Multitasking is hardest in the early morning

Multitasking seems to come easier for some and is virtually impossible for others, however new research shows that it is difficult for all in the late night and early morning.

Previous studies have shown that the time of day greatly affects human's reaction time (for a review, see Carrier & Monk, 2000). This performance decrement is constantly found during the night with its' lowest point in the early morning. This leads to the assumption that the time of day directly affects the speed of cognitive processing.

Daniel Bratzke at the University of Tuebingen wished to take these studies a bit further and figure out what makes our reaction time so slow during the wee hours. While many researchers have studied this, Bratzke focused on one of the three stages of human processing because he argues that measuring overall reaction time does not allow researchers to separate the effects of three different processing stages.

Bratzke describes, for example, that the stage models of human performance assume at least three distinct processing stages: early perceptual, central decisional and late motor. He writes, "Given this widely accepted view, the question arises whether time of day affects all processing stages in general or one or more stages selectively."

There is evidence that the circadian variations in reaction time are at least partly due to changes in two of the processing stages; in the early perceptual stage for example, it takes longer to detect and identify a visual stimulus if you are tired. Likewise, manual dexterity, grip strength, and tapping, which assess motor ability, are susceptible to our circadian rhythm, with a low point in the morning and peak in the late evening.

Bratzke wished to localize the time-of-day effects on processes that occur during the central decisional stage, such as decision-making. Along with his colleagues, he hypothesized that reaction time performance decrements during the night might be associated with slowing of this central processing stage. They refer to this as the central-slowing hypothesis.

Bratzke observed six subjects during 28 hours of constant wakefulness. During this time, the subjects performed various cognitive tasks every two hours. Bratzke used a dual-task performance test (psychological refractory period paradigm) to assess the duration of the central processing stage with two stimuli introduced at different times. The results provided evidence for a circadian modulation on reaction time with a constant decrement in the late evening while reaching it's lowest point in the early morning. Importantly, dual-task interference increased in the night and early morning as well. Thus, central processing slowed down during the night, a result that supports the central-slowing hypothesis.

It is important to note that Bratzke monitored circadian phases through salivary melatonin concentration and body temperature. These biological markers of circadian phases corresponded with the decrement in reaction time, telling us that sleep deprivation was not the only moderator in the performance decrement.

These results build upon a recent study showing that even the well-practiced simple task of vehicle braking is subject to dual-task slowing. When watching the car brake in front of you while processing another stimulus concurrently the braking response can be markedly slowed down. The present results suggest that dual-task slowing as e.g. in this driving situation is influenced by the time of day with the most pronounced slowing in the early morning. Bratzke writes, "in addition to sleepiness, a combination of slowed reactions and impaired central efficiency might contribute to impaired driving performance and a higher risk for traffic accidents in the early morning."

Source: Association for Psychological Science