

Supplemental Table S1. Definitions Were Used for Basic Features to Check the Circadian Rhythm in This Study

Category	Feature name	Description	Rationale
Activity	Step counts	The mean cumulative count of steps during a day	Sufficient counts of steps are an important factor in achieving a healthy lifestyle.
Heart rate (HR)	Resting HR	The average HR within timeslots where a user has no activity (subject's resting). Measuring the HR at rest is a good idea. It tends to rise when one is stressed, uneasy, or unhealthy, which might be correlated with mood state.	The HR contains important rhythmic information. HR falls when sleeping and rises when activity increases. Therefore, it is ideal to have a good S-shaped cosine curve in the HR graph as you sleep at night and engage in a lot of activity during the day. From cosinor analysis for the daily HR, four parameters are considered: consistency, magnitude, misalignment, resting HR, and variability.
	HR_consistency	Consistency means maintaining the shape of the daily HR in cosine curve fitting. The better the fitting, the higher the consistency.	
	HR_magnitude	The daily HR rhythm of cosine curve has its magnitude (the absolute value). A larger magnitude means a clearer rhythm curve with low HR during sleep and high HR during activity.	
	HR_misalignment	The daily HR rhythm of cosine curve shows each peak point. Alignment denotes whether the daily peak point is the same in the daily cosine curve of HR. The higher this score, the more irregularity in circadian rhythm.	
	HR_variability	Variability means the change of mean daily HR.	
Sleep	Time difference in going to sleep	The mean of this value is defined as the average of time differences from the moment of going to bed from 8 hours before the sunrise time of the next day. Its standard deviation means the variability of asleep point.	Sufficient and regular sleep is the important factor in achieving a sound circadian rhythm and relieving fatigue and stress.
	Time difference in waking up	The mean of this value is defined as the average of time difference from the time of waking up to the time of sunrise. Its standard deviation is the variability of awake point.	
	Sleep duration	The length of sleep time.	
	Sleep quality	The quality score of sleep between 0 to 100. It is computed by $(\text{sleep length} - \text{restless sleep length}) / \text{sleep length} \times 100$. The higher the score, the better the quality of sleep.	

Adapted from Cho et al. [6].
HR, heart rate.