Impact of time-of-day on cognitive function

The time of a day has a great impact on man’s cognitive functions,including memory,alertness and logical thinking.This is due to the rise and fall of circadian rhythms during the day,which could determine the activity of both brain and body.The study result could well explain the fatigue we usually feel in the early morning and post lunch,proving that it do have a physiological basis.Also,since the demand for cognitive performance in daily activities,such as studying, sports or work, the conclusion is significant in helping people better arrange their schedules,avoiding high demanding work in the low course of performance.

The cognitive function domains, ranging from attention to logical reasoning,memory in both short term and long term and other complex executions.(Schmidt et al.2007)These need to be assessed through objective performance measures via specific tasks in order to carry out the study.In the following process, we first focus on the subjective measures of alertness and sleepiness,which could be investigated via visual analogue scales and self reports.Using the collected data,we could outline the time-of-day influences on more complex cognitive performance measures such as attention, memory, and other executive functions.

But there are still some remaining questions.First,if the associations between circadian patterns in physiological parameters and subjective or objective performance measures are consistent and authentic?Second,do the connection differ according to what cognitive domain we explore? If not, we have to further question whether these discrepancies can be explained by differences in experimental designs. Each section is concluded by a synthesis of the main evidences yielded so far for the hypothesis that time-of-day fluctuations play a role in performance measures of cognitive functioning.

According to the research outcome,we could tell that the level of cognitive performance fluctuates in pace with the cycle of circadian rhythms.At the beginning of a day,the rhythms get to their lowest point.This, along with the sleep inertia,results in the low level of cognitive execution in the morning.After that,performance improves towards noon(14:00), but then decreases until dusk(16:00).It then gets better till the first half of the night(22:00),and decreases again and finally reaches its lowest levels at dawn (04:00) .(Valdez et al. 2012)

The result could be explained with the former finding of Kleitman (Kleitman et al.1938), who is generally credited for having first confirmed a systematic link between cognitive performance, chronobiology, and sleep.He proved later a parallelism between the time-of-day effects in performance for simple repetitive tasks like card sorting and the circadian rhythm of core body temperature (CBT). This and many other studies revealed a temporal relationship between circadian variations of cognitive performance and daily fluctuations in physiological variables.For example,when CBT is high, neurobehavioural performance levels also show to get high, while low CBT or high endogenous melatonin secretion are associated with a decrease in the level of alertness. (Colquhoun.1981)Kleitman et al. (1938) explained this association by arguing that speed and accuracy in performance are consistent with levels of muscle tonicity and in turn on the metabolic activity of the cells of the cerebral cortex. He therefore argued that raising the latter through the circadian increase in body temperature would mediately accelerate cognitive processing.

The low course of cognitive functions could disturb all kinds of daily activities.For example,while at work, persistent cognitive fatigue often leads to bad performance including a low motivation, increasing distractibility, poor information processing, and the feeling of burnout.Also,analyses have shown that the later in the school day the test was taken, the worse students performed on the test.Hopefully,the result of this research could help people better arrange their schedules in order to avoid our “low period” to enjoy a more efficient and pleasant life.

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Valdez, P. (2019). Homeostatic and circadian regulation of cognitive performance. Biological Rhythm Research 50, 85-93.

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