted on the acceptable side even at 14 °C), and lowering the preference for warmth than using heating chairs alone. Also, the former one enlarged the heated area of human bodies thus achieving better local thermal sensation and comfort in cool environments. Moreover, the average heating powers of heating chairs were 34.1, 25.3 and 19.4 W for each person at 14, 16 and 18 °C, respectively. When assisted by leg-warmers, the average powers of heating chairs decreased to 22.6, 15.0 and 12.4 W for each person at 14, 16 and 18 °C, respectively, while those of leg-warmers were 18.5, 19.9 and 13.0 W at 14, 16 and 18 °C, respectively. As compared to the electricity consumption at 22 °C without personal heating, heating chairs could

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