Circadian rhythms are 24-hour fluctuations determining periodicity in a wide range of physiological processes, including neural activity and hormone secretion, which controls sleeping and feeding habits. Despite significant diurnal variation in human brain function, neuroscientists have rarely considered the effects of time of day on their studies. Moreover, there are interpersonal discrepancies in sleep-wake patterns, diurnal preferences, and daytime alertness (known as chronotypes), which can cause different diurnal profiles in human cognition and brain performance. The study of circadian typology differences has increased in recent years, however, examining the effects of both time of day and people's chronotype requires further elucidation. In the present study, we performed graph-theory based network analysis on resting-state functional MRI (rs-fMRI) to explore the topological differences in whole-brain functional networks between morning and evening sessions, as well as between extreme morning-type and evening-type participants. To that end, 62 individuals (31 extreme morning- versus 31 evening-type) underwent two fMRI sessions: about 1 hour after the wake-up time (morning) and about 10 hours after the wake-up time (evening), scheduled in accord with their declared habitual sleep-wake pattern on a regular working day. The findings of this study revealed the effect of time of day on the functional connectivity patterns, and there was no significant difference in chronotype categories. Compared to the morning session, we found higher network segregation (i.e., higher small-worldness and modularity) and higher synchronization in the evening session. Interestingly, local graph measures were altered primarily across the left hemisphere in areas such as precentral gyrus, inferior frontal gyrus (orbital part), lenticular nucleus (putamen), and cerebellum.

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The public is welcome to attend.