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Sunshine Hour as a Factor to Maintain the Circadian Rhythm of Heart Rate: Analysis of Ambulatory ECG and Weather Big Data

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Abstract : Distinct circadian rhythm of activity, i.e., high activity during the day and deep rest at night are a typical feature of a healthy lifestyle. Exposure to the skylight is thought to be an important factor to increase arousal level and maintain normal circadian rhythm. To examine whether sunshine hours influence the day-night contract of activity, we analyzed the relationship between 24-hour heart rate (HR) and weather data of the recording day. We analyzed data in 36,500 males and 49,854 females of Allostatic State Mapping by Ambulatory ECG Repository (ALLSTAR) database in Japan. Median (IQR) sunshine duration was 5.3 (2.8-7.9) hr. While sunshine hours had only modest effects of increasing 24-hour average HR in either gender (P=0.0282 and 0.0248 for male and female) and no significant effects on nighttime HR in either gender, it increased daytime HR (P = 0.0007 and 0.0015) and day-night HF difference in both genders (P < 0.0001 for both) even after adjusting for the effects of average temperature, atmospheric pressure, and humidity. Our observations support for the hypothesis that longer sunshine hours enhance circadian rhythm of activity.

Keywords : big data, circadian rhythm, heart rate, sunshine
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