

Research Project

Influence of lighting on mental effort and on motivational deficit caused by fatigue

Third-party funded project

Project title Influence of lighting on mental effort and on motivational deficit caused by fatigue

Principal Investigator(s) [Lasauskaite, Ruta](#) ;

Organisation / Research unit

Departement Psychologie / Cognitive Neuroscience (de Quervain)

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Status Active

Most people in industrialized countries spend a large part of their life indoors and are exposed to artificial lighting. Thus, it is crucial to investigate physiological and psychological influences of artificial lighting, particularly in the current advent of new technologies for light emitting diodes. The overall aim of this project is to test the facilitating effects of light by manipulating its spectral wavelength composition and illuminance under mental fatigue and sleep restriction conditions. Within this project, I am proposing integrative theoretical models for lighting influence on mental effort. I suggest corresponding models concerning 1) impact through melanopic irradiance – spectral manipulation without perceived changes in color nor illuminance and 2) impact through illuminance when spectral properties remain constant. The models predict how, due to effects on alertness, light should impact experienced task demand and thus invested effort, based on motivational intensity theory. The main dependent variable—effort—is defined as resource mobilization to perform instrumental behavior. Effort will be quantified as changes in beta-adrenergic sympathetic nervous system impact on the heart. This proposal consists of three projects. Project 1 will focus on influence of lighting on mental effort by testing effects of melanopic irradiance and of illuminance. Project 2 will focus on predicted facilitating lighting functions in case of motivational deficits caused by mental fatigue. Finally, Project 3 will test the predictions concerning facilitating lighting effects on motivational deficits due to fatigue, where fatigue will be manipulated in controlled laboratory conditions by means of sleep restriction. Taken together, the planned systematic investigations will help to understand influences of different lighting parameters on motivation and effort investment. Moreover, interior planners, designers, and any of us who uses artificial lighting will benefit by understanding how to more appropriately adjust lighting for certain contexts, for example, for environments of high cognitive demand like in offices or schools. Finally, this research will also contribute in the development of future visual displays emitting light with which we will be able to modulate not only visible aspects but also non-visual aspects of light for effects on human physiology, cognition, and motivation.

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