

Temporal and light-induced dynamics in self-control and cognitive performance in real life situations

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TEMPORAL AND LIGHT-INDUCED DYNAMICS IN SELF-CONTROL AND COGNITIVE PERFORMANCE IN REAL LIFE SITUATIONS

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Objectives

To date, light-induced and temporal variations in cognitive performance have mainly been studied under well-controlled conditions in the laboratory. These studies have provided relevant insights in whether and how light and time systematically impact human performance. Yet, how light and time influence performance under the dynamic conditions in daily life is largely unknown. Moreover, little is known about the impact of light, local clock time and Chronotype on individuals' level of self-control. Self-control is a psychological construct related to cognitive task performance. It refers to the capacity to change one's behavior according to standards (Baumeister et al, 2007), and is important to achieve long-term goals and success in daily life. The current study provides a first exploration into structural variations in self-control and cognitive task performance as a function of light exposure, local clock time, and Chronotype during individuals' daily routine in real life.

Methods

We employed wearable light sensors (Daysimeter worn at eye level and Actiwatch worn at wrist) combined with an experience sampling method to track light intensity levels, cognitive task performance and subjective self-control during individuals' daily routine (between 8 am and 8 pm) for three consecutive days. Thirty-one subjects participated in the study (17 male, $M_{age} = 24$, $SD = 8.5$; $M_{MSFsc} = 4.68$, $SD = .90$). Short performance tasks were administered semi-randomly over the day by means of an app to assess sustained attention (PVT), inhibitory capacity (Go-NoGo task), and working memory (2-Back task). Self-control was assessed hourly with three self-report items ($\alpha = .68$). Multilevel analyses were performed to model temporal variations, and test the effect of the average light intensity during the prior hour and Chronotype.

Results

Results revealed significant variations in state self-control as a function of local clock time with lower self-control in the early morning and early afternoon. Chronotype and hourly light intensity explained additional variance in state self-control ($\beta = -.19$ and $\beta = .07$ respectively, both $p < .05$). None of the performance indicators showed significant structural patterns with time of day or Chronotype. Effects of light on performance indicators revealed mixed results: Reaction times on the Go-NoGo task were shorter ($\beta = -.24$, $p < .01$), yet the accuracy on the 2-Back task was lower ($\beta = -.12$, $p < .05$), when participants were exposed to more intense light during the hour prior to the task. Additional analyses will be presented at the SLTBR meeting.

Conclusions

The results showed systematic variations in self-control as a function of local clock time, Chronotype, and light exposure. Temporal and light-induced variations in performance established in the laboratory cannot be directly translated to real-life situations, and require additional research.

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None